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AN ENACTIVE APPROACH TO TECHNOLOGICALLY MEDIATED LEARNING THROUGH PLAY

by

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ABSTRACT

Research Question:

> Can the digital media artefacts and spaces in technologically mediated realities, afford sufficient embodied and situated presence to be embedded into enactive learning processes?

This thesis investigated the application of enactive principles to the design of classroom technologies for young children's learning through play. This study identified the attributes of an enactive pedagogy, in order to develop a design framework to accommodate enactive learning processes. From an enactive perspective, the learner is defined as an autonomous agent, capable of adaptation via the recursive consumption of self generated meaning within the constraints of a social and material world. Adaptation is the parallel development of mind and body that occurs through interaction, which renders knowledge contingent on the environment from which it emerged. Parallel development means that action and perception in learning are as critical as thinking. An enactive approach to design therefore aspires to make the physical and social interaction with technology meaningful to the learning objective, rather than an aside to cognitive tasks. The design framework considered in detail the necessary affordances in terms of interaction, activity and context. In a further interpretation of enactive principles, this thesis recognised play and pretence as vehicles for designing and evaluating enactive learning and the embodied use of technology.

In answering the research question, the interpreted framework was applied as a novel approach to designing and analysing children's engagement with technology for learning, and worked towards a paradigm where interaction is part of the learning experience. The aspiration for the framework was to inform the design of interaction modalities to allow users' to exercise the inherent mechanisms they have for making sense of the world. However, before making the claim to support enactive learning processes, there was a question as to whether technologically mediated realities were suitable environments to apply this framework. Given the emphasis on the physical world and

action, it was the intention of the research and design activities to explore whether digital artefacts and spaces were an impoverished reality for enactive learning; or if digital objects and spaces could afford sufficient 'reality' to be referents in social play behaviours. The project embedded in this research was tasked with creating deployable technologies that could be used in the classroom. Consequently, this framework was applied in practice, whereby the design practice and deployed technologies served as pragmatic tools to investigate the potential for interactive technologies in children's physical, social and cognitive learning.

To understand the context, underpin the design framework, and evaluate the impact of any technological interventions in school life, the design practice was informed by ethnographic methodologies. The design process responded to cascading findings from phased research activities. The initial fieldwork located meaning making activities within the classroom, with a view to to re-appropriating situated and familiar practices. In the next stage of the design practice, this formative analysis determined the objectives of the participatory sessions, which in turn contributed to the creation of technologies suitable for an inquiry of enactive learning. The final technologies used standard school equipment with bespoke software, enabling children to engage with real time compositing and tracking applications installed in the classrooms' role play spaces.

The evaluation of the play space technologies in the wild revealed under certain conditions, there was evidence of embodied presence in the children's social, physical and affective behaviour - illustrating how mediated realities can extend physical spaces. These findings suggest that the attention to meaningful interaction, a presence in the environment as a result of an active role, and a social presence - as outlined in the design framework - can lead to the emergence of observable enactive learning processes. As the design framework was applied, these principles could be examined and revised. Two notable examples of revisions to the design framework, in light of the applied practice, related to: (1) a key affordance for meaningful action to emerge required opportunities for direct and immediate engagement; and (2) a situated awareness of the self and other inhabitants in the mediated space required support across the spectrum of social interaction. The application of the design framework enabled this investigation to move beyond a theoretical discourse.

For Mum.

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Author's Declaration

At no time during the registration for the degree of Doctor of Philosophy have I been registered for any other University award. This was an individual study, with no contribution from collaborators. Relevant conferences were attended, at which work was presented.

Publications (or presentation of other forms of creative and performing work):

Hazelden, K. 2009. Authoring Spaces: Taking Advantage of Playful Expectations, Paper presented at the 4th Plymouth e-Learning Conference

Aga, B., Hazelden, K. and Phillips, M. 2008. The Play Algorithm - A(n):= [r = 1,2,.....N]. In HOMO LUDENS LUDENS - Play in Contemporary Culture and Society, GijŮn, Spain.

Carss, P. and Hazelden, K. 2008. Perception in Domed Virtual Environments. In Fulldome Summit, IPS2008, Chicago, USA

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Hazelden, K. 2006. Infinite Infants: Designing Telematic Playspaces. In IEEE Symposium on Visual Languages and Human-Centric Computing, Pg. 232- 233, Brighton, UK.

Hazelden, K. 2005. Infinite Infants. Poster presented at ESRC Research Methods Festival, St Catherine's College, Oxford.

Phillips, M. and Hazelden, K. 2005. Augmented Play Spaces. (or 'How to Demolish a Dream Architecture to Build the Augmented Play House'). Paper presented at the 2nd Plymouth e- Learning Conference, Plymouth, UK.

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1 Introduction

This study was an investigation into the application of enactive principles to the design of interactive digital media environments for young children's play in the classroom. The theory and practice presented in this thesis worked towards a design framework to maximise the potential for the enactive learning processes found in play. The design framework aimed to be relevant to the interaction, interface and experience design objectives, and the constraints of learning environments. This was a practical exploration of enaction in design; the work was embedded in a real world project that was required to deliver collaborative interactive systems for use in the classroom for Reception and Yr1 children's play.

My contribution was to address the design of young children's learning technologies in the classroom, the originality of my study came from viewing the design and analysis through an enactive lens. An enactive perspective is a non-reductionist view that is mindful of the complexity of learning and learning environments. It acknowledges the multitude of environmental, physiological, psychological, perceptual and social factors that converge to determine how we, as humans, make sense of our world. The enactive positions states that thought and action do not occur separately, but take place in the context of our semantic knowledge of, and interaction with, our environment, objects and other people (Jaegher & Paolo 2007, Varela & Rosch 1991). With this is in mind, the objectives of learning activities are to connect the self to physical and social worlds via interaction.

As an applied study, my contribution was realised as a framework for interaction design for learning. The framework clarifies an approach to technological mediated interaction and activity, and draws designers' attention to particular qualities which should be afforded. Theories of enaction applicable to learning focus on the coupling of physical, cognitive and social activity. In the first move made in

this thesis, these theories are drawn together and interpreted to define the necessary affordances. The interpreted framework comprises of three key attributes: (1) meaningful interaction - activity that is meaningful to the learning activity; (2) the creation, consumption and distortion of meaning; and (3) a situated awareness of others' activity. Through the course of this study, this framework was applied in my research activities and design practice.

Applying enactive theories of learning to the design of interactive media technologies assumes that the digital world is an adequate platform to support these theories. An enactive perspective considers physical action and social interaction as of parallel importance to, and inseparable from, cognitive activity. Therefore, development occurs via an ongoing interaction with social and material worlds. However, if this framework is applied to interaction with digital technologies and spaces, then a question arises:

> Can the digital media artefacts and spaces in technologically mediated realities, afford sufficient embodied and situated presence to be embedded into enactive learning processes?

And if so, what form should those technologies take? These two questions drove the inquiry in the research and design practice in this study. The second move made in this study was to apply the interpreted framework to the design and evaluation of deployable technologies for young children's learning. As such, I assumed if the design afforded the attributes defined in the framework, the enactive learning processes identified would emerge. If they did not, then the framework was used to determine the apparent shortcomings: how did the technology, method or task constrain the activity?

As the literature in this thesis will show, young children's social role-play is an manifestation of enactive processes. Though many factors were considered in this study, the lens was more sharply focused on play as a context to investigate the application of the design framework. Prior to embarking on the development of interactive technologies, the theoretical concepts were explored and grounded through an ethnographically informed and participatory design (PD) practice. The technologies, created as a result of the design activities, served as vehicles to understand how an enactive approach to mediated learning through play might be realised. The technologies selected

in the design practice aimed to favour whole body interaction, be socially accommodating and sensitive to context. The intention was to embed technological systems into physical spaces, to make the environment the interface, and exploit existing classroom behaviours.

An enactive approach attempts to put natural practice at the centre of the design and evaluation process. In this study, the implications of adopting this approach spanned across the inquiry - it defined the learning processes, framed the interaction and experience design, research, design process and evaluation methods. As an approach to design, an enactive approach absorbs the inherent mechanisms we have to engage with our world as the basis for engagement. Research and design activities are situated in their context of use, as the impact of a single element in learning, knowledge and behaviour cannot be defined or accounted for, without reference to the other factors. The role of design was also perceived in a different light, the research in this study did not only serve to provide design solutions, but extended the research. An applied design practice as a research method should enable theories to be put in-action. The hypothesis was that this approach to research and design would enable the children's engagement with technology to be more meaningful.

1.0.1 An Enactive Lens

Enactive principles have gained ground in Human-Computer Interaction (HCI) (Dourish 2001, Antle, Corness & Droumeva 2009b, Norman 1998), but have yet to be fully exploited in the design and evaluation of learning technologies for young children. An enactive framing for research and design is relevant to two key aspects of existing practice: physical actions and social behaviours.

First, an examination of the practices of a given environment should help locate spaces for intervention and ease integration. In this study, there was careful attention to how the technology co-existed with other aspects of classroom life. The objective of the ethnographic research, participatory and situated evaluations in this study, was to understand how classrooms' temporal, physical, organisational, social habits and habitats, placed constraints around the emerging design solutions. There was a requirement to study learning-in-action: to understand how learners and teachers interacted to generate meaning in naturalistic settings. Validity should therefore be achieved from situating research and applied practice in the context of use. A speculative design process considered what

role technologies should take. It was theoretically motivated, but also pragmatically grounded by attending to everyday practices.

Second, in terms of interaction design, established and emerging practices are a resource for a designer. In this investigation, the premise is that interaction should parallel the action in the learning activity - they should be the same. In enaction, 'action is more than an appendage to cognitive process' (Fischer & Zwaan 2008, p.837). We do not think first, and then act; rather actions are considered to be meaningful and part of our thought processes (Froese & Di Paolo 2012). Therefore, the action in the interaction should enable the user/leaner to think, perceive and act in a way that is meaningful to the learning objective - the interaction then becomes part of the learning activity. Meaningful interaction offers two advantages, one that interaction is more intuitive and therefore familiar. The other significant gain is that it may provide an environment to augment embodied and situated knowledge, and practice connecting the self to the environment. Within the scope of this thesis, this latter point, would be considered to be *learning to learn*.

The remaining part of this chapter gives an explanation of the project that initiated this study, an overview of the research subjects that ground the theoretical foundation of this approach, the methods used in the design processes, and the objectives and hypotheses that frame this thesis.

1.1 Project Overview

The PhD project described in this dissertation was conducted as part of the Infinite Infants project, a three year collaboration between i-DAT (Institute of Digital Art and Technology) and three local infant schools. The intention of the project was to identify and deploy technologies that could be used in the classroom, in conjunction with other curriculum activities. The head teachers of each school initiated the project with the aim of broadening the potential of what digital media and interactive technology could offer to the learning experience. The head teachers were responding to current thinking and publications in developing a Creative Curriculum[1], and specific calls to diversify the use of information and communication technologies (ICT) in cross curricula activities in Foundation level education[2]. Their objectives were aspirational, rather then concrete. They hoped the project would generate technological systems that would afford the three Cs - *communication, confidence and creativity*. These three qualities were thought to encapsulate a learning experience that could lay the roots for learning to be, learning to learn, learning to do and learning to live together, and therefore provide the critical elements in the journey of each child toward human and social development (Bennett 2008) [3].

To put these concepts in practice, the head teachers were keen to promote experiential, self-motivating, and a more embedded application of ICT in the children's classroom life. The technologies produced through this project were tasked with enabling opportunities to be imaginative and creative, and to provide a basis to build on confidence when using technology in learning and working with others. Further, the project and study needed a framework and method capable of

[1]The initiative termed Creative Curriculum was first introduced in the DfES paper Excellence and Enjoyment: learning and teaching in the primary years (DfES 2003). Within this approach, teachers were encouraged to take ownership of their curriculum, be more flexible and apply lateral thinking to the context and delivery of lessons. This was not a revolution in teaching strategies and primary school pedagogy, rather a distilling of best practice. A Creative Curriculum attempts to develop and apply learning skills, such as enquiry; problem solving; creative thinking; information processing; reasoning; evaluation; self-awareness; managing feelings; motivation; empathy; social skills; communication (Ibid., p.10).

[2]The DeFS publication, Curriculum Guidance for the Foundation Stage (DfES 2005) suggests the use of ICT in areas in areas of classroom practices and processes, such as storytelling, arts and research: 'Give opportunities for the use of ICT to develop skills across the areas of learning, for example a talking word processor to develop language and communication, vocabulary and writing, talking books for early reading, a paint program to develop early mark making, a telephone for speaking and listening, CD ROMs, video and television and musical tapes to find things out' (p.93). There is also a suggestion in this paper to include technology in the children's role play, to contextualise an applied understanding (p.94)

[3]The OCED (2008) paper cites Delors (1996) when defining these learning goals: learning to be (forming one's self identity); learning to do (through play, experimentation and group activity); learning to learn (through a learning environment providing interest and choice and that includes well-focused pedagogical objectives); and learning to live together (within the early childhood centre, in a democratic way, respectful of difference). 'The fostering of experiential, self-motivated learning in each of these fields requires a practice that puts children's participation at the centre of curriculum, and calls for the specific training of early childhood educators in the competences that allow this to happen' (Bennett 2008, p.33).

identifying and supporting children's confidence, creative and social behaviours; alongside the constraints and pragmatics of working in the classroom. The ethnographically informed design practice aimed to account for the multitude of factors that would enable these concepts to be realised.

I was the sole researcher, designer and developer for this project - working with Yr 1 and reception pupils (4 - 6 years) and teachers to shape the technologies into something that satisfied their, and my, criteria. The timeframe was to spend the first year researching the environment, the second year making a series of prototyped interventions, with final designs completed by the end of the year. By the third year, the interactive technologies were in place in the classroom to enable an initial evaluation of the children's first reaction, and a longitude study of the impact and integration of the design solutions over time.

A key objective of the design practice in this project was to support social play - multiple, co-located users engaging with the conceptual, physical and social world that emerges in group pretence and role-play. The focus on co-located play was a joint decision between the teaching staff and myself, and was decided early in the project's formation. For the teachers, play satisfied the 3Cs agenda. Play for reception and Yr1 pupils is a socially creative activity, and is an aspect of classroom life where the children have confidence. The teachers and I believed that it would be possible to lever these existing skills, and re-appropriate them for interaction design. As a designer, play is always compelling. It is an opportunity to engineer an environment that will be approached with a sense of fun and joy. Within the scope of this study, play is a manifestation of enactive theories of learning (discussed in depth in Chapter 2.2), and therefore provided a context for design via the repertoire of skills and expectations children have when engaging in play.

The design approach and emerging solutions needed to be mindful of the constraints of the design context. The deployed technologies were required to be accessible to the teachers and pupils, and to survive beyond the life of the project. Though the school were happy to provide an environment for experimentation, they wanted some tangible solutions which could be a part of everyday teaching and learning activities. Consequently, design outcomes needed to be stable enough to be deployable, simple enough to be used independently by the pupils and teachers without additional technical support, and malleable enough to satisfy the rotation of subject areas covered through the school year. The design choices were somewhat pre-determined by what was technically viable

in this space. To have any measurable impact in the long term, there needed to be a realistic approach to the types of technologies that were selected for use, and how they would be maintained beyond their initial deployment. Technologies that are too complicated, too big, or too delicate etc, would compromise the system's viability, and would cease to be sustainable in this environment.

Whilst the schools involved in this project had embraced technology in the classroom, there were some issues that were encountered when attempting to shape and deploy appropriate technologies. The ethnographic study described in Chapter 4 of this thesis, showed there was an absence of technology to support physical and social interaction, and an evident struggle on the teachers' part to make the technologies work for them. The technologies developed as part of this project aimed to tackle these issues by putting enactive theories of learning at the centre of the interaction and experience design. However, tensions with technology in learning and teaching practice, which are well documented (Selwyn 2002, Selwyn & Cranmer 2010, Loveless & Ellis 2001) and will be discussed in depth in Chapters 3 and 4, will not be eradicated by this project. As Selwyn et al (2010), and Loveless and Ellis (2001) state, it is better to be realistic about prospective outcomes of technological interventions. No application suite or pedagogical approach is going to overcome the insurmountable technical and knowledge challenges faced by schools (Selwyn 2002, p.175). This project accepted that accomplishments were likely to be modest, and therefore focused on subtle moves in local practices, rather than radical change. The framework for design that was established in this study would not solve all the problems, but took steps to acknowledge and accommodate them.

1.2 Theoretical Foundation

This section locates theories of enaction in learning and interaction design. Enactive learning, in this thesis, combines theories of situated and embodied cognition to establish comprehensive objectives and the requirements for design. The literature reviewed in this thesis to provide a theoretical foundation, looked to define the inherent mechanisms we have for making sense and developing, via our interaction with physical and social worlds. In the second part of the literature review, the enactive learning processes were held up as a template for interaction and interface design.

1.2.1 Enactive Theories of Learning

Valera, Thompson and Rosch (1991) are largely credited with defining an enactive perspective in cognitive science. 'We propose as a name enactive to emphasise the growing conviction that cognition is not the representation of a pregiven world by a pregiven mind, but is rather the enactment of a world and a mind on the basis of a history of the variety of actions that a being in the world performs' (Ibid., p.9). Valera at al draw on phenomenological view of mind and body, and therefore take the role of experience and the body seriously[4].

Theories in the enactive approach draw and build upon embodied and situated cognition. Embodied cognition states that sensory behaviour and cognition are inseparable. We do not act first and then think, these processes in the mind and body are simultaneous. 'The embodied perspective is built on the unification of these dualities, on the fact that mind and body, or representation and object, are not entities that dwell in two different worlds, but are participants in a single coextensive reality' (Dourish 2001, p.177) [5]. The body and body-in-motion are central. Higher-level cognitive skills,

[4]Phenomenology recognises the body in the function of mind and, in turn, considers the role of experience in consciousness. Concepts of embodiment gained ground in a growth in existential thought and phenomenology in nineteenth and twentieth century philosophers such as Edmund Husserl (1958-1938), Martin Heidegger (1889-1976) and Maurice Merleau-Ponty (1908-1961). 'Merleau-Ponty argues that perception and representation always occur in the context of, and are therefore structured by, the embodied agent in the course of its ongoing purposeful engagement with the world' (Anderson 2003, p.14). Phenomenology has been influential in multiple domains, each of which has a bearing on learning and theoretically driven design methods, including psychology (Piaget 1974, Gibson 1967, Hutchins 1994), artificial Intelligence (Clark 1998), linguistics (Lakoff & Johnson 1999), and design (Norman 1998, Dourish 2001)

[5]An embodied mind is a departure from classical, largely western, philosophies of how a mind develops and functions, and in turn the role of the body and the external world. In classical thinking, the mind and body are distinct entities; cognition is separable from the perceptual and motor capabilities and the social world. The fundamental principal of dualist thinking is that the mind and the body can be considered as disconnected in their development. A separation of mind, body and environment have remained central to theories of learning, from behaviourist to cognitivist and even constructivist models. Separating the mind from the body and the environment enabled theorists to consider these components in isolation. Be-

such as reasoning and problem solving, mental image manipulation, and semantic forms depend crucially on bodily structures (Lakoff 1987).

Situated cognition in the enactive framework is multi-layered. Foremost, perception, cognition and action are situated to contend with the here and now, in registering and responding to immediate stimuli. In dealing with immediacy, cognition is time-locked, and inseparable from real-time processes (ORegan & NoŚ 2001). 'The controller must generate appropriate action rapidly on the basis of ongoing interaction between the body and changing environment' (Clark 1998, p.7). Concepts around situated cognition also consider how the emergence of knowledge is contextually bound by the physical and social worlds we interact with. Consequently, the best way to learn is to immerse yourself in the environment you wish to learn (i.e. live in France to learn French). In this respect, learning is about understanding the meaning and significance of new environments, in accordance with other's understanding and physical parameters. Learners are tasked with gaining entrance into a shared world of meaning (Jaegher & Paolo 2007), and inference, modelling, mimicry and inquiry are the inherent mechanism from which understanding emerges (Spurrett 2004). Jean Lave and Etienne Wenger (1991) highlight that it is not just the tasks of a place that needs to be learned, but also the culture. Brown et al (1989) further consider the role of tools, language, values and the beliefs of practicing communities in learning and learning methods. These broad considerations shift the focus of analysis beyond the individual, to the whole of the social and physical attributes which both constrains and provokes action.

Accommodating these learning processes would be a challenging for any singular activity, however, as stated, many of these qualities are found in play. Consequently, children's play provided a context, parameters and measure for design. This thesis identified role-play, playfulness and pretence as vehicles for understanding the inherent and emerging processes in meaning making.

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haviourist and cognitivist pedagogies and methods are rooted in the assumption that everyone is learning from the same environment, from which each individual can construct an objective model of the world, from which one can make judgements. There is little attention the role the body plays in perception, rather perception is a passive acquiring of stimuli. The mind functions independently of the body; and the world, emotion, bodily states are sidelined. With the exception of a social constructivist approach, they are also highly individualistic, and give little thought to the influence of the social world in perceptual and cognitive processes. A separation made it possible to conceive of aspects of a world which are not received via stimuli, or constrained by the body's sensorimotor capabilities - the mind inhabits a body, but can transcend it. The misalignment between the apparent stimulus received through sensory apparatus and meaning that is perceived, led to assumptions about the capability of the mind. Termed a reductionist approach, the mind recovers and embellishes impoverished data, from which mental images are processed. As such, perception is indirect, mediated by the mind to create a mirror of the external world. Meaning then arises via a learned correspondence between symbols and things in the real world. Concepts related to enaction reject this notion of a separation of mind and body.

1.2.2 Technologically Mediated Learning and Interaction Design

This section introduces interaction and interface in terms of embodied, situated and social actions. To frame the design according to enactive theories, this part of the thesis will consider how interaction should occur, and what forms technologies should take to accommodate these interactions.

Paul Dourish's (2001) exploration of embodiment had a significant input into the realisation of enaction in applied design, and he was the first to offer a definition of embodied interaction. Embodied interaction attempts to make use of how we interact and perceive our world, as the basis for interaction and interface design. Of course, as Dourish (2001) acknowledges, all actions are embodied, and therefore the issue of embodied interaction could be a moot point, a meaningless objective for interaction design. To clarify, he states: 'What I am claiming for "embodied interaction" is not simply that it is a form of interaction, but rather an approach to the design and analysis of interaction that takes embodiment to be central to, even constitutive of, the whole phenomenon' (Ibid., p. 102). Rather than abstract reasoning, this thesis proposes that interaction and interfaces should be grounded by the integrity of the physical and social body.

Enactive systems should attempt to accommodate and exploit knowledge in action, by allowing the user to express and transmit their knowledge via different modalities. The design practice in this study considered blending the virtual and physical, to enable the environment to be the interface. Defined as *mixed reality*, they operate via a combination of augmented reality, by overlaying virtual data in the physical world; and augmented virtuality, by locating physical objects in virtual environments (Milgram & Kishino 1994). Mixed reality applications and environments predominately use mobile, context aware and ubiquitous computing to augment reality, and employ networked technologies to connect remote locations (Drascic & Milgram 1996). Sensory technologies enable physical spaces and objects to become an interface, with cause and effect spanning across the virtuality continuum (Milgram & Kishino 1994). There are some very positive elements to embedding interaction within a physical environment, which make it a compelling platform to enhance learning and play. The attention to sensory, auditory, visual and haptic modalities of mixed reality spaces are a welcome shift from the restrictive input / output of standard desktop systems. Technology is relocated from a land we peer into, to something we occupy.

The research at this stage in the dissertation, extrapolates a framework for the design of digitally

augmented learning environments, which acknowledges the holistic context of learning. The concepts that are outlined in this chapter were applied to my design practice when exploring how physical environments embedded with sensory and digital media (graphics, audio, video) technologies might enrich physical and social engagement with, and via technology.

1.3 Research Methods

The research methods described in this section are not new; the originality in this thesis comes from the enactive framing of the inquiry. This perspective acknowledges that the reason for the success or failure of technological interventions may be found far away from the human-computer interaction. An enactive lens attempts to capture a 360 degree understanding of a given context, so the attitudes, practices and expectations of the environment are factored into the design outcomes. This study pursued an inclusive approach in the design and evaluation methods, via an ethnographically informed PD process to acquire a tangible understanding of behaviour in context. The findings of the design and evaluation activities were to provide a platform from which to speculate how technology augments and affords embodied, situated and social interaction. The research and design methods were selected on the following assumptions:

- **The whole of the situation is under the lens**: To be accepted into classroom practice, there needed to be understanding of how and when the future technologies would fit into the physical space, structure and routines within the environment (i.e. organisation of lessons).
- **The design for technologies should emerge from the environments they were intended to be used in**: The approach started with a broad view, and developed via an ongoing interaction with, and participation from, the children and the teachers. The objective was to locate a viable path through the constraints of the design space. It was a process of emergence and elimination via a speculative design practice.

Situated action and context were highly relevant in this study: Firstly, in terms of interaction design, I wanted to make use of situated action - by that I mean the physical and social actions which equated to a learning experience. The second point was that in order to evaluate physical and social interaction with or via technological systems, I needed the systems to work in the environment. Accommodating situated action acknowledged that the meaning of activity is bound to its context. In order to locate familiar practice, there is a need to consider action within the situation it occurred - to make systems where the interaction is meaningful, but also the implications of that interaction on the wider environment. This requires designers to discover '(...) how work and interaction are embodied within those settings, because that embodiment determines how it is that computation

and the setting will fit together' (Dourish 2001, p.19). To aid familiarity and integration, this project worked with the technological tools that were already located in the classroom, such as interactive whiteboards (IWB), screen based technologies, cameras and digital media.

The methods used in this thesis generated qualitative, descriptive accounts of the classroom spaces and activities. The attitudes from pupils and teaching staff to technological interventions were, of course, paramount. However, at the same time it was not always possible to simply ask them what they wanted, how difficulties could be overcome, or potential realised. An enactive approach, as proposed in this thesis, attempted to allow the users to locate the technological, social, physical and cognitive constraints through their interactions. The meanings of these interactions were iteratively filtered by attending to existing practices and competencies, and validated by the users' direct involvement in the design practice. With the intention of accommodating emergence, as findings were revealed, formative assumptions were adapted and challenged. Consequently, the research was structured to enable refinement:

- Ethnographic field studies of practice to contextualise the study.
- Participatory design activities to specify the interaction modalities and technologically mediated environments that would afford situated and social action.
- The development and evaluation of an augmented play space to determine the potential for the technological mediation of enactive learning via play.

1.3.1 Ethnographic Field Study

From the mid-1980s, ethnographic methods have been employed as a viable approach to providing a detailed analysis of system design (Suchman 1987), and are now a common practice (Dourish 2006). Ethnography is a style of research rather than a single method, and is the study of social life in natural settings. 'It is premised on the view that the central aim of the social sciences is to understand people's actions and their experiences of the world, and the ways in which their motivated actions arise from and reflect back on these experiences' (Brewer 2000, p.313). The objective of the ethnographic fieldwork in this study was to comprehend everyday teaching and learning, as approaches to intervention needed to consider how to work from the chalk face (Selwyn 2010, p.20). Ethnographic methods seek to perceive the world from another's viewpoint (Agar

1986). It does so by allowing the researcher to describe the structure and dynamic happenings of the environment from the inside, with the focus of analysis extending to the whole system (Atkinson & Hammersley 1998). My aim was to embed myself in the school environment, as there was a requirement to determine accountability from the participants' perspective - how did they rationalise their behaviour? Spending time in their would meant that I could learn how to view the world from their perspective, which in turn influenced my analysis of research outcomes and design practice.

The ethnographic field study gathered qualitative data through observations of classroom activities, loosely and unstructured interviews, and discussions with pupils and teaching staff over a one year period. Observations included a wide range of classroom practices, but were largely focused on technologically mediated learning and teaching, and play in free and structured activities. Fieldwork data was analysed to reveal how well the current technologies met the needs and motivations of young learners and teachers.

1.3.2 Participatory Design

Once the ethnographic study was completed, the methods used for the second stage of the applied research were based on PD. The key difference between PD and ethnographical fieldwork is where the study is located. In PD, users come out of work situation to share the design task with designer, whilst ethnographic studies locate the researcher in the context of use (Dix & Abowd 1993, p. 506). As the approach in this design practice was emergent, rather than goal directed, it began with a broad scope for possible interventions, and therefore multiple directions were pursued through a series of PD workshops. The PD activities aimed to test anticipations and affordances of digital technologies from the knowledge gained through fieldwork. The design practice, at this stage and throughout this research project, was extremely pragmatic - workshop activities used low-tech equipment, prototypes, and other propriety systems.

1.3.3 Augmented Play Space

The intention of this study was to design systems that would allow a speculative exploration of the technological mediation of enactive learning. The final technologies developed through this project were created as a malleable tool for the children to use in their play. Given the modest scale of this project, there were limited expectations that the design outcomes would provide all the answers,

but instead the aim was to offer some guidance in the field of interaction design, through the trials and errors experienced in my process.

The final system consisted of a visual augmentation of the physical play space environment, using sensory technologies and large media displays. The objective of the design practice was to develop technologies to support multiple users engaging in shared mixed reality spaces. The task of the final system was to evaluate play in enactive terms, when the activity was technologically mediated. This project aimed to afford a social activity through shared representational spaces, to enable groups to coordinate their activity. The task in testing was to find evidence of the embodiment of the visual representations in the children's social play behaviour. The final evaluation therefore investigated whether the representations of reality could take advantage of children's embodied knowledge, which would be evidence if the children were able to integrate digital media elements in their play. Measuring the impact of technology on the school, teachers and children was anticipated to be problematic, as Selwyn et al (2010) notes, the data has no base to compare, if such a comparison would be useful due the complex and multiple variables. However, by evaluating the design technologies after a sustained period post deployment, the factors that influenced the degree of integration could be assessed.

1.4 Research Objectives

This section defines the key objectives explored in this thesis. As this was an applied study, the first two objectives contributed towards the third and final objective.

1. Identify the factors that define enactive learning processes, and demonstrate how play is a manifestation of enaction in-action.

Enactive theories pursue a holistic account of the development of conceptual understanding and expression, with an emphasis on social constructs and action in learning. Drawing theoretical parallels between processes and characteristics evident in both domains showed a relationship between an enactive understanding of leaning and play. Play therefore provided a context for design, as a manifestation of these processes.

The primary rationale for selecting enaction as a theoretical basis for learning comes from the application of these theories in cognitive science (Di Paolo & De Jaegher 2010) and interaction design (Dourish 2001, Antle, Wise & Nielsen 2011). However, enaction is not a complete departure from previous theories of learning, and as there is significant overlap, particularly with social constructivism. It was not the purpose of this thesis to closely examine the contradictions between constructivist thinking and enactive theories of development. Rather the view is to consider enaction as a continuation, and therefore lean on constructivist theories that are in tune with the enactive framework[6]. Theories between enaction and constructivism are similar as they are grounded by experience, the concept of what constitutes *real* and subjective constructions are dependant on lived experience[7].

Despite the continuity, there are some fundamental differences that separate the constructivist and enactive frameworks. Constructivism is concerned primarily with cognitive learning, though in agreement that meaning and knowledge is constructed through recurrent engagement with ma-

[6]This thesis draws on Vygotsky (1978), Piaget (1972), Bruner (1976), and Dewey (1966) as their significant contribution to learning theory cannot be overlooked. Social constructivist theories are particularly useful as the role of social and cultural situatedness of cognition is less explored within the enactive framework (Jaegher & Paolo 2007). Principals such as the social determination of meaning and value, are carried over into the enactive framework, though how they occur is at times contested.

[7]Within constructivism, 'what is 'given' or assumed at the outset of our construction is neither bedrock reality or out there, nor is it a priori: it is always another constructed version of a world that we take as given for certain purposes' (Bruner 1992, p.97). Dewey and Piaget recognise that knowledge and learning have a biological basis, 'a complex circuit of organism-environment interactions that makes up our experience, and he showed how experience is at once bodily, social, intellectual, and emotional' (**?**, p.97)citing Dewey]Lakoff1999.

terial and social worlds, it does not explain the development of unconscious cognitive processes. For constructivist theorists, perception is an unconscious inference that disembodies the learner (Lakoff & Johnson 1999)[8]. The final point of departure, is that action in constructivism does not go far enough. Bruner (1992) put forward a structure for development that suggested the infant moves through stages of enactive, to iconic and finally symbolic thinking. Each stage must be achieved prior to a development shift. Consequently the child first thinks only in terms of action, then imagery, before accomplishing words and numbers as mechanisms for cognitive action. There is no continual or parallel development of perception, action and cognition, but discrete phases which denote development. Bruner's definition of enactive learning is not how this term is used within this thesis. Enaction, in this study, is used to highlight the interdependence of action in thinking - it is not a discrete stage, but always present.

2. Execute context aware design practices.

The theoretical investigation, ethnographic fieldwork and design practice in this study, examined learning environments and behaviours to identify how technology and play are situated in the classroom. This was an attempt to understand how digital media was acted upon to reveal expectations and understanding of technology, and therefore locate appropriate technological interventions. Situated research and design methods aimed to create common ground between users and designer.

3. Develop a design framework to consider the potential for enactive learning processes with interactive digital media technologies.

Through the design and deployment of technologies for physical and social play in the classroom, this study explored whether the enactive qualities of play were transferable to digital environments, and therefore could be exploited in the interaction and experience design. The plan that emerged in the design practice was to augment the children's role play spaces. This raised the question of whether digital media artefacts and environments can afford a sufficiently embodied, situated and social presence to be embedded into enactive learning processes. The intention on my part was to

[8]Constructivism maintains the assumption there is a world of fixed properties waiting to be recovered (**?**, p.9). The meaning of things is there to be absectioned from the environment, therefore constructivism fails to consider how meaning is created by the agent. From an enactive perspective, meaning occurs at the threshold of action, perception and cognition interacting with an environment. 'The "finding" of meaning must be enacted; it is always a formative activity, never about the extraction of information as if this was already present' (Di Paolo & De Jaegher 2010, p.42). The constructivist position creates a division between the being and it's environment - a trajectory that leads to a dichotomy of the individual from their social and material world.

explore whether the children were able to integrate digital representations (images, video, sound) and causality in social play activities, as they did in their physical and social role play and pretence.

1.5 Chapter Structure

Chapter 2 in this thesis draws together literature to identify enactive theories of learning and play, and later how these are applicable to interaction design. Chapter 3 describes and qualifies the methodologies utilised in the design and evaluation processes within this investigation. As mentioned in this chapter, these are found in ethnographic, participatory and user/context centric approaches to research activities and analysis. Chapters 4 to 6 focus on the research and design practice in my study, at each stage the findings are analysed to consider how the theoretical framework should be modified or realised. Chapter 4 presents a descriptive account of learning, and the use of technology and play in everyday classroom settings. Chapter 5 in this thesis describes the formative application of technology to various learning processes and practices, to shape the form and interactional modalities for the toolkit of technologies built in the final stage of this investigation. Chapter 6 focuses on the final stage of the design process, which was concerned with the evaluation a suite of software onto a system located in the children's role play spaces.

2 | Enaction

This chapter defines learning from an enactive position, and then underpins and contextualises these attributes in play. Chapter 2.1 establishes the principles of enactive learning processes, outlining the basis of enaction from which an initial design framework is derived. Chapter 2.2 identifies how the established enactive principles are evident in play and playful activities, which mark it as an enactive learning experience, and offer a some parameters for design. The final section 2.3 considers how the combined play and enactive qualities, behaviours and motivations might be supported and accommodated in terms of interaction and interface design.

2.1 Enactive Theory of Development

This section is fairly substantial as it establishes the theoretical basis for the enactive approach to learning in this thesis. The key concepts work toward shaping a framework for learning that informs the approach to design. The framework is based on three key aspects of the enactive position on learning and adaptation:

1. Knowledge and behaviour is situated.
2. Meaning is generated via the creation and consumption of self produced values.
3. The social world augments our learning and defines what is meaningful in our world.

The objective of this section is to establish a basis for these principles, and to identify components essential for supporting enactive learning processes.

2.1.1 Enactive Principles

The first part of this section focuses exclusively on the principles that underpin enactive theories of development, definitions of knowledge and intelligence. An enaction position states that conceptual structures emerge from autonomous action with the resources (people and objects) available in an environment. This section describes how cognition, perception and action develop in parallel, are situated in, and constrained by, the environments from which they emerge.

2.1.1.1 Coupling

The enactive position states that adaptation emerges from a sensorimotor coupling with the environment. A foremost example of this is the recurrent sensorimotor patterns that enable action to be perceptually guided (Varela & Rosch 1991). Perceptually guided action defines a process where the senses do not passively recover stimuli from an environment, but play a role in guiding action in an environment. Perceptually guided action is best illustrated by an experiment done by Held and Hein (1963), whereby a litter of kittens were kept in the dark from birth, and only exposed to a lit environment under special conditions. When in the lit environment, one half of the litter were allowed to roam freely. Each roaming kitten was attached to a cart, in which another kitten was placed. Consequently, the kitten in the cart only experienced the lit environment from his position in the cart. 'Their seeing was passive and played no role in directing their movements' (Masciotra & Morel 2006, p.7). From the cart, the passive kitten had no opportunity to develop a physical understanding of his environment in parallel with his perceptual skills, as his self-produced motion had no correlation with the visual stimuli. 'He would be unable to tell, in short, whether his position in space was changing or whether the world was moving' (Gibson 1967, p.249). After eight of weeks of these conditions, both sets of kittens were observed roaming freely in the lit environment. The active kittens had no difficulty negotiating the space; but the passive kittens bumped into objects, walked into walls, and even failed to blink when objects were placed near the eye - essentially behaving as if they were blind. This experiment demonstrated that '(...) objects are not seen by the visual extraction of features but rather by the visual guidance of action' (Varela & Rosch 1991, p.175).

As a consequence of coupling, and evident in perceptually guided action, perception is considered to be direct - cognition occurs at the point of action, and not prior to action (Varela & Rosch

1991, Gibson 1979)[1]. The direct perception position claims that objects within the environment are recognised in terms of their affordances - perceived opportunities to act upon (Gibson 1979). For example, an animal sees a tree, but in real terms perceives it as something to climb, somewhere to shelter, a source of food etc.

The mechanisms to couple action and perception, which enable it to be perceptually guided, are considered to be innate (Gallagher 2005, p.81). 'There is no need to learn to translate back and forth between visual, proprioception and action as from the start senses linked to each other and to possibility of action in supramodal and interpersonal body schema' (Thompson 2001, p.7). The act of learning to grasp an object is an example of the progressive integration of cognition, action and perception.

> At a certain point, the activities of the eye and the hand intersect: the eye catches a glimpse of the hand or the hand moves in front of the eyes. Such occurrences provoke the eye's "interest" in the hand, and it begins to follow the hand's movement. Thus when the object is situated within the hand's reach, and both the hand and the object are in the same visual field, it becomes possible to grasp the object, under the perceptual guidance of the eye (Masciotra & Morel 2006, p.44).

The properties of an environment are enacted through the senses, rather than recovered, thus understanding is a consequence of a history of coupling action and perception through interacting with a material world. 'According to the enactive approach, perceptual content becomes available to experience when perceivers have practical mastery of the ways sensory stimulation varies as a result of movement' (Noe 2004, p.119). Objects are rarely seen from the same angle or orientation, and it is the prior knowledge of moving around, touching and holding objects, which contributes to perceived dimension and volume from a single point of view.

In addition to demonstrating how cognition, action and perception are coupled with the environment, the Held and Hein experiment and the act of learning to grasp an object reveal two further key principles of the enactive position - the parallel development of action, perception and cognition, and the need for autonomy.

[1] JJ Gibson's concept of *direct* perception opposes the Cognitivist's theory of perception as *indirect*. Indirect perception assumes the act of perceiving occurs in discrete steps: first the stimulus is received via sensorimotor systems, then processed by the mind, which in turn prompts action (Froese & Di Paolo 2012).

2.1.1.2 The Emergence of Conceptual Understanding

As demonstrated, understanding cannot be achieved from passively receiving information, autonomous agency is a necessity for meaning to emerge. 'At the core of the paradigm of enaction, we thus have a notion of movement that is actively self-generated through its living and lived embodiment, and which at the same time brings forth a world of significance' (Froese & Di Paolo 2012, p.3). With autonomy, the process of understanding an environment is to consider it in terms of possible affordances. Valera et al (1991) claims adaptation is made possible because coupling is viable. 'If this coupling were to be optimal, the interactions of the system would have to be (more or less) prescribed' (Ibid., p.205). This is clearly not the case - survival is about effective coping with an environment, and can take many routes. Rather than a prescriptive set of interactions, engagement within an environment is proscriptive within the structural properties of both being and environment: '(...) any action undertaken by the system is permitted as long as it does not violate the constraint of having to maintain the integrity of the system and/or its lineage' (Ibid., p.205). Put more simply, anything that is useful is considered, all other things are discarded.

The progressive integration of action and perception occurs with parallel shifts in action, perceptual ability and conceptual structures. The parallel shift in comprehension is evident, as with the kittens, when an infant achieves self-locomotion. Piaget (1974) conducted a series of experiments to determine an infant's comprehension of persistent objects in space and time, when they were positioned independently of the infant's interaction with them. During the trial, children aged eight to ten months were shown a toy being placed in a box - location A. After a short period of three to five seconds, the child was asked to retrieve the object. This process was repeated several times, each time the child would almost always retrieve the object from it's location. After this was shown to be consistent, the experimenter would switch without warning, and hide the toy in a different location (B), and after a short delay, the child was asked to retrieve the toy. Piaget noted the children make a strange behavioural error - rather than reaching for the place where the toy disappeared (location B), the child would look again in Location A. The child did not connect the switch in the disappearance of the object, to where it could be found. The object simply ceased to exist, and the expectation from the child was that it could be found where it had been previously located. However, when the experiment was repeated with infants aged twelve to fourteen months, the error was not present. This shift in search behaviour occurs during the time the child begins

to move themselves around their environment. At this stage, the experience of moving around a space enables the generation of new patterns of causality, which systematically alters the child's conception of self, object and environment. 'Each developmental achievement on the part of the infant - hand-eye coordination, sitting, crawling, walking - opens the infant to whole new sets of multi-modal regularities' (Smith & Gasser 2005, p.21).

Parallel development shows that with new ways of engaging (moving, touching etc) with the world, emerges new conceptual understanding[2]. Linguists Lakoff and Johnson (1987) suggest the conceptual system uses metaphors of the body and bodily action as the basis for its formation - we perceive as a body, therefore the body form and the body-in-motion shape how we conceive and communicate our world. This is made possible through the capacity to project bodily and interactional experience to abstract conceptual structures. A simple example of the metaphorical projection from the physical to the abstract can be found in a human's spatialised concept of time: we move towards the future, the past is behind. Additionally, there are many contexts where the concept of an *up* or *down* motion is correlated directly to quality or quantity - i.e. stocks are falling, anger rising. 'Metaphor allows conventional mental imagery from sensorimotor domains to be used for domains of subjective experience' (Lakoff & Johnson 1999, p.45). Metaphorical mapping arises from the occurrence of a structural correlation in our physical experience, for example, when we add more to substances, they rise (e.g. water rising in a glass as it is filled). 'To function as a source domain for a metaphor, a domain must be understood independently of the metaphor, VERTICALITY is directly understood, since UP-DOWN schema structures all our functioning relative to gravity' (Ibid., p.276). Conceptual structures are a consequence of the body perceiving, acting and thinking in a physical world, and our innate ability to project these concepts of movement and structures to conceptual meaning. Conceptual understanding would not develop, if there were no parallel growth in the ability to move and charter the environment, and vice versa.

2.1.1.3 Third Order Couplings

Enaction acknowledges that adaptation emerges both as social constructs (Lakoff & Johnson 1980), through processes that occur in the minds of others (Hutchins 1994, Pea 1993) and via

[2]Parallel development can be accelerated via mediating the body beyond the constraints of its physiology. An example of this can be found in the use of baby walkers, which allows the infant to move around their environment in a manner that is currently beyond their unmediated ability. In a replication of Piaget's A not B test, it was found that use of the walker could accelerate the search development of the infant by 3 months (Smith & Gasser 2005, p.22).

interaction with others (Jaegher & Paolo 2007). Maturana and Valera (1992) define social phenomena, as the spontaneous constitution of third order coupling, and as such third order unities are constructed as social systems (p.193). The recurrent interaction which produces environmental couplings, are the same inherent mechanisms which enable third order couplings. As such, social behaviour is a consequence of the being's phylogenic lineage, instinctive behaviour driven by internal mechanisms, and ontogenic forms of interaction (Ibid.). Cultural behavioural patterns and attitudes are acquired ontogenically in the communication dynamics of a social environment, and can remain stable for many generations (Ibid., p. 201). Knowledge acquired through these processes is so embedded, that it is often considered to be common sense.

There is an elevated competency in the learner brought about through third order coupling. 'This interaction enables them to generate a new realm of phenomena that isolated individuals cannot generate' (Maturana & Francisco Varela 1992, p.190). The social worlds we occupy enable us to make sense of these worlds together, either through watching and mirroring other's behaviour (Barsalou 2008, Meltzoff 2007), or in participating in other's thought processes (Jaegher & Paolo 2007). It is through communication and observation that we make sense of things together. Constant monitoring of feedback in communication enables a close awareness of other's subjectivity to test one's own concepts against - 'no other form of social relating can reproduce the plenitude of symptoms of subjectivity' (Berger & Luckman 1966, p.43). The opinions and practices of others provides a testing platform for one's own attitudes, it is therefore in close interaction that we best understand ourselves. In this respect, self-identity emerges through social interaction, the boundaries of self - in terms of similarities and difference - are made apparent.

2.1.1.4 Summary: Enactive Principles

This section has established the basis for the enactive position. Sensorimotor coupling is key, it demonstrates that we directly perceive and understand our environment in terms of how we can interact with it. The process of integration with an environment is proscriptive and viable, as opposed to predefined, and requires autonomy to actively locate possible affordances. Conceptual structures and understanding are a consequence of having a body and body-in-motion, as we understand the world in terms of the ways we can engage with it, and the phenomena we perceive. Cognition, action and perception are thought to develop in parallel, development in one domain,

such a movement, will occur with a shift in cognitive and perceptual ability. The social world has a significant impact on the meaning of our world, we understand the world, in part, as others define it, and behaviour is constrained by present and past social and cultural attitudes. The rest of this section explores these concepts in more detail, drawing attention to the requirements for learners and learning activities in respect to situating the self in environments, the emergence of meaning and social interaction.

2.1.2 Connecting the Self with the Environment

From an enactive perspective, an emotional and judgmental response to a situation is a mix of automatic and controlled reactions, based on phylogenic and ontogenic couplings (Varela & Rosch 1991). As memory is constructed from patterns of activity within the constraints of the body and it's environment, its function is to provide a direct experience in order to moderate situated action. Consequently, learning is contextually bound to the situations in which it emerges, learners must learn how to perceive, think and act within this environment, to understand the constraints and affordances. 'The function of the mind is to guide action, and cognitive mechanisms such as perception and memory must be understood in terms of their ultimate contribution to situation-appropriate behaviour' (Wilson 2002, p.627). If competency is situated, then learning is a process of situating (Masciotra & Morel 2006). This section will explore, how situating is an active process of physical, perceptual and cognitive participation, inquiry and reflection via interaction with an environment.

2.1.2.1 Autonomy in Learning Activities

Agency and autonomy are crucial factors in learning. Agency, the motivation and intention that drives action, is dependent on perceived affordances. Therefore it arises through interaction, and constrained by the environment. Learning to grasp, in the example cited, shows how agency emerges in action, and therefore needs to be exercised (Pickering 1993). Learning activities that provoke and accommodate self-initiated and self-directed behaviour enable a learner to refine his ability to ask questions and seek solutions. Learning activities should consider how the learner guides the self through situations, not just to practice existing knowledge, but also to acquire a new understanding about the world. These are the mechanisms of learning to learn.

Masciotra et al (2006) suggest that autonomy emerges via exposure to new situations, prompting

the learner to make use of lived experience to make sense of novel interactions in an unfamiliar environment. They draw on Jean Piaget's concepts of accommodation and assimilation as part of a cyclical process of development[3]. Assimilation is concerned with engaging new information with pre-existing knowledge, whilst accommodation is the transformation, or refinement, of existing knowledge into new knowledge. The learner exploits experience to guide action, not just to practice existing knowledge, but acquire new knowledge. Masciotra et al recommend employing a number of open activities including problem based learning[4], experiential learning[5] and project work[6] (Ibid., p.168). Each of these activities gives the learner opportunities to exercise their ability to locate not just the solution, but also the necessary questions (Ibid., p.169).

In each of these approaches, competencies should emerge through a cyclical process of inquiry and critical reflection of the experience (experiential), the impact of realised and theoretical solutions (problem solving), and adaptation to changing circumstances (project work). They require the learner to take ownership of a meaningful task in an authentic setting, to capitalise on lived experience and develop skills that are applicable to complex real world environments. With ownership comes autonomy, which gives the learner the space to locate the constraints of the situation that, in turn, provide a stimulus for action.

[3]Piaget's frameworks for learning are underpinned by his theory of genetic epistemology. For Piaget (1959) the child must develop through four key stages of cognitive structuring, mastering modality in one knowledge domain, before he can shift to the next one. Children start at a sensorimotor stage (0- 2 years), when knowledge and intellect is positioned solely in action. They then enter into the Preoperation period (3-7 years), attained with the use of symbolic knowledge, exhibited in verbal and representational (images and objects) expressions. From this the child will ease into the operational stage (8-11 years), where there is evidence of logic and a comprehension of structured systems (numbers, alphabet etc). The final stage is formal operations (12-15 years), where the child has reached a state where all cognition is based on abstraction. The child moves through each stage by relating new knowledge to existing schemata, adaptation through a process of assimilation and accommodation.

[4]In problem based learning, the problem is not defined. Learners must assess the state of the given situation to locate the cause of the state (Savery & Duffy 1995). For example, hypothesise about the cause of the illness based on perceived symptoms. By locating the problem and sourcing possible solutions, the objectives, research and analytical processes are self initiated and directed (Masciotra & Morel 2006, p.171).

[5]Experiential learning is considered a form of natural learning or *learning by doing* in settings that have the affordances of real life. It is a holistic, immersive approach to learning, such as apprenticeships. Experiential learning is considered as a favourable option for adult education, and as an approach to life long learning (Kolb 1984). David Kolb, who is credited for raising awareness and formalising experiential learning models, based his work largely on constructivist theorist such as John Dewey (1938) and Kurt Lewin (1890-1947). Experiential learning is closely linked to the situated learning model identified by Lave (1991) and Wenger (1998), which aims to structure activities based on the practices of professional and skilled communities.

[6]Of the three examples presented here, project-based learning is perhaps the method practiced most widely in school environment. Project-based learning asks the learner to be adaptive, to respond the results of their speculative investigation. The outcome relies on a learner's ability to generate ideas, aggregate, value and present information from multiple sources (Katz 1994, Katz & Chard 2000)

2.1.2.2 Distributing Cognitive Processes in the Environment

Part of situating, is learning how to offload cognitive processes into the resources in the environment. The use of tools can increase the efficiency and extend the achievements of the learner. For example, multiplication of high numbers is difficult to do unaided, easier with the aid of pencil and paper, easier still with a calculator. In both examples, the cognitive activity is partially externalized. Although the objective (calculate the sum) is the same in each instances, and activity is very different. Knowledge here depends on an ability to use what is available within an environment. 'The surround - the immediate physical and social resources outside the person - participates in cognition, not just as a source of input and a receiver of output, but as a vehicle of thought' (Perkins 1993, p.90). The artefacts in our environment participate in our development. The tools humans use, whether that be a pencil or Google, provide an extension to cognitive processes that would not be available without the use of the object.

2.1.2.3 Whole Body Learning

Cognition is the result of a lawful linkage between perception and action: 'Sensory processes (perception) and motor processes (action), having evolved together, are seen therefore as fundamentally inseparable, mutually informative, and structured so as to ground our conceptual systems' (Varela & Rosch 1991, p.173). To be considered enactive, learning activities should take advantage of the intrinsic connection between the psychological and physical domains - how we use the body to explore and solve conceptual problems. Approaches to learning therefore need to be mindful of exercising the multiple - physical, perceptual and cognitive - competencies in tasks. Learners should be able to actively use these competencies to assimilate the use of language in context, and to build conceptual structures which can accommodate new knowledge. This section considers the need for active participation in learning experiences

The Use of Language to Situate the Self

For enaction, language is an action and a mechanism for making sense of the world, rather than an abstraction. 'Movements are at the centre of mental activity: a sense-making agent's movements - which include utterances - are the tools of her cognition' (Jaegher & Paolo 2007, p.5). The parallel development of practical intelligence and speech in very young children is evident in their habit of verbalising aspects of their motivation and processes when completing tasks. Speech to support or

control action is not just a feature of childhood, *verbal shadowing* is a common behaviour in adults when completing challenging tasks. When engaged in verbal shadowing, speech supports thinking and moderates behaviour to complete the task, this may be in terms of self-coping or reminders. Andy Clark (1998) gives the example of a child being talked through a tricky task, such as tying a shoelace. 'Later, when the adult is absent, the child can conduct a similar dialogue, but this time with herself. Even in this latter case, it is argued, the speech (be it vocal or "internalized") functions so as to guide behaviour, to focus attention, and guard against common errors' (Ibid., p.195). 'By subvocally shadowing my action, I add a well-organised set of constraints to an already well-constrained problem. As a result, the performance is robust' (Hutchins 1994, p.314). Consequently, requesting that learners be silent in learning activities deprives them of an essential cognitive tool.

The Use of Action to Comprehend De-contextualised Information

Engaging in action whilst receiving verbal information in learning, can aid language comprehension by situating the concepts. When the information is presented verbally, there is no context to infer or construct meaning, comprehension can be hard to grasp. Glenberg et al (2004) showed that children had greater understanding of verbal language when they were allow to manipulate physical objects relating to the text, whilst being read stories - simulating the action being described. 'Correctly manipulating the objects forces indexing and facilitates the derivation of meaning. Both actual manipulation and imagined manipulation resulted in markedly better (compared with re-reading) memory for, and comprehension of, the text material' (Ibid., p.424). In addition to silence, requesting that learners be still in learning activities further deprives them of another essential cognitive tool.

2.1.2.4 Summary: Connecting the Self with the Environment

The objective of learning is to understand the perceived significance the environment, to think and act accordingly. This is not a prescriptive activity, rather learners need appropriate activities to exercise their autonomy in open-ended activities, where both the problem and solution need to be identified and pursued. This is competency based learning, across multiple knowledge (psychological, physical and perceptual) domains, focusing on process rather than outcome, to develop skills in inquiry and critical reflection which prompt adaptation. Such activities should attempt to engage the whole body in the learning experience - using language and actions as means of understand-

ing. To improve efficiency and capability the learner needs to develop skills in offloading cognition in the environment.

2.1.3 Meaning Making

This section considers further the process of making sense of the world, and how complex knowledge structures emerge, and how affective states and motivation play a crucial role in marking out what is meaningful. This section also established more how learning is a cyclical process of adaptation, constrained by and dependant by the learner's ability to interact with the environment.

2.1.3.1 Learning as the Consumption of Self-Produced Values

As established, cognitive and sensorimotor adaptations are a consequence of interactions with an environment that give rise to perceived interrelated patterns. Simultaneously, existing patterns obtained through a history of couplings, moderate and guide interactions (e.g. by defining contextual rules)[7]. Adaptation is made possible via these self-organisational processes, and happens at a threshold when the dynamic bidirectional relationship between being and environment is apparent and sustained. The constraints of the body and the environment are perceived simultaneously, and agency (i.e. grasping the object as it comes into the visual field) arises both through, and as a result of these constraints.

From an enactive perspective, the mechanisms which enable adaptation via emergence and self-organisation, are inspired by the concept of an autopoietic system. Conceived initially by Maturana and Valera (1972), autopoiesis literately means self-producing. It as the lowest form of structural organisation available to a living being, from which it can build increasingly complex forms of itself - 'their only product is themselves' (Ibid., p.49). The being therefore adapts by intrinsically consuming the meaning he generates, which means he essentially educates itself. 'Learning is a dialectical process whereby knowledge is simultaneously produced and re-produced' (Ibid., p.13). In short, we make meaning, and consume the meaning we make, which results in more complex understanding[8].

[7]The system has closure, in that some of these relationships remain invariant through continuous perturbation due to the system's own dynamic, and the interactions of the organisms it integrates (Maturana & Francisco Varela 1992, p.164).

[8]Cognitivist, and to a lesser extent constructivist, theories of learning ignore the crucial possibility that the cognitive agent may also be an active creator of meaning (Di Paolo & De Jaegher 2010, p.68). Enaction takes the position, as cognition is embodied it is constituted by emergent and self-organised processes that span and interconnect the brain, the body, and the

Due the scope of their lived experience, the meaning children make is not a reduced version of an adults - it is fundamentally different. 'Living beings are characterised by their autopoietic organisation. They differ from each other in their structure, but they are alike in their organisation' (Ibid., p.47). Despite their limited repertoire of experience, they still draw conclusions from events - a lack of information does not inhibit making connections, and children are clearly capable of having opinions of things they do not fully understand. Children, and indeed all learners, 'push towards logic coherence' (Bruner 1992, p.92). We charter our world from the very being of our existence. 'We do not sit and wait for the world to impinge on us. We grapple with it, we construe it intellectually, we represent it to ourselves' (Donaldson 1986, p.68). There is clearly an inherent urge to make sense of the world, to draw conclusions from linking events; otherwise early development would not occur.

Though somewhat overlooked until this point, the affective state is a key factor when considering meaning generation and consumption - compounding the concept that the body is a vehicle of meaning (Colombetti 2009, p.4). Giovanna Colombetti (2009) suggests just as the process of sense making is seen as autopoietic, emotion is subject to the same reflexive re-structuring. In defining emotions, Margaret Donaldson (1993) differentiates emotion from feelings, claiming: 'The crux is that emotions are our value feelings. They mark importance' (p.12). Emotions are evoked by the apprehension of importance. Where nothing matters, there is no emotion (Ibid., p.141). Through emotions we have degrees of meaningfulness, marking out preferences, curiosity etc - affecting both the meaning and the effort made to make meaning. We pay attention to what we perceive to be meaningful to permit direct perception. The affective domain is therefore considered to be active in the process of receiving, responding, valuing, organising and characterising value.

2.1.3.2 Cyclical Learning

Due to the need to self organise, and with parallel development in mind, learning is considered to be a cyclical process. Consequently, the ability to comprehend a given situation is constrained by the learner's ability to engage with the world. There are many developmental studies (Piaget 1974, Vygotsky 1986, Gibson 1967, Donaldson 1986, Masciotra & Morel 2006) which show there are discrete transitions in children's physical and cognitive development. These can be seen simply in terms of childhood as distinctive from adulthood, or as phases of childhood.

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environment (Thompson 2001, p.3). Self-organisation is the spontaneous formation of ordered states in complex systems under specific boundary conditions (Warren 2006, p.380), such as the perceptual field.

The cognitive, physical and perceptual parameters in ability are reflected in learning how to use a new tool or object. At the inception, the learner enters into an evolving relationship with the object. With each developmental shift, the conscious effort to use the object reduces. Consider the process of learning to drive, play the guitar, or paint. In each occupation, the tools - the car, bicycle, and paintbrush - are at first wholly absorbing, and the application of tool to task can be bewildering. With practice over time, the learner masters the constraints of the object, until the distinctions between them are no longer apparent. Interaction with the object is now automated, an extension of the self as opposed to an object distinct from self (Masciotra & Morel 2006). With the cyclical self-organisation that results from practice, comes an understanding. Until a state transpires, perhaps without conscious passing, where there is no sense of mediation, the object is no longer a concern when the subject completes the task.

Measures of accomplishment in cyclical learning models are qualitative. Consequently, the focus is on activity or competence - a re-organisation evident in a shift in ability; i.e. a conductor can hear a bum note from his orchestra, which everyone in the audience hears, but not all perceive. Between each transitional stage, there is continual activity as the learner can investigate the new realms made available in the previous transition, which cyclically contributes to another shift in development. A cyclical learning model is important as it places constraints on what the learner is capable of understanding. Learning activities should work towards appropriate thresholds when new understanding is achieved, and explore new modalities as they are revealed. This is relevant to the use of tools, environments and activities for learning, which need to acknowledge an evolving relationship.

2.1.3.3 Distortions of Meaning

The metaphorical projection of bodily states and actions into concepts and language, means adaptation occurs through the transference of concepts between sensory, motor, and conceptual domains - the learner's task is to both create and manipulate meaning. 'From the enactive perspective, pure assimilation involves a degree of distortion, since it cannot lead to new knowledge unless there is also accommodation, that is the transformation of old knowledge' (Masciotra & Morel 2006, p.14). Consequently, the development of conceptual thinking and meaning in the world results not

only from coupling action, perception and environment, but also a manipulation of previous coupling - shifting or re-appropriating meaning from one modality or context to another.

> In a system that exploits sensorimotor couplings to generate a value signal, if these couplings are modified, their semantic contribution to the generation of meaningful judgment is gradually withdrawn, and we observe a semantic drift of the value signal: Activity in the value system causes a change in behaviour, which in turn causes a change of "meaning" of the activity of the value system, which causes a change in behaviour, and so on (Di Paolo & De Jaegher 2010, p.55).

These processes indicate the ability to 'unstick' meanings from a given situation and 'stick' novel ones onto it, to generate the capacity to influence meaning generation (Di Paolo & De Jaegher 2010, p.89). It is in the manipulation of meaning, that we get new meaning, and distortion represents the process of a semantic drift of meaning between context and knowledge domains. This is a pivotal stage in learning development, as an element of choice is introduced into the hierarchy, with the learner choosing to apply an aspect of prior experience to new contexts. In the later stage of this process, the learner has learned to learn. 'These are the phenomena that underlie "transference"' (Bateson 2000, p.249), an expectation that the new relationship encountered will contain the same sort of contexts of learning as previously experienced.

2.1.3.4 Summary: Meaning Making

The key concepts in this section that are carried forward in design focus on the concept of the creation and consumption of meaning. There is particular interest in exploiting the child's intrinsic desire to make sense of their world, and the role affect plays in these inherent mechanisms. Further, attention in later work needs to be mindful of the constraints in learner's ability, and that competence should be considered as a state in flux. Understanding key thresholds in learning development, and working towards reaching these, and capitalising on new modalities as they are revealed, requires serious consideration.

2.1.4 Shared World of Significance

'Everything we do is a structural dance in the choreography of coexistance'

(Maturana & Francisco Varela 1992, p.248)

Conceptual and emotional development is considered to be shaped by prior generations, and augmented by those with whom we interact. Contact with social worlds triggers innate capacities to copy others, via modelling, observation, imitation and empathy. This section considers how learning and development is concerned with coordinating actions with others to acquire knowledge, and to learn how to integrate into the significance of social worlds.

2.1.4.1 Understanding Significance

Humans have an awareness of situationally appropriate behaviour from a young age. By five years, children realise there is a world of rules and categories, and therefore understand the concept of socially acceptable behaviour in a variety of situations (i.e. behaviour in the supermarket, as opposed to the play room). So by the time they enter school, though there is still much negotiation and guidance, children '(...) already know what counts as a legitimate account or justification for behaviour, as well as knowing which behaviours are acceptable' (Haste 1987, p.191).

How We Share Other's Significance

The objective of an education is to gain entrance into shared worlds of meaning through language, practices and tools (Brown & Duguid 1989). Learning then is a process of situating in other's realities. It is important to be mindful of the contexts in which we acquire knowledge, as these do not just determine what we learn, but how. Situating with others is primarily achieved through language. The aim of language as communication is to establish a jointly inhabited conceptual and emotional space. Clark and Brennan (1991) define the process of achieving common ground as *grounding*, and state that human's attempt to do this through most efficient means. Communicative acts simultaneously articulate concepts and monitor for comprehension and interest, looking for misunderstandings and correcting ad hoc. Humans, in dialogue, look for feedback to provide confirmation of comprehension and interest (facial expressions, body orientation utterances, etc). Achieving common ground depends largely on the listener's prior experiences of the situation and language capabilities. Part of grounding is to establish the listener as empathic to the speaker's

comments. Humans are social beings and, for the better part, want to connect with others, mirroring another's physical expression acts as a mechanism to reflect or produce feelings of empathy (Barsalou 2008, p.630).

In efforts to be efficient when grounding, language is often not exact, but pragmatic. There is an assumption that both speaker and audience entertain a common reality, of which a lot of information is not actually given, but has to be inferred (Schnall 2005). Learners do not have to understand the exact meaning of words, as much can be deduced from other contextual information (tone, accompanying gestures, objects, setting), i.e. pointing to an apple, whilst asking a baby if he would like an apple. Due to the high dependency human infants have on caregivers, the ability to communicate using movements, expressions and gesture - denoting hunger, joy, fear - is necessary prior to the emergence of the spoken word, essentially for survival (Spurrett 2004). The verbal language in the inquiry is almost redundant, but the recurring occurrence of sound, action and reaction gives way to semantic connections.

> The primary thing is now held to be the grasp of meaning - the ability to "make sense" of things, and above all to make sense of what people do, which of course includes what people say. On this view, it is the child's ability to interpret situations which make it possible for him, through active processes of hypothesis- testing and inference, to arrive at the knowledge of language (Donaldson 1986, p.38).

In turn, children are able to use language in appropriate contexts even if they do not really understand the actual meaning of the words (Cowley 2007). They are able to imitate the right language in the right context, without complete understanding.

2.1.4.2 Imitation and Empathy

To observe and imitate others is an innate learning mechanism. Imitation in newborn babies is evidence of how tightly coupled humans' development is with those around them from the very beginnings of their existence. Despite lacking a sense of external self image, infants are able to mirror facial expressions when only a couple of hours old. 'Imitation indicates that infants, at some level of processing no matter how primitive, can map actions of other people onto actions of their own body' (Meltzoff 2007, p.129). As the infant develops, she learns the perceived actions of

others in terms of what she understands about her own action. By looking to where others look, the child learns how, and what, to attend to in her environment. To be emotionally guided by and communicate with others, requires the observer to be able to read another's affective state, which is a form of empathy. Empathy is an inherent developmental mechanism which requires nurturing, through realising the viewpoints of others, we can better understand ourselves (Thompson 2001, p.23). 'It is through empathy as the experience of oneself as an other for the alter-ego that one gains a viewpoint of one's own embodied being beyond the first-person singular perspective' (Ibid., p.19). One activity which children are capable of enacting another's point of view, is through pretend role play (this is explored in greater detail in Chapter 2.2.).

Whilst language skills are emerging, much emotional communication is non verbal - facial expressions, gesturing, stance, along with pitch, volume of voice - verbal affirmations and laughing. Studies of infants' interactions show the child is not egocentric in all things (Meltzoff 2007, Smith & Gasser 2005). 'Pointing and gaze following offer even earlier indications of a recognition that the other's visual experience is not necessarily the same as the child's own' (Dunn 1987, p.45). Infants engage in emotional development initially through the didactic relationship between infant and their primary carers.

> While caregivers respond to infant behaviour, striking phenomena arise from how they guide and control the infant's affectively-based activity. Not only does this involve the development of joint evaluative behaviour but this outcome influences how they motivate and rationalise their own behaviour (Spurrett 2004, p.9).

The carer provides the affective framework - the dynamic range and diversity of emotion, qualifying what is positive and negative states against experience - in doing so mark out what in the environment has value. In exchange, learners (in their infancy at least) are inherently motivated to seek positive emotional response from the carer. The carer-infant dyad presents a simple hierarchical structure - which to some extent shapes the dynamic of the communication. Emotional exchange and interaction continues to be heavily affected by perceived social status, i.e. being polite or less willing to share emotion around someone considered to be important (Thimm & Kruse 1993). We learn not just when participating in dialogue, there is evidence that infants engage in 'emotional

eavesdropping' by regulating their own actions based on the observed emotional exchanges between others (Meltzoff 2007).

2.1.4.3 How the Social World Extends Individual Competencies

Living in communities installed with social rules and norms, can enable young children to act beyond their own competency. Children will use a term or expression before they fully understand the meaning of the phrase, but through observation can infer how and when a specific term might be used in context (Spurrett 2004), or enact a rule in a particular scenario before they can comprehend its function (Haste 1987, p.166). Parents and educators can nurture intelligent behaviour through affective responses, enabling children to exploit social norms before they are able to self direct their own action. Consequently, once the child achieves self-directed activity, they are already attuned to cultural activities (Cowley 2007). In the case of language and social concepts, the form can precede the function. It is through these mechanisms that the development of children's cognition and perception of action is augmented by those with whom they interact.

The enactive framework in this thesis, acknowledges that cognition can be a distributed activity that occurs among many minds. In social situations and collaborative tasks, the combined cognitive processes and structures that emerge can be understood in terms of a collective intelligence or distributed cognition (Pea 1993). 'It is the system (the aggregate of the interacting elements), rather than the autonomous and reflective individual, that must be understood as possessing "mental characteristics"' (Bowers & Finders 1990, p.97). 'This is what we call participatory sense-making: the coordination of intentional activity in interaction, whereby individual sense-making processes are affected and new domains of social sense-making can be generated that were not available to each individual on her own' (Jaegher & Paolo 2007, p.49). This is not a total homogeneity, individuality remains intact, and personal traits will affect the shape of group characteristics. Each individual adds to the behavioural diversity of the group, but continually adjusting his position in the network of interactions that form the group according to its dynamics (Maturana & Francisco Varela 1992, p.192). In coordinated behaviour, the individual's ability is potentially elevated.

> Enactive competence or collective intelligence is not a communal hodge-podge of individual intelligences, but rather the valorization and mutual reinforcement of unique intelligences. The level of personal competencies is raised in the harmonious enaction

> of the collective competence: individual brains cooperate in unity of a "common brain" (Masciotra & Morel 2006, p.33).

This is an ideal, collective competencies are not always distributed or conducted harmoniously and democratically. Nevertheless, social intelligence can be considered as the product of processes that are constructed through the interaction and negotiation with others. 'The magic of cognition may not reside in its specific components but their coordination' (Barsalou & Smith 2007, p.83).

2.1.4.4 Summary: Social Significance

This section suggests that children are motivated by connecting to social worlds, and have an understanding of situationally appropriate social behaviour from a young age. Gaining entrance to social worlds is accomplished via empathy and imitation, utilising social action in appropriate contexts even before the meaning of action is fully understood. Consequently, children learn the meaningfulness of social actions via performance, and the subsequent responses of those in their social worlds. Additionally, and critically from an educational perspective, coordinating and collaborating with others can extend the competency of the individual learner.

2.1.5 Towards a Design Framework for Enactive Learning

This section draws the concepts described in this section into key learning processes, as the first stage in developing a framework for interaction, interface and experience design. Though presented here as individual components, there is significant overlap between these processes. The separation is to aid the eventual design approach, and is not meant to imply that these processes occur in isolation.

Process 1. Learning is a process of situating the self in an environment.

The learner needs room to autonomously locate the affordances pertinent to situating himself in an environment. To learn is to physically, perceptually and cognitively engage with an environment in a meaningful and significant way - to find a place within it, by comprehending possible actions and their significance. The key elements of situating the self and mastering situations that are taken forward in this investigation are:

- Enabling learners to practice their autonomy. Learning activities that provoke and accommodate self-initiated and self-directed behaviour, to enable a learner to refine skills in inquiry and critical reflection.
- Attention to the parallel development of multiple competencies. Activities for learning must account for the bodily experience in the learning activity. Speaking, moving, touching etc - to contextualise the meaning of the learning objective. Action and interaction should be meaningful to the conceptual objectives in the learning experience.
- Distributing cognitive processes in the environment, enabling the learner to offload cognitive tasks and acknowledge that the environment plays an active role in cognition.

Process 2. Learning is a cyclical process generated from the creation and consumption of self produced values.

In a cyclical process and as a consequence of interaction, the learner educates himself. Meaning is created and consumed, generating increasingly complex meanings. The key elements of meaning making that are taken forward in this investigation are:

- Accommodate an inherent urge to create meaning, utilise curiosity, and consider the impact of the affective state on meaning generation and motivation.
- Learning is cyclical, as cognitive structures emerge from the parallel and recurrent development of cognition, action and perception. Within each transitional stage there is an exploration of new modalities in transitional periods, which in turn leads to re-organisation. In practical terms, this means that there are constraints on the learner's ability. To progress, there needs to be room to exercise existing knowledge, and space to encounter new knowledge.
- The creation and consumption of meaning requires a degree of distortion, an event that demonstrates the semantic drift of value between perceptual, physical and cognitive domains, as meaning is re-appropriated and projected between knowledge domains. Therefore, environments for learning should contain malleable affordances, which are open to re-interpretation.

Process 3. Learning is a process of gaining access to social worlds of significance.

The enactive position assumes that children strive to gain access to social worlds - they want to learn what others find meaningful. In a social world, learning occurs through the inherent and reflexive embodiment of others' actions, and via the distribution of cognitive processes into the minds of others. There is an assumption that learners want to connect to others, and an acknowledgment that communication needs to be efficient, and is often pragmatic. The key elements of social practice that are taken forward in this investigation are:

- Learning environments should allow the learners to contextualise new conceptual, physical, affective and perceptual abilities within a social environment, again where interaction is meaningful.
- There should be opportunities to work in social groups to the benefit of individual competencies. This should have positive gain to learners' ability, but also provide an opportunity to exercise and practice socially interacting.
- Social environments should accommodate a spectrum of social interaction, from direct communication to observing and imitating others. Copying and watching others should not be underestimated, as via empathy, a learner can learn what is meaningful in an environment.

The above elements show the initial stages of the framework from which the practical investigation will base its approach in research and design.

2.1.6 Summary

This section establishes the rationale for choosing enaction as a necessary basis for designing for learning, and identifies a framework to show the requirements for the learning experience I hope to create. The next section demonstrates how play is an exemplar of enactive learning processes, and therefore an appropriate context for design. This framework is also considered in Chapter 2.3, in terms of how to accommodate the concepts presented here in interaction and interface design.

2.2 Play

This section establishes the rationale for selecting play as a suitable context to design for enactive learning. The enactive framework is a tall order for any singular learning activity, and likely to be experienced in a variety of educational settings and situations. However, play is an activity where all of these processes occur. The objective here is to demonstrate how pretence and playful characteristics of children's play encapsulate the learning processes defined in the previous section, and therefore distinguish it as an enactive learning experience. Consequently, attention is paid to autonomy, the emergence of meaning and malleable affordances, developmental constraints, and the formation of significance in social worlds.

2.2.1 Pretence

This section defines pretence, and connects acts of pretence to the processes of learning previously defined. Pretend feelings are evident from the age of 2 years, emerging at the same time the child begins to talk about events and objects beyond the here and now. To pretend is quite literally, to make believe - to suspend disbelief and imagine an event or object to be something else. Pretence, the detachment of meaning from its stimuli, is an extraordinarily complex behaviour for such a young age (Haste 1987, p.32). The ability to produce and comprehend pretence is seen as a marker of development, to the extent that its absence is perceived to be a symptom of abnormal cognitive and social development (Frith & Leslie 1991). Pretence is encouraged and utilised from an early age as a social or affective tool to engage children. It is so compelling that it can also be a useful strategy to encourage the child to participate in routine activities - the classic technique of pretending a spoon is a plane to get a child to eat a meal is a good example. There is a simple joy in conceiving one thing as something else; it provides an additional layer of stimulation to the everyday. The previous chapter described imitation as an innate ability to learn through the mimicry of others. 'He comes into the world highly sensitive to this so-called "mimic gesture", and he exercises his earliest intelligence in his adaptation to his social environment' (Mead 1934, p 368/9). Imitation in pretence, in this respect, exercises inherent learning mechanisms.

2.2.1.1 Imagination in Action

From an enactive perspective, pretend play is an example where children realise the imagination in action. 'A child does not behave in a purely symbolic fashion in play; rather he wishes and realises his wishes by letting the basic categories of reality pass through the experience. The child, in wishing, carries out his wishes. In thinking, he acts' (Vygotsky 1978, p.100). The enactment of concepts occurs not only in the use of objects, but also in use of the body (i.e. holding out arms like an airplane, making engine noises).

Pretence in play reveals an ability to manipulate and transfer concepts, in the creation of new environmental and bodily meaning. Hence, pretence is the embodiment of activity in the value system. The world that opens up through pretence is multi-dimensional, it presents another way to perceive and act upon the environment. 'Whatever the nature of the object, this is detected by the perceptual system of the body, and objects can take on a meaning because of the role they play in affording human action' (Burkitt 1999, p.35). When substituting meaning in pretence, affordances are re-aligned, and agency arises according to these new constraints. The pretence is actively created and maintained through interaction with the environment.

> When a child skillfully supplements the perceptual lack of similarity between a spoon and a car by making the spoon move and sound like a car he has grasped in an embodied manner the extent to which perception can be action-mediated. With his body he can now alter his sense-making activity, both on external objects, as well as his own actions and those of others. He has become a practitioner of enactive re-creation (Di Paolo & De Jaegher 2010, p.40).

In pretence, meaning is willingly projected from one experience (or many experiences) and reassigned to give new meaning to a present experience, from which a new situation manifests. This process is not exclusive to play, but is clearly evident in it. For Vygotsky (1978), this semantic shift of concepts between contexts is evident in children as they begin to separate the meaning of object from the action. The enacted imagination is first seen in play activities, long before children are capable of doing this in reality. In very early years, prior to this developmental change, the child is wholly constrained by the present situation, and whilst playing a child starts with an imaginary situation that initially is very close to the real one (Ibid., p.103). Action and the perception of objects

imitates real life, an imaginary situation is created, but there is little distortion; e.g. the child may pretend to drink tea from an actual cup - there is no drift of meaning of the artefact from the action. 'At this age perception is generally not independent but rather an integrated feature of a motor reaction. Every perception is a stimulus to activity' (Ibid., p.96).

2.2.2 Playful Agency

By the time children start school they are capable of autonomy in play (Sutton-Smith 2001, p.168). In play, they are experts, and though they may not be able to describe the attributes and motives for playing, it is easy for children to define what is, and essentially what is not play. This is an important characteristic for this study, as differentiating between these two states could help draw out the attributes that enable the play state to be maintained. Understanding what drives the child in play will offer insight into, as Vygotsky (1978) commented, the needs and motivations which are effective in getting him to act. Without this '(...) we will never be able to understand his advance from one developmental stage to the next, because every advance is connected with a marked change in motives, inclinations, and incentives' (bid, p.92).

Vygotsky (1978) drew parallels between the affective domain and the pretend worlds as a place where the child could physically, perceptually and emotionally satisfy his own needs and wants. The urge to play, which Dewey (1966, p.78) would claim to be instinctive, is at any age defined by pleasure. There is an indisputable sense of physiological and psychological happiness that accompanies play in whatever guise (Watt 2004). It cannot be something one does not enjoy. The act of play, whether solitary or in groups is an occupation of childhood that parallels intellectual, social and physical progression. The evolving interests and incentives of the child are reflected in play, therefore it remains a good model for studying the emergence of knowledge in any capacity or domain. Vygotsky (1978), Piaget (1972), Garvey (1984) and many others, note their observation of play as a vehicle to witness transitions in learning on the hoof. It is, as Sutton-Smith (2001) concluded, *what children do* (p.49).

Pretend play uncovers a drive to create new meanings, and therefore offers some insight into self initiated meaning making processes, and the exploration of value systems. Play is a pursuit actively driven by intrinsic motives and a willing suspension of disbelief (Garvey 1984), where there is no obligation to participate. Even in social play, the play must be within the constraints and

control of the child. 'The player is the lawgiver and the rule-follower, the question-maker and the responder. Play is thereby autonomous in the strictest sense advocated by enactivism' (Di Paolo & De Jaegher 2010, p.82). In the absence of voluntary and self initiated action, the activity would not be defined as play. Time, space and objects are interpreted to satisfy the child's immediate demands, and no one else's.

The player sets the constraints of the play world. That is not to say he controls all aspects, but that he controls the impact of his behaviour. Serious consequences are not an expected outcome of play and playfulness. This means players are free to explore environments without threat, and in turn, expressions of play in children connotes a lack of risk. 'If he can interpret a novel event as non-threatening, then he will laugh or smile. As he matures he becomes increasingly active in producing and mastering new experiences that generate amusement' (Garvey 1984, p.23). Autonomy is not guaranteed, play denotes low risk, but also requires it. Play can be quite a fragile thing - if children are not comfortable, they are unlikely to want to engage in a playful way. Design approaches and products for play need to tread carefully to get it right. Play as a vehicle for design in this project was not selected because it is something that is crying out for digital support. The motivation stems from appropriating a context that encompasses the essence of a child's meaning making activity.

2.2.3 Playing with Other Realities

This section considers role play as a method to explore situated and situating behaviour. Role play is thought to be pivotal in the progression from the egocentric nature of pre-school children[9]. 'Role play provides time to explore other realities. It is a time to take a break from one's own reality and be transportation into another world with its own meanings' (Berger & Luckman 1966, p.39). In role play, children stipulate the situational constraints, and can be playful with aspects of the perceived experiences. It is a space to actively explore inferences of situations - even if the child does not fully understand the meaning or significance of the situation. In collaborative play, there are opportunities to actively share experiences with others. Role play encompasses both the phylogenic and ontogenic characteristics of social life, it is an expression of many imaginations and many experiences.

[9]As a caveat, and in the typical contrasting nature of play, if the objective in play to is to satisfy immediate desires and impulses, then play is remains egocentric throughout.

Role play is divergent thinking about social relationships through action and language - exploring multiple aspects of the dynamics in social engagement. When children assume roles in play, they adopt not just the language and the narrative, but the physical actions and gestures, decision making and responses of the characters they embody (Fien 1978, p.274). Experience is a resource for role play, the automatic and learned responses account for both the spontaneity and ritual in play. Children draw on all aspects of prior experiences and the lived reality in their everyday lives. 'In playing house children are just as apt to copy the coarseness, blunders, and prejudices of their elders' (Dewey & Dewey 1966, p.79). Mimicry and pretence are thereby a route to understanding the significance in situations through acting in other's realities - knowledge which is not only conceptual, but physical, perceptual, affective, linguistic and interpersonal.

Socio-dramatic play is thought to function as a platform to deal with emotions towards reality (Garvey 1984, Sutton-Smith 2001). The narrative or context is drawn from experiences of the things that most matter to the child (Garvey 1984, p.58). Aspects of prior experience are borrowed, as opposed to enacted verbatim. Role play is imitation, but not a direct reading and representation of an external reality. '(...) imitation serves as a means of evocation to achieve playful assimilation' (Piaget & Inhelder 1979, p.59).

The play narrative is driven largely by the affective state of the players. Pretend play is a place to discuss emotions. Haste (1987) observed whether playing alone or with others, exploring the emotional spectrum is of particular interest. In pretend play among siblings, their study showed a staggering 94% of time was spent discussing feelings. 'Within these pretend games the children did not simply obey the directions of their older siblings - "You're tired now, go to sleep", but offered suggestions and made innovatory contributions in the course of fantasy' (Ibid., p.32). With the support of an older sibling, children as young as 18 months are able to participate in this type of pretend play. However, the emotional states expressed in play are about their feelings towards reality, rather than a direct representation of reality. 'It takes the world apart in a way that suits their own emotions to it' (Sutton-Smith 2001, p.166). To heighten the pleasure of the pretence, actions and emotions are often exaggerated, magnified and intensified. In playfulness and pretence, this presents a paradoxical element of risk. Pretence can heighten the emotion in a situation (i.e. being chased) - so introduces an element of pretend risk to make the activity more engaging (Ibid.). Yet

there needs to be control, if there is actual risk then, as previously mentioned, it is difficult to be playful.

In acting like things and others, role play is an expression of active empathy. To act upon the world as another might act, and sometimes simultaneously the child can be both the plane and the pilot. This practice enables the child to explore a palette of affective and physical states in response to a conceived situation. For Mead (1934), role play is a route to understanding the self, via the imitation of others.

> The child during this period of infancy creates a forum within which he assumes various roles, and the child's self is gradually integrated out of these socially different attitudes, always retaining the capacity of addressing itself and responding to that address with a reaction that belongs in a certain sense to another. He comes into the adult period with this mechanism in mind' (Ibid., p. 366).

Role play is a means of exploring different selves in different situations - it is the re-creation of the feelings, impulses, habits, which define the child's social world. 'He is a composite of all the individuals he addresses when he takes the roles of those about him. It is only gradually that this takes a clear enough form to become identified with the biologic individual and endow him with a clear personality that we call self-conscious' (Ibid., p.369/70). The empathic embodiment of observed situations is a form of introspective reflection, from which the child generates consistency in his own identity.

2.2.4 Play Frames

Bateson (1955) describes the shared understanding that emerges as children play together as 'play frames' - a collective comprehension that situates their action in the play event. Play provides a useful context when considering the design for social coordination - the processes and dynamics of group participation in making sense of things together. As with all shared worlds of significance, the play world is a jointly inhabited space. 'Everyone enacts his own situation and also partakes in the collective enaction of the shared situation' (Masciotra & Morel 2006, p.32). There is active participation in the play activity, and in social play this is coordinated with others. As the pretence that emerges from the players must be communicated, if the shared illusion is to be kept alive.

Individual players need to be able to ground their playmates in the play world. The phenomena of pretence in a social context could only occur if the participants were capable of some degree of meta-communication, i.e. exchanging changing signals which would carry the message "this is play" (Bateson 1955, p.121). There needs to be something within the expression, which marks it out as meaning something else to the listener. In this way, play encourages children to discriminate multiple layers of meaning, and is a route to comprehending the differing communicational modes. There is an understanding that the action is pretence, rather than acting in error (Leslie 1987, p.413). The ability to communicate and comprehend playfulness is a means of dissipating the seriousness in a situation. Thereafter our expressions and recognition of playful behaviour emerges concurrently through social interaction. Garvey (1984) notes how instances of smiling parallel that of the ability to play, expressions are fleeting in infants and develop to different types of smiling and laughing in toddlers.

Words alone are often not enough to distinguish a playful meaning, humans (and other species) rely on nonverbal media of posture, facial expressions, intonation, and the context of the communication of these highly abstracted labels (Bateson 2000, p.203). Before children are able to engage in conversation, they are capable of quite complex communication in action, particularly in mimicry and imaginative play. '(...) children's symbolic play can be understood as a very complex system of speech through gestures that communicate and indicate the meaning of playthings' (Vygotsky 1978, p.105). In this light, playful enactment without words is a manifestation of semiotic function (Ginsburg & Opper 1987).

Meta-communication, the ability to shift between organisation (to socially coordinate) and enactment in play, is considered to be a contributing factor to understanding how the significance of situations can be expressed. Such skills can be developed in role play. 'It lays the foundation for the development of children's self reflection in communication and awareness of its rules and strategies' (Fails & Druin 2005, p.101). In role play, each new situation needs defining. As previously mentioned, there are rules of engagement, but the definition emerges from the group's experience. What, and how, artefacts and events are meaningful is socially negotiated through the group's interaction. 'In play, dimensions of value explored open up by the element of social interaction and forms of participatory sense making that it affords' (Jaegher & Paolo 2007, p.38). In role play there

can be seriousness first, to frame the coordinated activity within the constraints of the environment (Reed 2005, p.78).

2.2.5 Play as Design Aspiration for Exploring Enactive Processes

Via the self-directed mastering of situations, the creation and consumption of self-produced values, and in sharing significance with others, play is enactive in the truest sense. This section draws the above concepts more firmly within the enactive learning processes established in the previous section.

Process 1. Learning is a process of situating the self in an environment.

- *Practice autonomy*: There are a number of aspects of pretence and play that are of benefit to autonomous learning. For play to be play, it must be something the child wants to do. Consequently, in play, actions are self directed and self-initiated. Play is an opportunity to practice autonomy, as the child defines the inquiry, investigation and outcome of the play narrative. In terms of situating, role play can provide a perceived authentic environment, task and action - and the experience allows the child to be a different self in a different situation. The need to control surfaced as a requirement during the course of this chapter. For playful action to emerge, the situation has to denote low risk. Play is a route to learning about objects / environments without risk of making mistakes
- *Play requires multiple competencies*: In play, children use their bodies to create authenticity via action. In play, they talk, act, sing and dance concepts.
- *Distributing cognition in the environment*: Children will make use of props to enhance their play worlds. The perceived use of objects can be a re-interpretation its conventional use, which demonstrates semantic drift, and the slipperiness of affordances.

Process 2. Learning is a cyclical process generated from the creation and consumption of self produced values.

- *Urge to create meaning*: In pretence, children's urge to both create and consume meaning is revealed. Agency emerges in play to satisfy curiosity and imagination. The motivation for

play is driven and defined by experience, bodily states, imagination, and resources (including people) in the environment. Pretence also demonstrates how learning occurs through imitation, and thus the importance of empathy. Manifesting as a mimicking gesture in language, affective states and behaviour.

- *Cyclical development*: There are parameters in children's multiple competencies, and the type of play activities they are motivated to participate in. For example, very young children are more likely to mimic real situations in their pretence.

- *Distortion*: The player needs to have the ability to change the world in a way that suits their agenda. Consequently, environments and activities '(...) should allow for ambiguity of meaning as well as the generation of novel kinds of value' (Di Paolo & De Jaegher 2010, p.70). Distortion should be a marker of a proscriptive environment, where coupling is viable and therefore malleable - multiple affordances perceivable within the constraints of the pretence.

Process 3. Learning is a process of gaining access to social worlds of significance.

- *Understanding social worlds*: Role play is an act of divergent thinking about social relationships through action and language. The shared conceptual spaces created in social role play, contextualise abilities in a social environment. Further, it is a means of understanding the self, via the imitation and empathy of others.

- *Increase individual competencies*: Children can learn from the experiences of others in their social role play via multiple mechanisms. Their actions can be guided by others, but learning via the actions of others also occurs from watching. Consequently, and because of the contextualised nature of language and action in social situations, children are able to enact events beyond their comprehension. Through the enactment of social phenomena, meaning emerges.

- *Accommodate a spectrum of social interaction*: Social play is a platform to exercise cohesion, communication and coordinating behaviours. There should be opportunities to engage different communicative functions (organisational language, play frames etc), to achieve the jointly inhabited space of the play world.

2.2.6 Summary

This section has linked characteristics in pretence and role-play to enactive learning processes. Using play as a context for design does enable a narrowing of the enactive lens to a specific manifestation, but at the same time play has demands of its own. This section highlighted key aspects of play that will need to be considered throughout the research and design practice, such as control and low risk. The next section considers approaches to accommodate enactive learning processes, such as meaningful action, in interaction and interface design.

2.3 Enactive Interaction and Interface design

The discussion until now has focused on the emergence of knowledge via physical, cognitive and social interaction, which have been shown to exist in play. This section brings technology, interaction and interface design into the picture. Interaction is considered in terms of situated action and affordances. In technological terms, this part of the thesis focuses on embedding technology into the environment, with attention to collaborative systems. This study aimed to support co-located play, where children are shoulder-to-shoulder, so remote systems are not discussed.

2.3.1 Introduction to Enactive Interaction and Interface Design

Enactive technological systems attempt to accommodate and exploit knowledge of doing, the intuitive knowledge grounded in action made possible via inherent coupling mechanisms. Interaction design attentive to embodied and situated interaction, attempts to achieve a direct perception of the system's affordances. Designing for affordances is simply framed by Norman (1998):

> Part lies in the information available from the appearance of objects - the psychology of everyday things. And part comes from the ability of the designer to make the operation clear, to project a good image of the operation, and to take advantage of other things people might be expected to know (p.12).

According to Norman (1998), affordances are accommodated via a blended awareness of the physical, logical, and cultural conventions that guide the user's expectations of use. Conventions are not arbitrary; they are situated, having emerged in practice. In order to design for affordances, interface design needs to be aware of what the conventions are in the given environment; and also how the interface will be perceived when placed in that environment. By capitalising on the embodied and social knowledge developed through interacting in a world, in theory, interaction with technology should be meaningful. Enactive systems aim to allow the user to express and transmit their enactive knowledge via different sensory modalities. If successfully accomplished, then the use of the system should be self-explanatory (Suchman 1987, Norman 1998). Donald Norman defines this approach as *natural mapping* - 'taking advantage of physical analogies and cultural standards, leads to immediate understanding' (Norman 1998, p.23).

One potential solution to achieving embodied, situated and social interaction is to embed technology in everyday life, to make the environment the interface. Dourish (2001) and Weiser and Brown (1996) pioneered focusing attention on the social and tangible qualities in design, whereby meaning was negotiated via interaction with systems embedded in the environment. To accomplish this feat, technology needs to be ubiquitous, sensitive to context and the interactional practices in human-human exchanges to determine how it shifts from the peripheral to the centre of activity (Weiser & Brown 1996). 'The interface being both everywhere and nowhere (depending on the perspective), distributed as it is in space and time, and mediated by various kinds of physical structures in the environment that connect to all of the sensory-motor channels users have at their disposal' (Dijk 2009, p.40). It is by this approach that computation can be brought into the real physical and social worlds (Dourish 2001, p.103).

2.3.2 Meaningful Interaction

This section considers how to afford connecting the self in technologically mediated environments, specifically looking at approaches to interaction and interface design which relate to:

- Situated and situating behaviours within multiple competencies, with attention to the whole body - speak, act, think - in the experience.
- Distributing learning processes in the environment, to allow for meaning to emerge by autonomous interaction with the environment.

In design, interaction needs to be meaningful and multimodal because the action is crucial to conceptual development: Strategies for interaction should make use of whole body interaction and the body-in-motion. For play, there should be opportunities to act like things.

2.3.2.1 Movement-Based Systems

If situated and situating competencies are properly accounted for, then interaction should be natural and intuitive. 'One way in which intuitive interaction occurs is in movement-based systems, users enact appropriate input actions unconsciously or automatically, rather than consciously learning, step-by-step, how to interact with the system' (Antle et al. 2009b, p.240). The intention of movement-based systems is to use experience of speech, gesture, touch, and the conceptual un-

derstanding to emerge from autonomous action, as the basis for the meaning in interaction. One avenue has been to apply Lakoff and Johnson's (1980) theories of the emergence of cognitive structures via metaphorical projection of bodily action. Design approaches attempted to incorporate the conceptual metaphors derived from embodied schemata in the visual representations of functionality (Hurtienne 2009); or focus on the role embodied metaphors may play in supporting people to understand the possibilities for physical interaction in augmented spaces (Antle et al. 2009b, p.66). 'Intuitive judgements are unconsciously derived through embodied schema about appropriate movements and related embodied metaphors which link movements to system responses (Antle & Droumeva 2009, p.238).

A good example of a movement based system is SoundMaker, an interactive audio environment developed by Antle et al (Antle, Fernaeus & Marshall 2009), which correlates physical movement to auditory responsiveness. 'These interactions with the physical environment support the association up as more (as opposed to down as more). Embodied metaphors based on spatial experiences are called orientational metaphors. An orientational metaphor gives an abstract concept a spatial orientation' (Antle & Droumeva 2009, p.238). These interactions did not just enable a coupling of physical action to auditory response, but the auditory response to their action in turn affected the participants' individual and social behaviour. 'We also observed that many participants enacted the kinds of physical movement qualities we envisioned. Participants commonly raced around the space, moved slowly in one place, and moved together in a synchronised way to elicit sound changes' (Antle et al. 2009b, p.74). This adaptation of behaviour suggests that intuitive interaction does not just afford its initial use, but the ongoing and viable coupling recursively gives way to new interactional possibilities.

Another approach to augmenting reality, is to distribute the data spatially. Learning exploratory systems such as Savannah (Facer, Joiner, Stanton, Reid, 0002 & Kirk 2004) and Ambient Wood (Rogers, Price, Fitzpatrick, Fleck, Harris, Smith, Randell, Muller, O'Malley, Stanton, Thompson & Weal 2004), use handheld devices with GPS to gather data which has been distributed in the real world. Using the Ambient Wood system, children can collect data (temperature, humidity etc) via sensors and materials in a real woodland environment. Savannah is a role play application, where the children act as lions (sensorially hear, 'smell' and see the world as the lion), and are tasked with hunting for food and other activities necessary for survival. Savannah and Ambient wood ask

the learner to collect information in the outside world that is then embedded in virtual worlds. In both, the children are encouraged to be curious, to explore and discover the virtual information acquired through their physical investigation. There are some positive gains to distributing the information. Collecting the data from a physical environment appears to improve the learner's ability to remember spatially organised information (Facer et al. 2004), and provides a tacit understanding of the meaning of the data when extrapolated in a virtual environment (Rogers et al. 2004).

2.3.2.2 The Embodiment of Visual Media

Soundmaker demonstrates a coupling of auditory representation and motion, but it should not be overlooked that sensorimotor knowledge is also applicable to all forms of representational space. Visual perception is capable of viewing imagery as real space, judging the distance and scale with some accuracy (Gibson 1979, p.283). In Strommen's Wood Visit (1994), despite interacting with the virtual environment via a mouse and screen, there was a kinaesthetic response to the visual and narrative content. In this application the children (6-8 yrs) explore the space from a first person point of view - a common technique in gaming. Strommen observed a kinaesthetic response when the children ducked as they (virtually) moved through hanging branches, and hid away from the screen to see if any animals came out. From an enactive perspective, all perception is accomplished through embodied experience, and this includes imagery.

> Pictures depict because they correspond to a reality of which, as perceivers, we have a sensorimotor grasp. Pictures are a very simple (in some senses of simple) kind of virtual space. What a picture and the depicted scene have in common is that they prompt use to draw on a common class of sensorimotor skills (Noe 2004, p.178).

Many games occur in a representation of physical space, through a variety of arguably impoverished input and output modalities. Nevertheless, there is perceptually guided action when navigating virtual environments, even when using a Game Boy. 'It reflects a dynamic coupling between the eyes and hands of an agent and the environment of action. Agent and environment are locked in a high frequency dance' (Kirsh 2004, p.6). Affordances are directly perceived, and action is taken. This type of interaction, though very engaging, is little more than a twitch response, finely tuned motor action resulting from interaction in a repetitive scenario. It is not a suitable platform if the

aim is to encapsulate the breadth of enactive learning processes set out in this thesis. However, though the value of the experience would be called into question, the embodied interaction under these conditions suggests that the mediated experience does not need to be sensorially immersive or physical to be recognised an embodied experience.

2.3.3 Active Presence

This section considers how to accommodates processes relevant to achieving an active presence in the learning activity, specifically looking to support:

- The urge to create and consume meaning, driven by lived experience, curiosity and the imagination.
- The parameters in children's competencies.
- The distortion of meaning, as there should be room for creation and re-creation.

In design, this is conceived as opportunities for the child to make his own meaning. To achieve this, he needs to feel as if he has some presence in the mediated environment, and in the activity. Presence is conceived in multiple, overlapping terms, but is singularly defined as *being there* (Lombard & Ditton 1997). It is a useful concept to frame role play in social groups, as participants pretend to occupy the alternate reality generated by their collaborative activity. Children accomplish a sense of presence in the play world when they successfully communicate and interact with the other inhabitants - the objective of action is to maintain the illusion. In technological terms, presence is achieved when there is an illusion of non-mediation, which occurs when a person fails to perceive the existence of a medium in their communication environment, and responds as if the medium were not there (Lombard & Ditton 1997). In this study, the concept of presence goes beyond non-mediation. As learning and play are active pursuits, presence requires there is a role for the learner / player in the experience - opportunities to create and re-create meaning.

2.3.3.1 Distorting Affordances

Kaptelinin and Nardi (2012) suggest Gibson's direct perception model, when applied to HCI, does not go far enough, and suggest a 'mediated action perspective' is more appropriate. This perspective acknowledges that affordances emerge in practice, but differs from Gibson in proposing that

the affordances of available resources will be adjusted to meet situational needs. This perspective makes stronger ties between affordance and situated action. It acknowledges that there can be an intention that drives action, but tasks to achieve the objective are capable of adapting, depending on what is needed to accomplish the task. An enactive approach to interaction does not assume we think and then act in discrete steps. Rather, it presents a model of cognitive activity and intellect, where decision-making, comprehension and planning, arise at the point of interaction. Lucy Suchman (1987) claims interaction should be considered in terms of situated action, and not actions derived from fixed plans. 'The coherence of situated action is tied in essential ways not to individual predispositions of conventional rules, but to local interactions contingent on the actor's particular circumstances' (Suchman 1987, p.27/28). Given the context for design in this investigation, the notion of planning as a pre-requisite for action is particularly problematic when designing for children's play. This is not to suggest children are without intention, only that is it not readily identifiable or stable - and is likely to emerge in, and of, the moment. If the activity cannot be re-directed at a whim, it will cease to be play. As previously stated in this chapter, affordances are malleable, and will emerge in action. For example, to fix a loose nail, I'll use what is to hand, if a rock is nearby and will to the job, I will not bother looking for a hammer. We conceive the function of an object in terms of viability, and can quickly locate 'affordance through another tool' (Kaptelinin & Nardi 2012, p.9).

Consequently, affordances can be multiple, and emerge from a life beyond their creation. The challenge and aspiration in designing for play is that the affordances may be unknowable and nonconventional. An example of this can be found in Montemayor at al's (2004) evaluation of their system StoryRoom, a physical playspace designed for school children (7-12 years). They were driven by concerns of restricting creativity, so sought to enable children to create their own stories in interactive spaces. StoryRoom allowed the children to program physical instructions via physical props and icons. To program in this environment was described as 'magic', while the interactional rules for the physical object's interactivity were 'magical effects'. In use, the children first told a story verbally, then collected the physical props required to tell the story. Switching between the program and play modes were activated by taking off and putting on a wizard hat (to cast the magic). Interestingly with this system, it was by revealing the technical components of the system, sensors and actuators to the children, which elevated their direct understanding of cause and effect, not the abstraction to fairy tale metaphors. Norman (1998) suggests that real and perceived affordance can

be separated, the real may be hidden as they might not be the same as the perceived affordances, which is recognition of the actual function. However in this instance, the intended perceivable affordance hindered understanding. In order to be flexible with the system, the learners needed to obtain a tangible sense of the real affordances.

Montemayor et al (2004) further notes that 'the novelty of StoryRoom can sometimes hinder children from using the StoryRoom for its intended purpose' (p.21). This comment was in response to witnessing a child repetitively picking up and putting down an object because she liked the sound it made. Though in truth, this type of behaviour - repetitive action that causes a noise, i.e. banging a drum - would be classed as functional play. The issue here is the narrow scope of designer's perception of play, from a different perspective the child had not yet learned the intended structure of this play. However, looking at this in a more positive light, this finding suggests children are not constrained by the designer's intention. When situating themselves in augmented play spaces, the children will locate affordances that suit their play, even in systems where the activity has been largely predetermined. The meta-objective of enactive systems is to promote discovery through autonomous self-exploration, to learn from the environmental responses to their interaction. This is no mean feat; '(...) the key is to develop such spaces that exploit physicality in interaction, and trigger various digital representations at appropriate times, points and places, simulating the children to decide what to do next in the learning activity, while also encouraging them to think and reflect' (Price & Rogers 2004, p.138).

2.3.3.2 Parameters

Given the threshold constraints on ability, the interface and interaction need to be developmentally appropriate to the user and their context. Direct representations of graphical spaces and objects rely on the user being able to recognise these graphical elements as possessing physical affordances. However, if the representation is of an abstract concept then recognition might not occur. The meta-projection, or transfer of concepts between contexts is an emergent and constrained skill. In an evaluation of children's ability to map mathematical concepts of multiplication to graphical array representations, Barmby et al (2009) found that it was not only necessary to pre-teach the mathematical concept, but also the abstraction needed to have been used in prior teaching strategies. The children at this age (Yr 2), lacked the ability to transfer this concept between dif-

ferent representations. Their understanding of the mathematical concept was tightly coupled with the representational form. They had not reached a point where they could project these concepts to an alternative visual form, and therefore they were constrained in their recognition. Barmby et al (2009) recognise, as this thesis does, that encouraging transfer has educational gains, yet warn that there are parameters in children's ability which will limit the usefulness of this approach.

StoryRooms and SoundMaker are examples of augmented reality systems, which combine movement with the manipulation of physical objects to trigger audio and visual feedback. Although mixed reality is comprised of physical and virtual spaces, Alan Dix et al (1998) note there are really three kinds of spaces: (i) a real space, the locations and activities of actual objects and people in physical spaces, (ii) a measured space, the representation of that space in the computer and the representation of locations of objects and people from sensor data; and (iii) a virtual space, the electronic spaces created to be portrayed to users, but not necessarily representing explicitly the real world. In augmented reality, 'in order for the measured space to be meaningful it must in some way correspond to aspects of the physical space' (Dix & Steed 1998, p.157). So, not only must the media representation be relevant to the context of the representational space, but also when and how it is triggered.

There is concern about the potential lack of coupling between the virtual and real, as unexpected external phenomena may not be connected to action. Affordances are not properties of the system, but in the direct perception of the object or event. 'The stimulus is not the trigger, it is the perception of the stimulus that is the trigger to the sorts of transformations that are called learning. If something does not register on the sensory system, then nothing happens' (Proulx 2004, p.115). This is a necessary element when considering interaction modalities and feedback of any form, and it appears that connections along the virtuality continuum are extremely problematic: Children expect a digital effect to digital action and similarly physical effects to physical actions; but do not necessarily notice the physical effects of digital actions (Rogers, Scaife, Gabrielli, Smith & Harris 2002), or link physical action with digital effects (Bobick, Intille, Davis, Baird, Pinhanez, Campbell, Ivanov, Sch§tte & Wilson 1999). Even if the events happen at the same time, the children cannot always merge the layers into a cohesive situation, and the triggered response passes by as a disparate occurrence. Direct perception of stimulus across the virtuality continuum is essential if the user is to couple the self with the mediated environment.

2.3.4 Situating Co-presence

This section is concerned with how technologies may contribute to facilitating common ground, by paying attention to:

- Providing an authentic social platform for emergent social skills.
- Opportunities to make sense of world together.
- Supporting and encouraging social interaction.

In the context of role-play, pretence emerges through a creative interpretation of the environment and artefacts, which is negotiated and maintained through play action. In design, collaborative environments need to support a shared situated awareness and the dynamics of social systems. Those using the system need to feel they have social presence - being there together - in the mediated social activity. This sections shows that cooperative, or parallel activity, requires distributed interactional elements so everyone can participate, yet at the same time each participant needs an awareness of other's actions and attention. The children may find it difficult to synchronise their actions if there is no shared situated awareness.

Collaborative systems need to allow for the communication and coordination required to ground the activity within social groups. In addition to direct communication, to be effective, a system for group activity should acknowledge that gestural and body language, with opportunities to mimic and observe others, are crucial components to the learning experience. Dynamic patterns of interpersonal relations with others can emerge in play and work groups, as individuals can disband and re-assemble during the activity. 'An important feature of coordination, particularly with regard to fluid social interactions, is that it does not have to be absolute or permanent. There are degrees of coordination and coupled systems may undergo changes in the level of coordination over time' (Jaegher & Paolo 2007, p.491). Systems for collaborative work should allow children to form their own social groups. Strommen(1998) commented that children 'graze' in their use of play objects, this practice could also be a feature of social interaction where engagement could be disrupted, fleeting and re-visited. If this practice is carried forward, a system designed for social play may need to accommodate fractured, ephemeral, smaller groups within an unstable larger group. The

fluctuating dynamics of social systems may be achieved by a distribution of control rather than a single point of interaction (Jones & Issroff 2005, p.400).

Physically augmented spaces have been shown to support more diverse social groupings and higher levels of communication than desktop interaction (Price & Rogers 2004, Fails & Druin 2005). The systems already mentioned in this section all have a social component - the distribution of augmented reality throughout a space allows the children to co-exist in the environment - see others' actions, discuss and act upon their reflections and analysis. With mobile systems, such as Savannah and Ambient Wood, each participant received different information / media which could be collated and shared. The distributed activity generated an information gap, which gave the group members a purpose to communicate. A shared situatedness was achieved via the communication and an aggregate of the data gathered in a virtual environment. In the case of responsive spaces, such as SoundMaker, where the group would simultaneously share the actions of the group, there was an immediate shared situatedness. The participants could observe the events triggered by others, providing they were able to make the connection between the actions and the auditory feedback.

2.3.5 Design Framework

Enactive interaction, in this thesis, is framed by two key attributes: (1) interaction and interface should attend to social and physical conventions, and (2) sensory technologies are embedded in the environment, creating mixed reality spaces, can accommodate conventions. This section returns to the assumptions about enactive learning processes identified at the beginning of this chapter, and draws together the approaches to embodied, social and situated interaction discussed in this section.

Process 1. Learning is a process of situating the self in an environment.

In design: Interaction should be meaningful.

- Natural interaction may be possible by accommodating the body-in-motion. Movement based systems are an approach to multimodal interaction that exploit situated knowledge and coupling mechanisms. However, it is necessary to consider how and if, triggered (auditory / visual) feedback will be directly perceived.

- There is evidence of the embodiment of representation in interaction, and therefore coupling with the digital representations of object and space, which may produce new interactional possibilities.
- Mixed reality systems offer a potential platform to spatially distribute control by providing multiple points of interaction, and could allow knowledge to emerge via active exploration.

Process 2. Learning is a cyclical process generated from the creation and consumption of self produced values.
In design: there should be an active presence in the mediated environment and activity.

- There should be opportunities in interaction to make meaning through a distortion of the system's affordances. The interface and interaction should afford some ambiguity and malleability, to give space for distorting meaning. However, in order to manipulate the system's affordances, users may need to understand the constraints in real terms.
- The embodiment of representational forms and feedback will have parameters. Recognition relies on experience and ability (at the threshold, or beyond) of transfer.

Process 3. Learning is a process of gaining access to social worlds of significance.
In design: Co-presence.

- Social systems need distributed and multiple points of interaction, so each individual group member has some control in the environment, as they would in the physical world, and therefore a role in the collaborative activity.
- For the group to make use of the collective competencies of the group, there needs to be a shared situated awareness. This could be achieved directly and immediately in situated group interaction, or indirectly via the explicit sharing of information.

2.3.6 Summary

This section has considered the enaction in terms of the requirements for interaction and interface design. The next section draws together concepts of enactive learning processes with these concepts of design to form the framework which was applied to the design practice in this study.

2.4 Design Rationale

This section draws together the main concerns outlined in this chapter. The literature reviewed and categorised enactive learning into three key areas: situating actions, meaning making and social worlds. These have been linked to characteristics of young children's pretence and role play, to validate play as a context for design. The purpose of this section, chapter, and indeed this thesis, is to develop a framework for designing for enactive learning through play.

2.4.1 Play as a Marker for Enaction

Play was adopted as a marker because it is a manifestation of enactive learning processes. Pretence with others and objects reveals how couplings are viable, mutable and multiple in the creation and consumption of self generated knowledge; achieved through interaction with social and material environments. If there is evidence of pretence in the interaction and experience, then there is also evidence of autonomous meaning making and distortion. Whilst collaborating in socially active play, would indicate the group had achieved a shared presence. From the design perspective, there was an intention to engineer ambiguity in the system - to leave room for the imagination to set new constraints - while also ensuring the child was able to locate familiar elements to distort. Young children's play is an open system - a micro ecology influenced by overlapping macro worlds - so the situations that emerge in their play should mix experience with external stimuli.

2.4.2 Design Requirements and Assumptions

Drawing together the main points from this chapter, three principles of interaction and interface design have been identified as having parallel qualities to the enactive criteria:

Meaningful interaction:

As learning is a process of situating the self in an environment, the action in interaction should be meaningful within the context of the activity. Situating is considered to involve coupling bodily (thoughts / language / perception) actions with environmental factors, so there is attention to affordances for physical action.

Active Presence:

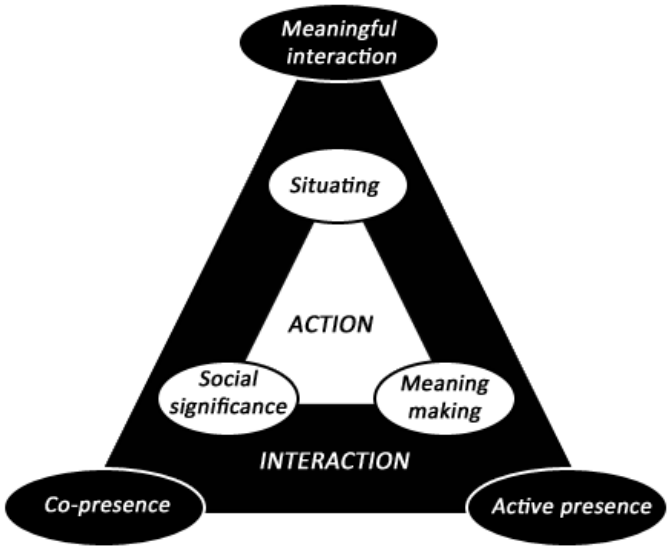

Figure 2.1: Enactive framework for interaction, interface and experience design

The user / learner should have an active presence in the mediated learning experience - there should be some efficacy to their actions. There should be opportunities to make meaning in the perception of affordances, and act upon distortions of this meaning. Activities should focus on areas where there is an inherent curiosity and room to develop autonomy. Making a system flexible enough for play and playfulness is the objective of my design practice. There is an attempt to encourage the children's ability to reconfigure their environment to suit their needs. At this stage, this challenge is conceived as providing malleable affordances, which may actually emerge from an ambiguity of designed functionality or representation. The distortion of meaning is the child's work, and since there is no hope of providing for all permutations of interpretation in this context, there needs to be a space in the interplay of computer interaction to act *as if*. Instead of prescribed affordance, the design should suggest playfulness, it should communicate that this is something to be played with.

Co-presence:

Designs for learning must acknowledge that others augment an individual's learning processes. As with the previous criteria, there should be room for the group to develop their collective autonomy. Technologies which mediate social learning should provide a shared situated awareness via a

spectrum of direct and indirect communication, and representations that aid achieving common ground. Through a combination of a shared media space to support situated awareness, and distributed interaction to support natural social groupings, it was hoped that the children would be able incorporate their interactions with the system into their social play.

2.4.3 Mixed Reality Spaces for Play

The objective of the design practice in this study was to exploit situated behaviours that were embedded in the play space environment. This rationale assumed that embedding technology in a familiar context (such as a child's play space) would trigger, initially at least, the situated action and social action that had emerged from this environment. This section clarifies the technological choices that have been identified as possible routes to exploiting situated action.

The technologies that created the augmentation of the play space aimed to create a situated awareness via shared visual / auditory forms and feedback, to comprehend the interaction of others with the space. There are two approaches to mixed reality systems: (1) in the moment experienced by all as SoundMaker and StoryRoom; (2) gather distributed data and collate, as the Savannah and Ambient Wood systems. Both are socially rich, with opportunities for discovery via interaction. However the structure of each method is likely to suit different competencies and learning objectives. Achieving co-presence - sharing information and coordinating activity - would be very different in these two environments. At this stage, the design practice aimed to move forward with the former approach, as the immediacy of the feedback seemed more in keeping with the spontaneity of play. Further, shared visual spaces are particularly advantageous when participants only have a simple vocabulary for describing their world (Kraut 2002). The shared visual reference would enable the children to be more efficient with their language (i.e. reference an object as *that*, as opposed to a full description), as some of the work of achieving common ground could be offloaded into the visual space.

There was an obvious question about how to structure the mediated activity. The children's role play and pretence would have its own narrative structure, which should be allowed to emerge. There have been a number of mixed reality systems which have considered interactive storytelling for children's play (Ryokai & Cassell 1999, Alborzi, Druin, Montemayor, Platner, Porteous, Sherman, Boltman, Taxen, Best, Hammer, Kruskal, Lal, Schwenn, Sumida, Wagner & Hendler 2000, Bobick

et al. 1999, Montemayor & Huha 2004). In the design of StoryRoom, Montemayor at al (2004) were critical that in many applications for storytelling, children did not have opportunities to program the interactivity, and without this freedom, they did not have control (Ibid., p.2). For Cassell (2002), collaborative storytelling is a chance to realise self-efficacy - embedded in the activity is an awareness that you can have an effect on your world, and thus increase confidence. In each of these examples, there is a clear objective that the child should actively participate in the unfolding of events. Consequently, there were a couple of concerns for storytelling in play. Unlike cinema, mixed reality spaces for storytelling elements can be non-linear, spatially distributed and require physical interaction. The challenge becomes finding all new conventions of suspending disbelief when you cannot disengage the reality of the human body from story experience, as passive cinema does so effectively (Stapleton & Mott 2006, p.38). The question then is how can the children have an active presence in creating and driving the play narrative, whilst also being immersed in it? Allowing the children to author the narrative of the playspace was a challenge in my design approach. Authoring ahead of the activity asks the child to predetermine his own play, when there should be opportunities for dynamic changes in the experience to suit the mood of the player. Authoring long before action also presupposes the child is able to plan the sequence of events in play scenarios, and has enough conceptual understanding to extrapolate elements from his intended pretence situation, which would complement his activity. Further, he may be asked to do this with others. The construction processes have an educational benefit, but perhaps do not meet the requirements for the spontaneity in play. This was an aspect of design - the generation of dynamic narratives - that would be explored during the fieldwork in this study.

2.4.4 Summary

This chapter clarified the basis and form of the design framework which will be applied in my research and design practice, identified play as a marker of enactive processes, and discussed approaches to creating mixed reality spaces for play. The next chapter discusses the methods used in this study to investigate these processes in the classroom.

3 | Research and Design Methods

This chapter considers the methods used for the design and evaluation processes in this study. This chapter considers what is demanded from the research and design methods to reveal, investigate and accommodate the design framework. The research methods are defined, and there is a discussion about the assumptions of teachers, children, schools, and technology prior to embarking on the research activities, alongside the pragmatic issues that were likely to constrain the research and design outcomes.

3.1 Research Methods

The objective of the research activities was to explicate the processes and affordances that link enactive theories of learning and play, to interaction and interface design. This study aimed to combine theoretical understandings of enactive learning with an applied practice, to create technologies to augment children's social and physical role play. To perceive this design problem through an enactive lens, the investigations and interventions were required to consider learning, play and technology in the classroom in holistic terms. Consequently, this study conducted situated design activities supported by ethnographic research.

3.1.1 Structure

The applied research activities in this study employed different research methods for different stages, to meet the research and design objectives. The structure of the research and design fit a very simple formula of an initial immersion in the context of use, where findings were fed forward to shape design activities. These in turn, defined the final design choices, which were re-

alised in the technological development. The initial fieldwork made use of ethnographic techniques to build a picture of the context and locate design interventions in existing practice. The second phase revolved around participatory design, whilst the final stage conducted evaluations of the interactive technologies that were eventually developed. The transition between these stages placed increasing constraints on my assumptions about software features, the structure of mediated tasks, modalities of interaction and representational forms - and therefore showed what was viable. As the designer, I was tasked with finding the balance between the familiar and the unfamiliar via an exploration of the design space, to identify the tipping point of existing knowledge and novelty, and to achieve understanding between the technology and user. At the end of the design process, the design practice aimed to:

- Create technologies for the children to physically play within a social context.
- Create technologies that would contribute to an understanding of designing for enactive learning processes.
- Create technologies that aimed to work in accord with the demands and constraints of the context of use - if learning is about situating, then whatever is significant within the environment is also significant to the design of technologies

The remaining part of this section describes the rationale for selecting ethnographic and PD as suitable methods for this study. There are some key considerations which run across both approaches that will be discussed in detail in the next section.

3.1.2 Initial research: Ethnographic Study

The research at this stage sought to understand a working knowledge of the multiple and overlapping learning, social and institutional practices in the school environment. The investigation considered the social and physical organisation of school life in terms of people, spaces, tools, materials and time. Though a broad view was taken, there was a focus on technology and play, in small groups and whole class learning. Of particular interest was meaning making activities, which were creative and collaborative, and where there were opportunities for autonomy.

Ethnography holds that the true locus of inquiry should be in the everyday activities in situ, the

relationship between the environment and the individual (Nardi 1996, p.71). Within ethnographic methodologies there are three assumptions (i) actions are accountable within a set of located practice; (ii) utterances and actions are situationally bound and therefore only understood by their context; (iii) a measure of the rationale of behaviour in the social world is how intelligible actions are to others (Fetterman 1998). As an open inquiry, it considers the nature of social phenomena for generating, rather than testing, hypotheses. (Atkinson 1988). Ethnography is inherently reflexive in its analysis. 'Reflexivity means reflecting upon the way the ethnographer is part of the ethnography itself, their background and perspective is as much part of the research as those of the culture being studied' (Johnson 2012, p.1136). The researcher's agenda, expectations and ability will play a significant role in what is perceived in the environment, and how it is inferred. As a result of this unavoidable filtering, research activities should be scrutinised: what was done and why, what misgivings, what mistakes, what expectations, what disappointments etc - should all be accounted for in analysis.

Ethnography has long been used as a methodology for human-computer interaction (HCI) design (Suchman 1987), particularly in computer-supported collaborative work (CSCW) (Anderson 1996, Mercer & Rupert 2004) and ubiquitous systems (Dourish 2001, Dourish & Bell 2011). Dourish and Bell (2011) have high regard for ethnography in design practice.

> Ethnography approaches yield a different perspective on the creative process by which people put technology into practice and meaning. These are seen as consequences of everyday actions, not as problems to be eliminated. Technology here is a site for social and cultural production; it provides occasions for enacting cultural and social meaning and, as with technology, so also with space, gender, family, time, animals, food, death, emotion, and everything else (Ibid., p.73).

In using ethnography to assess technology, the focus of analysis shifts from the narrow human-computer perspective, to the everyday actions into which the device is to be appropriated. There was some apprehension of the possible difficulties in adopting ethnography for design intentions. 'For many software engineers ethnography seems far too unsystematic a method, its results presented in an overly discursive form, design options are not clearly stated and do not attend sufficiently to engineering needs. In other words, its virtues become vices' (Hughes, King, Rodden

& Andersen 1995, p.58). Moving from the descriptive accounts of practice to definitive interactive design features is potentially problematic, involving a large amount of inference on the part of the ethnographer / designer. There is no real solution to this issue, other than an openness to refining assumptions, when it becomes apparent that the analysis is flawed. Also, as both Hughes et al (1995) and Dourish and Bell (2011) point out, the concerns about the messiness of ethnographic research for design is trumped by the alternative - laboratory based testing; which is a nonsensical method when designing for situated action and practice.

Every school day produces a multitude of contexts in which learning and play occurs. At this stage in the study, I focused on the structure and organisation of classroom life - time, space, routine, habits, rules and roles - to determine a repertoire of meaningful action. Understanding these structural and organisational constraints was important, as 'the structures of social lives themselves have meaning' (Dourish & Bell 2011, p.47). Cultural rules and practices do not just define behaviour, they generate action. 'Rather than being determined by rules, actors effectively use the normative rules of conduct that are available to produce significant actions' (Suchman 1987, p.66). Revealing how different spaces were configured for learning, the timeframes of activities, the interaction between pupil-pupil and teacher-pupil; established the parameters to technological invention. For example, knowing how much space the children had to play in and how much time they were given to play, placed physical and temporal constraints around the intended system's use. Autonomy was considered in terms of exploring the application (design and use) of technologies for independent (non-teacher assisted) learning, and the negotiation of meaning making in social contexts. Meaning making activities were defined as any process of creation - acting like a plane, writing a story, drawing a picture - or a component part of these activities.

My role in the school during this stage, and throughout the project, was extended beyond the confines of my research project. From the school's perspective, I was a digital media resource. This meant that I also helped teachers with technical issues relating to the use of devices (i.e. setting up data projectors or how to use a newly acquired digital cameras) and digital media production (i.e. making short movies of a school excursion). Help was provided ad hoc, but also through a series of practical training sessions. This meant that I did not just observe daily life, but participated. This provided an understanding of the teacher's skills and attitudes to technology in their teaching practice, without the need to rely solely on self reported concerns and expectations. I could instead,

experience these problems in-action at the chalk face. Informal time was spent in the staff room and the school environment, which actually proved to be a real resource to gain understanding - many insights could be challenged by chatting to teachers whilst waiting for the kettle to boil. Aside from observations of, and participation in, classroom practice, data was also gathered via discussions, meetings and documentation relating to the project's development (specific activities are described in Chapter 4). As a result of all of this activity, during the course of the ethnographic fieldwork, a large amount of descriptive data was collected. This data was cross-referenced until patterns in the structure and organisation emerged. Specific issues with handling data from multiple sources are discussed in Chapter 3.2.

3.1.3 Participatory Design

The ethnographic fieldwork grounded the study, but finding the common ground required to reach solutions, needed to be an ongoing dialogue. In PD, 'researcher-designers must come to conclusions in conjunction with users' (Spinuzzi 2005, p.167). This part of the design practice aimed to give the teachers and children opportunities to be more active in the design process. Druin (1999), Rogers et al (2002), and Cassell (2001) pioneered PD in the design of children's technologies. It is a popular method because of the prominent role participants have in shaping the products they, and their peers, will use. Learners should know that they too can participate in the enculturation of tools, and have some efficacy in the design of the artefacts they consume (Cassell 2002). 'Users are therefore active collaborators in the design process, rather than passive participants whose involvement is entirely governed by the designer' (Dix & Abowd 1993, p.365). Being part of a design process could also be considered a learning experience, as it is a meaning making activity (Bellamy 1996, p.130). The participatory process is not just for the benefit of the user. In understanding a new context, the designer is a learner, and therefore subject to the same processes. Consequently, there was a need to actively engage in authentic, social practices in PD activities, to make sense of the environment and processes I aimed to support in design. One of the cited limitations of PD is that, by involving users to co-design, radical change is unlikely, as the designer must work within the limitations of the participant's ability to conceive and articulate innovations (Spinuzzi 2005). However, in the context of this study, as previously mentioned, small moves were the intention.

PD in this project revolved around iterative workshops designed in response to the formative findings from the ethnographic fieldwork, with children working on tasks that contributed to shaping the final design. The gains and challenges to working with children is discussed in more detail in Chapter 3.2., as these are issues that span across the entire study. There were two phases to the PD workshops. The first phase relied on low-tech, familiar tools to tease out ideas. The workshops were orientated around story making activities and opinions of play, to elicit possible correlations that may help structure role play narratives, and supplement what had been learned from previous observations of play. During the initial stages of the PD workshops, given the young age of the participants, I wanted to avoid the children getting too caught up their own assumptions of technology. So, in the initial PD sessions, rather than structuring workshop activities around the development of specific features, loosely structured tasks were set, for example "draw places you like to play". The use of drawing and visual materials as a method of communicating ideas and opinions are discussed in more detail later in this chapter. The second stage of the PD sessions made use of proprietary and prototyped systems to test the water. All of the PD activities were conducted in situ - either in the classroom, and when possible, the children's role play spaces - to draw out actions meaningful to these contexts. Specific objectives and activities are described in Chapter 5, as they were refined by the ethnographic findings.

3.1.4 Evaluation of the Augmented Play Space

The purpose of the first two stages of research was to define the design choices that would realise and assess the design framework established in this thesis. In the final stage, interactive systems designed to accommodate physical and social behaviours were installed in role play spaces in the classroom. The design of the final system assumed that augmenting a familiar space would capitalise on situated behaviour. In this light, there was no singular interpretation of the correct use, instead the hope was the children would draw out the playful affordances, and share these with each other.

The intention of the design practice was to create a digital layer in a physical play space to explore whether children were able to integrate digital representations in their social play activities. The success of which would serve as an indication of the potential for enactive learning in mixed reality spaces. The evaluation of the augmented play space specifically looked for evidence of meaningful

interaction, active presence and situating co-presence in use. This stage relied on observations and discussions with the children and teachers.

Once the system had been installed, it was important to consider whether it had integrated into the environment over time, as despite the system being designed to acknowledge existing practice, there was an assumption that over time there would be a shift in practice. As Nardi (1999) comments: 'A natural environment offers many toeholds for life of various forms. With tenacity and vigour, species migrate and change to fill the available niches. These adaptations lead in turn to further change, as the entire system adjusts to new constraints and possibilities' (p.52). Consequently, longitudinal evaluations were conducted to assess if the children and teachers adapted the technology to be their own, by examining how the mixed reality play space was used during the school day.

3.2 Threads Across Mixed Methods

Although mixed methods were used through this study, there were key factors which ran across all of the research and design activities. This section considers more closely the demands on research that resulted from an enactive framework for design, issues relating to data gathering and working in schools with children.

3.2.1 Enaction

It is worth re-iterating here, the scope at which enaction influenced all aspects of this study. Enactive principles are applicable to theories of learning, and define play as a manifestation of these principles. The influence extended to the research methods, which looked for structure and emerging patterns in terms of factors that were relevant to enactive principles. The design framework established in chapter 2 was the lens, directing how research methods were applied, and what was attended to in the environment. There was an attempt at each stage of the research and design practice to re-assess the application of the design framework. This section outlines the demands of the research and design activities from an enactive perspective.

3.2.1.1 Evaluating Situating Actions and Meaningful Interaction

In evaluating how to support the different aspects of meaningful action, the focus was squarely on situated and situating action - what was situational-appropriate behaviour, and how was it achieved? 'Rather than attempting to abstract action away from its circumstances and represent it as a rational plan, the approach is to study how people use their circumstances to achieve intelligent action' (Suchman 1987, p.50). There needed to be an understanding of action-in-context, to identify behavioural patterns and practices within key environments and in meaning making activities, which could be exploited in design. The fieldwork findings were categorised in enactive terms, so learning and play experiences were considered in terms of the learner's autonomy, the role of the body in the activity, and how elements in the environment dovetailed action to facilitate the learner / player - in both a broader ecological sense, but also in the moment. In assessing learning, play and using technology, findings sought to reveal how the meaning of action was achieved in the interaction with the resources (objects and people) in the classroom, and framed via procedures, rules, methods

and forms of organisation. Also, attention was paid to instances of confusion and breakdowns in use and communication. As meaningful actions were an expression of the user's expectations, breakdowns would reveal a mismatch of the user's understanding and the design of the technology, and therefore work towards placing parameters around interaction and interface choices.

3.2.1.2 Evaluating Meaning Making and Active Presence

Evaluating active presence looked for occurrences of the learner's autonomy and agency in the experience - simply what did the learner/player/user do? Particular attention was paid to opportunities in classroom activities to act upon self-initiated action, and how resources contributed to meaning making. In terms of playfulness, the evaluation of learning and play settings focused on evidence of malleability, and the circumstances in which distortion of meanings and playful agency occurred.

3.2.1.3 Evaluating Sharing Significance and Co-presence

Situated co-presence is a shared awareness, achieved through communication and coordinating action. To move beyond an individual notion of learning, it was important to account for the creation and maintenance of co-presence - i.e. how learners make sense with others. In order to reveal the dynamics of collaborative and cooperative activity, it was necessary to examine how cohesion in various groupings was achieved and sustained. In this study, the fieldwork aimed to locate situating interactional patterns in learning and play contexts, by analysing processes the children used to achieve cohesiveness in their group activities. Situating co-presence was assumed to be achieved via the least collaborative effort, and included direct communication, observation and imitation. In play, situating (meta-communication) and situated (play talk) action should be evident.

3.2.2 In the Wild

All of the research activities were conducted *in the wild*. This was important from an enactive perspective as the context will have a significant impact on behaviour. Selwyn et al (2010), when looking at the use of technology in the classroom, observed that children were allowed to use the computers if they had completed their work before their peers, providing there was nothing to do in the "unfinished drawer" (where outstanding worked was kept). In this classroom, time to chose your own activity was a currency, it meant that finishing your work quicker, and finishing work more

regularly, created gaps to play. In my study, it was observing these local practices that would reveal potential uses for technology.

There are a couple of specific issues that needed to be accounted for when situating research and design activities in the wild. Foremost, tasks need to be useful to participants outside the study itself, in order to make practice meaningful to the participants (Johnson 2012, p.1139). The tasks should not be isolated, they should be perceived by the participants as a continuation of their existing practice. The second concern, was whether to participate in activities, or just observe, and the implications of each method. As an observer, I would get an overview of the dynamics and structure of the activity, with time to gather data. However, I needed to consider how to observe natural practice without impacting behaviour - some related issues with data collection are discussed a little later in this chapter. As a participant, I could experience the activity with the group, which might reveal some of the tensions and accomplishments from a first person experience (Johnson 2012). Though as before, I needed to know how my presence affected the dynamic of the activity, also if I was active in the task, then I might not have time to gather data beyond my own subjective experience. Further, I had to be mindful that my position as a researcher would have an impact on the relationship, and my ability to make inferences. I had a different activity, agenda and pressures. I did not have to deal with the same concerns and responsibilities as the teachers. The choice of participation and observation in practice was decided by the appropriateness of my presence, whether it would have been natural for me to participate. For example, during observations of young children's social play, my involvement would have been disruptive and strange.

3.2.3 Qualitative Data

The research activities in this study took a varied approach to data collection. Sengers and Gaver (2006) suggest in unravelling ethnographies, methods of data collection should be as diverse as the possible re-interpretations of design affordances. Fieldwork therefore set out to comprehend the mixed and many situations and competencies, from which specificity should emerge. 'The big net approach ensures a wide angle view of events before the microscopic study of specific interactions begins' (Fetterman 1998, p.33/34). The big picture is then refined and concentrated to identify the 'master narratives' (Livingstone 1997). Ethnographic and participatory design processes in this study, cross referenced subjective and observational data, participant-observational techniques,

interviews, observations, visual data and surveys, to locate behavioural trends and patterns that persisted across situations.

The use of video recording as a source of data was varied. Some sessions were video recorded for accuracy in analysis. Video data has the advantage of 'density' and 'permanence' (Powell & Maher 2003), and as a lone researcher it was difficult to capture all activity via notes. However it was not always possible to use the camera. On occasion, this was because the children did not have the required parental consent, but also because the children's behaviour could be heavily affected by the presence of the camera. As Alison Druin (1999) noted: 'We found that when children saw a video camera in the room, they tended to "perform" or to "freeze"' (p.594). On many occasions in this study, use of the video camera was counter-productive. The children's behaviour was so affected that the session would be severely disrupted (i.e. overly excited, focus on camera rather than task), and part, or all of the material was rendered useless. The teachers were also not so keen on the camera, partly because it disrupted the children, but also because it made them feel self conscious of their own behaviour. Audio recordings were attempted on a couple of occasions, as this could be a more discrete way of capturing activity. However, audio is not as rich, and it was very difficult to distinguish multiple and quiet voices, especially in noisy environments.

3.2.3.1 Qualitative Analysis Methodologies

Analysis of data aimed to categorise findings in terms of their relevance to the enactive framework established in Chapter 2.4. The analysis used an agile approach, whereby data was categorised as patterns, or indications of patterns, emerged. The analysis looked to triangulate findings across multiple sources, but given the iterative nature of this study, unstable behaviours were also considered. Trends in findings were important, but some anomalies in behaviours were also considered, if thought to be pertinent to the future user, or an incident I hoped would not re-occur (such as breakdowns in technology). If the positive anomalies did not re-appear, then they were factored out at a later stage.

For analysis, the video data was transcribed to show spoke language and physical action - as both were considered relevant to understanding situated action. The types and social groupings in play were classified using Kenneth Rubin's Play Observational Scale (2001) (see Appendix 3), which combines Piaget's cognitive and Parten's social classifications for play behaviour. This is

essentially a socially constructivist framework, but served as a solid foundation to categorising the contexts of the play action. Only the play sessions that were video recorded were coded.

3.2.4 Participants as Researchers

Involving users directly in research activities meant they could describe the use of technologies in their own terms, and define the meaningfulness of interaction, interface and experience design choices. The designer cannot assign meaning, the only meaning that is important comes via the user's perceived affordances (Norman 1993, Dourish 2001). The designer's perceptions of the system's affordances are almost an arbitrary concern. In this study, teachers and children were asked to assess the design concepts and outcomes in their own terms. In this respect, the participants act as researchers, and the designer becomes a dependant - the focus shifts to observing practice, to asking from guidance.

There were issues that needed to be accounted for when employing participants as researcher, namely the Hawthorne effect - the influence of the experiment on the attitudes and behaviours of the participants[1]. Brown et al (2011) identified three key issues that can arise when including participants in research activities, all of which will skew data. Firstly, participants can make conscious efforts to get the right result, to satisfy the research agenda. Secondly, a few participants may take a lead in the research activities, they will provide a wealth of feedback, but also data which is not in accord with the less pro-active members of the group. Finally, participants can find it difficult to articulate their use of the system, and therefore be unable to provide a complete account of use. Children are likely to be particularly prone to these all of these issues.

To overcome, as far as possible, issues with children giving the right answer, research activities avoided direct feedback from children via Smileyometers, or similar child friendly ranking techniques. This type of data was not considered to offer much insight into children's opinions. Partly because the questions would have to be simply framed, and may not give room for the children to actually contribute an opinion. Also, there was an expectation that the children would not necessarily recognise this as a method for showing preference. Children can consider a negative opinion to

[1]The Hawthorne effect refers to the subject's response to being the focus of research activities. The term is derived from a series of experiments at the Hawthorne plant of Western Electric Company between 1924 to 1932. Researchers noted that the workers being observed demonstrated improved performance irrespective of the changing variables (i.e. improved and poor light both led to increased productivity). When under scrutiny, the employees put their 'best foot forward' to impress management (Barnes 2009).

reflect on their own ability or character, so will report positively regardless of the actual experience (Sim 2006). Rather discussions and open interviews were conducted.

There are likely to be inconsistencies in self reported behaviour and observations, either as a result of the diversity of the group, or because of dominant lead participants (Brown & Sherwood 2011). However, it may be that the differences between what people say they do, and what they actually do is, as Dourish and Bell (2011) suggest, 'fertile ground'. 'It is lived and embodied experience - the articulation of aspirations and cultural ideals along with all the spaces in between - that give form and meaning to technology' (Ibid., p.73). Selwyn et al (2010) noted when getting feedback from children, there was a high variation of opinion, but that there were themes within contradictory discourses (p.85). If patterns cannot be identified, anomalies in data will show there was differing, as opposed to homogenised opinion and action, which has equal meaningfulness.

Asking children to methodologically evaluate or hypothise about an experience was likely to be problematic. This study did not anticipate that the children would be unable to give an opinion, but that it might be difficult to infer and translate their opinions into tangible outcomes. For example, children tend to focus on detail (i.e. "computers hard to draw a line") (Selwyn & Cranmer 2010, p.80). Additionally, children are not the best assessors of their own performance. For example, Sim et al (2006) found children's opinion of a good learning application contradicted with actual performance results.

This study took a number of steps to help the children express their ideas. The research, design and evaluation activities used multiple media forms to articulate ideas, largely using familiar tools and skills. One method to gaining access to children's opinion of events and concepts, was to use drawing as a form of self-expression (Selwyn & Cranmer 2010, p.110). Externalising thoughts and ideas visually can aid the children's reflection (Wall & Higgins 2006). Further, children are familiar with drawing images to depict events as a measure of comprehension for all subject areas. Also, as discussed in Chapter 5 of this thesis, the process of drawing turned out to be a useful time to discuss what they were drawing, and why, as children's drawings can be difficult to decipher.

The analysis of childrenÕs drawings needed to be mindful that the visual representations were unlikely to truly reflect what they saw, but rather how they expected things to be. For example, perspective can be overridden by expectations of relative size. The pictures created should not be

considered as direct depictions of the experience, '(...) but rather to catch experience in the act of making the world available' (Noe 2004, p.177). 'Picture making, like experience itself, is an activity, it is at once an activity of careful looking to the world, and an activity of reflection of what you see and what you have to do to see' (Ibid., p.179).

3.2.5 Research with Teachers

In this project, the situated research and design activities, and their outcomes, had some responsibilities. My presence as a designer, and subsequent interventions, needed to be mindful of possible disruptions to teaching. As a result of this responsibility, activities had to be purposeful, results tangible, and products usable. Research activities needed to be flexible enough to fit around school programmes, and not take up disproportionate amounts of time. However, the technologies aimed to have an impact, and in the pursuit of solutions, it was likely there would be tasks and technologies that did not work as intended, or challenged the participants. The teachers involved had to be prepared to make changes that would involve taking risks and moving into areas where they might not be confident, in order to allow technological development to move forward. (Loveless & Ellis 2001, p.10/11). However, this had to be seen in balance with their other priorities, so the intention - if it was thought there would be elements that would be challenging - was to take small steps forward.

The methods used in this study for gaining and sharing information with teachers via loosely structured interviews and discussions in formal meetings and informal settings, have already been mentioned. This meant that the primary means of getting opinions was in verbal conversations, with individual teachers and in small groups. The timeframes, duration and frequency of the research activities were structured entirely around their teaching requirements. The choice of lessons to observe was negotiated between the teacher and myself. My initial areas of interest were meaning making activities, play sessions and the use of technology. After each session, there was an immediate debrief with the teacher, so that some of the most prominent observations could be validated or clarified. The PD activities were discussed at length with three of the participating teachers, who again advised on how to structure activities, the materials we should use, and what the children would realistically be able to do. The teachers also gave feedback toward the end of the project

about how the augmented play space had been used in the classroom, how they felt the children had responded to it, and the impact it had on daily life.

3.2.6 Research with Children

Children may not be able to reliably self-report, but when it comes to their own play, they are experts - they are very good at defining what is, and most importantly, what is not play (Garvey 1984, p.21). This is important for this study, as differentiating between these two states could help draw out the attributes that enable play to be maintained. As previously mentioned, understanding what drives the child in play will offer insight into the needs and motivations which are effective in getting him to act.

Research and design activities needed to manage the children's involvement to ensure tasks were within their competencies. Activities had to be developmentally appropriate, as it was the ideas, and not completing a challenging learning exercise, that was the focus. However, as previously mentioned, design activities themselves could be seen as a learning experience. 'Involving children in age-appropriate decision-making may also have other benefits, including providing opportunities to improve their self-esteem and support of each other' (Schenk & Williamson 2005, p.5). As such, and although it was not the focus, giving the children autonomy and opportunities to participate may have had some educational gains.

3.2.6.1 Ethics of Working with Children

The children from participating schools were involved or present in all of the observations of classroom activities, design activities, and software evaluations. To ensure activities were appropriate, teachers were regularly informed about research tasks, and were often involved or nearby. Given the very young age of the children involved in this project, creating an environment where they were comfortable enough to discuss ideas and be creative was paramount. All of the activities in the research were located in the classroom spaces, to ensure a familiar setting for the children. There were no covert activities, my attitude with all of the participants and stakeholders was to attempt to as transparent as possible about my research agenda, questions and assumptions. It would have been counter-productive to hide or mask my intentions, particularly as in order to move forward with my understanding I needed the teachers and children to judge, challenge or validate my opinions.

This study adhered to the BERA Ethical Guidelines for Educational Research (BERA 2004), and an ethics statement can be found in Appendix 1.

There were different ethical issues present in the varying research and design methods used in the study, which needed to be justified (Alderson 2011, p.101). This project aimed to take a mixed approach to data collection, including observations, discussions, participation in design workshops and evaluations. Observations could possibly make the children feel as if they were under scrutiny while working, or at play. When observing, there was a need to be outside of the children's work and play spaces, to allow them to operate freely. As this was an investigation of the children's behaviour and attitudes relating to their social interactions and play, they were likely to explore their experiences drawn from all aspects of their lives, including their home life. Though the issue never actually arose, it was anticipated that there may be situations portrayed by the children which would inadvertently reveal personal aspects of their home environment. In the interests of anonymity, and given the children's potential lack of understanding of their right to withdraw, prior to embarking on research activities I had decided these observations would best be omitted. To reduce any potential pressure the children may have felt when directly asked questions, I opted for discussions over interviews. The key difference from an ethical perspective is that in an interview scenario when asked a direct question, the child may feel time pressured to both answer the question and get it right. Discussions are less formal. The children would not be asked the questions individually, but as a group. If they did not want to answer, they were not required to actively reject the question. Consequently, their unwillingness to participate could be passive.

As stated, the research activities made use of familiar tools, and tasks were constructed to be achievable, so as not to negatively effect the children's self esteem, and to ensure a sense of contribution. The structure of the design and evaluation activities were close to other classroom tasks, but there was some trial and error in their design. One of the weakness of PD is structuring the activities to get the right data - the approach is less distinct than interviewing where direct questions can be asked to clarify points, or in observations where (arguably) the data is filtered to areas of interest. In PD, it is possible that the children would successfully complete the task, but the research question was not answered. As a practitioner I needed to make sure my desire to get usable data, or failure to do so (and perhaps accompanying disappointment) was not projected outwardly. Conversely, much is learned through failure, and it is also possible the children did

not manage to complete the assigned task, but I learned that something which was useful to my research. It was therefore important to make it clear to the children that their activity had a greater meaning, than just completing the task. There was an attempt to convey the concept of research to the children, and a simple debrief post task to communicate to my observations. It was essential that the session ended with the children being thanked for their participation, so that they were aware that they had contributed to the school project.

There were three layers of consent to consider for each research activity involving children: (1) consent from the teacher to consult her class; (2) consent from the children to participate in the research activities; (3) consent for individual children by proxy of the teachers to be involved once they had volunteered. Parental consent was required for the children to be involved in research activities and data collection, that often included video and photography. The school managed obtaining written consent from the parents. As this information was confidential, the consent forms were held by the school. I was not privy to the identities of the children who did not have consent, only that recording with some groups would not be possible. In whole class activities, where video recording was not possible, observational data relied on field notes.

All the design and many research activities relied on the children volunteering, which I would need to recruit. Priscilla Alderson (2011) raises the issue of how to get around having to refuse an unknown adult (p.112). I needed to be mindful that it may be difficult for the children to say no, or indeed yes, to a stranger. As the teachers knew the children, and vice versa, they were responsible for selecting appropriate participants. To obtain the children's consent and assess their willingness to participate, the teacher would explain the research activity to the whole class, ask for volunteers, and select participants from a subset of the volunteers. It was possible that children who wished to be involved, might not be allowed due to a lack of parental consent. If possible, children who wanted to be involved were accommodated by altering the data collected. On occasion the teacher would also ask specific children if they would like to participate. Given this process of selection, the teachers acted as the 'responsible other' for the child's immediate consent[2].

[2](BERA 2004, para 16): In the case of participants whose age, intellectual capability or other vulnerable circumstance may limit the extent to which they can be expected to understand or agree voluntarily to undertake their role, researchers must fully explore alternative ways in which they can be enabled to make authentic responses. In such circumstances, researchers must also seek the collaboration and approval of those who act in guardianship (e.g. parents) or as 'responsible others' (i.e. those who have responsibility for the welfare and well-being of the participants e.g. social workers)

Fully informed consent is problematic when working with children, but should in all cases attempted to be obtained[3]. The teachers played a crucial role in this aspect of the research, it is important to note their role in co-design extended beyond the observations and reporting of their own practices. The teachers working on this project had a set of skills which enabled them to help shape activities which were age and ability appropriate. To inform the children, the teachers were able to grade their language so the children would understand what they would be expected to do as part of the research task. Therefore, I relied heavily on the teachers to recruit volunteers, explain the activity and monitor the children's willingness to participate. In this respect, the teachers played a significant role in structuring the research, the sample of participants involved in this study, and the children's understanding of research activities - and therefore the research outcomes.

The issue of children's consent was further complicated in research activities that involved the whole class. In smaller groups the children were able to go back to class if they no longer wished to be involved, but whole class activities were conducted as normal lessons. Not wanting to be part of the research would have meant leaving the lesson, which was unlikely to be permitted by the teacher. This issue did not manifest in practice, probably as the children were really too young to comprehend the scope of my presence and research. As a whole class activity, if the child had wished not to participate, then I anticipated that their unwillingness would be managed in the same manner (encouragement, rationalisation, guidance etc) as a normal classroom task.

In both whole class and small group activities with the children, it is possible that given their young age, they would not be able to comprehend their right to withdrawal. Their initial willingness to participate could well be a misinterpretation of the task, or what is being offered by the activity. The children may also struggle to understand that they are able to leave the activity before it is completed, or be able to explicitly express this wish. It was therefore important to closely monitor the children's behaviour for signs of discomfort, disagreement and boredom. If the child appeared to withdraw, then if possible the activity was altered, or they were gently asked if they would like to leave. Had any child exhibited discomfort, then the data collected would not be used.

Outside of collecting data for research, the children's competencies and affective state constantly

[3](BERA 2004, para 14): Article 12 requires that children who are capable of forming their own views should be granted the right to express their views freely in all matters affecting them, commensurate with their age and maturity. Children should therefore be facilitated to give fully informed consent.

needed to be monitored in the research activities. Were they happy with the task, happy working together, did they have a sense of accomplishment, feel as if they were part of the project? It was not just the children working on research and design activities, but those who did not. As the research was conducted onsite, the wider environment was also a factor. There was an effort not to be disruptive to others, but also ensure that as many as possible could participate. If there were a high number of volunteers, then the effect on children not being selected needed to be considered. I did not want to create disharmony. As with the issues with data collection, the research activities needed to be flexible to adapt to the needs of the participants. In instances where activities were very popular, I would adapt the timeframes (short sessions for each group or extend the evaluation period), or increase group size (or both) to make the activity more democratic.

Research involving participants must be worthwhile, particularly those working with children, and especially in an educational context (Alderson 2011, p.11). Given the high levels of commitment from the participating schools, it was critical to question the value of this study and its potential impact. In the first year I observed normal lessons, and therefore, other than my presence, did not disrupt the course of the normal classroom practice. The second and third year were potentially more disruptive. The design activities in the second year would take the children out of the classroom, and would be time away from learning. I needed to make sure the workshops warranted time away from the classroom. With the help of the teachers, I attempted to shape design activities so they paralleled other aspects of their children's learning. In the third year, there would be disruption caused by deploying technologies in the classroom, followed by a period of adjustment to adapt to the presence of the technologies. In terms of security (installing hardware, software, Internet security), I liaised with the school's usual technical support and worked within their existing infrastructures and recommendations. On a daily basis, outside of the evaluations sessions, the teachers would be responsible for managing the children's use of any deployed technologies. I hoped that the research outcomes, not just in terms of findings, but the designed products would justified the schools' involvement. This deferred responsibility further compounded the need to ensure the final technologies had a lasting positive effect.

3.2.7 Adaptation and Emergence

The research and design was an active process of finding some common ground between the designer, the technology, the user and the environment. This is a bi-directional exchange of information. As a designer, I needed to identify patterns and structure in the environment that may have suggested possibilities and constrain design ideas, but this was a dialogue. The teachers and learners also needed to know what new technologies and I was capable of, before they could innovate. As Sengers and Gaver (2006) noted, users need to be aware of limitations before they can re-interpret the system. If the designer only ever spends time observing users, there can be no mutual adaptation, both the users and the designer need to be active in each other's domain. Consequently, there were opportunities for the children and teachers, as users, to direct and define research activities.

Evolving practice necessitates a spectrum of adaptation, as opposed to a binary shift in behaviour. Within adaptive systems, the object's affordances will depend on the state of the relationship between the object and the user. The design and evaluation therefore needs to consider structural changes over short and long term timeframes. Each threshold shift in understanding should give way to new ways of engaging with the technology, and engaging the technology in the world. Designing for interventions in practice may take time to have any significant impact, and validity may be better proved over time. Agamanolis et al (2003) noted that it was only after two years of continuous operation did they start to notice certain evolving behaviours with telepresense systems installed in remote Media Lab workplaces. 'There must be time for the novelty factor to wear off, for its users to come to terms with its presence, to reject and hate it, to later reflect on how it can benefit them, to take ownership and integrate it into their lives and spaces, to gradually take it for granted' (Ibid., p.22). It was hoped the children would locate the system's playful affordances, and that over time it would integrate their everyday play. However, it was also accepted that as a consequence of integration, the children's play would also adapt in accord with the affordances they generated through their interactions.

3.3 Assumptions in Research and Design

This section outlines the assumptions prior to embarking on the research and design activities. As the system was intended for the classroom, both the teachers and the children were considered. Particularly in relation to my expectations of their relationship and the use of technology in their environment, their skills, attitude, and everyday practice.

3.3.1 Children and Technology

There were a number of assumptions about children's experience and attitudes, and how this would impact their expectations and thus use of technology. The key expectations are:

1. Children are confident and experienced computer users, they are motivated to use computers, but need and expect autonomy.
2. Managing cooperative collaboration and achieving a situated awareness in the group may be difficult to achieve.

3.3.1.1 Children are Confident and Experienced Computer Users

Children have experience of using interactive, networked and digital media technologies beyond and before they enter the classroom (Loveless & Ellis 2001, Masciotra & Morel 2006, p.11). This experience, and therefore confidence, arises through the embedded presence of technology in their home life (Selwyn 2010). 'This is the Net Generation, students who were born after 1982 - students who have never known life without the Internet.' (BECTA 2008, p.11). Experience and confidence are relative terms, and there should be care when considering the implications of children's ease with technology. Children have been termed digital natives - 'Our students today are all "native speakers" of the digital language of computers, video games and the Internet' (Prensky 2001). With the confidence they exhibit when using technology, comes an assumption of ability. 'While this generation shows no fear of technology, 'digital comfort' does not necessarily mean technological proficiency - particularly with academic tools' (BECTA 2008, p.18). Confidence resulting from exposure, does not necessarily equate to an understanding of real affordances, but that the child is driven to persevere with the interaction. The inclusion of technology in a learning experience is a

motivating factor, especially for boys (Sutherland & John 2009). It is not the learning objective that encourages children, but the opportunity to interact with the device (Selwyn 2010, p.7).

Children clearly enjoy using technology, and as a means to encourage them to engage with learning technologies, play is often the selling point. Fun is injected into children's technologies via multimedia stimuli and incorporating a gaming genre as an incentive to use (Alessi & Trollip 2001). Play is often used to disguise learning, much like hiding vegetables in a meal. There is a '(...) lack of focus on the value of computer use as play per se' (Verenikina & Mantei 2008, p.102). Rather, play is a component that 'adds sugar to the pill' to encourage learning (Loveless & Ellis 2001, p.37). This is particularly an issue when designing for play in formal education, though still applicable to domestic settings where learning through play a marketed towards parents (Loveless & Ellis 2001, p.37). To just play is not enough, there must be some value added to the experience to bring it out of a perceived frivolity. Systems for education are, after all, intended for work, so actually play is value added to work, rather than the other way. However as Loveless & Ellis (2001) noted, utilising play in this way does not create a hybrid learning activity, but actually re-enforces the dichotomy of work and play (p.43). In contrast, 'having fun is a matter of transforming the (necessarily) formal structured basis of activity into moments of triviality and playfulness' (Reed 2005, p.79). Cementing play to work without consideration to the conditions, motivations and expectations, means neither agenda is truly satisfied. If play is the motivating factor for engagement, then this expectation will determine the meaningfulness in actions and interaction. If the technology is presented as a play object, then the child's behaviour will be playful, and the learning objective may not be realised.

Harnessing children's playful approach in their engagement with technology is applicable beyond play. Play as a route to learning, and a playful attitude is something that will flourish if they are given autonomy (Selwyn & Cranmer 2010). Autonomy may mean providing features in technology to allow children to author their own experience, direct their access to information, or control simulations (Lowe 2004, Chan & Black 2006). When Selwyn (2010) asked children what they wanted to do with technology, they responded, "let us do what we want" (p.113). Children want control, and as such, technology serves to satisfy the children desires in the same manner as play. Indicating, that it may not be the activity, but the time that is the critical element. In play mode, the player should be able to engage with the object at her own pace to repeat, re-use, manipulate and practice (Garvey 1984, p.49).

The research activities needed to clarify the children's playful expectations of computer use. Expectations are directly perceived, and if they can be met in design, can provide a real opportunity. For children, there is an overriding expectation that is carried over from their domestic setting, that the computer is 'a leisure window' (Loveless & Ellis 2001, p.10). Children, with their expectation of play, approach technology armed with an extensive repertoire of situated behaviours that the design practice in this project hoped to exploit. As established, the autonomy in use will come in part from being given time to play with the technologies, but also from giving the children control in a low risk environment. Autonomy when using technology in this project was constrained by the context of use, and was a point where the design approach in this study went beyond the technology, and into the environment. This project worked from the assumption that if the children were not too constrained by the activity, then they might consider the computer as a play space.

In the classroom and at home, children are used to working autonomously. At home, technology has as a babysitting role, a way of keeping children occupied without supervision (Selwyn 2010, p.79). Plowman and Stephen (2007) showed that this function parallels computer use in the classroom, where children largely work without any supervision. The example of practice cited in the previous section of the "unfinished drawer", shows that technology in the classroom can have a similar role, by occupying the child whilst the teacher is busy. For this study, this was a positive aspect of practice. I wanted the children to be autonomous, to locate and act upon the perceived affordance under their own self-initiated activity. That both the children and teachers considered this to be a norm, was an aspect of practice that I hoped to lever in the use of the final designs.

3.3.1.2 Cooperation and Collaboration in Groups May be Difficult to Achieve

Collaborative systems generally work on the assumption that users are able and want to connect. With technologies for adults this maybe has some basis, whereas for children there may be the immaturity in their collaborations to also consider. There is a line between encouraging children to collaborate, and forcing them, and children's group work can be autocratic - equal participation is usually managed by the teacher. In autonomous social groups, children can find it difficult to maintain a presence in the activity with uncooperative, dominant, or competitive team members (Stanton & Neale 2003). Natural social groups should be allowed to emerge in activity, as children require opportunities for collaboration which would enrich the activity from the child's perspective,

rather than the group use being a constraint (Benford, Greenhalgh, Reynard, Brown & Koleva 1998, p.192).

Using computers together in the classroom can be problematic. With the exception of the interactive whiteboard, interaction is largely bound to the desktop, with single user input devices (keyboard and mouse). Due to the number of potential challenges when using computers (errors and faults), solitary use is considered too isolating for reception level learners (Plowman & Stephen 2007). Consequently, children in the classroom are often asked to use computers in pairs, though still only provided with a single desktop machine to use. This is not ideal, children can be motivated when playing with another child on a single machine, but there are instances when the child who is not in control will drift and there maybe, though not always, dominant behaviour (Inkpen, Booth, Gribble & Klawe 1995, Stanton, Neale & Bayon 2002, Stewart & Raybourn 1998).

There have been some attempts to make desktop computers more collaborative for co-present learners, with the use of multiple input devices (Stanton et al. 2002, Stanton & Neale 2003, Stewart & Raybourn 1998). Stanton et al (2003) demonstrated that using multiple mice with a single screen could produce a higher level of engagement and more productivity in the task, than pairs sharing a mouse. Giving every user independent control of an input device resulted in work that was parallel and cooperative, rather than collaborative. However, there were more discussions of ideas when sharing a single mouse, providing the group were cooperating. These findings present some potential concerns for the earlier assumption in Chapter 2.4 - that distributed interaction will support natural social groupings. It may instead be the case that providing independent control, will result in solitary interaction.

3.3.2 Technology, Teaching and the Classroom

There are a number of assumptions about the presence of technology in the classroom:

1. There are some tensions with technology in the classroom.
2. Technology has multiple roles in the classroom, but limited scope.

3.3.2.1 There May Be Pockets of Digital Discomfort

As the teachers manage the children's classroom life, it would be impossible to move the design practice forward without factoring the teachers' relationship with technology. There are aspects to the relationship that cause tension, due to an ongoing misalignment between expectations and aspirations of use, and actual use, of technology. Technology has not integrated into school life with the same ease and degree as other aspects of social life, and it has not kept pace with actual advancements or expectations of change (Selwyn & Cranmer 2010, Loveless & Ellis 2001). A BECTA study (2009) identified 35% of primary schools as ambivalent or late adopters (Ibid., p.13). This would not be notable if there were no expectation that teachers should be using technology in their teaching; but of course the opposite is true. For the teachers, there are multiple social, cultural and political agendas to satisfy. They need to be seen to be embracing technology to the same degree as other aspects of social and work life (Selwyn & Cranmer 2010, p.6).

There is likely to be a spectrum of technological skills and attitudes among the teaching staff. Some teachers will be completely comfortable in using computers in and outside the classroom, particularly newly trained teachers (Fisher et al, 2006). However, even if teachers enter school life equipped with the necessary technological skills, they must keep pace with new innovations and expectations. The lack of the integration may not be an indication of a lack of interest, but rather a lack of understanding. The problems with technology and teachers in primary school classroom stem from, and are exacerbated by, a lack of support and training on the ground (Loveless & Ellis 2001, p.15), (Selwyn 2010, p.31). There is not enough training to keep teachers abreast of technological advances, or enough technical support for human and machine breakdowns. The constant shifting technological advances means constant attention to skills. When it comes to technology, it should be acknowledged that in this domain, teachers are learners too. Further, it is not just the technology to be learned. 'Teachers need not only access to technologies, but also a framework to promote understanding and confidence in their own creative teaching practice and professional development' (Loveless & Ellis 2001, p.17).

The skills and and attitudes of teachers may be the cause of tensions in the relationship between technology and the classroom, but it cannot be considered to be the teachers' fault. The reason technologies have failed is the lack of acknowledgement of teaching practice and its demands (Cuendet & Kaplan 2011). It is the technology that is not working, not the teachers. It was important

that there were products at the end of this study. Selwyn et al (2010) does not believe solutions will emerge without intervention, and in this project having to deploy technologies forced resolutions. It meant I could not ignore the surround, and had to take a wider view of the context to ensure, to the best of my ability, the deployed technologies worked as the children, the teachers and I expected.

3.3.2.2 Technology has Multiple Roles in Teaching Practice, But Limited Scope

The expectation of autonomy when using technology is not just the children's, but also an assumption made by many teachers. As mentioned, teachers will let children use computers unsupervised in the classroom - meaning that technology is often promoted as a place for independent work (Plowman & Stephen 2007), and compatible with work and play (Selwyn 2002, p.81). Technology therefore has multiple affordances depending on its context of use.

The types of technologies and software in reception and Yr1 classrooms are fairly narrow. There is reliance on desktop computers, supported by the IWB, consequently, screen based technologies dominate in educational practice (Simpson & Toyn 2011). The types of software and use of computers for teachers and children are much the same as the rest of us use to connect, research, collate and present information - word processing, multimedia production and the Internet (Selwyn & Cranmer 2010). There have been some attempts to embed conceptual and active learning with physical interfaces, particularly in mathematics and logic with systems such as Roamers [4], which focus on autonomy in discovery (Murphy 2003).

In terms of software, there is a great deal of enthusiasm for the use of games in schools amongst a significant proportion of teaching professions (Williamson 2009). There are a wide number of applications that span the whole of the curriculum (Ibid.). Disparities between play, as defined in this thesis, and educational gaming have already been identified. However, to further the discussion, it is worth mentioning at this point that there was an awareness that the children's experience of game play at home and school would impact expectations of use. Games for learning are nicely defined by Klopfer (2008) as 'purposeful, goal orientated, rule based activity that the players perceive as fun' (p.14). Though there is no contention that gaming is fun, his definition highlights the difference with

[4] A nice example of young children's use of the roamers in action is in Murphy (2003) citing Dorman (1999). Dorman is describing a group of 3 - 4 year children sitting in a circle sitting in a circle and playing with a Roamer[5], sending it to each other. One child secretly programmed the robot so that before it reached the child opposite, it bleeped and came back. This imaginative use of the system was soon picked up and replicated by the other children.

play in gaming, and just play. In my system, the purpose, objective, structure was to be decided by the children - to achieve a sense of active presence. In gaming, the goal, achieved by a specific set of predefined actions and rule based structure, is build into the system. If children's expectation of play is driven by their experience of game play on computers, then this will effect how they interact. For example, they may expect to be constrained by assumed structures, and expect to be guided.

3.3.3 Expectations of Change Through Applied Practice

As mentioned in the introduction, this project aimed for realistic marginal shifts in local practice, over grand gestures. Success, in whatever form, is more likely to be achieved if subtle interventions are attempted (Laidlaw 2004, Selwyn & Cranmer 2010, p.36).

> Change is thus understood not in terms of a strict appropriation of new practices, but rather as a process of ongoing renewal and improvements of practices already in use. Thus the primary role of change agents (pedagogical consultants and teacher trainers) is to support teachers in transforming their existing practices rather than to instruct them in applying new ones (Masciotra & Morel 2006, p.15).

The small move I sought to make in this research was to make interventions on existing practice. This approach meant the children and teachers had to determine how to integrate the new technologically activity into their practice - that would have been unnatural. Rather, the children could access the technology whilst they engaged in familiar everyday activities.

4 | Situating the Design

This chapter describes the ethnographic research, findings and their impact to the design practice and framework. The first part of this chapter is a description of the project's initial development, results of the discussions with teachers about their ideas for the project, and the role of technology in the school. The second part of this chapter presents the fieldwork findings framed by the enactive principles defined in Chapter 2. The final part of this chapter is a reflection on the ethnographic study, and draws the findings together to determine how the project should move forward in the next stage. An overview of the research design can be found in Appendix 2.

The final intention of this study was to create a mixed reality play space by embedding technologies into the children's role play space. The research was orientated towards locating the constraints that would determine how the design in this project should be developed. All parties needed the technologies and the mediated activity, to fit within the everyday practices and capabilities of the teachers and the children. For my research, I was interested in how the representational visual and auditory forms could be coupled with the children's play, to create richer embodied and social play experiences. The teachers wanted a system that would benefit from the rich learning that occurred within the play space. Both objectives were compatible providing the interpretations of play were attuned. Consequently, this part of the investigation was a process of mutual grounding - the teachers and children responded to my expectations about what I could make / do in terms of augmenting the play space, and I, in turn, responded to what the children and teachers expected when it came to play and use of technology. A mutual understanding was pursued through direct communication and observations of classroom life. Discussions about how the project should develop were conducted via a series of meetings with head teachers and teachers, and an examination of the presence of technology in the classroom and teaching practice. Observations of classroom

practice were framed by the enactive criteria defined in Chapter 2, from which the constraints could be identified.

The remaining part of this section outlines the objectives of the ethnographic research, the research activities, and a description of the data collected and analysis methodology.

4.1 Ethnographic study

The two key areas to the investigation were:

1. What did they teachers explicitly want from the final design? Though teachers were not the end users (children were), I needed to carefully consider their views because they were the gatekeepers to the classroom. For an intervention to work, design solutions need to account for the teacher's agenda, as it would at some point be a feature of her classroom.

2. To frame activities in the classroom in terms of enactive learning processes, and consider the implications of these findings for the design framework. The intention therefore is to connect factors that define situating action, meaning making and sharing significance, which would contribute to developing systems that attend to meaningful interaction, active presence and co-presence.

4.1.1 Research Methods

A mixed methods approach was taken in the ethnographic research activities, focusing on three key areas: classroom practice, technology and play. Though a range of data was collected, this part of the study pivoted around observations and discussion.

4.1.1.1 Observations

At this stage of the research, I participated in the discussions with teachers, but did not participate in classroom activities, as the objective was to observe natural practice. Across the three schools involved in this study, seven full lessons were observed: two Yr 1 literacy classes, a Yr1 science class in the ICT suite, a Yr 1 Art class using physical crafts, and three free play session. The play observations occurred in a variety of settings. There was one observation of reception level children using the play space during a whole class play session, where my attention was focused on their activity. There was one observation of free play with a Yr2 group, the slightly older participants were selected as the observation was coupled with a open interview (discussed later). Finally there was one observation of the whole class at play in a Yr 1 classroom. The two literacy classes and the art class were selected to get a wide view of meaning making activities. The ICT session aimed

to consider the impact of the whole class engagement with technology. The play observations were aimed at better understanding the children's social and physical behaviours when engaged in autonomous play activities. In each case, the teachers volunteered, and the whole of the activity was observed. The children did not seem unsettled by my presence, often I was one of many adults in the classroom, as in addition to the teacher, there were usually two or more TAs.

4.1.1.2 Discussions

As the spark for this project came from the teachers, discussions (as opposed to interviews) felt more natural and democratic. This moved the project forward as a negotiation between agendas, rather than any one stakeholder determining the project's direction. There were two related threads to the discussions with the teachers participating in this study: project development and conversations about practice. In the first year, there were four meetings with the head teachers directly related to the project development, with some further negotiation via email. The discussions of practice were more mixed to generate ideas, explain and demonstrate what technologies we could use, and the play space. Planning meetings, differ from discussions in their focus and structure. The dynamic was orientation around presenting my intentions for developing the project and organising time for research. The teachers present in the meeting, articulated what they would like from the project, and accommodated my research demands by suggesting suitable lessons and activities. There were two scheduled discussions with the children. Both sessions were short (five to ten minutes), and were attended by volunteers via their teachers. One discussion was conducted with Yr1 pupils to talk about play on the computer, whilst the second discussion was with Yr2 pupils. Although the intended system was intended for a different group, it was felt by the teachers that the Yr2 would be able to give more considered opinions on play.

4.1.1.3 Other Research Activities

In addition to the observations and discussion, I also conducted an audit of the hardware and software in the school to determine the scope of use, and gathered information about the classroom layout of spaces and objects (furniture, play objects, teaching aids). The final source of data came from two succinct surveys for the teachers in one of the schools, about their use of technology and play in the classroom.

4.1.1.4 Schools

The head teachers from three local Infant schools initiated this project, and participated in the study. Each school had approximately 250 - 300 pupils in the Infant School and were located next to, but separate from, a Junior School. Catchment areas in UK Infants schools are local, two schools were situated in small suburban areas near to rural spaces, the third was more centralised in the city centre.

4.1.1.5 Participants

All observations were conducted in the reception, Yr1 and Yr2 classrooms to give a balanced view of school life. The participants were observed during whole class teaching, the children's presentations, small groups working collaboratively, and play spaces. Though I spoke with many teachers, during the life of the project I worked closely with three reception level teachers, one from each school, and consulted the head teachers.

4.1.2 Data Collection

Qualitative data was collected from all observed sessions. All of which fed into descriptive accounts of organisation, structure and methods in the classroom environment. With the exception of the video data and photographs, all of the data omitted any references that would identify the participants. The visual data presented in this thesis was in accord with the ethical guidelines outlined in Chapter 3.

4.1.2.1 Documentation

Documentation included curriculum guidelines provided by the head teachers to give an overview of the lesson and meta-learning structures. The teachers contributed lesson plans and examples of digital media work they had done, these were obtained ad hoc during discussions, rather than requested. As mentioned, other documentation included photographs and diagrams of the school environment, which I produced.

4.1.2.2 Video

Only one discussion with the teachers was recorded. I chose to capture this primarily to enable a detailed description of their opinion, which was difficult to do to any degree of density with note taking. Issues with using video with children have already been discussed, and because of the anticipated and actual disruption the camera caused, it was used sparingly in the classroom. However, it was a rich source of data, which enabled a close examination of behaviour, so was not dismissed completely. Of the seven classes observed, only three lessons were video recorded. In the literacy lesson that was recorded, the camera was placed at the back of the room, whilst the children sat at the front facing the teacher and the IWB, with their backs to the camera, so were unaware of its presence. However, in the later part of the activity, when the children moved back to their desks, the camera was noticed. The impact of the children's reaction to the camera - which largely consisted of putting their faces very close to the lens - disrupted both the learning and research activity, so was removed.

Video data was to used to capture the Yr2 children using the role play space. In this activity the camera was always on, and placed in the corner of the room. The children were informed that they were being video recorded, in this instance it did not seem to unsettle their activity. The video data captured the discussion of play and their use of the play space. I chose to video this session because I wanted to capture the multiple activities in the play space, and detailed records of their opinions of play. The final use of video data was to capture two Yr1 children using a computer collaboratively. Again, I had the camera behind the subjects, but because of its close proximity they were aware that they were being recorded. They asked questions about why I was recording them (I explained that I was interested in how they used the computer together) and played with the camera for about 5 minutes before starting the activity, after which they returned to their computer play.

4.1.2.3 Photographs

One of the free play sessions with the Yr1 pupils was photographed to capture the spread of activities and the use of space. The photography did not seem to disrupt the children, other than smiling at the camera on occasion, I was largely ignored. The teacher in this class reflected that it was because the children were used to being photographed as she was in the process of gather evidence

for her studies and towards a BETCA accreditation for the school. The only instance where I used my camera in the discussion was to capture a series of screens that demonstrated the teacher's used of the IWB, as evidence of practice.

4.1.2.4 Field Notes

Field notes were taken for all discussions and observations. In sessions where I did not use the camera, I took notes during the activity. If I had video data, I made short notes of prominent observations to discuss with the teachers in the debriefing time.

4.1.2.5 Survey

The teachers in one school were asked to complete two very simple surveys. This activity was conducted at the beginning of the project to get an overall feel about play (Appendix 14) and their attitudes to technology play (Appendix 10). A printed copy of the survey was placed in the staff room so the teachers could respond at their discretion, and were completely anonymous, other than stating which level they taught. It was hoped that this approach would allow the teachers to be more open.

4.1.3 Analysis

There were two threads of the research activities which needed to be considered, one was the explicit shaping of the project which emerged in negotiations with the teachers, and the other was the implicit study of practice. As an open inquiry, the analysis of practice looked for patterns and pockets of activity according to their relevance to the enactive framing of learning and play, and was later considered within the context of interaction, interface and experience design. These threads were drawn to together to identify constraints in the development of the augmented play space, and probes for further questions.

4.2 Project Work

This section presents a description of how the Infinite Infants project was initially shaped. It describes a pragmatic inquiry of the current state of technology in the classroom, and the teachers' attitudes to technology in their practice. This aspect of my research relied largely on discussions and self-reported data.

4.2.1 The Infinite Infants Project

There were strong aspirations for the potential of technology in this project - highlighted foremost by the name the teachers gave the project - *Infinite Infants.*

Extract 4.1.1. Field notes (Appendix 5.1)

> We chose the title "Infinite Infants" to reflect the limitless opportunities for fun and exploration and the boundless imagination of young minds. The inclusive nature of the project aims to offer quality provision promoting active learning and positive engagement with cutting edge technology. (...) Our ultimate aim is to share "Infinite Infants" as a vehicle for improving the '3 C's' (Communication, Creativity and Confidence) with the global community.

In one meeting with a head teacher to discuss what she hoped the augmented play space would provide, she said she wanted the "to enable learners to have experiences beyond their own setting - to have a unique experience" (Appendix 5.2). Another head teacher stated she would like to see an environment that was "exciting, visual and auditory stimulating experience for the children" (Appendix 5.3). Reasons for engaging in this project however, were also grounded by external and internal pressures. From the teachers' perspective, the push to embed more technology in the classroom came in part from the children who now used technology extensively at home (Appendix 5.3) and local authorities, who expected to see a higher and more diverse ICT inclusion across the curriculum (Appendix 5.4)

When the project started the project team (myself, my supervisors, the three head teachers, one class teacher from each school and the sponsors) took a very broad view over what technologies

to consider. In discussions with head teachers at the beginning of the project, they sought design solutions that would encourage enhanced social and creative learning experiences. As stated in the introduction, the decision to focus on play and the play space was agreed upon very early on in the project's inception. For the first few months, there were plans to create a networked system that would link the schools' role play spaces for remote play (Appendix 5). However, the scope of the necessary infrastructure and concerns of safety meant this direction was not pursued. At this point, how to digitally augment the play space became an open question.

The use of role play spaces linked with the sense of allowing the children to be in a different setting, was the catalyst for my original research question: If we were adding a digital layer to a place for physical and social play - would the children be able to role play with the digital artefacts (sounds / video / graphics), in the same way they use the objects in their play space? I also had to recognise the use of the role play spaces in teaching practice (considered in more detail in Chapter 4.2.). From the teachers' perspective, the design of the play space changed according the subjects the children were studying. The system therefore needed to be able to change its content to suit these changing themes - in that sense, authorable. This opened up questions about the ability of the children and the teachers to create their own media artefacts, or find suitable content. With this realisation, the head teachers and I started to consider running a series of training workshops (Appendix 5.2). Considerations for content creation were carried over to the PD activities. In the meantime, and reported in the sections below, I conducted a review of the technologies and digital production processes the teachers used, along with their attitudes and support structures. The objective of this survey was to find some common ground between the choice of sensory, motion and display technologies, and the technologies currently in use in the classroom.

In terms of measuring the project's success, the teachers were not inclined to apply formal metrics. Rather they wanted to see a culture of change in the local practices in their classrooms, particularly the children's use of the computers. They wanted the children to engage with more ease (Appendix 5.4), to engage for a longer period of time (Appendix 5.3), and to use computers without guidance (Appendix 5.2). The schools were aware of the underuse of the technologies they had at their disposal, and therefore asked that I incorporate technologies that already existed in the classroom (for example, the digital cameras) (Appendix 5.4; Appendix 5.3), and in one instance make better use of public spaces (Appendix 5.4).

4.2.2 Use of Technology in the Classroom

As the initial intention was to make use of existing technologies and practices, the research conducted a review of the types and application of the hardware and software in the participating schools (Appendix 6). The types and amount of technologies appeared to be fairly consistent across each site, though were used with some variation. Some resources were updated over the life of the project, but the functionality of the available equipment was steady. The only significant exception was the purchase of laptops that were shared by all the classes. Each class had three to four small scale PCs in the classroom, and two of the schools had dedicate ICT suites. For the teachers, the creation of materials occurred in very managed production environments - such as PhotoStory or PowerPoint (Appendix 5.10, Appendix 5.11). For more interactive materials, there were applications such as Activity Builder, which had preset templates for formulaic learning activities, i.e. matching shapes, counting money, sequencing, set the time. Though there were applications for every aspect of the curriculum, the children's daily use varied between classes and years.

Extract 4.1.2. from questionnaire (Appendix 10)

> PC daily, individual or paired to play Literacy / Numeracy games. Weekly - individual to complete ICT areas. (Yr1 teacher)
> At least weekly - individually / paired and in groups. Working with adults and independent research. (Yr2 teacher)
> Daily choice of individual / pair work. Occasionally 1:1 with teacher (Reception teacher)

The tools for creating teaching materials meant the teachers also needed to be able to source or capture media assets via the Internet and digital cameras. Powerpoint was used more extensively through the schools as a means of creating bespoke presentations which made use the IWB. There were only a handful of the teachers who regularly used software for creating time-based media and interactive activities. The spread of teachers' use and skills of technology did not appear to be any different from those outside of the school, and in that respect they were not lagging behind at all. This suggests that it is the external pressure to be seen to be more active technology users, which creates this perception. Extract 4.1.5. below shows the shear number of technologies for schools

drives the assumption that they should be used. In additional to the digitalisation of their teaching practice, technology had of course permeated administrative tasks. Further, teachers were also expected to use video and photographs to document work for assessment.

The types of applications available for the children's independent use included screen based virtual environments, which involved tasks to populate spaces with objects (i.e. Spark Island, Blackcat Logo), building representations, counting and memory games. The latter two contained a large amount of repetition. Visualisations of information were explicit, rather than an abstracted representation - money as coins, graph showing actual items (i.e. 'How many people like oranges?' Would be shown as oranges in a bar graph) (Appendix 5.10). This seemed developmentally appropriate given the parameters of children's understanding of abstracted representations, discussed in chapter 2. The children's software was highly instructive, suggesting that the children were used to being guided when using computers, but were guided by the computer, rather than the teacher. The children's technologies for media capture and production offer very simple functionality, again to guide the child (i.e. limited duration to record). One of the problems identified here was not the children's ability to use these tools, but the interoperability of the assets. Bespoke devices, such as the DigiBlue cameras, used non-standard file formats which would limited their usefulness.

Standard desktop machines were used widely in the classroom, so interaction consisted of a keyboard and mouse. The IWB used either a touch screen, or an interactive pen. Consequently, the child's only modality was fingertip interaction. The Curlybots did allow the children to sit on the floor and move around a little, and the IWB required the children to stand up, but there was no other physical activity in their interaction. In many instances, the location of the technology was not well considered. Issues with usability did not start with the interface, but with the placement in the room. In one Yr 1 classroom, the laptop was housed on a tiny shelf about 4.5ft high. Consequently the (rather short) teacher had to stand on a box to reach the keyboard (Appendix 15.6). This was not unusual, in most classes the teacher's laptop was located so it was inaccessible to the children. The location of the laptop in this example, was actually due to pragmatic reasons - there were only a few locations where the shelf could be installed, and still be within the range of the VGA cable. It was also difficult for the children to access the IWB itself, unless they also stood on a box, interaction was confined to the lower half of the board. The layout and type of technologies available to the children meant their opportunities for meaningful physical interaction was almost non-existent.

4.2.3 Teacher's Attitudes

Just as teacher's use of technology varied, so did their attitudes. There was a gamut of opinions, some were extremely positive:

Extract 4.1.3. Survey (Appendix 10)

> Easy to find games / activities on the Internet. Easy to save resources which can be used again - easily edited. Easy to search for documents. Easy to share with others (Yr1 teacher)

For others, it was a prickly subject.

Extract 4.1.4. Survey (Appendix 10)

> Word processing and saving files of planning are useful. Other functions often take more time. Often unnecessarily complicated. I am now happier to plan to avoid it (Yr2 Teacher).

However, even the teachers I worked with on this project, were sometimes sceptical. The most frequent complaints from the teachers about technology in their work, were the lack of training and the lack of onsite technical support.

Extract 4.1.5. Transcript (Appendix 9.2 (a) 00:19:00)

> W3: ( ) I find the trouble is the Government has all this software, with all this technology but no training, and most of staff are not familiar or are afraid.
> M1: You still find that y'know people say oh teachers must know a lot of technology but you often find that they don't have the time-
> W3: A lot of the time we pick up things by chance we get something thing we want and then we can't remember how we got it and we get frustrated

Extract 4.1.5. shows the pressure to use technology was compounded by the lack of time to learn new skills, and inadequate training. In schools, the IT support was provided by more capable colleagues (Appendix 9.2 (a) 00:19:30-00:20:00). Consequently, a competent and proactive teacher

could raise abilities throughout the whole school (Appendix 9.2 (b), 00:11:30-00:12:30). This was a potential gain for this project. Although I was only working with a single teacher from each school, any training I could provide might have a positive impact as the teacher disseminates any newly acquired skills to her colleagues.

Technology breakdowns in class, whether due to user or technical error, were frequent and stressful, even for teachers who would be described as confident (Appendix 7.2. line 131- 143). To cope, teachers would have a contingency in case of failure: "Although over-reliance on ICT can be a problem if there is a technical issue, so I always plan a non ICT alternative" (Appendix 10). This made technology in teaching anything but labour saving, and meant there was widespread distrust.

There were very low levels of confidence among some teachers, made more anxious by the increasing pressure to use rapidly changing and more capable technologies. Consequently, some teachers felt left behind. Given the low confidence and frequent breakdowns, the most significant technical intervention, from the teacher's perspective, would be constant onsite support (Appendix. 10). Evidently, any technological interventions would have to be sensitive to the pressures and stress the teachers were dealing with on a daily basis, and manage expectations of a widespread uptake of new systems.

4.2.4 Summary

This section outlined the teachers' aspirations, the educational hardware and software they had to hand, and their concerns in relation to having technology as a feature of their teaching practice. The teachers' input was both aspirational in terms of an enhanced learning / play experience, but also pragmatic (i.e. use of existing technologies), and I was given a very free rein in how I responded to these constraints.

Though the teachers involved in the project were clearly keen to include more technology in their teaching, realistically, due to the range of enthusiasm throughout the school, I expected varied levels of interest in the technologies that were created. A review of the equipment the schools had on site appeared relatively well stocked by infant school standards. However, the children and teachers were fairly limited in terms of the breadth of activity and interaction modalities that were

available. The introduction of any new system into the school would require some form of training, but more than this, the teachers wanted adequate hands on support.

4.3 Enactive Framing of the Classroom

This section details the findings from observations and discussions of classroom practices. The results have been grouped according to their relevance to the enactive framework.

4.3.1 Situating

This section focused attention of the degrees of autonomy the children had in the classroom, how the schools approached whole body learning and utilised the environment in the children's learning experiences.

4.3.1.1 Autonomy

Objective:

> *To identify areas where the children had autonomy, to what degree they could exercise their autonomy, and how this autonomy, or lack of, affected their behaviour.*

The observations were grouped into two areas: instances of low autonomy and high autonomy. There was no criticism of the degree of autonomy - this was a descriptive account of practice, not prescriptive. Though I favour autonomy in my framework, I also recognise the pragmatics of school life. Clearly children require some guidance in challenging activities, and organising the school day would be impossible without some behavioural parameters. What I was interested in during this inquiry was how much choice the children had, to determine the degree of freedom they would expect.

Low Autonomy

Low autonomy was defined as activities where the child's behaviour was directed either by temporal schedules (i.e. time to go to lunch), spatial (i.e. what was acceptable behaviour in the reading corner) and activity (choice over what to do, and how to do).

1. Whole class activities require a high degree of teacher control.

In situations where the whole class work together, to manage the group and the activity every component was decided by the teacher - when to start / stop, how to complete the task (See

Appendix 4)[1]. In the art class, the task, materials used, and what the final product should look like, was predetermined (Appendix 8.2). In the literacy classes observed (Appendix 7.1), every aspect of the task, including the exact words in the sentence structure, and who would answer the question, was elicited.

Extract 4.2.1. Appendix 7.2. Transcript 00:00

18	T.	What other word could I use instead of *funny noise*?	T Direct question
19		(5 children with hands in the air)	T select answer from raised hands
20	T.	What could I use?	
21		(6 children with hands in the air. T points to child)	
22	P2.	A silly noise.	P Answer
23	T.	A silly noise, hum::	Ps answer not accepted – T's (-ve) intonation
		(T points to another child)	T select answers from raised hands
24	P3.	A strange noise.	P Answer
25	T.	A STRANGE. (T writes in the board), heard a STRANGE	Ps answer accepted – T's (+ve) intonation
26	Ps	BANGING noise.	
27	T.	[	
28		strange	Ps shadowing
		(*quietly*) a strange banging noise. (*pauses, looking at the board*)	T Repeats words as she writes on the IWB

The rules of working as a group meant the children were asked to put their hands in the air to answer questions. To give the children time to participate, the teacher would wait for more children to raise their hands, as can be seen in Extract 4.2.1, lines 19 - 21. Children did of course shout out answers. To enforce the rule the teacher sometimes ignored this behaviour, or asked the child to raise his hand and then give his answer. However, going against the rule, the comment was sometimes accepted if it was the right answer (Appendix 7.1, line 126). There was some confusion with this behaviour, as raising hands in the classroom also functions as a request. In a literacy session (Appendix 7.2), the children also raised their hands to ask for water (line 108) and to go to the bathroom (line 64). These requests occurred at the same time the teacher asked for answers, meaning that the children saw raising hands as an opportunity to speak, so would voice issues

[1]A breakdown of the repertoire of behaviour which was compiled by cross referencing the lessons observed, these structures were stable across multiple lessons, in different schools and classrooms.

which were off task. At this stage in their development, the children realised this was situationally appropriate behaviour, but had not yet fully comprehended the nuances of these rules.

2. The structure of the school day and the organisation of the class, constrained autonomy.
As expected, there were regimented times for starting and finishing classes and breaks, routine activities which denoted the type of activity, and contributed to efficient organisation of the children's activities. The children did not appear to anticipate what the next activity was before it was announced - there was no evidence that the children would start to prepare for a change in activity (i.e. start to pack their drawing materials away) - rather they responded to instruction. This demonstrated that although the children knew enough to follow the rules, they did not fully comprehend the organisational structure. Consequently, they would not know how long they had to play. Appropriate behaviour in the classroom when working, operated within tight constraints on noise levels and movement. There were times of absolute quiet, principally when the teacher was giving instructions. When working at desks moderate noise levels (chatter) would be allowed. Inappropriate behaviour would being overly excited, loud, distracted (off task) behaviour, unkind comments or actions, talking over the teacher, unfounded complaints and rough and tumble activity.

To halt the current activity, shift between timeframes, or quieten too much talk at inappropriate times (i.e. queuing up for lunch etc), the teacher gained the attention of the class via repetition and the imitation of a particular action. For example, children are asked to place their index finger on their nose / ears; or to break through the chatter, the teacher would clap or click her fingers in a rhythm, and the children would stop what they were doing to join in (Appendix 8.3, Field notes). This action focused the children's attention, and saved the teacher from having to shout to be heard. Further, the teacher could quickly scan the room to locate the distracted children.

High Autonomy

High autonomy is defined as choice, instances when the child selected the type of activity he engaged with, or exercised choice within an activity.

1. Play and play spaces had a higher degree of autonomy
For reception children, play was part of their curriculum of learning and something they engaged with on a daily basis. They spent from 20 minutes to an hour in a single play activity (Appendix 12.1). There was not total freedom, as there were parameters in the number of choices available.

The popularity of a single resource would result in the teacher managing participation to ensure fairness (Appendix 12.1; Appendix 12.2). The initial decision was not fixed, though some children would stick with the same activity for the duration, others would roam between groups during free play sessions (Appendix 12.2).

Figure 4.1: Reception parallel play and work in a mixed play session

From the teacher's perspective, there was a distinction between the different types of play in the classroom, which would affect the extent of the child's autonomy: *child initiated* and *structured* (Appendix 12.1). Child initiated, or free play, involved activities where the child created something using malleable materials such as sand or Lego. Use of the role play space would be considered self initiated, as would play with trains, cars and puppets. As the definition suggests, during this time the child could do what he pleased - there was no demand to be productive, and products often had a fleeting existence. Further, there were no instructions about how materials should be used, other

than discouraging antisocial behaviour. With structured play, there was more 'purposeful play', such as pattern making and puzzles. Craft making and the use of the PCs could be both self-initiated and structured, depending on the context of use. Purposeful play was often supported by the TAs, whilst playing with toys and role play were child-only activities. I never once saw a teacher or TA play with the children in these spaces.

Self-initiated, structured play and work could occur concurrently within a single session. In one Friday afternoon reception class (Figure:4.1, Appendix 12.1), there were eight simultaneous activities. One small group of four children worked on their writing skills, supported closely by the teacher. Additionally, there were trains, craft making, small plastic dinosaurs on a wildlife mat, the IWB, the PCs, an outdoor space, and drawing. In amongst these choices, the computers were very popular during free choice activities (Appendix 12.1). The limitations of the computers (such as processing speed) did not seem to affect their enjoyment, for the children the computers were easy to use (Appendix 11.1). Their independence when using computers (choosing the application, working through the mediated task, and the perceived ease of use), demonstrated the children's confidence. This confidence was indistinguishable from their use of other play activities - they were not given instructions to play with the sandpit, or animate the dinosaurs on the wildlife mat.

Variable Autonomy

In some classrooms, the children would be seated on tables according to their ability to focus support where it was most needed, leaving the more capable children to work with occasional, rather than constant support (Appendix 7.2. line 222-227). In a literacy lesson, after working as a whole class, the children that required additional supported were collectedly named the *sentence group*, in this instance a small sub set of 4 children worked closely with the TA, whilst the rest of the class worked independently. If the independent group wanted help, they would directly ask for assistance. This shows that the *able* group were not just given autonomy to complete their task, but also the aspects of the task that were assisted. Ability also affected the amount of time the children had to engage in more autonomous activity. In a mixed play session (Appendix 12.1), some children worked, whilst others played. In this circumstance, the teacher could rely on the children's independence when playing, to give her some time to focus her attention on structured work with others. This meant that at any one time, during work or play, there would be variations of autonomy that occurred in parallel in the classroom.

4.3.1.2 Approaches to whole body learning

Objective:

> *To identify areas where knowledge was attained or explored in multiple sensory activities, specifically activities that had a physical component.*

The role play space served to provide an environment for active and tacit knowledge of cultures, history and work places, which appealed to the teachers' multisensory approach to the children's learning. In a project about Mexico, the children made cultural artefacts, ate the food, dressed up in the clothes, listened to the music and traditional Aztec tales, and played with the Mexican objects (Appendix 12.2). When learning about Florence Nightingale, they listened to and wrote stories, looked at images, dressed up as nurses, and played in a hospital role play space containing bandages, bed and mock medical instruments (Appendix 12.2). These activities gave the children a tangible knowledge of the cultural practices, times and events they were studying, and demonstrated the efforts made to embody the subject. In a discussion with teacher (Appendix 12.1), she commented that only so much could be taken in linguistically - the taste, tactile, visual information and activity provided a more complete experience.

These experiences did appear to be fragmented. On one day the children ate beans, cheese and tortillas, and a couple of days later dressed up as Mexicans. The teacher's rationale for the deconstruction was that it would allow the children to consider each element in isolation, and concentrate on its individual qualities (Appendix 12.2). The disconnection of multiple aspects of a single experience suggested the teachers deconstructed the learning both in terms of the task, and in terms of sensory knowledge.

From an enactive perspective, the role play space was the critical component of the multisensory learning program, as it afforded the most cohesive experience. As with the examples cited, often the design would incorporate a diverse range of real world places, including space travel, a building site and domestic settings such as kitchens and living rooms (Appendix 5.8, Appendix 12.2). In one play space, themed as a pirate ship, there was a crow's nest to get into, a mast with a sail and a flag which could be raised. The children had tri-point hats, jackets and eye patches to wear (Appendix. 5.8). In the schools involved in this study, there was a distinction between play spaces

for different age groups (Appendix 5.3, Appendix 5.4). In the Y1 class, the play spaces were less defined by real world settings. Instead they were filled with mixed dressing up clothes and objects meant to inspire role play (i.e. witch's wand, cloak, joker's hat). The modification of the play space design reflected the teacher's approach to supporting the developmental shift from mimicry to more imaginative play.

4.3.1.3 Distributing Learning Processes

Objective:

> *To identify how the visual elements in the environment are utilised to aid cognitive processes and actions.*

The Creation of Meaningful Referents

Communal areas in schools and classrooms were filled with creative work (poster displays, crafts and documentation of events) produced by the children as part of curricular activities (Appendix 5.3, Appendix 5.4) The presence of their work outside the classroom communicated elements of learning to the school's wider community. The learning displays, entitled *celebrations of learning*, were the public face of the learning processes, a self produced habitat which presented a snap shot of an active and productive environment. Putting work into the displays served as a motivator, the children and teachers placed value on the public display of creative and academic work (Appendix 7.2, line 168 - 180). There was emphasis on refining work, to make it the "very best".

Inside the classroom, the displays were a reminder and reflection of ongoing learning activities. They provided a representation of the progression of knowledge, exhibiting individual measures of attainment, and combined, illustrated the sum of collective knowledge. Displays to show achievements in learning (i.e. Learning Trees) marked out threshold concepts, and placed the child's name next to the statement when the objective was met. Generally these public markers paid attention to all knowledge domains - cognitive: *use of sequencing adjectives*, physical: *I can ride a bike*, and social: *I can work with others* (Appendix. 5.8), with the intention of providing a situated awareness to enable the child to locate their own progress in relation to their peers. However, despite all of these efforts, it should be mentioned that not once during the classroom observations did I see a learner attend to the material on the wall, or a teacher reference it - even when discussing relevant

Figure 4.2: Learning displays

material. This was not to say it did not happen, but the lack of active referencing suggested these displays were more learning wallpaper than cognitive nutrients - they did not seem to be actively drawn from the peripheral environment to the centre of the learning activity.

Guided Perceptual Action

As with learners of all ages, the deconstruction of stimuli could be challenging. In one art class (Appendix 8.2), as part of the project about Mexico, the children were asked to produce a chalk drawing of an Aztec mask, and given photographs to copy in their design.

Figure 4.3: Mexican mask learning display

The children worked on communal tables, each with a TA encouraging the mask construction. Encouragement took the form of making suggestions, asking intentions, praising accomplishments and focusing attention on the task. I noted that during the observation, though there were photographs on the tables, the children did not look at them unless they were prompted. The children were directed to reference the object by the adult, and then guided through a deconstruction: i.e. "You've used lots of blue, what other colours do you see in the picture?" However, even when the child's attention was focused on the original artefact, often the examination was fleeting rather than sustained. For a more advanced learner, locating the meaningful detail in an image would be the challenge, but young learners are still at the stage where they fail to refer to the object at all. As with the learning displays, though the stimuli were available, they were not perceived.

4.3.1.4 Summary of Findings

This section outlines the key findings from the examination situating behaviours in the classroom.

Autonomy

Children appeared to given opportunities to be autonomous when they are capable of managing their own activity. Play afforded the highest degree of autonomy, but was still subject to overriding rules about noise, good social behaviour and timeframes. However, the extend to which designs could rely on situationally appropriate behaviour, needed to be aware that the children are still in the process of understanding the rules of the environment. Their action may be appropriate, but their intention may be inappropriate (i.e. raising hands). The children had autonomy in both individual work, and when working in small groups. Though there were opportunities for every child to engage in free play, there might be occasions where some children had time to engage in self-directed behaviour, whilst others were working under instruction.

Whole body learning

Approaches to whole body learning are used extensively in reception and Yr1 classrooms. The role play space is designed by the teachers to provide the children with an authentic context for learning by populating the environment with real objects, and is an activity which provides the most holistic account of situated learning.

Distributing

A lot of visual material was generated by the children and the teachers, to assist and demonstrate the children's learning activities. However there are questions about how the children acknowledge these materials, as from this examination, the visual artefacts were not perceived as aids to thinking and actions. Even when they were tasked with replicating visual materials, the children had to be directed to reference the item.

4.3.2 Meaning Making

I have already discussed areas where the children had some autonomy in their meaning making activities. There were many areas of meaning making that could have been considered in this examination. However, to keep findings relevant to this project, I focused on instances of playfulness. Meaning making in this context, was concerned with the emergence of playful agency. Specifically: what were the parameters in the children's playful meaning making, and how did they approach distorting the affordances of objects?

4.3.2.1 Playful Agency

Objective:

To identify the circumstances where playful agency emerges.

In observed play, pretence in terms of the interpretive use of objects, often emerged through playful action. In the Extract 4.2.2. below, a child was playing with a plastic plate and a pile of wool (these were part of a Chinese themed play space, the wool was meant to represent noodles).

Extract 4.2.2. Transcript (Appendix 13.3.)

57		*(C4 moves over to the table and picks up the plastic pan with the noodles and*	C2 Solitary
58		*flips it slightly, C3 watches)*	C4 Dramatic
59	C4	Oh	C3 Onlooker
60	C4	It's a pancake (*looks at C3*)	C4 Conv
61	C3	(*Laughs*)	
62		*(C4 gets up and moves around to the other side of table – where more room)*	
63	C4	I've got a pancake	
64	C3	Woh, C4 making pancakes	C3 Conv
65		*(C4 move over to far side of the play area, C2 watches)*	C3 Onlooker

The action occurred before the event was verbally defined by the child, it appeared that moving the plate around triggered the idea that the object could serve a different purpose - essentially the new affordance had emerged in action. In this respect, moving the objects in the space did more to frame the play narrative, than the overall theme. Understanding the theme might provide one situation, but in observations, children in reception, Yr1 and Yr2 deviated according to the emerging playful affordances of the objects in the context of their play activity. The play observed in the role play area was not confined to the parameters of the theme. In the kitchen space, one reception level child pretended to be asleep in bed (Appendix 12.1 Field notes), whilst in the Extract 4.2.2., there was little Chinese about pancakes. These children were not unaware of what to do in a kitchen, how to eat noodles, but quickly moved beyond it. This highlights, as the theory in this thesis suggested, that the children would bend the affordances in play to suit their emergent activity. This calls into question the reason for authenticity in the role play spaces, if the children can quickly transcend the careful arrangement of these objects.

Playfulness was not just confined to play time or play spaces, children were eager to find humour wherever they could. Something not being as it should be, was curious, and prompted inquiry. In Extract 4.2.3. below, the child had misread the teacher's handwriting on the board.

Extract 4.2.3. Transcript (Appendix 7.2)

29	T.	Okay, lets go back to our plan.
30		(1 child with hand in the air)
31	P4.	Mrs X, Mrs X, I can see a mistake.
32	T.	What's a mistake?
33	P4.	Katie was snowing.
34	T.	was *snoring*, sorry that's my writing, P4 shall I rub it out and re-wite it for you. It was *snoring*.
35	P4.	[Sn-or-ing]
36	T.	*Snoring*. Is that better P4?
37	P4.	Yeah.
38	T.	Okay, so back to my plan again.
39		[
40	P5.	He was snoring.
41	P4.	It said he was snowing
42		(P5 & P4 laugh)
43		(T select item from menu on IWB - different screen with previous work)

Outside of playtime, as was the case here, this type of behaviour was discouraged. It could be considered to be disruptive, off task behaviour and therefore not productive. Especially during a whole class activity, when it was already difficult to keep the flow amongst other disruptions.

4.3.2.2 Parameters

Objective:

> *To identify parameters in the children's meaning making activities, focusing specifically of the production of visual artefacts and narratives*

Production Constraints

Formal lessons normally revolved around creating products - a story, picture, mask etc. The teacher's rationale was to guide the child's attention to the meaningful aspects of the original artefact or event, and then ask them to communicate their understanding in their own production. The reproduction of meaningful attributes (i.e. key elements in a story) was a common method in sense making activities, as an active and measurable demonstration of the learner's recognition and comprehension of the original's qualities. The teachers anticipated the children's difficulty in Extracting meaningful information from their environment. Aside from the direct instruction, in an art class (Appendix 8.2), to assist the creation of a product similar to the original, the children were given a restricted colour palette of blues and greens. Guiding the production process did not come wholly from direct instruction, but rather by omitting materials that were not useful. The teacher knew that if she gave them all the colours, the children would use the whole palette. There is one clear example of a proscriptive approach to materials - to take away anything that is not useful. When children work with adults, the child was capable of achieving results beyond their capability, however this could result in work which was too advanced, and no longer represented their knowledge. In one literacy class, the children struggled to read written work produced when working closely with a TA in the sentence group (Appendix 7.2, line 284-292). In contrast, devising parameters such as the restricted palette gave the children autonomy - they were able to complete the task, by operating within the constraints set by the absent teacher.

In terms of production in meaning making activities, there were some observable issues with structuring narratives. In the Extract 4.2.4 below, the teacher attempted to elicit the sentence: *It was*

a letter. The class had been working for 5 minutes, and had so far completed: *Before she could get down stairs she heard a strange banging noise. Katie thought the noise had come from the letterbox. So she ran to the door to have a look*.

Extract 4.2.4. Transcript (Appendix 7.2.)

110	P15.	And, and she saw a little name at the top of the letter.	T select answer from
111	T.	And what did it say?	raised hands
112	P15	It said, it said, please help me, I'm trying to make a red suit -	P Answer
113	T.	Okay, okay, so that's what it's *going to say*. So she ran to the door to have a look. P16?	T direct question P Answer
114			Answer not accepted, T
115	P16	She, she couldn't read it because -	Recap,
116	T.	I, just watch me.	T select answer from
117		[	raised hands
118	P16	(...)	P Answer
118	T.	WATCH. I just *thinking* (T taps head) of my story. (T runs across	T Acts
119		the front of the classroom) She *runs to the letterbox to have a look*. That's *as far* as we've got. (T pauses)	P Answer T Acts
120	T.	Okay, Am I missing something?	T Question
121	Ps.	YEAH.	Ps Answer
122		(4 children with hands up)	
123	P17	She pick it out.	P Answer
124	T.	She picked *what out*? I don't know WHAT IT IS.	T Direct Question
125	P4.	A letter	P Answer
126	T.	Ah. IT WAS A LETTER (As writing on board) It was a letter.	T accepts answer - T Repeats words as she writes on the IWB

In this session, the teacher drove the narrative using an exaggerated voice, stress, gesture, eye contact and movement, alongside inquiry. The words of the story were spoken whilst they were written on the IWB, and often repeated once completed. After each question, the teacher would pause and repeat the question, to allow as many children to respond, the first hand up did not guarantee selection. The teacher, her tone denoting the suitability of the response, also repeated answers. When her verbal language required further emphasis - to clarify miscommunication, the teacher resorted to non-verbal action, acting the answer with exaggerated gestures, to guide the children to the right answer (Appendix 7.2, line 118). In this session, whole class production was extremely slow due to grammatical errors, disruptions from off-task interruptions, ad hoc teaching (spelling, syntax), or waiting for others to engage. Consequently, it took the class seven minutes to produce three short sentences. The principle difficulty in this particular session was the children's urgency to move the narrative forward. The description would jump ahead to key episodes, whilst the teacher required a formal retelling of events.

The children's engagement in whole class teaching was not a passive learning experience. Aside from the moments of direct engagement, where they contributed an answer, the children would often verbally shadow - repeating the teacher's or peer's comments (Appendix 7.2). This mimicry had the impression of a linguistic exploration. The mimicking technique was also used as a concept checking strategy that gave the teacher feedback on the state of the childrenÕs comprehension, for example: "Put your thumbs up if that's a joining word?" (Appendix 7.2, line 81, line 192). Though, this was clearly not the best method for actually ensuring everyone truly understood, as some children would just copy their peers.

Deconstruction of Task

Working towards communities of practice by wholly situating new knowledge within its authentic context may not necessarily suit learners of this age, according to educators and practitioners in the field. Younger learners might be better served by receiving skills in structured, discrete steps, until there is some mastery. As the Extract 4.2.5 shows, this was the usual approach to teaching children at this age. Older learners are more likely to be able to draw out threshold concepts and principals to give the 'learning in situ' a meta-context. However, younger learners will struggle to extrapolate and therefore the authentic task can have little cohesion.

Extract 4.2.5. Discussion (Appendix 9.2. (a) 00:21:30)

> W1: I mean, certainly, through the project that we did (.) I suppose the skills were introduced as they were needed (.) for the project (.) weren't they? That was the thing.
> M2: Yeah yeah. I think we started off with the process of making a film, and then we went to little pieces (.) one at a time. And I said to them (.) have a little play around with them.
> M1: This was at the beginning. Yeah we brainstormed a project that was far too big.

The risk for the learner in this situation was reduced by the presence of the practitioner, who was able to deconstruct the task into manageable activities and resolve any breakdowns (errors and misunderstandings) with the device and process. The subtasks were made simple enough for the learners to play within the parameters of their new skill.

4.3.2.3 Distorting meaning

Objective:

To identify instances of distorting meaning in pretence as examples of semantic drift

Authentic Pretence

As mentioned in the description of the role play spaces, often they were filled with authentic objects for the children to use in their role play. This feature did not go unnoticed by the children. During a discussion with four Yr2 children, a couple raised the issue of playing with real things.

Extract 4.2.6. Interview transcript (Appendix 13.2.)

24	C2.	*(Laughs)* Um my favourite, my favourite was in the kitchen because um:
25	C4.	The baby died
26	C2.	No because we could like have, like little, like kitchen and we could phone, we could, we've
27		got a little phone for the kitchen
28		[
29	C4.	It was an actual REAL phone
30	C2.	It's a real phone.
31	K.	A real phone.

Extract 4.2.7. Interview transcript (Appendix 13.2.)

126	K.	So if I said you've got five minutes to pretend you're in China. What would you do?
127	C2.	Um::::
128		[
129	C4.	Actually in China?
130	K.	Actually in China
131	C2.	Um::::
132	C4.	[
133		Woh, I'd eat scrambled eggs (plays with chop sticks)
134	K.	Scrambled eggs?
135	C4.	I love them
136	K.	Okay
137	C4.	And I hate noodles

Later the children commented that other objects were not real, just pretend (i.e. boxes of produce for the play kitchen were empty). It was clear from these comments they understood the difference between real and pretence. Why real was a distinct feature remained unclear, but it did have more value. It is possible, as it is arguably with adults, that playing with something real enhances play illusions. It was interesting that they gave merit to authenticity in their pretence. This distinction between reality and pretence emerged again, when the children were asked what they would do if they were actually in the place the play space was meant to represent. Though again, what

difference this had was not clear. The child established and clarified the extent of the realness, and finding that unsatisfactory quickly deviated to an experience that would be more satisfying. Behaviour which of course was true to the play ethos - i.e. "I do what I like". What was clear was the children, despite not using objects in an authentic way (i.e. the example of sleeping in the kitchen cited earlier), did value the *realness* of these items.

Pretence Out of Context

As was outline in Chapter 2, it was not always possible for children to see the pretence if it was in an unexpected context. In one observed literacy class, the teacher in demonstrating how she wanted the children to write their stories, drew pretend writing on the board (it was not a word, but a squiggle representing a word). When the teacher had finished giving her instructions to the class, one confused child asked what word the writing represented (Appendix 13.3, line 187-190). In this situation, all the cues suggested that the squiggle should be a real word: the IWB was a place for writing, this was a literacy session where the group had been constructing sentences, and the teacher spoke words as she wrote on the IWB etc. In this instance, the child expected the 'real' thing - the word - not a representation of a word.

4.3.2.4 Summary of Key Findings

This section presents a summary of key findings.

Playful Agency

As the theoretical research suggested, the findings demonstrated how pretence appeared to emerge in action, and would distort the authentic affordances of the objects in their play space. Play agency emerged as a consequence of the object's structural affordances and the child's action. These acts called into question the meaning and purpose, from the children's perspective, of the authentic places that had been created for their role play. As in action, the objects could quickly become something else.

Parameters

There were two key parameters to the children's creation of meaningful materials:

A. *Restricted tool kit*: to assist the creation of a product similar to the original, the children were given a restricted colour palette of blues and greens. The teacher knew that if she gave them all

the colours, the children would use the whole palette, so constrained their autonomy by limiting their tools. The children could then work autonomously within these constraints, rather then being guided by direct instructions.

B. *Pre-structured or re-sequencing of narrative events:* Story construction was of interest to this study as role play can have a narrative structure. However, structuring narrative forms, when not in play, appeared to be a complex process, particularly when there was a 'correct' order to achieve - the retrospective deconstruction placed a heavy demand on a young learner. In class, the teacher used the construction of predetermined narratives as an opportunity to model and elicit syntax and grammatical details in context, and check comprehension. Even when the children were not actively answering questions, there was evidence of participation in the children's shadowing and mirroring the modelled language.

Distortion

Despite the distortion of authentic objects in the play space, the children appeared to value the realness of objects in their play, for example, they would prefer a real phone, to a pretend one. This suggests that pretence has more meaning, if it can incorporate real objects.

4.3.3 Sharing Significance

This section is concerned with examining how children shared information and structured their interactions. Activities in the classroom involved various forms of group interaction, the school would often come together in whole school assemblies and sports days - there were class, year, and school identities which both fractured and united pupils. The classroom is designed to support multiple social groups, with work and play areas to support small group interaction, and space for the class to come together as a whole group (Appendix 15). The children worked as dyads, small groups of three or four pupils, alongside whole class activities such as *sharing* or *circle time*. Whole class activity was entirely teacher led. This section focuses on the children's social interactions in their shared used of computers, and in their collaborations in play.

4.3.3.1 Participatory meaning making

Objective:

> *To identify the dynamics of children's social interaction when they are participating in collaborative activity.*

Sharing Control

In all the schools observed, the use of the small classroom PCs and sometimes the IWB was largely conducted in pairs. It was a situation where sharing the resource was part of the learning experience (there was a sign next to the computer stating "We learn to share nicely"). Dyads using single user interfaces are problematic, as outlined in Chapter 3 of this thesis, it can be a place where dominant and distracted behaviour emerges. Observed practices in the classroom confirmed that the children used the small PCs and IWB without direct support from the teacher.

Figure 4.4: Dyads using the computer in free play

It was noticed that when dyads share, although the child with the mouse had perceived control, they actually acted on the instructions given by their partner. During use, from which Extract 4.2.8 has been taken, as soon as the child with the mouse relinquished ownership, he started to give instructions to his partner. However, when he had the mouse he made no decisions about what actions to perform, instead the child without the mouse entirely dominated the dialogue with instructions.

The partner without the mouse instructed the action - and this was typical of use. However, from the children's perspective, as Extract 4.2.8 shows, it was the mouse controller who was perceived to retain ownership over the work produced. This suggested that from the children's perspective, it was the action / interaction, not the understanding, that was key to production. P1 did not take ownership

of the work even though every act P2 performed was under her direction. The consequence for P2 was that he did not recognise his own work when the task was completed. As with the previously cited sentence group, the child was assisted beyond his own comprehension[2]. The spectrum of social interaction appeared to very limited during this activity, as the children were absorbed by the action on the screen. There was very little eye contact between the children, but there was a lot of referencing the screen objects and tracing (with fingers) where the digital objects should be moved to on the screen.

Extract 4.2.8. Transcript (Appendix 11)

(Context: P2 has control of the mouse, P1 is sitting next to P2)

04:15	P1	And now do those. Do the arms.	P1 points to graphic on screen, and traces across the screen
04:20	P2 P1	The squares are up there Not there	P1 points to graphic on screen, and traces across the screen
04:25	P1	Do the same body and then the arms	P1 points to graphic on screen, and traces across the screen
04:30	P1	You do that (.) okay	P1 points to graphic on screen, and traces across the screen
04:35	P1 P2	That's (where the triangle) [Do (.) do the circle and (one triangle)	 P1 points to graphic on screen, and traces across the screen
04:40	P1	One circles (00:03)	P1 points to graphic on screen, and traces across the screen P1 selects a circle
04:45	P1	And one triangle (00:03)	P1 points to graphic on screen, and traces across the screen
04:50	P1	No no (.) click on that click on that and get (the men)	P1 points to (arrow) graphic on screen
04:55	P1 P2 P2 P1	It's cool isn't it Yeah Where's mine? You did all of them.	New screen – menu of objects created On different screen P1 point to all the objects in the menu

Co-presence in Play

Observations of free play looked to identify moments of cohesion in the group. As with the social workspaces, just because the children shared a space, there was no guarantee that collaboration behaviours would follow. There were a number of incidents of solo play in the role play spaces,

[2]I do not mean to suggest with this observation that this type of activity is not without merit. Over time the child would make connections between his actions and the instructions, and it is possible that the instructions the child received would guide further action (as in the example of tying a shoe lace cited in chapter 2)

where the children engaged with different objects in different areas of the play space. In parallel play, the children might play with the same objects (i.e. Lego), but did not engage with each other (i.e. build separate towers). In the sessions observed, children who exhibited the most dominant

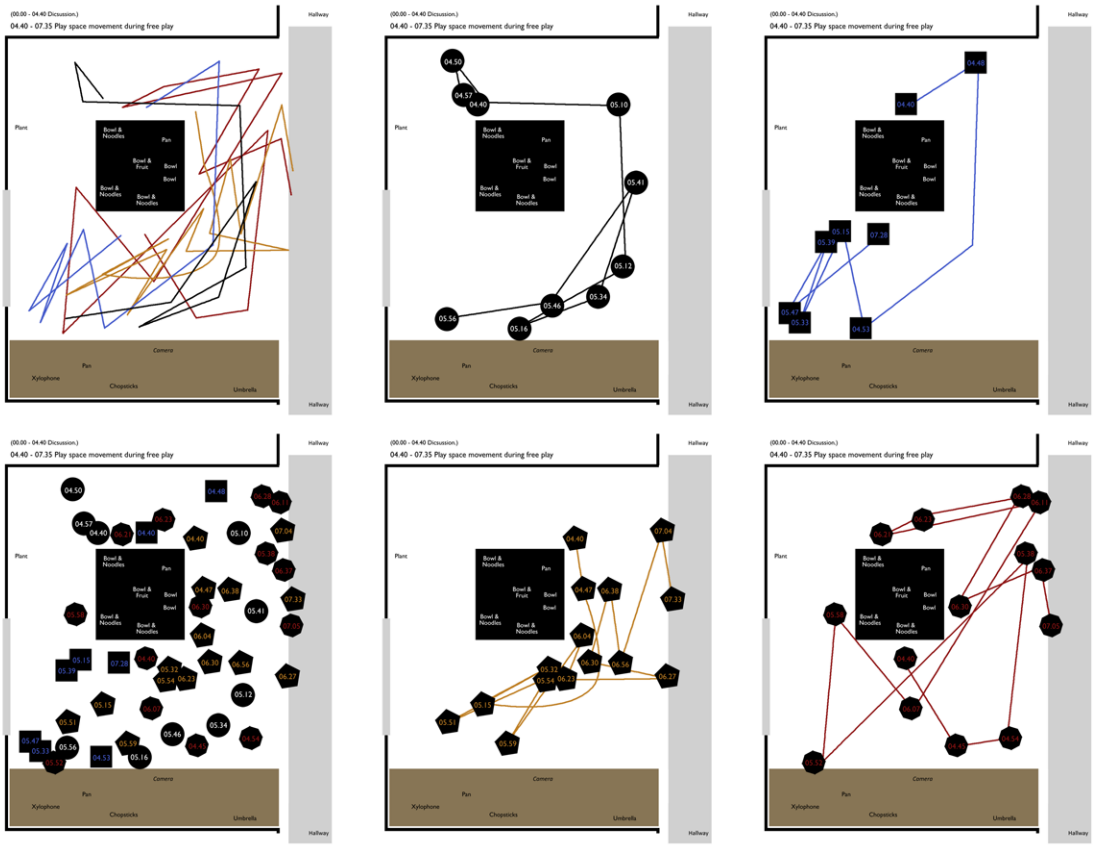

Figure 4.5: Movement in the play space

behaviour during group play appeared to engage in more solo play, though all the children in the observed sessions at one point played independently. Conversation occurred most around the shared physical activity, or calling attention to a notable incident (Appendix 12.2). Children did not talk to each other if they were not playing together, or had their attention drawn away from their own activity (i.e. there was no off task talk). There was a spectrum in the intensity of collaboration, from onlooker to socio-dramatic play (Appendix 12.1). Though onlooker behaviour was the most minimal, it frequently led to collaborative behaviour - if the (new) partner was willing to engage. Even if this did not lead to social play, children would habitually mimic another child's play if it was of interest (this is discussed in more detail later in this section). Within the role play spaces, there

could be a lot of movement to be closer to another child, or a particular resource, or to find a better place for a chosen activity (Appendix 13.3, line 34 -59).

As figure 4.5 illustrates (this can be seen in more detail in Appendix 13), there was a lot of movement in the play space. The children used the whole of the available space as they explored and used the artefacts and tools. Individual children could be occupied in completely different areas and activities in the play space at the same time (Appendix 13.4). As expected, there was both situating and situated language in role play. The children called to others to draw their attention to something, make plans, enact play narratives, and state intentions: "I'm going to put my train over here', though this latter action could be shadowing as opposed to a dialogue. As Vignette 4.2.9 demonstrates, situated and situating language in role play could be highly repetitive.

Vignette. 4.2.9 Field notes (Appendix 12.2, Time: 11 - 15 mins)

> P1 picks up large cloth and lays it on the floor, and tells P5 to lie on it and go to sleep. "You're a cat and I'm your mum and now you must go to sleep". P5 lie down and pretends to be a sleeping cat. P1 repeats the instructions "You're the cat" and "Go to sleep", while P5 continues to be a cat. P5 doesn't question this ((no negotiation)). They repeat the action of the cat going to bed and going to sleep. This activity continues for 4 mins. Some play talk "Go to sleep now", but mainly action (getting into bed, tucking in, pretending to sleep).

Once the play scenario had been enacted, the situation could be replayed three or more times, with little deviation, though perhaps some with refinement to the activity (i.e. doing it better). If an activity was enjoyable once, then it was likely to be enjoyable many more times. There were only a couple of instances in each observation, where the whole group came together. These occurred when something was particularly eventful. In the play spaces, some the most notable events occurred when a child discovered a new way to use an object. Collaboration as a result of the discovery of playful affordances is discussed in more depth in the next section.

4.3.3.2 Spectrum of Social Interaction

Objective:

To identify the spectrum of communicative acts, and the contexts in which they emerged.

Cohesion through Pretence

There were only a handful of occasions when the whole group came together. In one early session, a child turned a cardboard oven upside down, climbed inside and put his head in the space for the oven door. The child then pretended to be on TV (Appendix. 11.1). His announcement drew the attention of the other children, the act was seen to be extremely funny, and they each took turns to be on TV. There was no attempt to act as if they were on actually on TV (i.e. change in tone of voice, stance, play talk etc), just excitement in locating a new affordance. Another incident of group cohesion is described in Extract 4.2.2., where the children were trying to flip pancakes (wool) in a pan (plastic plate). This novel use of the objects was a challenge for the rest of the group, as through the observation other members intermittently attempted to make a clean flip (Appendix 13.3, line 82-83). In both of these observations, the pretence of one child was picked up by another, who communicated it to the rest of the group ("Look what XXXX is doing!"). Cohesion came about through watching, rather than direct engagement. Further, it was the act of re-appropriation of use, the new affordances that had been located, that was notable. Using an oven as an oven was not commented upon with the same intensity, if at all. The cohesion could also occur over time. The idea in the pretence spread from one player to another. Sometimes, by the time the other child joined in, the child with the original idea had moved on. This example highlights the importance of enabling situated awareness among the group, but also the importance of considering communication across the spectrum, from talking to watching. In a small area, such as the role play spaces, it was difficult not to be aware of the other inhabitants. Cohesion in the group occurred when something eventful was created, consequently the most meaningful aspects of the play experience were generally shared as a whole group. Curiosity was present, but it was humour that drew the group together.

Fluid Social Dynamics in Play

As Extract 4.2.10 shows, in play, even in the short space of 20 seconds, the dynamics of the group shifted constantly.

Extract 4.2.10. Transcript (Appendix 11)

(Context: P2 has control of the mouse, P1 is sitting next to P2)

5:00	C1	(C1 and C3 seated at table) (…) oh (…) (C3 pretending to eat chicken, C1 watches and laugh) [At same time] (C2 and C4 move towards and start to play the Xylophone at other side of play space – as play C1 and C3 look over) (C1 gets up and walks towards the table where C2 and C4 are playing the Xylophone)	C3 Dramatic / C1 Onlooker [+ve] C2 & C4 Group / Functional C1 & C3 Parallel with C2 & C4 C1 Onlooker	C1 and C3 playing together C2 and C4 playing together Whole group – notable object grabs attention of all (xylophone)
5:10	C1 C3 C3	See if there's any more chicken (C3 moves towards table) Chicken (laughs, pretends to eat) (C4 picks up Xylophone and waves it at C3 head) (Ducking) Oh (C2 sits down on opposite side of the table to C3 and pretends to eat noodles – wool) (C4 puts the Xylophone on the table and starts to play) (C1 and C3 move to table and start to put up and look at items)	C1 Conversational C1 & C3 Group / Dramatic [+ve] C4 Rough & tumble [-ve] C2 Solitary / dramatic C4 Solitary / Functional C1 & C3 Group / Exploratory	C2 and C3 playing together C1 and C3 playing together C4 dominates use of object to 5:50

The four children in this group first collaborated as dyads, then as a whole group, before returning to dyads but in a different configuration, and finally to solo play. Each child in the group of four, crossed paths with every other child during the play session. It was not just the formation of the group that varied, but also the type of play. Groups formed in functional play, dispersed, and re-formed in dramatic play. As with children's interaction with play objects, they did socially graze. The time they spent together varied, some pairings were more sustainable than others, and some children preferred to engage almost wholly in solitary play.

The Placement of Computers Affected Social Cohesion

The schools participating in this study had no digital technologies that were designed to accommodate multiple user interaction. The IWB provided a dynamic shared display space, but was not capable of registering multi-touch use, and single desktop machines meant negotiating the mouse between two users. The social affordances were a consequence of the way technology was used - such as the pairing rule, where children were expected to use the computer together as an exercise

in collaborative work - rather than a feature of design. This is an example of how educators adapt technology to meet their needs. In this situation, individual technologies were re-appropriated to fit into social pedagogies. As mentioned, there was a peculiar distribution of control when children shared a single PC. Having control of the mouse appeared to be the paramount position, but the user without the mouse drove the action. Despite not leading the activity, the work produced belonged to the child with the mouse. This is possibly because children were used to working to close instructions in activities with adults, yet still retaining ownership - if an adult helped a child write a poem, there would be no assumption that the poem was the adult's. It is possible this dynamic was transferred to the child-child interaction. However, the shared use of a computer gave neither child ownership of the work.

Figure 4.6: ICT Suite in Infant School

The observation of the ICT class (Appendix. 8.3), showed how the placement of computers could affect social cohesion, restricting the shared situatedness of the group and thus, the spectrum of social interaction. The orientation of computers in the ICT suite required the learner to turn outward and face the wall, which goes against the grain of the design of other learning spaces (Appendix 15.3 -15.5). This had a number of observable influences to the structure of teaching and social interaction. In one science class in an ICT suite (Appendix. 8.3), it was difficult for the teacher to address the class as a whole: the computer proved to be too tempting, and the children wanted to engage straight away without waiting for instructions. As this meant the children would turn away from the teacher, it was then impossible for him to gain eye contact with the pupils, and cohesion with the class seemed to be lost. To gain the children's attention, it was necessary for the teacher to verbally address the pupils individually - "John will you turn around." or "Emily stop doing that, and listen." Once the task had begun, there was very little dialogue between the children compared

to the normal level of chatter, and the children did not watch each other work - there were no acts of onlooker behaviour. The teacher's involvement was 1:1 assistance, however support tended to pivot around using the computer, or how the software related to the physical task it was replicating, rather than the learning activity.

This restriction to social interaction was not only observed in the ICT classes. During one observation of free play, I noted that a child during a mixed play session had used the computer on her own for the whole duration of the session. The child was using a computer in the classroom, orientated in the same way as the ones in the ICT suite. Consequently she had her back to the class, and was disengaged from the group - she spoke to no one and only looked up on a couple of occasions.

4.3.3.3 Summary of Key Findings

This section outlines the key findings from the examination of how children share meaning in their social interaction

Participatory Meaning Making

When collaboratively using a desktop computer designed for single user interaction, there was a distribution of control, whereby one child used the computer (clicked the mouse), and another instructed the interaction. As the children's attention was solely focused on the screen, there were few instances where they looked at each other, and therefore restrictions on the possible social cues available in communication. The children's communication was very one dimensional (instruction). In contrast, other classroom activities such as role play, showed a variety of communication to create the social pretence (meta-communication, including instruction) and play talk.

Spectrum of Social Interaction

The situated awareness of the play space meant ideas in the group could spread via verbal and physical acts in direct communication and onlooker behaviour. Onlooker behaviour, although arguably the most diminished in terms of social interaction, actually proved to be a gateway to richer interaction in the group. The children would watch each other, and then copy behaviours, if they were considered to be of merit. The playgroups demonstrated the highly fluid nature of children's social play, both in terms of social interaction, and the purposes of that social interaction. Conversely, the observations of children using the computers in groups and on their own, showed a

much reduced spectrum of social interaction. The children, in turning towards the computer, turned away from each other, and the social situatedness of the group was difficult to maintain.

4.3.4 Discussion of Findings

The fieldwork revealed the places and practice of play and technology in everyday teaching and learning in Infant's classrooms. This section was a discussion of the fieldwork findings, to begin to work towards defining the parameters for final design, whilst also raising questions that required additional inquiry in the subsequent PD sessions. The PD sessions explored what had been learned in reference to the situating, meaning making and sharing significance, and how this would this be inferred in terms of meaningful interaction, active presence and co-presence in design. The design framework at this stage was transient, and still open to further probes in the PD activities.

4.3.4.1 Situating

The children have a high degree of autonomy in play and when using technology compared to other activities in the classroom. Both are activities the children do independently of the teacher. These findings were perceived positively given the objectives in design. They provided contexts where the children assumed control, and therefore the potential for true playfulness looked hopeful. Not unsurprisingly, there were no instances of complete autonomy, as there were restrictions on time and resources, which any technological designs would also be subject to. There was also a likelihood that some children would be given more time to play in the play space than others. Given the variations in activity in the classroom, and especially during mixed sessions, the activity in the play should not spill over to the others spaces. Use of the play space should be in harmony with the parallel activities in the classroom.

The play space provided an environment that paid attention to the physical experience in learning exercises, through the arrangement of artefacts meaningful to particular subjects. Consequently, and bearing in mind that there are multiple objects and multiple children in the play space, the system needed to consider two fundamental design problems: (1) how does the design incorporate physical play objects, and / or accommodate multimodal interaction that on par with the perceived use of these objects? (2) how does the design adapt to the changing themes to keep pace with the programme of study?

Teachers and children put considerable time and energy into creating visual artefacts to show work, and information to aid the children's social and cognitive development. This was a positive aspect of practice in relation to creating meaningful visual material that could be used in the play space. These were processed that were familiar to the children, and the teachers were very adept at handling. However there was a caveat, in that when the children were engaged in learning activities, they did not appear to reference the visual artefacts in the environment. This lack of attendance flagged a concern about how the visual artefacts in the augmented play space would be used - would they be passively received (as a picture on a TV), or would the children be able to use representations of objects and events in a manner that was more akin to their use of play objects?

The children were enthusiastic to use *real* objects in their play, though paradoxically, objects which were authentic potentially afforded better play, even though the children could quickly transcend the original affordances. Consequently, there was an essential requirement to ensure the real value of play object was retained when it was virtualised. This seems like an oxymoron, but as NoŚ (2004) stated, we are capable of perceiving pictures of object as real objects, and the Strommen's (1994) observation of children physically ducking in a virtual wood supports the notion that this is possible. Drawing these two points together suggested that the children would respond to virtualised object as real, if it looked real and behaved in a real manner within the context of the activity. The design practice therefore needed to investigate how to ensure digital spaces and objects had authentic qualities.

4.3.4.2 Meaning Making

The children clearly looked for opportunities to be playful and to distort meaning, particularly in humour. Playful agency was a positive aspect of play, but also confirmed some initial concerns for the design. To accommodate playful agency, I would have to consider interaction in terms of actual bodily action. It would not be enough to click a button, the child would have to be allowed to move, so that the motion and response in the interface would provoke alternative meanings for actions. There was no accounting for the repertoire of these actions.

Teachers were very mindful of children's parameters in their meaning making activities, and employed strategies which used constraints to guide their activity, such as restricting the tools they had to work with. This was a potential route for design - constrain the children's activity by purposely

giving them an over simplified palette. The child can then freely operate within these parameters, rather than under instruction. Structuring narratives from the retelling of stories, and the deconstruction of tasks also appeared to be an activity where the teachers anticipated difficulties for the children. To overcome the challenges in both construction and deconstruction, teachers guided learners through processes in discrete steps. The observations showed that children's play did include loosely formed narratives. The enacting of these narratives could be extremely short, and repeated many times during a single play session. Though pre-creating narrative structures prior to play were not currently considered, a question remained about how to provide the mechanisms for supporting narrative creation on-the-fly.

4.3.4.3 Sharing Significance

The control / instructional behaviour that emerged as the children used the desktop machines and the changing dynamic of the children's social groups, strengthened the assumption that they would be better served if they did not have to negotiate single points of interaction. Consequently the assumption of distributed interaction remained. However, concerns about the children's absorption were raised. The plan was to include a visual element to the augmented play space, which would require a screen in some form to hold the image. If the children's attention was pre-occupied by the screen, then they would not attend to their peers.

All forms of direct communication should be supported in a system for co-located play. What was interesting about this study, was the elevated importance of onlooker behaviours. This meant that the children needed an awareness of each other's activity, even if they were not collaborating. They needed to be able to peer into each other's world. Further, the fluid dynamics of the children's social interaction in the role play space, meant designs needed to accommodate parallel activity, and shifting social groupings engaging in different types of play.

4.4 From Ethnography to Participatory Design

This section considers the aspects of the ethnographic study that were carried forward in terms of the design practice and research methods; and describes the constraints, rationale and further questions that emerged. The needs and aspirations of the stakeholders are drawn together, along with the findings from, and reflections of, the enactive framing of practice.

4.4.1 Constraints

The constraints below are formed from an aggregate of the findings in this study.

The use of existing classroom equipment

This was primarily at the request of the head teachers, but also to ease integration. The teacher were likely to have to learn how to use new software, I did not want to compound the problem further by giving them new hardware to learn. Development strategies considered how to make use of data projectors, IWB, webcams etc. The current desktop machines installed in the classrooms were quickly ruled out because of their limited processing power.

The space needs to be authorable

The role play space had an important role in the classroom as a multi sensory social learning environment, no other aspect of the classroom accommodated whole body learning to the same degree. By choosing the role play space to augment, there had to be steps taken to ensure that these positive qualities remained intact. This meant that the system and the content needed be distinct, so the subject mater could be changed in line with subjects in the curriculum. The teachers therefore, needed to be able to author the experience. With this, came some concerns about creating content for the system, which would need to be considered as the project moved forward. The children also needed a say in defining the subject matter used in the play space. This might be from a selected palette of options, so there is an element of choice but with guidance. When considering the impact of the teacher's experience to options for this project, the outlook was quite positive. Teachers could source digital materials and had experience of using digital cameras, transferring data and grouping assets to create a digital media presentation. Armed with these digital production skills, a clear understanding of their audience and their learning objectives, the

teacher worked as a designer of learning materials. Augmented reality systems for learning need a strong coupling between content and interactivity, so that the links between the subject matter to be learnt and the interactive elements of the AR are strengthened (Luckin and Fraser, 2004). If given a system where the content and system are distinct, it could be assumed that given their existing skills, the teachers would be able to use the system as a tool to create a cohesive mediated experience.

The duration of the mediated activity should be open

Timeframes for play could be highly variable. A couple of seconds or minutes if children were roaming between play activities, up to 50 minutes if they wanted to use the system for the whole of a session.

Consideration to the wider environment

There may be multiple activities happening in parallel during a single session, including other children at work. The design needed to consider how the noise, movement, light from the augmented play space would impact the wider environment, and recursively, how activity outside the play space would affect activity within it. For example, if motion systems were used as a means of tracking movement, then they would need to account for unrelated movement close to the play space. Further, when using the system, the children should also be aware of the wider environment, so they are aware of instructions from the teacher to halt the activity.

This is a child only activity

The children will expect to use systems for play without adult intervention. If they needed help, the properties of play would shift, and might disappear completely. Further, needing the teacherÕs help would be a barrier to use, if the teacher was occupied elsewhere. Requiring the teacher to step in would also upset her practice. Without the augmentation, when the children used the role play space she could expect them to be independent of her help, and therefore she could concentrate her efforts elsewhere. If the children needed assistance, then this would place further pressure on her time and ability to attend to the other children. This is not to say the teachers could not assist the set up, as they would select and arrange to objects in the role play space, but that the set up would only be required very occasionally (i.e. termly).

Simple palette of tools to guide action

Reducing the options of tools within a given task will constrain the ways in which the task can be completed. Some balance does need to be found here. I do not want to restrict the options so much that the children's experiences are limited, but at the same time, not overwhelm them. So though this aspect is a constraint, it is also a question about what options should be made available - where is the tipping point of control and guidance?

Strive for authenticity of objects and environment

To enhance the degree of presence in the activity, and thus provoke agency in the augmented environment, there needed to be a sense of real to the object or experience.

Distributed Interaction: Children needed to move in and out of the space and the activity, and the system needed to allow for parallel activity. This could to be multiple subsets of children engaging in the same type of activity, or engaged in entirely different activities.

Support situated awareness among disparate co-locate groups

The system needed to support social interactivity across the spectrum of communication, from a quick glance to direct and coordinated activity. Onlooker behaviour was an important behaviour to accommodate, therefore the system needed to give the child an awareness of activity outside of his own play - a shared situatedness of parallel action.

4.4.2 Further questions

The first question related to the play space experience prior to use:

1. How to support changes in the theme of the role play space, to re-populate the system's content with a different collection of meaningful objects? There were two further questions which arose through the need to author the play space to match changing themes:

(a) How can the content be made adaptive? Solutions needed to be mindful of teacher's and children's digital media production / capture skills.

(b) Would the teachers and the children incorporate creating content for the play space into their practice, as they did for their learning displays? This would require a commitment to the system beyond the project, and would impact the long term use of the system. The integration of the

system into other classroom activities would be dependant on the previous question, but also that the experience of using the system made these efforts worthwhile.

2. How to accommodate the physical objects that are arranged within a role play space to create an authentic context?

The remaining questions relate to interaction with the technologies in the augmented play space, and the subsequent experience. The questions are grouped in terms of their relevance to the enactive framework:

Situating

3. If the system used visual and auditory material, would the children embody digital images, video and sound into their actions?
4. What distinguishes a digital object as authentic?

Meaning Making

5. How to support interaction where movement generates new meaning?
6. How to create dynamic narratives to match the spontaneity and repetition in role play?

Social significance

7. How to support situated awareness for parallel and coordinated activity?

These questions were pursued in the continuing design practice. The PD data was interrogated and categorised according to these questions, to reveal additional constraints and affordances that would need to be factored into the augmented plays space.

4.4.3 Reflections of Study

The reason I stayed close to classroom play, rather than a broader examination of different types of play, was because of the variations of situated action in context. Something would undoubtedly have been learned from examining outdoor play, but it would require further inference on my part to strip away the situated attributes, and re-appropriate certain aspects for a different context. Arguably this was what I do anyway as a designer when creating experiences with technologies that do not yet exist, but would have required a higher degree of inference. I did look beyond the role

play space to other classroom activities, as they either had a direct relationship with children's classroom behaviours, or would reveal more information about technological practices (i.e. sharing computers).

My support role helped me overcome feelings of being disruptive in the school. I was extremely concerned that research activities would cause the teaching staff to see my presence as a nuisance. By being more involved in the school, I felt teachers could be more honest in voicing their concerns and suggestions about research activities, and about the project's development. The additional activities, and conversations in informal contexts (i.e. the staff room) were ethnographically rich experiences, but also meant it was not always easy to provide conclusive evidence to validate shifting assumptions. However this involvement in school life did contribute towards a feeling of immersion, from which inferences should be more in tune with the context. The only conscious bias I was aware of as a result of my involvement, was a reluctance to be negatively critical. For example, I would never perceive a teacher as lazy for not being more proactive in her use of technology, the perception would instead blame the tools for making the task unnecessarily demanding.

Using note taking as a method of data collection made it difficult to record a detailed account, particularly in the chaos of observing multiple participants. Video data was really useful for a more granular analysis, and I relied heavily in this chapter on the sessions I was able to capture, but the camera remained a distraction for the children. As a sole researcher, I had no real solution to this - at this stage I proceeded with a *play it by ear* approach, using the camera when I could without disrupting the children too much.

Situating discussion in the classroom was very useful. The discussions with teachers tended take to place around ideas, and showing each other examples of technology, work, technical and media support issues. For example, a teacher demonstrated how she used certain applications to gather ideas that emerged during whole class interactions. Orientating the discussion around the artefact in the classroom meant we had a tangible point of reference, I could see past work and her use of the system when not under pressure. Therefore the conversations that were had in the classroom gave some additional depth to the discussions of practice.

Though it has its own challenges in terms of the breadth of the inquiry, the enactive framing of this design practice actually helped to cut a vertical slice into educational practices. There were so

many factors to consider in this study, and I was aware that there were many aspects of school life I did not include that could be perceived to be relevant - such as play in the playground. The enactive framework and choice of activity helped define what was relevant, what was worth attending to - without this, and armed only with instructions to create a "stimulating experience for social play", I would have been adrift in a sea of data. The enactive framework with its attention to context of use, physical and social interactions meant I could account for the multiple factors which would impact any technological intervention, but at the same time narrow the view. Enaction helped to select certain attributes of play behaviours as a context, and therefore what was pertinent within the activity.

5 | Participatory Design

This chapter describes the PD activities. As there were multiple sessions, the specific details and rationale for each session is outlined with the description of the results. The constraints of use (skills, technologies, time etc) were identified in the ethnographic study, so this stage was more concerned with the children's voices. The teachers continued to be a part of the study as meetings and discussions continued, but the focus of their involvement was directed towards structuring and participating in activities. The PD sessions explored various production processes and interactions with traditional and digital media, during a series of small workshops that were divided into two stages. The first stages used low-tech (paper and pens) in activities to evoke ideas and discussions about narrative structures, the use of the play space, and social interaction. The second stage of the PD sessions asked the children to engage with different technologies, to consider the interaction modalities and the interface requirements for parallel physical and social play.

The objectives and rationale for the PD activities were guided by the questions and constraints that emerged from the enactive framing of practice that was identified in Chapter 4. The analysis of the data collected was intended to contribute towards specifying the qualities, and realising the features for the final designs.

5.0.4 Overview of Methods

The methods adopted at this stage were based on a combination of observations, participation via guided support, and discussions. Additionally four of the activities also included a supervisory role. The choice to observe or participate depended on the type of activity, and whether my presence was required. When the children were freely engaged in play or play-like tasks, I distanced myself

so I could observe. In sessions that used technologies or unfamiliar processes, I would step in to assist.

The PD methods attempted to explore the questions and constraints in action, rather than defining specific features. Using low tech materials in design activities appeared, on the surface at least, to be very simple. The tools were familiar, easy to source and set up, but this could be deceptive. The complexity came from creating an activity that would produce meaningful results. The design activity had to be structured so that it asked the right question, whilst also working within the children's understanding. At this stage of the research, the teachers were the solution to keeping design activities within the parameters of the children's understanding. The approach taken in these activities was to either ask the children to complete tasks with which they were very familiar, or to engage with a task, or sub task, that had a singular objective. The children were not asked to consider how they might approach design challenges such as interface features, but asked to do something which would reveal their conceptual understanding, and contradict or support my expectations of systems for play.

Children across the three schools were involved in the PD activities, and they were conducted on site at the school. Almost all of the sessions took place with small groups of Y1 children, and were attended by volunteers organised by the teachers. Consequently, I had little control over the sampling of participants. As there were multiple sessions, the details of each workshop are described more fully later in this chapter. As before, data collection relied on field notes, and video recording and photographs where possible. The use of the children's drawings as a means of expression was used more extensively at this stage. The children's drawings would focus on a key element of the experience, which helped identify valued aspects, and gave the children more time to reflect. When having discussions with the children, it was far more comfortable to draw whilst we talked. This method took away the pressure of having to talk all the time, so the conversation could flow more naturally, and for a longer period. If we were having a round table discussion, I would also draw a picture. This sounds a little strange - it not something a teacher or TA would have done - but it actually felt more comfortable, as it stopped the sense that the children were being observed.

The analysis categorised findings in terms of their relevance to the constraints and questions previously defined in the ethnographic study. The design of the activity was led by specific questions,

	Activity	Investigation	Method	Narrative structure	Media production
1	**Story Planner**	Generation of narrative via character placement in fixed environment.	Observation	Spatially mapped within single scene.	Image placement in fixed background scene.
	Branching Stories	Multiple narrative threads.	Guided support and observation.	Multi-linear branching stories.	Drawing / writing key event in discrete sections.
	Places We Play	Attitudes to playful spaces.	Observation and discussion.	Descriptive.	Drawing single representation.
2	**Kidpad**	Creation of narrative via digital graphics in a dynamic environment.	Guided support, and observation.	Spatially distributed with hyperlinking.	Graphics application, with visual programming environment.
	Stop Motion	Animation of characters within a single visual frame.	Guided support, participation and observation.	Spatially animated within single scene.	Stop motion animation.
	Virtual Dressing up	Pretence through RT visual augmentation.	Guided support, discussion and observation.	Real time within single frame.	Live capture during action.
	Audio Spaces	The embodiment of a RT audio feedback in a motion tacking system.	Guided support, discussion and observation.	Dynamic mapping	

Table 5.1: Participatory Design activities

but the data was examined for possible answers to all of the questions that emerged. The most straightforward aspect of any evaluation with the children, was whether or not the activity afforded play. The analysis identified the children's engagement with technologies in the terms developed through this thesis, but the true defining factor was whether they appeared happy and were enjoying themselves - simply, were they playing.

5.0.5 PD Activities

Part 1 was largely concerned with strategies for dynamic narratives. The first two workshops, Story Planner and Branching Stories considered the spatial and temporal distribution of narratives. The third workshop, Places We Play, explored and discerned attitudes to physical and digital play, and play spaces. All the activities at this stage used low-tech materials to ensure the children and teachers were familiar with the tools, even if they were not familiar with the activity.

Part 2 of the PD sessions focused on collaborative behaviours and interaction with interactive digital

media technologies. The children were active in evaluating the software and prototyped systems, to identify possible routes for intervention.

5.1 Part 1. Low Tech Participatory Design

This section documents the first three PD workshops. The first two sessions pivot around the collaborative creation of multiple and dynamic narratives, to consider approaches to representing spontaneous events in shared environments. The final activity intended to draw out conceptual understandings and attitudes towards play, to identify what qualifies a positive play experience from the children's perspective.

5.1.1 Story Planner

The story planner was a bespoke resource created by one of the participating schools for literacy development, and was a permanent feature in their classrooms.

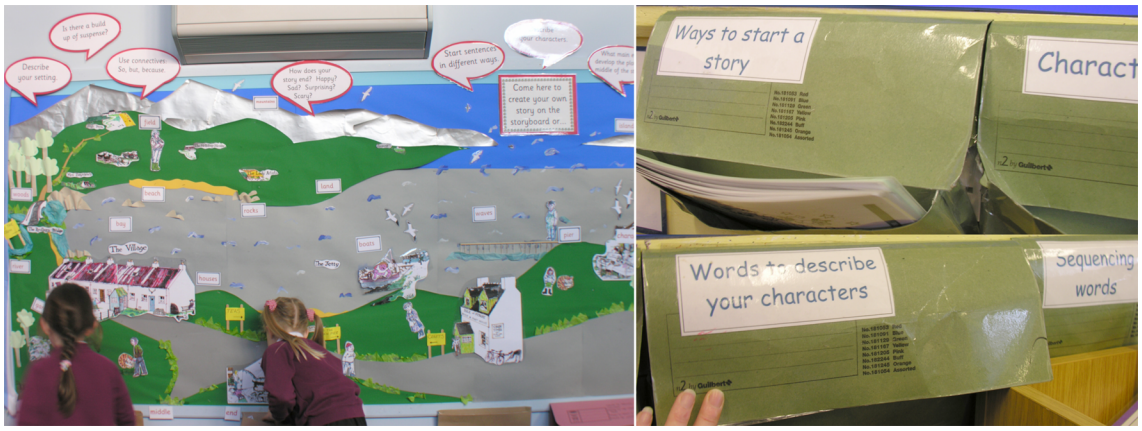

Figure 5.1: Storywall and story items

The planner was a large paper display, with a fixed background scene and envelopes underneath containing story components. The story components came in the form of images of characters, printed words (namely sequencing and descriptive adjectives) and phrases from key events or characters. The theme of the display was tied to an ongoing class project. The purpose of the resource was to create a visual reference to write stories. The pupils took story components from the envelopes and placed them in the scene to create pictorial narratives that were distributed within the visual story space. As a class exercise, once all the relevant components were placed on the display, then the children would write a story based on the arrangement of the scene. The story

planner could be used in small groups of two to four pupil, or as a whole class activity with the teacher mediating interaction.

The suggestion to use the Story Planner in the workshop came from the class teacher, responding to my interest in the dynamic, parallel narratives that emerged in play. She was also keen for the Story Planner to be evaluated for this project, as she considered it to be a valuable resource in aiding the creation of narratives. As a successful resource, we thought some of its qualities might be transferable to the augmented play space. The Story Planner had been a constant feature in the classroom for many years, and the children were very familiar and confident with using it. Using the story elements (the moveable characters and background scene), the children could create individual stories within this space, and working as a group meant multiple narratives would be created within the single story space. Consequently, the activity had both the dynamic and parallel quantities of narrative that I needed to investigate.

5.1.1.1 Method

As this was a process the children could do independently, I observed the activity so I did not disrupt their autonomy. The children appeared to be conformable with the camera, and were not too preoccupied by its presence, so the session was video recorded and transcribed. The observations aimed to gain some insight into the children's narrative creation via a visual aid, and explore how the resource was used collaboratively. The specific questions that were addressed in this activity and framed the analysis were:

1. How to create dynamic narratives?
2. How to support situated awareness when there is parallel activity?

5.1.1.2 Activity

Three Yr2 participants, who had experience of using the planner with this theme, volunteered to demonstrate using the resource. It was the teacherÕs suggestion to work with the slightly older group as she felt they would be able to give a better example of the activity. A TA was present to supervise the children, so I was free to observe the group. The participants were asked by the TA to use the story planner to create a story, and were given about 10 minutes to place the

paper elements in the scene and write their stories. The rest of the class were outside engaging in another activity, so the room was quiet with no distractions. The children were expected to complete individual stories, and were not instructed to work together.

Figure 5.2: Story Planner

5.1.1.3 Results

In this exercise, the resource was used in a variety of ways to construct the story. Initially the children placed the objects in the space. Although they knew the story the planner represented, they took time to consider where elements should be placed depending on which element of the story they chose to represent. The children held up components to test different locations, and occasionally animated the characters within the scene. They repetitively referenced the planner in the second part of the activity, they collected sample sentences to copy, but also glanced, looked at and stood in front the resource when writing.

As in prior observations of children working, the amount of verbal communication and shadowing was not balanced across the group. As an aggregate, the types of communication this activity provided was extensive - children voiced decision making processes, intentions, ideas, problems, made suggestions, asked questions, corrections and referenced aspects of the resource. But the

weight of talk was largely with one child, and another child barely spoke. In this exercise, P1 talked most the time - the other children did not always respond to her chatter, but she was persistent, and her talk generated an awareness of what she was doing. As a result of her communication and verbal shadowing, P1 frequently received peer support from other members of the group. This was in response to a direct request, or as a result of voicing problems, which can be seen in line 30-31 in the Extract 5.1.1 below. During the activity, the dialogue was largely between P1 and P2. P3 did appear to be a bit marginalised, but because of the dynamics of the group rather than a constraint of the resource. P3 was a little shy, and the other two children appeared to be close friends.

Extract 5.1.1. Transcript (Appendix 16). The children have been working for 50 seconds.

1	P3. Right (.) put her there (*takes a character from the bottom of the planner*). Put her (.)	P3 verbal shadowing (intention /
2	um: walking on the pier (*puts character on pier on planner*)	decision). Other 2 P's attention
3	P1. She's walking on the pier, she's walking on the pier P2	elsewhere – to self
4	(00:04)	P1 comments to P2 on the character
5	(*P3 puts a character in the middle of the planner*)	P3 has placed in the planner.
6	(*P1 takes character from right of planner and walks to left*)	P1 and P2 are playing with the
7	P1. Katie (.) Katie can be climbing the tree.	characters (they are meant to be fixing
8	(*P2 and P3 look at where P1 has placed image on board*)	them in the scene), animated
9	P1. No I want one.	movement against the scene.
10	[	P2 begins to voice intention to P1
11	P2. ((Too quiet)) Floating away. (*moves image across the board*)	
12	[	
13	P1. (Laughs)	P1 makes suggestions to P2
14	P2. (Still moving image around) No (.) I'd put her in the house (to P1)	
15	P1. Yeah.	
16	P2. (Here?)	
17	[	
18	P1. Stick her over there. (Points to space on planner)	P2 animating characters
19	P2. ((Too quiet))	Character placed where is shouldn't be
20	(00.03) (*P2 moving image around*)	
21	P2. There (.) there (.) there (puts character in middle of the board, in sea) (.) there.	Until now, P1 and P2 work together,
22	(Laughs)	P3 work in different place on board
22	[	and separately, brought in here – draw
23	P3. She put her in the sea.	attention to the character in the sea.
24	All. (*Laughs*)	Use of humor to bond the whole
25	P1. (*Jumps to put image high on the board*) I'll put her in the holiday home (.) I think.	group.
26	[	
27	P2. Look she's. (*Points to character in sea, looking at*	
28	*P1*)	
29	P1. I can't reach the holiday home. Where's the holiday home.	P1 voice intention – questions not
31	(*P2 points to the planner*)	directed
32	P1. Hey where's Katie? I'll put Katie in the holiday home. (*P1 stretching to reach, P3 takes*	P2 responses to P1's comments
33	*the image and being taller easily sticks it to the board at required height*)	P3 helps P1 without a request – see's
		her struggle as can't physically reach
		top (P1 is much shorter)

The planner did contain elements which made it an enhanced social learning environment. The children's language was efficient as they could explicitly reference the resource in communication. In the Extract 5.1.1, line 11-21, the children's comments were mutually understood in relation to their actions in the shared visual space provided by the planner. The group were brought together as a

whole three times during the activity - two incidences were situated in humour, and the third was when they were asked a question by teacher. The playful use of the resource emerged when the characters were situated in unusual predicaments, that were not a feature of the story. Throughout there was a dominant sense of putting things in the right place, but putting a character in the wrong place - not just in terms of the story, but normal conditions - was a notable event. In the Extract (5.1.1) line 21- 28, P2 instructs P1 to put her character in the sea. This event was noticed by P3, and drew her into the pair's activity. Up until this point P3 had been working alone on the left side of the planner, whilst P1 and P2 worked closely together on the far right side. After this incident, P3 was still quiet, but had a higher presence in the social group, as can be seen in her actions in the lines 32-33.

Extract 5.1.2. Transcript (Appendix 16)

1	T. That'll be endings in there I expect (.) where you want to end the story.	P2 corrects P1. P3 queries the correction, P1 agrees with P3.
2	P1. It says end -	
3	(P1 takes 2 sentences from pocket and puts on table)	
4	P2. Middle. (Looking at the envelope)	P2 does not really acknowledge correction and carries on with own task.
5	(P3 moves forward and points to label next to envelopes)	
6	P3. But that says end and that (.) settings.	
7	P1. Its end and settings.	
8	[	
9	P2 This is for the beginning (.) middle (looks away and takes more sentences	
10	from the end envelope)	

Other playful affordances were found in animating the character, by moving it across the background scene. The physical actions were accompanied by verbal utterances, as in Extract 5.1.1, Line 11, and was entertaining for others. There was a high degree of autonomy when using the resource as a group, but less so in completing the whole activity. When using the Planner, the children did not ask the TA for help with placing the characters in the planner - they asked each other. Additionally they made suggestions (Extract 5.1.1, line 14) and corrected each other (Extract 5.1.2.) when characters were misplaced on the planner. They had confidence in using the system as a group.

The adult guidance in the activity were prompts to move the activity along: once the TA checked the children were aware of additional story elements; the second time she asked the children to start writing their stories, and finally there was a request to read the completed stories to the others. The children did not want to read their stories out loud, so were not pushed.

5.1.1.4 Discussion

This section outlines the key findings from the Story Planner activity. There was attention to the specific questions that drove the inquiry, but also additional findings which were relevant to the constraints and questions established in Chapter 4.

Dynamic narratives:

The children were familiar with this activity, and difficulties in placing elements were not conceptual misunderstandings about how to use the resource, only about where to place the elements in relation to the story. They clearly understood the concept of moving foreground objects within a background scene. Consequently, dynamic narratives emerged in playful actions. There were difficulties in the second part of the activity - translating the story into a written form - but I was not too concerned with the support the children required at this stage. Formal retelling was not anticipated to be a feature in the final designs as a result the structuring issues previously discussed. More positively however, were the instances of animating the objects across the scene. This was interesting firstly, because it suggested another route to creating dynamic narratives, but also that there was an aspect of this action that hinted at embodiment.

Support for parallel activity via distributed interaction and shared situatedness:

The large single visual frame provided by the planner meant it was not just a communal workspace, but a social place which could visually and physically support situating activities via a persistent situated awareness. As interaction was distributed, there was no turn taking, the children could engage with the planner independently. The single visual frame gave each child an awareness of the present and past actions of others, which in turn, contributed to collaborative behaviours as there were substantial cues for efficiently establishing common ground.

Parameters:

The Story Planner was a simple approach to providing the children with a simple tool kit for generating stories. The pre-selection of the story elements meant the children worked within the constraints of the narrative, but still retained some freedom. It was a way of exploring a familiar story, whilst also being able to take an active role.

Distortions of meaning:

I did not expect playful agency to manifest in this activity, but there were playful affordances that

emerged as the children used the system. The highest levels of group cohesion resulted from a distortion of normal use, and the keenness to share the distortion with others. This demonstrated how the drive to locate and communicate playful affordances socially bonds the group - even if the moment is fleeting. Moving the objects into dangerous or odd places was funny.

5.1.2 Branching Stories

The idea for the branching narratives activity also emerged from a discussion with a class teacher about structures and creative strategies for collaborative narrative content development, and our conversation about the party game Consequences. We re-interpreted the game as a strategy for generating multiple narrative threads. The activity was framed by a common technique to break the story at crucial stages and ask the audience to make a decision, which would turn the plot in a specified direction. Unlike the Story Planner, this was not a familiar exercise for the children, and so we anticipated some difficulties with completing this task.

5.1.2.1 Method

As this was a novel experience for everyone, it was felt by myself and the teacher that the task would run smoother if she managed the activity. The teacher took the lead role in setting up and supporting the activity. This also freed my time, and meant I could observe the activity from the outside. The activity was conducted in the Yr1 classroom, used their materials and workspaces. To document the session, the teacher photographed the children working, whilst I took field notes. At the end of the session, the children's drawings were collected and audio recordings were made to accompany the completed written stories.

The specific question that was addressed in this activity was:

1. *How to create dynamic narratives with multiple users?*

We focused exclusively on this question. In the Story Planner evaluation, the children had worked in parallel on different narrative threads, this activity was an attempt to consider a cohesive narrative structure in parallel activity.

5.1.2.2 Activity

Ten Yr 1 children participated in the activity, and the session was supported by the teacher and 2 TAs. At the beginning of the class, the children were assembled on the floor in front of the class, away from their desks. The teacher first introduced the structure of the activity. She used a game book as an example, reading a section and then asking the children which options should be taken. The children voted, and the teacher read the next section. This process was repeated, but rather than voting the teacher asked one of the children to roll dice to illustrate the concept of chance.

It was then explained by the teacher that she wanted the children to create a similar type of story to the game book. The children were given a familiar narrative to use in the exercise: *The Great Fire of London*, which had been used in a recent project. The teacher gave the children the starting point, and the class were divided into two groups (five participants in each group). The groups were asked to pick up the thread and develop the plot to a certain point, without completing the story. In each group, three children were responsible for drawing and two were asked to write the story. The written and visual components were required to be the same, which meant the group had to divide the task. The children worked for about 20 minutes, and were supported by the teacher and TAs. When completed, the children reported their stories to the class, by showing the picture they had drawn and reading the sentences that had been written. After, the groups were again divided in half, and the pairs or group of three were asked to pick up on the end point of their story and complete the next series of events.

5.1.2.3 Results

The meta-organisation was led by the teacher: what task was completed, and when it was time to move on. She elicited, and confirmed the storyline before the children proceeded with the task. There was substantial support from the teacher and TAs during the activity in both the pictorial and written tasks. Prompts came in the form of suggesting what else could be drawn in the picture. For the children writing, there was a higher level of help, which focused on more functional aspects such as spelling and syntax.

Collaboration

The children were not assigned roles in the task, and did manage to organise themselves to complete subtasks (Appendix 17). There was not a long discussion, the children took no more than 2

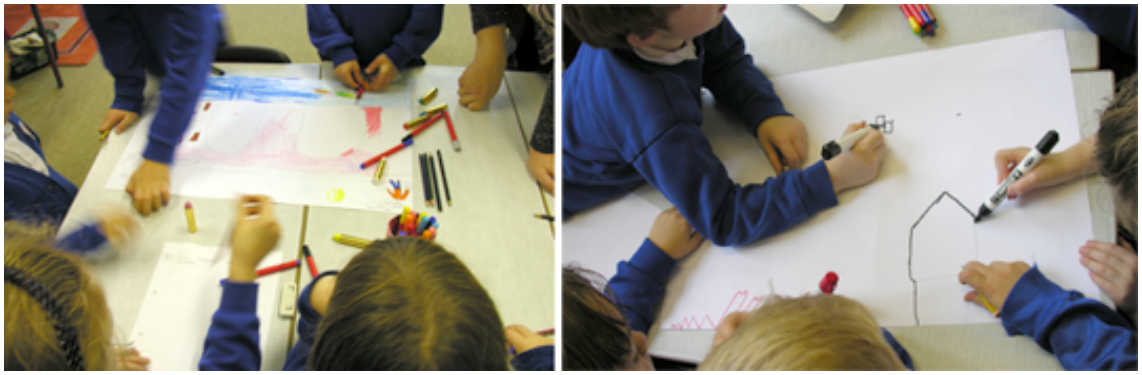

Figure 5.3: Collaborative drawing

to 3 minutes to decide who would do what. Intentions were announced ("I want to draw") or roles when assigned ("You write") by more outspoken members of the group. Quieter members did not always concede, drawing was the preferred option over writing, so there was a little negotiation. Despite the collaborative nature of the task, there was a high level of parallel work once individual tasks were established.

Figure 5.4: London's Burning children's collaborative drawings

Drawings

The drawings produced by the children illustrated key concepts in the story: the baker's house burning, the baker jumping into the river etc. The children started drawing their images with no perceivable delay or planning, there was an obvious ease with which children use visual media to communicate - they were not hindered at all when asked to draw what they understood about a

situation. The drawings produced in groups in the first part of the activity were visually richer, with more story elements filling the whole page. The groups working on pictures together created a cohesive scene, rather than two images on a single piece of paper.

The section of the narrative the children were asked to represent, contained a number of events in sequence (i.e. the baker discovered the fire, ran upstairs and jumped off the roof). In their drawings, rather then creating a sequence of images, the linear story events were represented spatially in the scene. The overall image therefore contained many events, as the children were able to visually conceive the whole story space.

Figure 5.5: London's Burning children's solo drawings

The children were asked by the teacher to read their written stories out loud, so the class could see how the individual stories might be connected. Although the children did not seem to have difficulties reading back their stories, they did not appear to be aware of the overall structure, and were very much led by the teacher's instruction and explanation. This was possibly due to the delivery, where all choices were retold so every child had a chance to present, and therefore there was not a singular story thread to follow. The stories were audio recorded, with the intention of possibly attaching the file to the image as part of a storytelling application. However in each instance, the audio recordings were unsuitable due to the high levels background noise (children chatting, crashes and bangs in the room) and children's quiet voices. A couple of the children would pause for a long time and needed a bit of prompting, or the reading would be interrupted (i.e. the teacher quietening class chatter).

5.1.2.4 Discussion

There were two key findings relating to the representation and generation of dynamic narratives:

Representation of Multiple Narrative Events in a Single Scene

The drawings revealed the children's tendency to visually represent linear events within a single visual space. There was no attempt to present a linear story as a sequence of images; in all cases, one picture would show concurrent, past and future events. The events in their images were created in different locations within a scene, in a very similar manner to the story planner. This finding validated the focus on a single visual frame of reference as a possible constraint.

Structure for Generating Narratives

As a parallel task, a lot of time was required to create the branching narratives, which made production a fairly lengthy process. The high level of support challenged the autonomy of this activity. The story production necessitated too much scaffolding to retain the overall structure and organisation, which left the children with few choices. The children really needed more than the two hours to complete this activity, the teacher said she would normally have given the children a couple of sessions to complete this task. The teacher did feel that if this task was done repetitively, the children would have become more efficient and would eventually learn how to use this technique for story making. However, given the commitment this would require, this structure for generating dynamic narratives was not pursued.

5.1.3 Places We Play

This workshop was an attempt to construct a reflexive activity to comprehend the value of virtual play environments in relation to real play spaces. The key objective was to identify what the children perceived as an authentic play experience in both domains, and their reasoning for their preferences. Though discussed with the teachers, the idea for this workshop was mine. I wanted the children's opinions about what they expected from physical and virtualised play, and what kind of qualities were valued in each context.

5.1.3.1 Method

This activity was a discussion with drawing. I also drew pictures, as it felt more natural to talk if we were all doing the same thing. The data collected from this activity was observational and subjective. As it was not possible to video record the event, post task analysis relied on field notes and the drawings created by the children. The main question that led this workshop was:

1. *What marks a digital object as authentic?*

There was a slight sidewards approach to asking the children to answer this question. The task focused on the attributes of physical play spaces and activities, and compared these qualities with their digital play.

Six Yr2 children volunteered to participate in this activity. The decision to work with slightly older children than the target age group was suggested by the teachers, as they thought this group would be better at deconstructing and articulating their interest and understanding of play.

In the workshop, the children were asked to make two drawings - somewhere they play when using the computer, and somewhere they play when not using it. Whilst the children drew, I asked questions about what they were drawing and why, and hoped that the drawing activity would contextualise this discussion. I had also noted in the previous activities that children could easily draw a picture to express their ideas, and in whole group discussions there can be dominant and marginal engagement from members. The process of drawing was therefore a mechanism to give everyone a voice, by providing a reference and a means of presenting ideas - either in stating intentions, commentary of work in progress, or presenting the completed work. I asked questions to prompt the children, i.e. "Why have you drawn that tree?", but also gave the children room to discuss their work with their peers.

5.1.3.2 Results

The children considered both domains as contexts for authentic play, but saw the domains as offering different playful affordances - i.e. cast spells in a gaming environment, or go swimming with my mum.

The task itself did prompt some social interaction. The children did not ask questions about each

Figure 5.6: Places we play

other's spaces (Appendix 18), but did respond to statements made by others: "I like playing snooker with my Dad", which prompted: "My Dad likes snooker, I play football with my Dad". The places identified as the best for play were physical, it should be noted that the unanimous response could possibly be a result of copying peers, rather than an actual preference. However the suggestion from the children was that more could be done in the physical realm. The children perceived physical (away from the computer) play spaces (top three images in Figure:5.6) in terms of the objects, action and people - the beach, snooker table (twice), football, cricket, BBQ. It was the supporting components that were important in real environments, not just the activity. Physical play activities were social activities, a time to engage with those closest - parents and friends. This was not surprising, but worth noting that who they played with was paramount from their perspective. The children did not talk about using computers socially, in feedback and reported behaviour it was very much an "*I ...*" activity, whilst playing in physical spaces was nearly always articulated as "*We ...*". The children largely used computers for play at home, where the device was rarely shared.

Computer use for play almost wholly pivoted around gaming, and related to current children's mainstream media - Crazy Taxi, PS2, Hogwarts (twice), Brats, Star Wars. Harry Potter was selected because "I like Harry Potter", rather then the game itself, suggesting it was the associative media reference that has value here. The game is quest driven, and the user benefits from understanding the related material (i.e. casting spells and characters) to progress in the tasks. Crazy taxi and

PS2 are typical children's gaming based largely on twitch response, so perhaps there were functional qualities here. Brats is an activity where graphical dolls are dressed, and therefore would be considered constructive play.

5.1.3.3 Discussion

This section discusses the key findings from the Places We Play activity.

Authenticity:

The children's digital play was clearly influenced by mass media, other games are available to this demographic, but the connection to other media experiences - films, TV programs and advertisements - was highly compelling, easily recognisable and gave the experience some authenticity. The type of play that appealed to this group could be explained by their age. As a slightly older group they preferred more structured play. This activity actually presented more problems, than solutions. Firstly was the charm of systems that had a commercial association. This was not a route I, or the teachers, were keen to pursue. However, given the assumption that the children would be able to author the content, I surmised that they could select their own media - that way if the children wanted to put Harry Potter into the system, they could. However, the move would have to come from their initiated action, rather than something that could be built into the system to make it more appealing. It was more difficult to know how to satisfy the children's interest in gaming, whilst also keeping the system open enough to satisfy the enactive framing of play in this thesis. The examples cited by the children were highly prescriptive, with few opportunities to be creative. At this stage, I concluded that it was likely that the children's experience of using computers had been dominated by gaming, but this did not rule out other possibilities for future experiences. A gaming model would require some rule-based behaviour, and though I was interested in how I could introduce a structure for dynamic narratives, the pre-defined goals that determined action in gaming did not fit. That said, interaction with a visual space, such as the story planner, presented a different structure to the time-based media, and more akin to a gaming model.

Spectrum of perceived social interaction:

It was not surprising, given the hardware and software constraints of the equipment used for digital play, that the children had no concept or expectation of social engagement when playing on computers. In contrast, play in the real world was wholly driven by social collaboration. Often it was

the collaborator who enabled the activity in the real world (i.e. the BBQ), but also made a regular activity extra special - the children regularly played football with friends, but playing with Dad more fun.

5.1.4 Summary of Findings from Part 1

This section outlines the formative findings which are carried forward to the next stage of PD activities.

The use of the Story Planner suggested that creating environments with a fixed background plane, and movable and animated foreground objects was a route for further investigation. Further, playful agency emerged through a combination of the environmental attributes and the freedom to manipulate the object, it allowed the children to distort the norms by put the objects in unusual settings. The Story Planner also demonstrated that some control of the theme could be provided by restricting the movable elements, and therefore placed some parameters around the activity.

The design practice acknowledged the gains from a single visual frame of reference. Firstly, as the Branching Stories workshop indicated, it provided a space that could be used to map events over time, and so contain the multiple events of a single narrative. Secondly, it supported a shared situatedness, as it provided a reference for the group's current and previous action. Thirdly, it could accommodate multiple and parallel activity by distributing interaction.

At the end of this stage in the PD activities, determining authentic play objects was still indistinct. However, there was an evident need to keep the focus on affording physical and social experiences. The people the child had to play with could heavily influence the quality of the play event; therefore it was essential to accommodate socially bonded groups.

5.2 Part 2. Evaluating Technologies.

This section documents the workshops conducted in the second phase of the design practice, and were concerned with evaluating different types of software with the children. The workshops adapted a variety of techniques for creating and manipulating content, including stop motion animation, live capture with motion tracking and sequencing still images. The rationale was to think about possible routes to digital media production, but also interactional modalities. The questions about dynamic narratives, playful agency and distributed interaction continued through the evaluations, but activities also paid attention to the constraints that emerged from the first phase of the PD. There was a specific focus on single frames of reference for multiple users and multiple narratives; and consideration to how to develop a system that could take advantage of manipulating foreground objects as a meaningful interaction.

5.2.1 Shared Digital Narratives

This workshop used the Kidpad software to support the creation of collaborative pictorial narratives. Kidpad was developed at Maryland University by a team headed by Alison Driun (1999). It is a Java based graphics application, where graphical elements can be hyperlinked to author interactive stories. Providing there is hardware support, there is also a feature to enable multiple mice to be connected. It was my decision to use Kidpad in the evaluation, as the findings from the previous workshops suggested that a single story space would support multiple children. In the Kidpad application, narratives were spatially mapped and objects could be drawn directly into the scene. Therefore, the environment and the content could be created dynamically. In the evaluation, the application was used on the IWB - the large shared work area meant there should have been opportunities for collaboration, alongside the children's individual and parallel work.

5.2.1.1 Method

In this session, I worked with the children without any additional teaching support. Consequently, I had to manage the technology, the activity and the research. The data collected from the session included field notes and photographs. Video recording was attempted, but quickly abandoned when the camera became the focus in the early stages of the evaluation, though I was able to

photograph a few key moments. Supervising the activity meant there was not enough time to take notes during the evaluation, so they were completed post task. The questions that framed the analysis, considered the narrative qualities and potential opportunities for collaboration:

1. How to create dynamic narratives?
2. How to support situated awareness in parallel activity?

5.2.1.2 Activity

Four Yr2 children participated in this activity. The children used Kidpad on the IWB in the ICT suite, which was controlled via digital pens. The children were familiar with using drawing applications and the IWB. The evaluation was conducted in the ICT suite so that we did not disturb activity in the classroom. There was a catastrophic technology breakdown when the multiple mice failed as we started the evaluation, which meant relying on the single user interaction available on the IWB. I continued with the evaluation as I thought the children might be able to get beyond the single user constraints, and adapt to the limitations of this environment.

As the application was unfamiliar, I gave the children step-by-step instructions to use the drawing tools, zooming and scaling the scene, and linking graphics. We practiced using the system together, and ad hoc support was also provided through the activity.

5.2.1.3 Results

The lack of multiple mice or a multi-touch screen was a real hindrance. The whole group working together was not harmonious. First, there was confusion when the children realised they could not all use the application simultaneously, with a lot of complaining. Then dominant and conflict behaviour emerged (no turn taking, ignoring others when there were requests to use the screen, some pushing). After observing this behaviour, I took the decision to split the group into pairs, one pair used the IWB with application, whilst the other pair observed. At this point, the first pair initially reverted to controller and pilot behaviour (one child directing the other), after 2 minutes the controller (possibly frustrated at the slowness of the request responses) left to use another PC in the suite to play a game of her choice, on her own. The second pair did not use the application

together, one child started to use it, whilst the other stayed at the PC she had drifted to earlier in the activity.

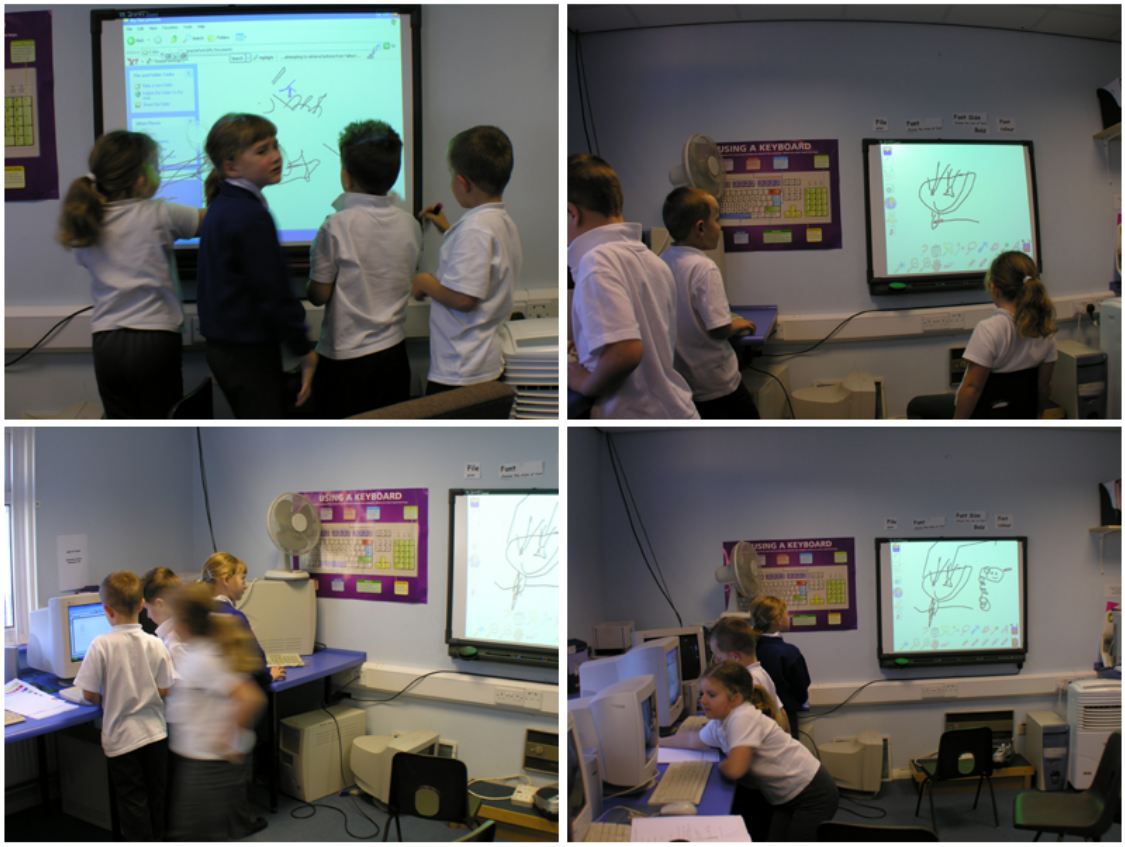

Figure 5.7: Using Kidpad: 5 minute intervals

Though the collaborative aspect of the evaluation did not transpire, I was still interested in the narrative attributes of Kidpad. The standard graphics features (basic tools such as brush, colour, shapes) were used by the children with very little instruction, not surprisingly the special features needed a lot of explanation and practice. The function of the zooming and scaling features to create new scenes, were not clearly understood. The children became listless during the explanation, which suggested they could not comprehend the intended use. It is also possible that they felt they already understood the concept of zooming, or that my explanation was longwinded. However, during the entire session, the children did not achieve more than a single graphic each, all the individual images were within the same scene. In the controlled use, the children appeared to experience problems conceptually connecting the story elements in different scenes. The problem

was the layout of the 2D graphics within the 3D space. The children would create a graphic, zoom out and lose the graphic. When moving to the next stage of the story, the previous image would be hidden, and they did not connect the graphics without prompting. Even though the graphic was created in the same space, if the reference was not visible it was not considered.

5.2.1.4 Discussion

This activity essentially failed, but there were some relevant findings in terms of the reasons for the failure.

Parallel activity:

Clearly, the parallel activity did not really happen. The single user interaction modality could not accommodate the spectrum of collaborative behaviours beyond ridged turn taking, which was not sustainable. There were only a few moments of collaboration, and these were largely as a result of instruction. There was a high level of conflict, particularly when working as a four, because each child expected to have autonomy. However, by the end of the activity, a sort of equilibrium emerged, as the children regained autonomy by moving to their own machines. However negative this experience was, it did strengthen the assumption that interaction should be distributed.

Dynamic narratives:

A sense of narrative did not emerge using the KidPad application, as the children could not understand how to use certain features within the context of a narrative structure. Creating multiple events on paper is something the children can clearly do with ease, so this was a problem of transfer. The tools themselves were deceptive, zoom and scale are not new for this audience, and therefore the children believed they understood, when actually they did not. They struggled to conceive the functionality of these features, as a means of creating spatially distributed narrative events. This was a complex method for mapping stories. Although the narrative was contained within a single visual frame, there was no constant overview of the story space to contain sequenced events, so the children could not retain the narrative thread.

Reflections of methods:

This was the first time children were not happy in the activity. The moment this behaviour became apparent I took steps to manage the situation, first of all I asked the children if they would like to

stop, and return to class. They were not keen to go back, and preferred to stay and play with the computers in the ICT suite, so I tried to make the activity more democratic by dividing the group. When this failed, it seemed mean to send them back, so I let them do what they wanted for the last 15 minutes of the evaluation. This meant by the end, they were all playing computer games on the machines in the ICT suite and had abandoned the KidPad completely.

5.2.2 Stop Motion - Foreground / Background Spaces

Two workshops were conducted to consider the use of stop motion and live animation as possible production techniques for creating materials for the play space technologies, and a possible way for interacting with graphics. There was a lot of collaboration with two Yr1 teachers for these workshops. Having seen the gains from the Story Planner, we considered approaches to creating animations using fixed background scene with movable foreground objects. The teachers, with their classes over several sessions, created the necessary objects and scenes to be used in the animations. These workshops were then used as an activity to reveal whether the children's understanding of the foreground / background spaces could be transferred to an alternate context. Though obviously as a result of filtering the activity, there was an assumption the children would understand a separation of character / object and scene.

The two activities took different approaches to animation. For the live recording, the equipment was set up with a camera feed to capture the animated scene, which was projected on the IWB. For the stop motion, the camera was set up on a copy stand. The children animated characters in the scene and operated the camera, whilst I managed the audio recording.

5.2.2.1 Method

There were two separate evaluation sessions, using the classroom technologies, with teacher support. I was active in the sessions, supporting the technical components, whilst the teachers organised the task. My role was primarily to support the teacher, as opposed to the children. The work produced by the children (drawings and audio) and the photographs were collected as data, along with field notes. The analysis was framed by the following questions:

1. How to create dynamic narratives?

2. How to support changes in the theme of the role play space?

5.2.2.2 Activity

The drawings created by the children were linked to other curricular activities. The stories in the first activity were based on a literacy assignment, whilst the second activity was derived from work on personal behavioural skills. For both the activities, the children created the characters and scenes to make their animations.

- Activity 1. Nursery Rhyme stories created by reception level children. During the activity, the children moved the objects around the scene, whilst they retold familiar rhymes. The video recorded their movements, and was played back after the session
- Activity 2. Good Behaviour animations based on personal stories. In this activity, four pairs of Yr1 made short (about 15 to 20 frames) stop motion animations, moving the characters and taking the pictures. The stories the children told were their own.

5.2.2.3 Results

The section describes the results from both sessions.

Live Video Animation.

Using the live video did hold the children's attention, but they were really hesitant when moving objects around the scene. When re-telling their nursery rhythms, they did not coordinate their movement, and had to be encouraged to so do. They would drift from telling the story, to watching their hands move the characters within the camera view. They were clearly more interested in the live camera than the story making. As was observed in the low-tech workshops, there were difficulties when capturing audio with reception level learners. Due the uncoordinated action, the video action was out of synch. To compound the difficulties, the quiet voices had to contend with the ongoing background noise. The children enjoyed, and were absorbed when watching the films after the recording. We played the movie after each recording, hoping that seeing the end product would assist the children's understanding about what they were doing. However, watching the films did not immediately trigger observable comprehension. The camera set up remained the focus of the children's attention (Appendix 19.1).

Figure 5.8: Nursery Rhythm pictures

Stop Motion Animation.

When capturing the stop motion footage, the children had to be restrained from moving the characters too far, rather than the required "baby steps". They wanted to tell the story by just moving the image around the background scene, and forgot / or did not want to wait for the photograph to be taken. Despite the movement from the reception class, the teachers were surprised by the level of patience from the children in both groups. Stop motion production could be considered rather tedious, but the children were focused throughout the task. The presence of the teacher would have had an impact on the children's behaviour. However, even under these conditions there were low levels of distraction, conflict and complaining, and high cooperative behaviour and closely followed instructions. For the children fairness is a right, and the teachers were attentive to equal participation through the activity. Using the camera was the desired role, so there was strict turn taking in pressing the button. Though the child was wholly directed under these conditions by two adults, and peers were involved in moving the foreground objects, the camera controller retained a sense of ownership of the work produced (Appendix 19.2).

Foreground / Background.

The reception level children in this session had struggled to comprehend the separation of the story elements. This was exhibited in their drawings, as the picture above shows (Figure:5.8, left image) the key character was included in the background scene. It was also evident that the children were unable to conceive the end state required from the foreground objects, i.e. the children's character

drawings were not cut-out-able to work against a separate background scene. The Yr1 children did not exhibit the level of difficulty as the reception class, as in their drawings they were able to separate the background and foreground elements (Figure:5.8, right image).

5.2.2.4 Discussion

This section outlines the key findings from the foreground / background workshops.

Dynamic Narratives.

The live video was the most compelling aspect of the activity for the children. Though as with issues data collection, it could be so compelling, it was a distraction. The children were clearly fascinated by the projection of their own image. Rather than trying to manage this, at this stage of the project, in moving forward it was considered more worthwhile to embrace it.

Parameters.

Separating spatial planes to create a virtual environment for activity became more problematic at this point, as there was some concern about the inability of the reception level children to separate foreground and background components. Upon reflection, the teachers and I felt that we should not abandon this method of production. It was, after all, achievable for the Yr1 children, and therefore within the grasp of the reception level children providing there was adequate guidance.

Creating content.

The advantage of these approaches for content creation was the use of materials that could be made using familiar craft processes, therefore the teachers and children could be independent in creating content. The stop motion proved to be a very viable route to creating time based content, and was continued in other projects, both with these teachers, and others within the schools. Audio capture remained a concern, the mechanism was simple, but creating usable material under these conditions was problematic due to the background noise and readiness to record.

5.2.3 Virtual Dressing Up

This activity followed on from the background / foreground workshops as a possible interpretation of manipulating foreground objects in a virtual space. To explore this, the LogiTech video effects application was evaluated to investigate a simple AR avatar system as a means of interacting and

generating real time media content. The application applies the effects to a live video feed via a web cam, tracking facial features (eyebrows, nose, eyes and mouth) to overlay selected graphics. When the child moved, the tracking informed not just the location of the overlaid graphics, but also the orientation and perspective relative to their head motion. Graphical objects either replaced features (i.e. hairy eyebrows, cat eyes) or attached headwear (i.e. glasses, hats). The palette of features and artefacts available were child-friendly characters, such as robots, monsters and fairies.

This software was recommended by a teacher, who used it as part of literacy and ICT curricular activities for class and 1:1 work. We had discussed that what was of particular interest was the change in the children's behaviour when they were augmented by the digital facial features. This system was designed for single user interaction, so when used in the classroom, the children took turns. However the intention in these activities was to use the software with an autonomous group, consequently there were expectations that the children's collaborative efforts would be hindered, as it was in the previous evaluation. However, the issues that arose in use should highlight the shortfall, and therefore what was required for multiple users to be accommodated (i.e. what was missing from this experience?).

5.2.3.1 Method

As with the first workshop in this section, I both observed and supervised the group in this activity without additional support from a teacher. The data collected from this group included field notes, post task drawings, video recordings of the motion tracking animation and photographs. Use of the camera was not really an issue in this workshop, as the LogiTech system used a live video feed which was projected on the wall, my camera became less interesting. After using the software for about 10 minutes, I asked the children if they would draw some pictures of using the system, as before the draw and discuss method was used. Due to the properties of the system, the analysis was framed by the following questions:

1. How to create dynamic narratives?
2. How to support interaction where movement would generate new meaning?
3. If the system used visual material, would the children be able to embody digital images, video and sound into their playful actions?

5.2.3.2 Activity

The software was tested with a group of four Yr1 children and consisted of three boys and one girl. The system was set up in a communal hallway role play space. The location of the testing meant the children passing by did occasionally join the activity. The children involved in this activity did not have prior knowledge of the Logitech application. There was a short demonstration, followed by guided use, before the children were given control and I moved into the periphery. The group used the avatar feature and recorded short video clips, the AR (tracking their faces and augmenting with character features) effects. The group were asked to use the system together, with the intention of giving them complete autonomy.

5.2.3.3 Results

During the evaluation, the boys dominated use through the 10 minute activity. The girl was very marginalised, and only used the system for 20 seconds on her own, before the boys took control again. I made a few gentle interventions to encourage the boys to allow the girl to join in, but the boys quickly pushed her out. Eventually she lost interested, and played with something else in the play space.

Control of the mouse remained the key role. Either the observers directed the mouse controller ('Click on the red face"), whereby the mouse owner did not have any autonomy; or there were demands to relinquish the mouse. Initially the behaviour was very demanding, in the first 30 seconds, one child asked for the mouse nine times, before eventually pushing his way in and taking control. After 5 minutes, the behaviour shifted from less demands for the mouse, to more directed control.

Aside from the mouse control, the other interactional element was having movement recognised within the composited image. When a graphical object attached itself to a child's face, they would instinctively pat the area it was located. Possession of the object was also desired, the children commented: "It's on me", "Put it on me". When the children placed their hands where the object was located, it would disappear. When a new member joined the group, this was explained as: "You have to smack your face to get rid of it" (Appendix 20, 08:30)[1]. As the calibration of the system was not exact, the graphic would relocate to the nearest match to replace the obscured features. The

[1] It should be noted that face smacking was not as forceful as it sounds.

children quickly realised that if they obscured another's face, the object would jump to their own face, which meant they could take the object away from each other.

The social affordances of the application were expected to be slight, given the limitations of the system. However, the imprecise tracking, which resulted in the graphic jumping from member to member, meant there was not just singular interaction. The composited image provided a shared virtual space where multiple children could see themselves, and therefore be part of the experience. Aside from almost constant onlooker behaviour from the boys in this group, with there was a high degree of simultaneous joyful behaviour - excited jumping around, laughing and mimicking action. In fact the noise level from their excitement was too loud for this activity to be suitable for the classroom without supervision, though this may diminish when the novelty wears off. When left working on their own, the children were twice reprimanded by passing teachers for non-sensible behaviour. The only real disruption to the boy's collaboration was the result of my intervention. The group of three boys drifted away when the girl was given control of the system, but quickly rejoined the group when I left.

Figure 5.9: Using Logitech software

Extract 5.2.1 from Transcript: Audio recording from avatar use (Appendix 20)

> Monster: (In monster voice) "I live in a dungeon. I have loads of friends. And SOMEBODY'S coming:::. (laughs) I can't wait. And my dungeon's really nice. And I can live anywhere:: (tilts head back). (laughs).
>
> Cat: (In cat voice) I am a cat. Meow. Meow. (Laughs)

In the evaluation, sustained tracking led to a physical and linguistic adaptation to account for the

virtual costume. As the Extract (5.2.1) and Figure:5.9 demonstrate, the children modified their behaviour (changing voice, adapting gestures, language) to be in keeping with the character depicted. This perceived adaption of the self was also reflected in the children's post task drawings (Figure:5.10). They did not draw themselves using the system, rather the view from the composited video.

Figure 5.10: Video still and child's drawing of using the Logitech system

5.2.3.4 Discussion

This section outlines the key findings of the LogiTech evaluation.

Embodiment and agency in action:

The children's action and language indicated there was a sense the object was attached to their bodies. The physical responses from the children when the digital object appeared, suggested the use of real time (RT) compositing was an attractive avenue for exploring the embodiment of digital artefacts in playful action. Attaching a virtual cowboy hat appeared to trigger similar behaviours as wearing a real hat - the child's stance, voice and action modified to accommodate the perceived associative qualities - this was virtual dressing up. There was also a degree of causality perceived through the limitations of the system, stretching the real constraints. Face smacking to remove the object was a genuine interactional modality for these children, as they quickly adapted the system to work beyond its limitations.

(Too) Playful content creation:

The production of digital media via the real time video compositing was by far the most enjoyable of the production methods attempted through this design practice. Using this system, was without question, play. Though they actively took photographs and captured video of use, the children were not in work mode, as they had been in previous task. For my part, it was gratifying to find a system that the children really enjoyed using and was wholly captivating (even for passers by). The concern however at this point, was that they were too playful in the activity. The autonomy they had in the role play space would not extend to overly excited behaviour. What I had not anticipated in locating a stimulating experience, was that the children would be over stimulated.

Parallel activity:

The social dynamic and use of the system was heavily affected by the gender imbalance of the group, demonstrating it was possible to completely marginalise members. However it should be noted that had this group been using the play space without the technology, it is likely that the boys would have played together, leaving the girl to play on her own. Mouse control was still the dominant role, though this dissipated as the children engaged with the interface. As before, there was an apparent fascination with self image, and by projecting the live video feed each child could see himself in the view, and therefore there was a sense of inclusion.

5.2.4 AudioSpaces

The AudioSpaces application was a prototype I developed at the tail end of the design practice, and was the first attempt to augment the whole of the play space. This application augmented the physical environment by spatially distributing audio to locations in the physical space. The sounds were triggered as the users moved through defined areas in the play space. As the audio was attached to multiple locations, there were multiple points of interaction for the group, which I had hoped would support parallel activity. The sounds were played through speakers in the play space so that every child could hear the sounds triggered by the others, and therefore achieve an awareness of the group's activity. To author the space, the children could mark out areas of the play space via a visual interface, and then assign a sound to each area. The system used simple motion tracking (based on difference) and a live camera feed, to detect any changes (indicating motion) within the defined areas to trigger the assigned sound.

The AudioSpace software aspired to enable the children to paint the physical space with sound. To create a single, shared audio environment that could be used collaboratively, and enable the group to be playful in their interpretation of the sounds. The generation of dynamic narratives was supported by triggering the audio feedback through motion. I had hoped that the sounds would be integrated into the multiple and fluid play narratives, and that the children would be able to acoustically author the play space to respond to their actions. As the space was shared, there were opportunities for the children's actions to overlap with others, as with the Story Planner and other play activities.

AudioSpaces software did contain a sequenced set up, over multiple screens, to author the sounds. Although there were expectations this might be problematic, as the children were likely to struggle with the discrete steps. However, the first screens would only need to be used in the initial set up, i.e. pre-selecting sound files collected by the class in a prior session, or sourced by the teacher to be in keeping with the themed space. All other settings - capturing live audio, marking out responsive spaces - could be set from the main screen. A controlled vocabulary was available to name new sound files created on the fly. This feature was included to overcome difficulties in accurately producing written words and prompt recognition. It was also possible to load a pre-recorded set of sounds created prior to the play session to tie the theme to curricula activities, such as samples collected on a field trip.

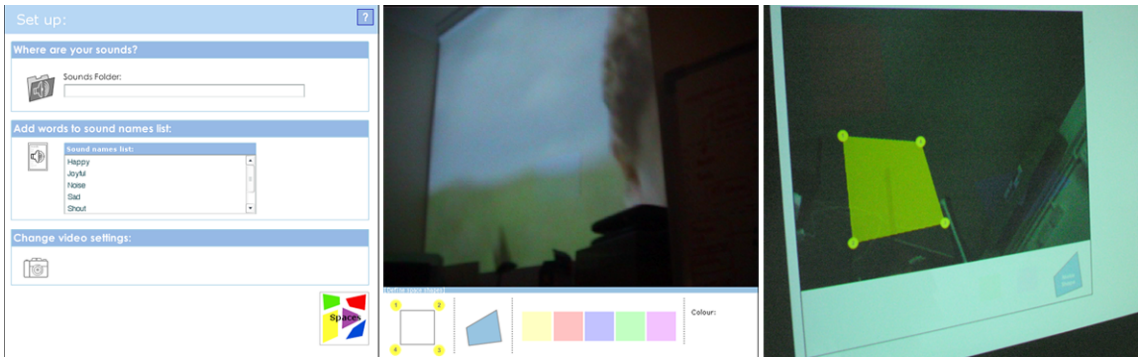

Figure 5.11: AudioSpace screenshots

5.2.4.1 Interface

The software consisted of a series of three steps to establish the responsive areas, create / load and assign sounds, and a live screen to see the areas triggering sounds. The user could revise the tracked colours, spaces and associated sounds separately as required. A sound amplitude feature was included to make the children aware of the volume their voices needed to be. There had been issues when recording audio throughout the PD workshops, and the sound level indicator was a successful technique to get the children to speak in loud-enough voices.

5.2.4.2 Method

As in previous sessions, I both observed and supervised the groups. I had meant to video record both sessions - due the complexity of the software, I assumed the children would need some support. The video recording in the first activity was successful, but in second activity, the children were too excited by the cameras, so analysis relied entirely on field notes. The key objective for this evaluation was to assess the system in context, principally would the children connect their action to the audio feedback? However, the analysis also paid attention to the following questions:

1. How to support changes in the theme of the role play space?
2. If the system used auditory material, would the children be able to embody the sounds into their playful actions?
3. How to support interaction where movement would generate new meaning?
4. How to create dynamic narratives?
5. How to support situated awareness in parallel activity?

5.2.4.3 Activity

There were two key evaluations of the AudioSpace application, initial prototype testing and an evaluation of the system in situ.

Activity 1

The first evaluation of this application was conducted with a group of four Yr1 children. The children worked in pairs, two controlling the system via the panel, two triggering sounds. The system was

still in development at this stage, the purpose of the testing was to refine the UI and the children's conceptual understanding. For ease, the system was tested in the ICT suite using the IWB, rather than the play space. As the children were unfamiliar with the software, a substantial part of the evaluation consisted of guided use. The children took turns to use the mouse. The guidance was largely informed by directly referencing the action (i.e. which button to press). The intention, once the process was comprehended, was for the children to use the system in a free play activity.

Activity 2

The second evaluation was concerned with testing the system in situ. The group of three reception level children were allowed to freely use the play space with the software running. The children were not directed during use, but an explanation and demonstration of the system was provided prior to play. As the first activity, the children were supported in marking out the responsive areas and deciding what sounds to attach. However, this was not done repeatedly, it was not the intention to further evaluate the UI in the same level of depth, rather focus on the presence of the audio layer in the children's physical and social play.

5.2.4.4 Results

The first evaluation focused on the usability of the system. There was not time for free play at the end of the session, as the set up took far longer than was anticipated. For the second evaluation, there were some minor modifications to the system prior to testing, based on issues encountered in the first evaluation. To give more feedback of which area had been triggered, the shape on screen would flash to indicate this sound was playing. Given the short time periods for play, and the focus on the connection between motion and auditory response, I controlled the audio capture to speed up the second activity.

Evaluation 1

Understanding the application's purpose and functionality was, to some extent, via peer support. There were multiple instances of individuals directing others (Appendix 21. line 210 - 214; line 276 - 283; line 348 - 353; line 359 - 363), suggesting there was comprehension of the set up procedure within the group, acquired over the short evaluation period. Through this dynamic, it was clear the children understood the concept of selecting the right colour for motion tracking (Extract 5.2.2., line 227), marking out a responsive area in the video image (Appendix 21. line 255 - 260), and attaching

a sound to the marked space (Appendix 21. line 350 - 353). As the Extract (5.2.2.) below shows, selecting a colour required the subject to stand still to ensure an accurate colour was tracked, which could be a potential issue if play was in full flow. Even under these controlled conditions, it was difficult for the children to stand still, as the video feed to the IWB was too distracting. They were too preoccupied with watching themselves on the screen.

Positive, collaborative playful behaviour was present in the testing period, namely laughing together, which was prompted by shouting out to make a recording, being silly in front of the camera (Appendix 21. line 276 - 283). There were also instances of peer discipline, and some annoyance (Extract 5.2.2., line 229). For the children, recording and hearing their own sounds was joyful, almost every recording and playback was followed by laughter and direct eye contact between group members.

Occupying the camera view and seeing the self on the screen was highly desirable. Conflict emerged when the children did not share the camera view, and therefore could not be seen on the projection screen (Appendix 21., line 182 - 183). There were also instances of directing the mouse operator, that was typically found in pair work with single user interfaces (Appendix 21., line 253), and waiting for a peer to use the control panel could cause a little impatience.

Extract 5.2.2. Transcript (Appendix 21)

226	08.30	P1.	STOP IT.	P2 is wiggling in front of the camera
227		P4.	Right let's see can I find the yellow.	P3 gives the mouse to P4. P3 step
228		P2.	He he he ((Laughs))	back to watch P1 and P2
229		P4.	Guys I can't (.) I'm trying to trying to get you.	P4 moving mouse to select colour
230		K.	I think you have to stand still.	P2 is dancing in front of cam
231		P4.	There you go.	
232			[	
233		P2.	I'm not in the picture	P4 Checking roll over colour
234		K.	You have to move over a bit	
235		P2.	Oh yeah.	

In the initial phase of the testing, the set up could cause dominant behaviour as the mouse control was not balanced. During this activity, P2 watched P1 using the mouse for 6 minutes. During this time, he once tried to use the keyboard, but could not gain access, and instead overlooked the typing. P3's and P4's participation in this period had been to record the sounds, and move in front of the live video feed, to trigger the recordings. When the process had come to an end (the sound was recorded and the children were attempting to get the system to play back the sound via movement), P2 requested he and his partner use the movement system (Appendix 21. line 171).

Suggesting that, although the playback was unsuccessful, using the audio record and the live video was a desirable interactional modality. If it was not seen in this light, the mouse control would have been the requested action.

In terms of usability, the file naming was problematic. The children supported each other in typing the words, demonstrating how difficult this task was for children of this age. Thinking of a name prior to making the sound took time, and typing the name of the sound was too ambitious. Even when naming sounds after their own forenames, they required help spelling (Appendix 21 line 300 - 310).

The background noise was not a hindrance, rather the audio recording equipment was not sensitive enough to capture quieter voices. Consequently the children had to shout to be captured, which, at this level, would be unsuitable for use in the classroom. The children connected the volume of their recording to the amplitude graphic - "That one went right to the top" (Appendix 21 line 316), indicating that this was a viable representation to ensure the correct volume was achieved. There were re-occurring issues with long pauses at the start and end of the recorded audio.

Evaluation 2

The second evaluation was situated in a role play space. The recurring theme of the play space was 'China', and was filled with a number of typical Chinese artefacts, such as fans, chopsticks, a xylophone, Chinese dressing up clothes and images of dragons and Chinese typography. However, despite the children recognising the reference to china, when asked to create appropriate sounds, the children struggled. They required substantial support to create sounds which might relate to these objects. Eventually they were guided through making noises such as slurping noodles, whooshing the fan, and clicking the chopsticks, but this did require some practice.

Vignette 5.2.3 Field notes (Appendix 22, 12:30)

> P1, P2, and P3 run and jump around the play space, the sounds (whoosh and slurp) in the play space are triggered, but there is overlap and a delay (due the lag in playback and multiple triggers). P1 and P3 look at the screen, P2 watches P1. P4 watches others from the edge of the play space, laughing watching the screen.

As the vignette shows, the children were able to trigger sounds, and the playback was accompanied by joyful behaviour (laughing, jumping around, dancing). The children were therefore playful, but it was not apparent that they were connecting their movement with the corresponding sound. The children's actions did not accommodate the sounds into their dramatic action, and there was no evidence of them integrating the sounds into a play narrative. The biggest problem was the multiple sounds being triggered by multiple players. Even with my support in making the sounds to ensure there were no gaps for pauses at the start of the recording, the multiple players meant it was not possible to know who had triggered the sound, and in what region. The children's joyful behaviour appeared to be a result of the wall of sound they were able to generate by running round the play space.

The children's attention was again, fixated on the live video feedback (Appendix 22, 01:50). Seeing themselves on the screen was too compelling, and the other objects in the play space were ignored. However, despite paying attention to the flashing shapes, these representations did not give adequate feedback to connect the sounds to their actions. With so many sounds being triggered simultaneously, the computer used in the play space stalled, and there was some latency. This meant there was often a delay in the audio feedback. The chorus of constant noise was also disruptive to neighbouring classrooms (this was the hallway space), the noise levels were compounded by the children's highly excited behaviour. On two occasions there were requests from teachers for the group to calm down and be quieter, as it was drawing the attention of children who were meant to working.

5.2.4.5 Discussion

This section outlines the findings from both evaluations.

Context creation. The first evaluation demonstrated the AudioSpaces system was comprehensible with some initial guidance and peer support to complete a set up process, but it did not qualify as play. It was important in the first evaluation that although individuals may not understand the application in full, the aggregate knowledge of the group did appear to work through the challenges the interface presented. In the second evaluation, which was conducted with the younger, reception level group, there were significant problems creating the sounds. Though there was no assumption of 'right use', the noises created by the children might be difficult to fit into their play narratives.

Playful agency. In both evaluations the children were playful with the system, though not as a consequence of the audio responsiveness, but the video image of the self on the projected screen. However, as witnessed in previous observations, the play behaviour bonded the group, and it is notable that the children approached the system ready to play.

Embodiment / generate meaning / dynamic narratives. The second evaluation raised the most concern in terms of AudioSpaces being a system for autonomous use in the play space, due to the lack of awareness of cause and effect in the representational space. The children did not appear to acknowledge which action triggered a specific sound. They enjoyed making a lot of noise, but there was no evidence of coupling. The multiple players and simultaneous sounds meant it was impossible to know how each physical action could be connected to a single digital reaction. This was due in part to the latency in the system. However, even without a delay, the lack of understanding would mean there would be no distortion or adaptation of movement in response to the sounds. The children needed to first make the connection, if they were to adapt it, and therefore manipulate the audio space according to their intentions. By not comprehending the constraints, they could not determine the malleability of the system. Consequently the trigger was unperceivable. Any pause and gaps in audio, which was likely when the children were recording their own sounds, would exacerbate the problem. The audio could be trimmed - but this would add an additional process to the set up. A larger area, with more space between active regions would be a solution, but not practical in this context given the small size of the play space.

The final barrier to long term use was the impact to those not using the play space. The loud and continuous noise created was not acceptable in classroom spaces, particularly when others were working, as in the case of mixed play sessions.

5.2.5 Summary of Findings from Part 2

The PD activities in this section focused on evaluating different approaches to content creation, computer and social interaction, to reveal some further constraints and affordances for design. The next section discusses the findings from Part 2 of the PD activities, alongside the results from Part 1, to refine the constraints and questions that have been identified through the design practice.

5.3 From PD to the Augmented Play Space

This section describes the findings that qualify the rationale for the next step in the design practice. The dynamics in play and children's interaction with each other and technologies in the varying situations explored in the PD activities were key to shaping the design. These factors, in conjunction with the previous work cited in this thesis, narrowed the constraints of the eventual technologies that would augment the play space.

5.3.1 Constraints and Questions

The constraints and questions raised in the ethnographic study are re-examined in this section in light of the findings from the PD activities.

Use of everyday classroom technologies:

In the PD activities, we explored the varied use of cameras, microphones, video camera, web cams and data projectors to consider content creation and possible modalities for interactivity in the augmented play space. The issues with collecting video data and the children's behaviour with the video, made the choice to a live video feed via the data projector an appealing direction. However, capturing audio was problematic, as was the uncontrolled audio play back, which meant the activity leaked into the wider environment. Live recording and playback of audio was therefore ruled out. The use of cameras to gather assets for the system was not a problem, as pictures and animations the children created could be captured. By this method, content creation could use established craft processes, which would also be relevant to other classroom activities.

Distributing interaction:

With single user systems, the mouse operator was the desirable role through all situations with technology - having control of the device was the key position from the perspective of the children, even if this did not equate to actual control. Single points of interaction generally caused conflict among the group, upsetting the balance in collaboration and cooperation. Conflict behaviour such as pestering, pushing each other out of the away could emerge if there was not seen to be fairness in the activity. To overcome this autocratic and disruptive behaviour, system designs should allow for many points of interaction. Given the fluid dynamics of social groups in collaborative activities,

and the frustration and distraction that result from turn taking, it was considered important that interaction in augmented environments was distributed to support parallel activity. Consequently, the members of the group could engage with the environment, but need not continuously engage with each other. However, as the AudioSpace evaluation showed, multiple users triggering multiple actions could be confusing. The overlap of sound meant it was impossible for the children to connect their action with the system's feedback. This lack of coupling was a concern, and so this method of making the play space technologies responsive to location was no longer considered. An alternative means of enabling multiple user engagement is discussed further in this section, with final solutions outlined in the next chapter.

Direct and immediate engagement:

Classroom observations and PD sessions noted that activities comprised of structured processes and sequenced procedures were more likely to require a high level of supervision. Consequently, multiple setup screens and the time it would take to complete them, would disrupt free playtime. What the children required was immediate engagement. Systems for play should be grab-able, like a toy. The research in this study found when the play activity required a long set up procedure (beyond 2 /3 steps), the children commented this was "not play". Final solutions sought to contain the entire set up process within a single visual user interface - no drop down menus or sequenced screens - where all controls were always visible and required minimum set up.

Single visual frame to support situated co-presence:

Affording a shared situated awareness should evoke collaboration in social groups. The findings of the PD activities showed that a viable route was to provide a single visual frame which was accessible to the whole group. A visual reference of each other's collaborative and parallel actions within a shared context should support a situated awareness of other's behaviour. In the study of behaviour in the role play space, onlooker behaviours proved to be a gateway to more involved social interaction. It was important to enable the spread of ideas through observing and copying other's actions. The children should therefore be able to engage in each other's activity, but also watch and glance without direct social interaction. Containing all of the children's action within a single visual frame would then enable them to capitalise on inherent mechanisms to empathise and imitate via observation.

Background scene:

The Story Planner resource showed that the children were able to create narratives with background scenes by placing and moving objects to represent multiple events within a single frame. The branching stories evaluation further showed that when tasked with representing multiple events, children opt to represent events within a single visual frame. Consequently, the augmentation could provide a background scene, with the children themselves acting as the foreground objects. The dynamic narrative of the play activity should emerge as the child acts upon, and within, the context of the augmented space.

The embodiment of visual representations:

The findings from the evaluation of the Logitech system went some way to answering the original research question about the embodiment of digital media representations or artefacts and events. The Logitech system produced the most dramatic results. The change in behaviour when the children saw themselves in a different context (i.e. as a cowboy), produced the most noteworthy adaptation in behaviour in relation to this inquiry. In terms of the enactive framework defined in Chapter 2, this behaviour would qualify as having situating and meaning making qualities, and therefore the system afforded meaningful interaction and an active presence. The observed behaviour showed that if there were a perceivable augmentation of the body, behaviour would adapt. The dynamic placement of the virtual objects on the body, gave the digital image authenticity. If the children had not perceived the Stetson hat or rabbit ears as real, their reaction would not have been situationally appropriate.

5.3.2 Reflection

The teachers were essential in shaping the PD activities. This was also my first project working with such young children, so the teachers' guidance was essential. When designing activities for young children, understanding how they would comprehend tasks and objectives was difficult. Many of my ideas were met with wry smiles and gentle redirection from the teachers, suggesting that my plans were somewhat ambitious. The problem was not just misunderstanding the children's capacity to engage in new activities, but in assumptions about their ability to transfer skills they exhibited in one context, to another. One of the reasons I continued to pursue audio was because I had seen the children using audio recordings in other contexts (i.e. on nature walks). However, in a different

setting, these skills did not manifest. The conceptual issues the reception level children had with the foreground / background activity were surprising, as this seemed like an obvious distinction that was easily demonstrated. The extremely slow speed at which they worked was also unanticipated. Having the teachers, who could articulate those parameters and suggest why trials had failed, meant that I could lean on their craft knowledge.

Installing and using technology in the school was problematic. Evaluating technology inevitably meant there would be breakdowns, and these were stressful. Using technology often meant additional visits to the schools to test (and re-test) systems and set up prior to the evaluation. However, even with attempts to be prepared there were times, such as the Kidpad evaluation, when the technology failed. As with the teachers, contingency activities needed to be considered. Another source of stress in design, was the time spent developing prototyped systems that were later discarded when they failed. The AudioSpaces application took some time to develop, and there were some positive elements when testing early prototypes. However, it was not until the finishing stages and the system was tested in situ, when the features were close to fully formed, that the major issues were confirmed. Although there were some indications this was going to be problematic, it was hard to shake the sense that the time had been completely wasted.

Though I had no objections, working with the children on my own was not at my request, but more for pragmatic reasons. It was far easier to organise research activities that did not require a teacher to find cover for her class. Managing small groups on my own was perhaps the most challenging aspect of my role during this phase of research. As stated, working with young children was new territory, so I did not have the skills to effectively manage the activity to get the best results. I noticed that the focus of my attention during informal observations of classroom activity shifted to identifying strategies to manage the children (such as the touching noses to be quiet). Though bad behaviour was not frequent, and more on par with being a little bit naughty, they did get over excited in manner they would not have had a teacher been present, as I did not have the same level of authority. It also meant that my attention was diverted away from thinking about my research objectives, and would be more focused on keeping the children quiet enough so that a passing teacher did not tell us off. This point also highlighted the need to consider the wider environment, both in play related research activities and the final system, disruption was expected, but there is a requirement for the children to be not too playful.

6 | The Augmented Play Space

The final system created for the role play space was a live video compositing application. The main inspiration for the system was the work on background / foreground scenes in the PD workshops, and the use of a live video feed in the play activities. The application enabled the children to combine live video with recorded, or found, video on the system to create an augmented reality play space. This meant the children could see themselves in the video space provided by the background scene, and they were the foreground objects in the scene.

This chapter draws together analysis from the fieldwork and PD investigations that directly contributed to the design rationale of the final designs, and the evaluation of the system in use. There were three stages to the evaluations which are described in this chapter: the prototyped system, the children's initial use of the system when it was installed in the play space, and the evaluation of the system after it had been in use in the classroom for six months. The remaining part of this section describes the play space system, details the rationale for design against the constraints defined through the design practice, and outlines the research design for the final evaluation.

6.0.1 Description of the Play Space System

In the final installation, the video compositing application was deployed on a computer in the role play space. To enable the chroma key feature, a green screen was placed on one wall. The composite image was projected on the opposite wall to the green screen, with a small web camera underneath to capture the live video. The children could control the system via a touch screen or screen and mouse, placed on a small table in the corner of the play space. Aside from the green screen, the touch screen and camera, the play space also contained the usual themed objects. The

application was built in Max/MSP and Jitter, and mixed a live video feed with a selected video files via a standard file browser. The application opened QuickTime (.MOV) video files, or JPEG, Gif, PNG, and TIFF image file formats. When using these applications, the user could select to remove the background from their own location (enabled with the use of the green screen) in the There software, and so place themselves in an alternate location. Conversely in the Here application, they could select to remove the background from the stored video footage, to place the foreground objects in the video footage in their location. The application also had a recording feature that allowed for the combined footage to be captured for later reflection, as a record of work, or to be used in play.

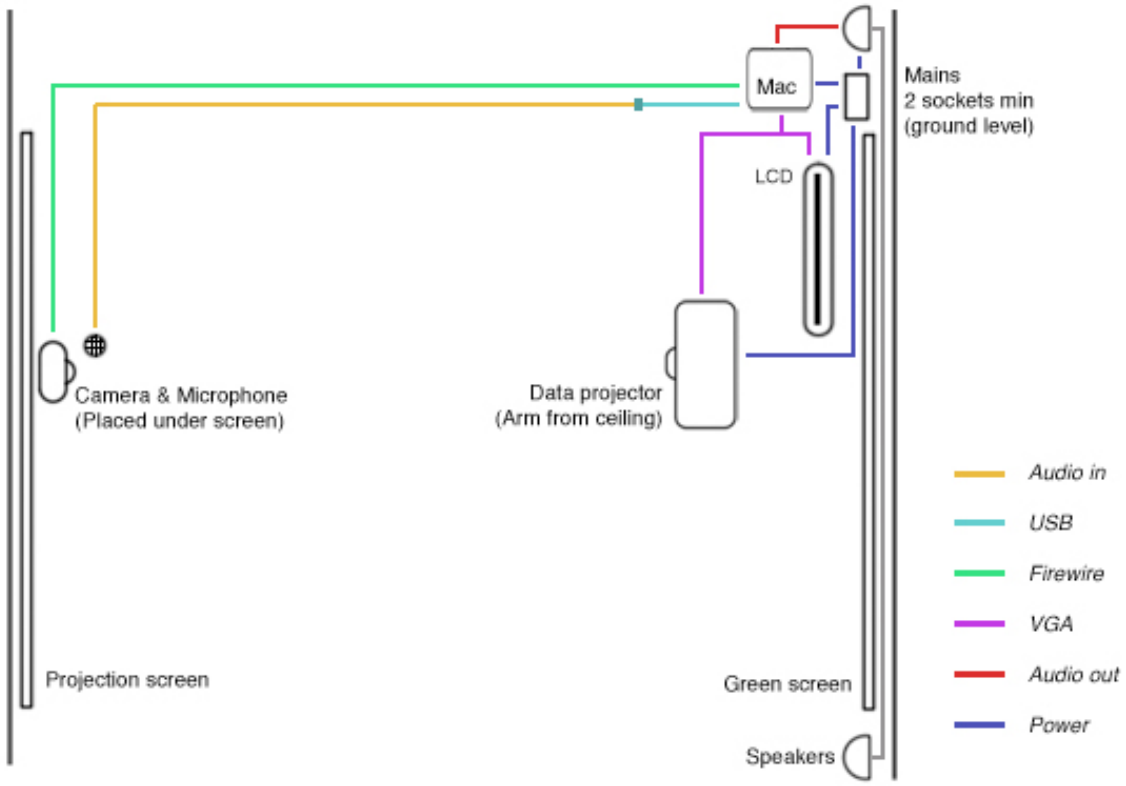

Figure 6.1: Technology in the playspace

The applications were installed on the computer in the role play areas of two of the schools participating in the study. One play space was located in a hallway, at the request of the school, as they wanted the space to be in a communal area so to be more available to the connecting classrooms.

The second system was installed in a reception classroom. Budget restrictions meant that at this stage, until further funding could be located, we could only equip two schools.

6.0.1.1 Interface

In the final system, the UI of both applications were the same in terms of screen and layout, but were different colours - Here was green, There was red.

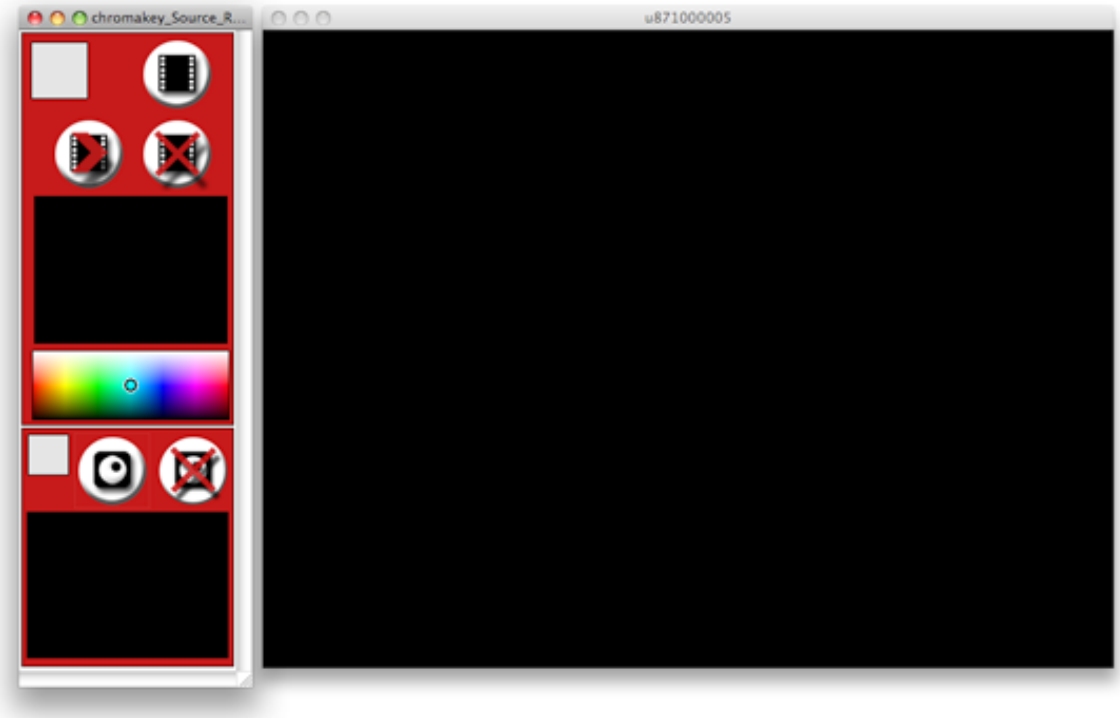

Figure 6.2: Here Interface

There was a single interface, with the control panel placed on the left of the screen, and the composited video occupied the majority of the screen (Figure:6.2). The user could turn the camera feed and video track off and on. There were two preview screens to display the live and source video, in addition the large view of the composited video. There were two options to specify the key colour: (i) click to a select a colour from the preview of the live video feed (to enable the green screen, or other objects in the play space), or (ii) select a colour from a colour palette.

6.0.2 Design Rationale and Hypotheses

This section describes the system's design and choice of technologies in terms of the constraints that have been established in the design practice. There were some imperfections in some aspects of the technologies chosen at this final stage, as a consequence of conflicts between the constraints. The resolution in the trade off between features and functionality was a result of a pragmatic decision-making, as the overriding factor was the ability to use the system on a daily basis in the classroom.

6.0.2.1 Design Constraints

Before justify the rationale for the design choices, it is worth summarising the key requirements for the design. The environmental factors that defined the design choices:

1. The hardware for the system should comprise of technology that already existed within the classroom.
2. The system had to be compatible with the classroom environment. Consequently, interaction needed be contained within the space, and not leak into adjoining activities.
3. The content of the system needed to be changeable to be relevant to the changing themes within the play space. The teachers' and the children's technical and media skills, and how creating content for the system would occur within the curriculum activities, needed to be carefully considered.
4. The physical objects within the play space should be able to be used in the system.
5. When using the system for play, there should be immediate engagement, and so a minimum set up procedure.
6. The children should have autonomy when using the system. It was accepted that the children would require some initial help when learning how to control the user interface, but it was vital that the play in the video space would need no instruction.

The system's ultimate intention was to provide a vehicle to determine the potential for enactive learning via interactive digital media technologies. As play encapsulated key enactive learning

processes, the design practice focused attention towards creating an environment that contained digital artefacts and spaces that were able to contribute towards situating social role play. The research question which arose from selecting play as a context was: would the children be able to role play with the digital artefacts? Would they be able to embody the representational forms, distort and share them with other children in the same manner as their physical play objects and spaces? In order to achieve this, I established that the design for the augmented play space should afford:

1. Meaningful interaction: The child's physical actions when using the system to be meaningful to his activity.
2. Active presence: The child should be active in his interpretation, and re-interpretation of the system's affordances. Therefore the perceived affordances within the system should be malleable to support the dynamic narratives of play and pretence. Role play activities should be allowed to emerge, and be repeatable, at the whim of the child.
3. Co-presence: The child should be able to share his ideas and actions with his playmates via a spectrum of social interaction (onlooker to direction communication). Therefore, the system needed to provide support for social play by providing interface and interaction features that enabled parallel and collaborative play, via a shared situated awareness and multiple points of interaction.

The crucial factor however, was could the system be used for play. In this study, there was an expectation the children would exercise prior experience and familiarity that would lead to playful interaction. Given that behaviour is governed by norms, if the technologies were embedded in a play space, then the time allocated to use the system would occur at the same time the children were given to play - therefore the children would interact with the system only if it was perceived as a play thing. The context should afford the opportunity to use the system in a manner that suited the children's role play, ideally distorting the representations within the content to match the situations they wished to explore. If it did not, then they children would not play with the system.

6.0.2.2 Design Solutions

Use of existing classroom equipment:

The application accepted a wide range of standard media formats to provide a background scene, so the teachers could use video downloaded from the Internet, scanned drawings, movie clips and photographs. The hardware consisted of a Dual Core Mac Mini computer, a standard SVGA data projector, a Firewire web cam for a live video feed, speakers and a touch screen. All in line with the types of technologies that are already located in the classroom. Although speakers were installed, the teacher could provide content that did not have an audio track, if she was concerned about noise levels.

Alternative places to play:

The chroma key applications were built on processes and concepts which emerged in the PD sessions. The fixed background scenes and foreground, movable objects were the main inspiration to provide the augmented play space. The chroma key feature would place the children into an alternate location - in the projected video space. Consequently, the children and the physical objects would become the foreground objects. The use of the camera embraced the children's fascination and playful approach to seeing themselves on the screen. As stated, a crucial factor when using the system was that the children would play.

The use of a video space:

Though the video background / foreground could be changed, the video space was non-reactive, the children could only occupy the space. This was the most contentious aspect to the final design choices, and the most significant trade off. A non-responsive space jars with the message of meaningful interaction articulated throughout this thesis. The basis for the enactive framework is grounded by the assumption that the creation of meaning requires interaction. Rather than being interactive, the use of video in this system projected a background scene to provide a shared context for action. The LogiTech system produced the most dramatic results in relation to my inquiry and I would have preferred to create a similar system to support multiple players. The deciding factor was the need to make the content authorable, and to reduce the need to set up the experience. Connecting multiple users to interactional elements within the interface would take up precious playtime, and may require help from the teacher. As a simple alternative, the occupation in the video space would be immediate, and therefore, unlike the AudioSpaces application, engagement could

be direct. If the content had not needed to adapt with the curriculum, then pre-defined fixed points of interaction and feedback could have been developed. Further, whilst the teachers had begun to grasp digital media production, adding to their load by asking them to engage with technology at this level seemed a step too far.

Whilst the constraints were satisfied, the decision to build a non-responsive environment raised concerns about how the children would respond to their presence in the video spaces. As there were no opportunities for meaningful interaction with a non-reactive virtual environment - the children's actions would have no consequence. However, it was hoped the children's actions in the video space would be meaningful within the context of the video space. Therefore an active presence and meaningful action would potentially emerge via a sense of immersion, rather than responsiveness. In some ways this approach was not so different from the LogiTech system. The digital facial features provided by this application did not change, but rather tracked the children, and they responded to their augmented bodies. The Here and There compositing applications I developed should essentially provide the same experience. However rather than attaching digital artefacts to the body, the body was placed in an alternate location. I had therefore hoped that the children would respond in to their perceived presence in the video space, as they had with the LogiTech system - that they would perceive the composited space as real, and adapt their behaviour accordingly. Use of the video space with the green screen also meant that the children could bring physical objects from the play space into the video space.

Share situatedness and parallel activity:

The singular video space could accommodate many users, so each child could see his own actions in relation to others, and therefore situated awareness should be achieved. As there were no points of interaction (other than changing the content), the children could freely move about the video space - playing together or separately - and so it supported parallel and collaborative behaviour. Observations of children using computers showed they were predominately occupied with the screen, which restricted opportunities for social interaction. However in this system, the projected screen provided a means to socially engage, as the children could clearly see the actions of others within the video space. The children would still have to use a single interaction device (touch screen / mouse) to control the content, which was a concern. However it was hoped that

there would be more interest in occupying the video space, than changing the content, and so the mouse or touch screen would not be a desired position.

6.0.3 The Study

The schedule of study was divided into two stages, each application was tested first when the system was deployed, and then a second evaluation was conducted when the system had been installed for 6 months. The key objective of both evaluations was to observe whether the children's activity incorporated the composited imagery into their physical and social play actions.

Stage 1: Initial use

There were two evaluations conducted in the first stages of development. Prior to completing the application, I developed and evaluated a prototype system to test the assumptions in the rationale, and refinements to the design. The findings of the prototype evaluation are described in the first part of the next section. The second evaluation was conducted when the system had been installed in a role-play space to consider whether the system was adopted by the children and teachers. Only one augmented play space was set up at this stage, it was placed in a role play area in an open space, rather than a classroom, to reduce possible disruptions to class when conducting the evaluation (as the system was novel, I anticipated a lot of interest from the other children). This evaluation is detailed in the second part of the next section.

Stage 2: Long term use

The second phase of evaluations were conducted once both systems had been installed in role play spaces in two of the participating schools for six months. The longer view enabled the evaluation to look for evidence of enactive qualities that had persisted from the initial evaluation. The aim was to determine the system's affordances via the behaviours and interactions that emerged, and were sustained over this period of time. The objective of the long-term evaluation was also to consider the fitness of the system for play. Attention was paid to the presence of the interactive system in the wider environment, and the children's and teachers' attitudes and habits in use. It was essential the technology did not disrupt the balance, that its presence was viable and could cohabit with the multiple practices, constraints and competencies which construct playful experiences in the classroom.

6.0.3.1 Method

Observation as a research method was used in all of the evaluations. During observations, providing there were no technology breakdowns with the system, I observed from a distance to allow the children to use the system with the highest degree of autonomy. I conducted all of the evaluations without teaching support, and so also had a supervisory role in the activities. In the first stage of the evaluations, once the children had used the system for an appropriate period of time (10 - 20mins), further observations were coupled with discussions about their initial impressions of using the system.

In the long term study, rather than having open discussions I opted for loosely structured interviews as I had specific questions I wanted to ask the children about their use of the system in their play time. Correlating the questions aimed to ease cross referencing in analysis, and find definition patterns in the children opinions and attitudes. To gain insight into the teachers' opinions and use of the system over time, we organised short discussions. These discussions were not recorded. To give the teachers some time to reflect, after the task I also asked them to note some key points.

6.0.3.2 Participants

The children in these evaluations were always tested in groups, and as before, they were asked if they would like to volunteer by their teachers. The children in the final evaluation were selected as they had used the augmented role play space in their classroom for the extended period, it was important to get their opinion and gain an understanding of their experience. The other children were selected by the teacher. The sessions lasted no longer than 20 minutes, after which the children returned to class. Alongside the school, two teachers from each school participated in discussions about the use of the augmented play space in their teaching practice. The teachers had either been directly involved in the project, or had used the play space over the extended period of time.

6.0.3.3 Data collection

All of the evaluations, discussions and interviews with the children were video recorded and transcribed. As the system featured a camera, with the live feed projected onto the wall, my camera as

Stage	Activity	Participants	Time	Location	Method	Data
Installation	Prototype	Four Y1	20 mins	ICT Suite	Observations and Discussions	Video
	Free play	2 x Four Reception	15 mins per group	Role play space	Observations and Discussions	Video
6 months post deployment	Free play	5 x Three Reception	15 mins per group	Role play space	Observations, Discussions and loosely structured Interviews	Video

Table 6.1: Final stage research activities

before, was largely ignored. I continued using discussions as a method of asking the children their opinions, either before, or whilst they were using the system.

6.0.3.4 Analysis Method

Data for analysis was categorised in terms of its relevance to the original enactive learning and design frameworks, and the impact of accommodating the augmented play space in the wider environment. The main objective of the data analysis was whether the children's play in this system would reveal something about designing for enactive learning processes? The analysis aimed to determine the context of the children's activity to indicate the circumstances actions emerged, with the aim of locate patterns in their interaction with the system. Consequently the data was interrogated and classified to consider:

1. *Situating: Did the children's interaction with the video space show evidence of coupling?*
Context: *How was the meaningfulness of the children's action related to the video space?*
Crucially in observations, I highlighted instances where the children adapted their behaviour to the context of the video space. Although meaningful interaction with the system was largely unachievable due the constraints, I considered that their actions should still be meaningful to the subject matter of the video space.

2. *Meaning Making: Did the children's interaction with the video space generate new meaning?*
Context: *How did playful agency emerge in action?*
Playful distortion was conceived in terms of a re-interpretation of environmental elements for the

purpose of situating action in pretence. Consequently, the observations of practice looked for evidence that the children distorted the meaning of the video space in their action, to assess if the system afforded an active presence in pretence.

3. *Social significance: Did the video space provide a situated awareness for parallel and coordinated activity?*

Context: *Did the children make meaning together?*

The data was analysed to consider the spectrum of social interaction and collaborative meaningful action, to assess if the system afforded a shared situated awareness. The children's social behaviours were defined in terms of the instances of coordinated and parallel activity, and the function of their social engagements (i.e. instruction, shared joy etc).

6.0.4 Summary

This section outlined the rationale, constraints, research design and questions asked of the evaluation as the system moved into the next final stage of the project. The next section describes the findings from the initial testing.

6.1 Initial Evaluation

This section describes the findings from the evaluations that were conducted prior to and when the system was first deployed.

6.1.1 Research Activities

The same procedure was used for each group in the evaluation: I explained that I was creating software for the children to use in their play space. There was an initial presentation, where the system was demonstrated in discrete stages, before I moved away and observed. At this stage, I would stay close enough so that if the children required support, I could step in. Assistance came in the form of technology breakdowns, explanation of features and group supervision. In all activities, with one exception, the video used in the background was supplied. I sourced video content with large flat colour areas so a significant portion of the image could be removed, and replaced by the physical scene.

6.1.1.1 Activity 1: Prototype

The early prototype of the Here/There applications was evaluated with the Yr1 children, in the school's ICT suite. There was a laptop with a control panel to change the system's settings, and the composited image was projected on the IWB. The children used the system for fifteen minutes, which included a short discussion. This version of the software enabled the children to apply video effects to the live video feed. The available effects included a chroma key with a fixed video background (flight over Mars), comic book effect, ghosting (a blurred, tracing effect), and a bi-tonal palette. This was a simplified version of the final application.

6.1.1.2 Activity 2: Free Play

The second set of evaluations were conducted in the play space to investigate autonomous use, and the children were given five minutes of unobserved play prior to the evaluations. In the two groups, a mixed group of three boys and one girl, and a second all boy group volunteered to participate in the evaluations. The children were asked to play in the space, but not especially with the video

space. Though the system was demonstrated, the children were given no instruction about how to interact with the video space, as the intention was to ascertain whether use was intuitively playful.

6.1.2 Results

This section describes the results from the prototype, guided use and free play sessions.

6.1.2.1 Prototype

The children appeared to be engaged for the whole session, their attention was focused on the projected composited image, aside from some mildly distracted behaviour when playing with the video camera recording the session, the children did not drift off task. When setting up the activity, there was no explanation of what the application did, or how the children should engage. Less than a minute was spent guiding use, after which no further help to use the system was required, aside from initial prompts to try an alternate effect, and managing turn taking with the mouse. Midway through the activity, the children were able to offer a physical demonstration and conceptual explanation of the system's functionality to passing teachers, whilst also encouraging them to engage. (Extract 6.1.2., line 333-343). The explanations showed that they had quickly understood what it afforded.

Possession of the mouse to select the effect did lead to some initial conflict among the group (Appendix 23., line: 233-234). There were a few supervisory interventions to resolve the disputes in turn taking, not via direct instruction, but suggestion. This was not always followed as it might have been had a teacher made the same request, as there were instances where the prompt was rejected by the child (Appendix 23., line: 265-269). Focus on the mouse did dissipate as the activity progressed - for the final third of the activity one child (surprisingly the quietest) had sole possession, which was not seriously contested.

Situating.

As Extract 6.1.1. shows, there was evidence of the children modifying their action in response to the perceived presence in the video space (i.e. flying arms). When using the chroma key effect, the children responded to the secondary motion[1] in the movie clip. As the camera view moved from

[1]Secondary motion is movement in the camera, rather than movement from action in the scene.

right to left, the children swayed as if they two were moving, as if they were in a flying vehicle (a space ship) and the projected image was the outside view. The movement of the camera and the subject matter (a flight over mars), created an instant context for their playful actions. When the children saw themselves in the composited image, there was clearly an urge to move. Each time the chroma-key effect was displayed, the children's physical action adapted in response to their location and the context of the video space, alongside the motion of the background footage.

Extract 6.1.1. Transcript (Appendix 23)

204.	K.	Do you want to let P3 have a go? And then you can play	P3 takes control of the mouse	Select Mars
205.		with the camera		
206.		[		
207.	P3.	UH HO-		
208.	P2.	Er oh, we're going round the moon again.	P3 has face in camera view.	
209.	P4.	Turn it around	P1 and P4 can see themselves in	
210.	P3.	We're going round the moon.	the distance – standing still	
211.		[		
212.	P4.	We're going aound the moon. WO::	P2 holds out arms (like a plane)	
213.			and swings side to side	
214.	P2.	We::: We're going round the moon again-	P2 holds out arms (like a plane)	
215.	P3.	We're going to (.) crash	and swings side to side	
216.	P2.	Er oh. We're going to fly away. Wee:::	P3 pushes face into cam	
217.		[		
218.		We're in a space ship		

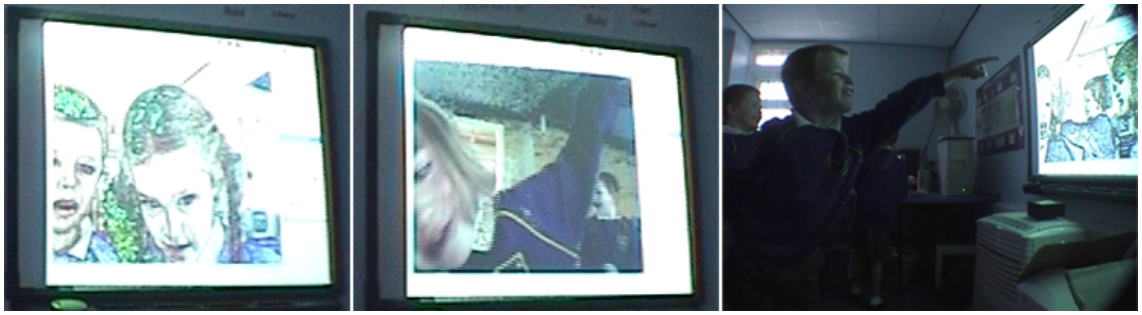

Figure 6.3: Brains, flying and mimicry

Meaning making.

The children's language and gesture demonstrated an imaginative interpretation of the combined content: "You look like vampires" (Appendix 23, Line 379). Repeatedly, the children used their movement to maximize the video effect, using the dynamic of their interaction to create a new context. In the Extract 6.1.2 (Line 339), the children discovered that if they moved quickly when using

the ghosting effect, their image of the screen blurred so much that they would almost disappear from the composited view. This for the children was a means of achieving "invisibility". On another occasion (Appendix 23, Line 429 - 436), they discovered that if they moved very close to the camera when using the comic book effect, flat colour areas in the live video would change to colourful patterns (actually half tone dots). When their faces were close to the camera, their hair became multicoloured, which for the children interpreted as a means to see their “brains”. These perceived effects (brains and invisibility) were discovered as a result of the children’s motion and interaction with the video space. This latter point suggests the children perceived one of the system’s affordances was to reveal hidden aspects of their physicality. Though a formative finding, this observed behaviour with the system indicated that with more familiarity, their creative interpretation of the video space could be active in role-play events.

Social significance.

There were many types of communication among the children when they used the prototyped system. As mentioned, there was a large degree of instruction directed towards the mouse controller. The function of other instructions did vary, in the Extract 6.1.2 (line 337) the directed behaviour was constructive to achieve a known state, and in the Extract 6.1.3 (line 147), the purpose is more exploratory. Some of the children’s communication was a verbal reaction to the system. In Extract 6.1.2 (line 153), the utterances were not directed towards any one listener, rather the children shouted out responses, drawing attention to notable action or in response to the experience (i.e. shrieking, singing).

Extract 6.1.2. from transcript (Appendix 23)

147.	04:30	P2.	Do the third one.	P2 speaking to P4	P4 and P2 in cam
148.		P4.	Four.		
149.		P2.	Black and white.	P2 speaking to P4	P1 Change to ghosting effect
150.				P2 sways back and forth in from of cam	Ghosting effect now evident
151.					
152.			((All Ps loud laugh))		
153.	04:35	P2.	Dee, dee, de, da (singing 00:03)	Singing while dance in front of cam. P3 starts dancing	P4 and P2 in cam
154.			(All Ps laugh)		
155.		P4.	That is wicked.	P2, P3 and P1 dancing – same motion as P2	

Cohesion occurred when the group gathered around the camera to share the view. This arose when a new effect was loaded, or a new interpretation / use was discovered. Extract 6.1.3 (line 342 - 344) shows that when one child discovered that by moving quickly the ghosting effect meant they

could see their image fade away, the others moved closer to imitate his action in the video space. This reflected behaviour observed in the play space in the ethnographic study, and suggested that the video space could afford the shared awareness which enabled the spread of novel affordances.

Extract 6.1.3. from transcript (Appendix 23)

333. 334 335.	09:05	P4.	Watch this. Look. Watch this. Go on show them. Go on. Click on play just click on one.	P2 talking to T P2 talking to P1 P2 walks over to T and points at IWB	
336. 337.	09:10	 P2.	(00:02) Click on play. See it goes onto different ones.	 Giving direction to P1	Change to ghosting
338. 339. 340. 341.	09:15	T. P4.	Wow. Move P1. De de de. See. See	 P1 sways in front of the cam	
342. 343.	09:20	P2. P4.	And it's fading away look. It fades away You can see through her a bit	P1 sways in front of the cam	
344.	09:25	P2.	Hello. You can see through me	P2 dancing in the background	
345. 346. 347. 348.	09:30	 K. P2. P4.	[That one won't play Oh wicked Wicked	 P1 clicks on option at top of menu (system fault)	
349. 350. 351. 352.	09:35	P4. P1. P2.	That one's good [No the other one Oh.	P2 ref menu Giving direction to P1	 Change to comic

There were instances of short collaborative dramatic action, where a shared understanding among the participants was framed by the video space. In Extract 6.1.1. a pair simultaneously enacted flying around the moon, with no need to establish the context prior to the experience. Instead they both reacted to motion and subject matter in the space, and could coordinate their action as a result of the shared occupation. In addition to coordinated behaviours, there were occasions where multiple users stood shoulder-to-shoulder in the video space, but engaged independently and did not acknowledge their neighbour. The independent action suggested that there were also opportunities for parallel play, and distributed interaction.

Feedback.

The feedback from the children was very positive. Throughout the evaluation there were affirmative comments when using the application. The children were keen to use the system, there were suggestions and demands for particular effects, laughing, smiling and other joyful behaviour. When asked directly, the children reported that it was fun to use (Appendix 23, line 502 - 510), and they said they would prefer to use the system at home, suggesting that they perceived the system for

play, rather than work. Preference in the types of effects reflected the perceived manipulation of their self image: opting for ghosting "cause we go invisible sometimes."; comic book effect: "We can see our brains."; and chroma key: "The one where we go places". The plain video and bitonal was considered to be boring.

The feedback from passing teachers was also encouraging, not just in terms of reaction, but also suggestions of use: "We could transport them in a Tardis." "Load a football pitch (...)" (Appendix 23, line 485). These opinions showed how the RT compositing readily afforded adaptation, the teachers were able to conceive not just content, but re-appropriate the system into alternate contexts for learning.

6.1.2.2 Free Play

In the free play sessions, neither group changed the video content without prompting. The second group (G2) loaded their own images (with support) at the beginning of the session, whilst the first group (G1) used footage installed which related to the play space theme. It was possible that the children did not fully realise they were allowed to use the computer to alter the background, or were not properly instructed.

Figure 6.4: Free Play with There application

Situating.

There use of the physical and the video play space between the two groups was very different. G1 spent a lesser amount of time using the video space, and were instead preoccupied with other objects in the physical play space. Whereas G2 were almost constantly engaged of the video space, and took little notice of the physical play space.

Extract 6.1.4. Transcript (Appendix 25)

	Time	Sp	Transcript	Action	Group	Type
128	04:15	P4.	Ding ding ding ding ding ding	P1 and P4 wave chopsticks in front of screen	Group	Func. /
129			[		(pair)	Drama.
130		P1.	WHO HO			
131			{(P1 andP4 laugh)}		Group	
132				P2 and P3 play game at table	(pair)	Game
133	04:20		{(P1 andP4 laugh)}	P1 and P4 wave chopsticks in front of screen	Group	Func.
134		P4.	No.		(pair)	
135			[			
136		P1.	{(Laugh, fighting noises)}	P4 Leans over and bashes his chopstick with P1		Drama.
137		P4.	Hey You do it ( )			
138				P2 and P3 play game at table		Game
139	04:25		{(P1 andP4 laugh)}	P4 puts chopsticks on tables turns and picks up	Solo	
140			{(No dialogue)}	chicken	Solo	Trans.
141				P1 plays xylophone	Group	Const.
142				P2 and P3 play game at table	(pair)	Game
143	04:30	P4.	Turke:::::y	P4 waves chicken in front of screen	Group	Func.
144			[		(pair)	
145		P1.	Don't fight. {(Laugh)}	P1 hits P4's chicken with his chopstick		Drama.
146			[			
147		P4.	{(Laugh)	P4 puts down chicken		Trans.
148				P2 and P3 play game at table		Game

As would be expected of free play, there were a high proportion of transitional actions (moving from one activity to another), but little distracted or unoccupied behaviour from either group. G2 engaged in a high degree of rough and tumble play with objects in both the physical and video spaces, which was not surprising given the dominant number of boys. G2 were loud and active - shouting, fighting noises and actions - to an unacceptable level, resulting in two direct interventions from passing teachers to request the children be quieter and play more sensibly (Appendix 26., Line 45 - 47, Line 160 - 169). The second request effectively brought the evaluation session to a halt, to avoid any further disturbances the activity was purposefully wound down.

G1's preoccupation with a board game found under the table in the play space, meant there was a narrower variation of play behaviour via the system than G2. G1's use of the video space was sporadic - they drifted away and then revisited, which as the field work from Chapter 4 showed, was not unusual in play space behaviour. G1 participants were observed using the Here application to

animate or move objects in the camera view (Appendix 25, Line 25; Extract 6.1.5), with moments of dramatic behaviour (Appendix 25, line 164).

In contrast, G2 participated in a broader range of play behaviours despite the rough and tumble tendencies. The boys in G2 engaged in constructive play activities, including planning via suggestions and directions (Extract 6.1.5, Line 37; Appendix 26, line 66 - 75); dramatic action in pretend situations (Extract 6.1.5, Line 41; Appendix 26, Line 108); functional actions such as jumping and swaying (Appendix 26, Line 105, Line 116); and exploratory Appendix 26, Line 154 - 159).

As a group, G1 directly engaged with the video space three times in the 5 minute evaluation (Appendix 26, 00:20; 04:10; 04:55). There was little direct verbal reference in G1, the children looked at, and moved in video space, but there was no observable connection between their action and presence in the video space. In each interaction, the children engaged via an object: i.e. watching the self holding an umbrella, or as in the Extract 6.1.4, animate objects in dramatic action. In these instances, the children watched themselves perform actions via the screen, the video was a mirror of activity.

As the Extract 6.1.4 (line 143), demonstrates, the children were momentarily amused by waving objects in front of the camera so that it appears on the screen. Seeing a representation of their actions, though short-lived, had a passing amusement, but there was no attempt to adapt this affordance into a new situation for play.

Meaning making.

As indicated in the previous example, both groups largely ignored the video content and focused the experience offered by the live video feed. The varying video backgrounds did not appear to influence the context of their actions. As the Extract 6.1.5 illustrates, the children's interpretation of the system was that it was a TV, which afforded, in this instance, a space for wrestling.

The TV theme was revisited later for G2 (Appendix 26, Line 127 - 151), so this interpretation retained some enduring value. For G2, the perceptual stimulus that triggered the wrestling activity emerged though interaction with the system. In the G2 session, there was one instance of the children's action responding to the content in the video space. In this occurrence (Appendix 26, line

54 - 55), when the children swayed like the flower, they were essentially mimicking the motion of the represented object.

Extract 6.1.5. Transcript (Appendix 26)

	Time	Sp	Transcript	Action	Group	Type
34 35 36	00:35	P3.	Hm. Hm. Hm.	P2 Solo use of system - waving P3 punching towards screen (mock fight) P1 watching P3 use system	Solo Solo Onlooker	Const.
37 38 39	00:40	P1. P1.	Let's do a (.) let's do a wrestle fight on TV. Look its TV.	P1 Speaking to P3 P1 Speaking to P4 – P4 joins pair Pair use of screen end - Group (3) use (looking at each other)	Group (pair) Group (3)	Drama. Exp.
41 42 43	00:45	P1. P1.	TV ((loud)) (00:04) ((Fighting noises)) Wrestle match.	P1, P3 & P4 pretending to fight (play punching)	Group (3)	Drama. / Tumble.

Social significance.

Both groups, being everyday classmates, were already highly bonded; therefore a large amount of collaborative behaviour was anticipated. G1 was slightly fractured due to the imbalanced gender mix, which meant that the only girl often played on her own, whilst the three boys played together. There were a number of instances of onlooker behaviour via the screen in G1, promoting actions in others. It occurred in circumstances where the watcher observed someone else performing an action on the screen (Appendix 25, line 89-90; Appendix 25, line 169 - 170). On these occasions, the screen was the reference for situating awareness, the onlooker attended to the video space because this was where the subject's attention was focused. There was evidence of parallel play within this group as seen in the Extract 6.1.5, P3 and P2 interact with the video space separately, before P2 and P4 joined P1 to form a triad.

As previously mentioned in this section, in the G1 evaluation there was only a fleeting amount of time spent engaged in collaborative action via the composited video space. On a couple of occasions the children in G1 gesturally drew another's attention to the screen (Appendix 25, Line 10 - 12), but they did not explore further, and quickly moved to another activity. Their actions, suggest uncertainty, rather than directly perceiving this as a situation for interaction. The joint interaction pivoted around functional and exploratory playful actions (repetitive), as opposed to constructive (interpretative) or adaptive.

In the G2 session, there was evidence of the children collaboratively locating playful affordances in the system via collaborative action. The Extract 6.1.6 below highlights an instance where one child is getting another to stand in a particular place so he could move the cursor over his face. This incident showed that the direct of instructions had shifted, rather then the mouse controlled receiving directions, he instructed the other children.

Extract 6.1.6. Transcript (Appendix 26)

	Time	Sp	Transcript	Action	Group	Type
67 68 69 70	01:30	P1. P3. P1	P3 go over there [Yea:::H Like if –	P1 (mouse) instructing P3 (screen)	Group (pair)	Const.
71 72	01:35	P1.	I need to get. Go on the mouse. (00:02) Go on the mouse. There's a (.) see it there	P1 (mouse) instructing P3 (screen)		Const.
73 74	01:40	 P1.	(00:03) Get down	Camera obscured		 Const.
75 76 77 78 79	01:45	P1. P1. P3.	Put your face in the mouse. No a little bit clo- Ha ((Laughs)) [((Laughs))	Camera obscured		Const.
80	01:50		((P1 and P3 laughing))	P1 and P3 Repeat cursor on face action		Drama / Const.
81 82	01:55	P3. P4.	Watch my face is going to be on the mouse I'm going to.	Speaking to P4. P4 runs over. P4 jumps to run of camera view, tries to grab mouse	Group (3)	
83 84	02:00	 P4.	((P3 and P4 laughing)) I'm going to.	P3 and P4 jumping to grab cursor, as P1 moves mouse		
85 86 87	02:05	P4. P4.	I've got you mouse. ((P3 and P4 laughing)) I've got you.			
88 89	02:10	P4. P1.	Got you mouse. Got you. Go mousy go Shall I delete it?	P4 reaching to catch cursor. P3 pushing P4 back (playful away from cursor, not conflict)		
90 91 92	02:15	P4. P3. P4.	No. Get out of the way. No AHA. NO::::::	P4 speaking to P3, neither respond to P1 P4 Runs round P3 to grab the cursor on the other side		
93 94 100 101 102 103	02:20	P4. P1. P4. P1.	We want mouse [Let P3 go – We::::: [Let P3 go over	P4 Run left to right to attempt to grab cursor		

The affordance of this situation - moving the cursor - was easily adapted in use. Without discussion, the activity shifted from moving the cursor over faces, to the cursor being a chase-able object (Extract 6.1.6, line 75 - 85). From a group action of standing still to attain the playful action, the group moved to catch the cursor. The suggestion came once from the child controlling the mouse,

and on the second occasion, from the child occupying the screen. Both activities emerged in interaction with each other via the screen, and to achieve the desired playful actions, the group were required to work cooperatively.

6.1.3 Discussion of Formative Findings

Though not every aspect of these evaluations was entirely successful, there were key trends in situating actions, meaning making and shared experience from the observations, and the children's feedback, which were evident:

- Agency and direct engagement with the video space.
- Perceivable playful affordances emerging in action.
- Perceptual, affective, social and physical presence in the RT composited space via a shared situated awareness and co-action.

6.1.3.1 Situating

In terms of the children's autonomy, when engaging with the video space, no direction was required. The children were given a short explanation of what the system did, but when the RT video composition was active, there were no instructions of how to interact with the system, and the children did not ask what they should do. In most instances they just played. When the system had been installed in the play space, two of the groups were very excited, and the children did not question the presence of the system in their environment. They expected to have autonomy, even the reception level children requested the mouse, and therefore saw this as a system that they had the right to use. There were multiple instances however, when children's behaviour did not adapt - they just watched themselves. In this respect, the screen appeared to function as a mirror rather than a new space to play in. However it was likely the screen was still too novel, and perhaps the parameters of the system still needed to be explored, before it could be re-conceived.

As there was no programmed responsiveness in space, interaction was considered in terms of occupation and authorship. The children did not seem to be hindered by the lack of responsiveness. Rather, their action responded to their presence in the video spaces, which was evident in the breadth of their play actions. Particularly with the group in the prototype evaluation, the chil-

dren's adaptive movement and language reflected their perceptual and physical presence in the augmented space. Motion and behaviour was not just prompted by the video content, but also by primary and secondary motion in the source video, which was not something I had anticipated. In this sense the children had perceived a degree of responsiveness.

6.1.3.2 Meaning Making

The dramatic play observed was particularly valuable from a design perspective, as it revealed a creative interpretation of the composited video resulting from active meaning making. The perception of causality took the system way beyond its actual functionality. The children's interpretations of the meaning of the video effects, such as capable of representing "brains", elevated the system's affordances to an advanced technology. I did make a couple of attempts to explain how these effects occurred, but they were not stressed - magic of this kind was a valid phenomenon for children in this context.

Feedback from the first group was that the system was something they would 'mess around with', coupled with observed play behaviour suggested that this system had perceivable playful affordances. The children pulled funny faces, jumped, danced, swayed in front of the camera, and laughed at the comedy that emerged in action. There was clear joy and humour, and excited behaviour, in seeing visual projections and distortions of the self and others.

6.1.3.3 Social Significance

There were many types of communication observed that occurred either via the video space, or when authoring the system's content - direction, discussion, commentary, shared joy, explanation - all of which suggested the video space provided a shared place for situating co-action. With a wide enough camera view to ensure the subjects could see themselves on the projected screen, the video space was capable of supporting parallel and coordinated action. The opportunity to observe others in the video space provided a situate awareness of other's action, which meant the discovery of a novel interaction could ripple through the group.

Group organisation was primarily conducted through instruction and suggestion. The presence of which indicated the children were capable of driving the activity, demonstrating not just individual agency in this mixed environment, but group autonomy. The initial demand and instructing the

mouse controller was a concern, the focus needed to be on engaging in the video space, not fixated on selecting and applying the RT effects. This behaviour suggested that driving and being in control of the experience was more appealing for the children. However, in the G2 free play session, there was a notable shift in the direction of instruction, rather than the group guiding the mouse controller, the mouse controller directed the group. The orientation of the hardware in the play space put the mouse controller at the back of the room, whilst the camera and the large screen were at the front. This arrangement distributed the interaction with the system, and required the group to coordinate their actions to achieve the desired effect.

Some negative behaviour was present in use (conflict for control over authoring the space and pushing to dominate the camera view, which also raised concerns. However, the loud and excited behaviour of the boy's only group was a minor issue. As previously mentioned, the children's behaviour when I was supervising did tend to be a bit freer than when teachers were present. The children were more than capable of being loud in any play activity, but could control their behaviour in the classroom, as they knew this was unacceptable. Consequently, I concluded that when the system was deployed in the classroom, the children would behave in an appropriate manner.

In the G1 free play evaluation, the composited space resided in the play space, but did not dominate play space action, instead the children drifted in and out of the space whilst they also engaged with other activities. As the system was not the solitary focus, as it was in the initial evaluations, there was no evidence of the domineering behaviour. Though somewhat underwhelming, G1's lack of engagement did prove that the system in the play space was capable of being in the background when it was not required. Its presence did not disrupt the natural flow of play.

6.2 The Long Play

This section outlines the findings from the final evaluation. The system was installed in a classroom play space in one school, and a hallway play space in another. This final stage of evaluation was conducted once the systems had been in use for free play activities for six months. After the initial phase of testing, there were two training sessions with reception and Yr1 teachers and TAs in the schools, with the system installed in their play spaces. Additionally there were numerous sessions where I worked with small groups of reception children to familiarise them with the technology. No child received more than one demonstration, after which the system was available to use at the discretion of the teachers and the demands of the children. At the time of this review, only one school had used the system on a regular basis. The school with the play space in the hallways did not adopt the system as part of their daily activity, whilst there was significantly more integration in the school where the technology had been located in a classroom play space.

6.2.1 Activity

The review looked to get subjective feedback from the children about the presence of the system in their play space, alongside observations of how the system was used. The evaluation of long term use was conducted in two parts. Initially, there were observations of the use of the play space during a free play session. Shortly after, a series of interviews were conducted with a reception class. Fifteen reception level pupils, in groups of three, participated in the evaluations. With the exception of the final group, the children were asked if they would like to play for a short time before returning to class, so the discussions could continue as they used the system, and additional data could be gathered to support their reported use. In the post play interview, three groups opted to use the augmented role play space, whilst one group chose to play in the other play space objects (in this case the sand and kitchen objects).

6.2.2 Results

This section presents the results of the free play evaluations.

Situating.

During the free play evaluations of the children using the play space technologies there were mul-

tiple instances when the children coordinated their action with their physical presence in the video. In one instance (Figure:6.5a), a child repeatedly jumped, attempting to grab a jellyfish in the background scene (Appendix 27., line 218-223). Whilst his playmates had spent a large amount of time aligning themselves in the video space so it looked like they were shooting objects in the movie (Figure:6.5b), and hitting the screen where the objects appeared (Appendix 27., line 96-110).

Figure 6.5: Grabbing jellyfish (a) and shooting crabs (b) in the There Application

There were other types of coordinating action with the video content, suggesting the children achieved a physical and perceptual presence in the composited video spaces. During the free play sessions, the children would often imitate the primary motion of the video content. In Extract 6.2.1 below, the children perceive the movement as "stretching", as they mirrored a crab's up and down motion in a looped video. Mimicking the motion of the crab in this clip was also seen in other groups (Appendix 29., line 208 - 222).

Further coordinated action emerged in response to the secondary motion in the background clips, particularly where the view was from a first person perspective. The rollercoaster movie clip on the system had an enduring quality for the children. Whenever this clip was loaded, the children would instantly hold out their arms and sway accordingly. The Extract 6.2.2. below shows how this response was so compelling, the children's motion was coordinated, even when the chroma-key effect was not correctly applied. So even when the video compositing was impoverished, the children were still immersed. This group did however, generate an additional element of physical realism to the experience by pushing each other in direction and time with the video (Extract 6.2.2., line 120).

Extract 6.2.1.Transcript (Appendix 27)

	Sp.	Transcript	Action
39.	P1.	What are they?	P1 looks at screen, talking to K
40.	K.	Crabs.	P3 and P4 quiet conversation
41.	P1.	Crabs they are. CRABS	P1 looks at screen and mimics crab motion
42.			
43.			P4 pretends to shoot crab, P3 watches P4
44.			
45.	P1.	What they doing? Why are they going like this (mimics crab getting up	
46.	P3.	and down)	P4 leans in to P3 talking quietly, looking and pointing to screen
47.	P4.	P4 like this (holds snorkel up to P4, upside down)	
48.		(...)	
49.	K.	[They're stretching (talking to P1)	
50.	P1.	They're stretching::	P3 mimic crab motions, after 1 stretch, P4 mimics crab motion
51.			
52.			

Extract 6.2.2. Interview (Appendix. 29)

	Sp.	Transcription.	Notes.
113.		(P1 and P3 select rollercoaster background))	
114.	P1.	Rollercoaster	
115.		((P1 and P3 turn round to face projection screen))	Ps did not step out of frame – key effect not applied
116.	P2.	Roller coaster. WE:::::: (arms out stretched)	
117.	P3.	We:::::: (arms out stretched)	
118.	P2.	[	
119.		Wo::::	
120.	P1.	We:::::: (P1 and P3 pushing each other in direction of the Rollercoaster ride)	
121.		[	
122.	P3	(Laugh)	

Other instances of situating action emerged in interaction, as a particular effect, content or pose would stimulate a concept, then recognition and adaption occurred when the combined (body and system) effect was discovered. In the images below, one child (Figure:6.6a) commented she was making a "mountain", after standing with arms extended suggested this object (Appendix 29. line 88). Whilst the child (Figure:6.6b) discovered if he stood in a particular position the bee in the movie would fly out his mouth.

Despite the fleeting nature of these instances, these observations of coordinated action were seen as evidence of physical and perceptual immersivity in the video space. During a single play session, the action that emerged persisted through the session, and was constructed from repeated actions: shooting in the first observation (Appendix 27, Extract 6.3.7.), and holding the same pose (superman, strongman) in the second (Appendix 28). If the children found something that engaged them, they could satisfy their tendency to repeat their action by looping the clip.

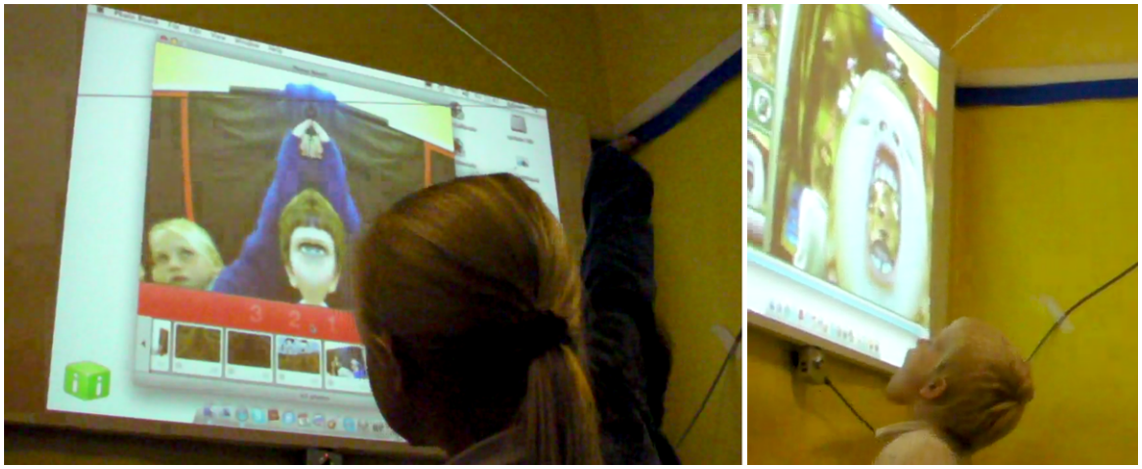

Figure 6.6: Making mountains in PhotoBooth (a) and Mouthful of Bees in Here software (b)

Meaning Making

When asked what they liked about the play space, the children appeared to enjoy the distortion made available via live effects. Particularly when there were opportunities to distort their appearance, as was seen in the prototype testing.

Extract 6.2.3. Interview transcript (Appendix 29)

	Sp.	Transcript
35.	P1.	I like the pictures. I like the roller coaster the sea and the waterfall and the best thing is.
36.	P2	I like taking pictures.
37.	P1.	That one because we get weird mouths.
38.	P2.	Weird mouths and weird eyes.
39.	P1.	Weird eyes weird clothes.
40.	P2.	Weird ears.

Extract 6.2.4. Interview transcript (Appendix 30)

	Sp.	Transcript
13.	P1.	And we also had a go on the computer quite a few times (.) and at the moment it's crabs scuttling away from something.
14.	P2.	Did she ask you to come in? (Speaking to P1, talking about the crab)

In Extract (6.2.4.), the children again were asked about using the system, the response from one child prompted her peer to then question how the objects in the system responded to her presence. There was a suggestion in this comment, that the objects in the space could engage the subject. Consequently, the child had perceived causality where there was none.

As previously mentioned, the first free play observation was dominated by the persistent theme of shooting. The pair in the activity, re-appropriated the snorkels (provided for the ocean theme) to

act as rifles. The children, tracked the objects in the video space, held up the snorkel guns, trained their sights with the primary motion before mimicking the kill, even, as the Extract (6.2.5) shows, going in for direct contact.

Extract 6.2.5. Transcript (Appendix 27)

	Time	Sp.	Transcript	Action
15. 16. 17. 18.	00:10	P3. P4. P4. P3.	(P4 holds snorkel up – looking down sight following the dolphins on the screen) Shoot them The dolphins. BANG. BANG. BANG. BANG. BANG	P1 & P2 at touch screen P3 and P4 looking and jumping at screen, waving snorkels in direction of screen and pretending to shot
19. 20. 21. 22.	00:15	P4. P4.	I'm whacking them with my gun BANG BANG (waves snorkel in front of the web cam, hitting it and knocking it from it's stand). (P4 looks at cam on floor) Oh. (Picks up cam and looks at K) (Laughs)	P1 & P2 at touch screen P4 bash wall with snorkel

Manipulating the meaning of the snorkel was partially evoked via the video space (the chroma key placed them in the sea with a dolphin) and the shape of the object - the snorkel easily represents the shape of a gun when held like one. Whether this was a regular occurrence for the children was unclear. However, towards the end of the play observation, the pair drifted off to pursue this same activity (shooting) in a different location (in the sand), suggesting that it was probably a habitual activity.

Social Significance

Though there was some drift and shifting dynamics, all the groups observed worked together when using the system for free play, but the group cohesion came with some caveats. There was a high degree of dominant behaviour, which meant some children were marginalised to onlookers without opportunities to be involved in the activity. In addition, there were lower levels social fluidity, when compared to free play in normal role play spaces. Of the five groups observed, when playing with the system, one child from the group would attempt to maintain persistent control of the system via the touch screen. This control of content was challenged by peers, and was the highest cause of conflict. Extract 6.2.6 shows how mild aggressive behaviour was prompted over initial control of the touch screen, the children looked to an authoritative figure to resolve fairness and pushed each other. Dominant control of the live camera feedback was also an issue. The camera was placed quite high in the play space to ensure a wide view in a narrow space, and therefore thought to enable multiple occupancy, and largely it did. However, in one of the observed sessions, the children stood on foot stalls (pulled into the space by the children specifically for this purpose),

resulting in a very good image of just one child (Appendix 28., line 13), whilst the others were left to act in the peripheral of the video frame.

Extract 6.2.6. Transcript (Appendix 27)

	Time	Sp.	Transcript	Action	Group	Type	Notes
1.	00:00	P3.	IT'S THAT (…)	P1 at touch screen	Solo	Exp	
2.			(P2 turns from projection screen to touch screen)	P2, P3 and P4 looking at screen	Group (3)	Conv Trans	
3.		P1.	Um::: (looking at touch screen, finger ready to select option)		Parallel		
4.			[			Agg	Conflict over access to the touch screen. [Control]
5.		P2.	No let me do something. (Pushes P1 out of the way)		Solo		
6.			(P3 clicks on touch screen, P2 moves P3's hand and selects option to change background media)				Difficult for K to not be involved when present in the play space. [Prac.]
7.							
8.							
9.		P1.	Oh no. P2 won't let me have a go. (Speaking to K)				
10.		K.	Will he not?				
11.	00:05	P2.	ITS -	P1 & P2 at touch screen	Group (2)	Exp/Agg	Conflict [Control]
12.		P1.	P2 STOP PUSHING:		Group (2)	Func	Groups working in parallel (projection / touch screen)
13.		P2.	It's an MP3, it's an MP3-	P3 and P4 looking at screen, waving snorkels in direction of screen.			
14.		P1.	Shut up. No::::				

Extract 6.2.7. Transcript (Appendix 27)

	Sp.	Transcript	Action	Group	Type	Notes
68.	P4.	That's (not)		Group (2)	Conv	
69.		[				
70.	P3.	Yeah. It is. (Looks down at				
71.	P1.	snorkel).	P2 opens video menu to change background			Change content on system
72.		Lets do something (speaking to P2)				
73.	P4.	P2 do the number two. (Waves snorkel at projection screen) Do number two up the top (excited)	P4 indicating on the projection where to click		Conv	Request for video file
74.				Group (2)	Conv	
75.	P2.	(…) start again (speaking to P1)				
76.	P4.	Oh P2 now now				
77.	P1.	Let's do something (louder)	P4 looks at projection screen, P3 turns to look at p1 and P2	Group (4)	Conv	Whole group together to discuss changing content
78.		(Dialogue inaudible)				
79.			P1 using screen – 3 onlooker			
80.	P4.	See if there's any animals.		Group (2)	Conv	Return to parallel pairs Conflict Screen changes to sea (crashing waves)
81.	P1.	P2 (demanding tone)				
82.			P4 turns back to projection screen			
83.						
84.	P3.	Wo-oh.	P3 jump as waves crash	Group (2)	Drama	Motion in response to content
85.	P2.	If I press that one				
86.	P4.	It a sheet of water. Bang bang bang bang ban::::::::g (loud)	P4 turns around to watch P1 and P2	Group (2)	Conv	Conflict – has distracted other pair.
87.	P2.	See I'm solving it P1				
88.	P1.	P2:::::: (loud and annoyed voice)				

On a more positive note, within the dominant action, there was also moderate degree of coordinated behaviour - with children self organising by taking self appointed roles to manage the activity.

In both of Extracts (6.2.6 and 6.2.7), there were occasions of coordinated parallel action, which was a consequence of the systems layout. The distributed set up of the control panel and projection screen meant the group had to work collaboratively, as to be in the video space meant being away from the control panel. The result was a fragmented group: one group or single controller used the touch screen, whilst the others occupied with the video space. Issues and conflict between the two groups arose when this system broke down. The children using the screen would instruct the screen controller when they required the system to change: select a clip or take a photo. However in both free play observations, there were instances where the child controlling the panel would drive the experience. When he changed the content without prompting, he generated randomness to the experience, in a way that suited the other children in the play space. In the case of the first observation, this would mean something new to shoot at (Appendix 27). In the absence of domineering behaviour, if the camera view was shared, then the children were able to engage with the composited video without continual direct social engagement. In one of the observed sessions (Appendix 32., line 57-82), once an effect that was satisfactory to all the group members had been selected, the children occupying the live video feed were able (for a brief period) to use the system in parallel.

During the interviews, participants in two of the groups responded to a peer's reference to using the system, suggesting there was a perceived shared experience. When the children in Extract 6.2.3 discussed their memory of one of the video effects, their language was efficient and associative because of the grounding provided by the shared visual image, and thus the experience. There were other references in the interviews about content the children had used together, and therefore could recall and confirm notable attributes (Appendix 30, line 17-18, line 23-25; Appendix 31, line 7-8).

There were other pockets of collaborative pretence made possible by the projection screen providing shared a reference to converge and coordinate action within a pretend context. Again, the pair's shooting activity in the first evaluation was a clear example (Appendix 27), as was the children collectively holding out their arms when using the roller coaster clip (Extract 6.2.2, line 116- 117).

Extract 6.2.8. Discussion 4 (Appendix 32)

	Sp.	Transcript.
58.	P1.	I'm going through a dimension (walks across play space so disappears on screen)
59.		(P3 in front of cam sway and dance in front of cam)
60.	P1.	No look. I'm going through a dimension (walks across play space so disappears on screen). Squeeze. No look.
61.		(P3 places head in cam so video effect gives her two heads)
62.	P1.	It's a two headed monster
63.	P3.	I'm a. I'm two headed monster and my ear (.) my ear (singing)

As in previous observations, sharing interpretations and verbal shadowing occurred as the children discovered new affordances. Extract 6.2.8. above shows how this emerged in interaction and action - moving and orientating the body to create meaning from the composited image. The "dimension" would not have been located, had the child not walked across the play space. Whilst the two-headed monster (and the mountain) would not have been identified by the collaborator, had he not been aware of his partner's interaction. Often the action is repeated and communicated, as my previous research showed, the urge to share novelty is too compelling. In the first observation, first one child mimics a movement in the video, shortly followed by the second and then third participant (Appendix 27, line 41)

6.2.2.1 Impact to the Classroom

This section considers the children's and teachers' attitudes to the augmented play space and its use, to consider what impact it had in everyday classroom life.

Children's perception of the augmented play space

All of the groups interviewed, listed the digital system among the repertoire of play activities, alongside the sand, kitchens, blocks, colouring, and themes in socio-dramatic play (i.e. mums and dads) which occurred during their free play sessions. They also mentioned "fun" in their description of using the role play space with the computer. Distinguishing the system's attributes from other play activities was not easy to determine. One group of children described what they could not do with the computer (Extract 6.2.9.). These comments were not expressed in a critical tone; the children were just trying to think what it meant for them in terms of their own activity. However, they also differentiated the digital system in terms of appropriate behaviour, material and functional attributes. So the rules of behaviour, and thus the restrictions to their autonomy, were clearly understood.

In balance, the system had some discernible qualities, all the groups interviewed, except one,

reported enjoying using the system to take "pictures" and "seeing yourself" (Appendix 33, line 35-37). In the Extract (6.2.10) below, when reflecting on their use of the play space, one child commented on the potential of the video space to extend the play space, and situate the occupant in an alternate location.

Extract 6.2.9. Interview transcript (Appendix 31)

	Sp.	Transcript.
32.	K.	So what's different about playing on the computers? To like playing with the sand?
33.	P2.	It's different
34.	P1.	The computer is electric and sand is not.
35.	P2.	Don't use spades.
36.	K.	Yeah.
37.	P2.	And you don't use plates.
38.	P1.	And you don't smash the computer with a spade.
39.	K.	No.
40.	P2.	And sand doesn't have wires.
41.	P1.	No.
42.	P2.	And you don't use plates on that.
43.	P1.	And you don't see yourself in the sand.

Extract 6.2.10. Interview (Appendix 30)

	Sp.	Transcript
20.	P2.	It changed the role play and you can imagine in your head like the at Somewhere:
21.		[00:02]
22.	K.	Somewhere else?
23.	P1.	In the sea and I like the video because in the video there was that crab and it was going up and down doing it's exercises.
24.	P2.	That was the best one.
25.	P1.	That was funny.

The opinion, '(...) you can put yourself anywhere" was also held by another child (Appendix 33, line 62). These comments suggested the children comprehended a principal purpose of the play space was to provide alternate situations to play. Though this was positive, there were no reports or observations of the children using the system in established play narratives, or to extend the physical play space. Their interaction in the video space was determined by the content of the movie, and the children did not appear to converge their normal play experiences with the use of the system. As Extract 6.2.7 demonstrates, the children seemed to be aware of the media installed on the system - evident in their reported use, requests for content to be selected for use, or not be selected for use, and the motivation to locate a specific clip. Further, the children repeatedly participated in the same play narratives (i.e. Mums and Dads etc), and therefore could have anticipated

the backgrounds required, yet there was no urge to author the environment for these purposes. It appeared that these play activities were conducted as isolated pursuits.

There were also no reports of the children obtaining or downloading video to use in this space, or requesting particular content to use that was not already on the system. There did not appear to be any desire to install additional places for the RT compositions, though it was possible that the children did not fully comprehend this was an option. The children did produce a large amount of digital media via the capture features. Despite the children's keenness to take lots of photographs, in the sessions observed, they did not spend time looking at previous photographs from the current or past play times. The captured image was acknowledged with laughter, smiling, but the satisfaction was fleeting and not re-examined (Appendix 30, line 81-82) . Taking the picture was the event. It had no value beyond the first viewing. Instead the feature was used as a freeze frame, rather than a photograph.

Teachers feedback

In conversations, the teachers from the school with the interactive play space in the hallway, were largely apologetic that they had not made more of the resource. However, they also acknowledged that there was not enough time to properly learn the system. These teachers did not appear to be comfortable letting the children use the system for free play, when they did not feel competent in using it. As the teachers in this setting did not understand the system's constraints, there were fears the children would break it, whilst also uncertainty about whether the play space would be suitable as an autonomous activity - they had expected the children to need some help.

In the school where the system was used regularly, there were varying opinions of the value of the learning experience provided of the system. One Yr1 teacher, whose children would use the play space during an occasional classroom swap, commented, "All they do is mess around", suggesting little value was assigned. The teacher with the play space permanently installed in her classroom had a contrasting opinion and high level of use.

> I use the play space with one group daily in the literacy lesson and again in the afternoon during one of the foundation areas. I'm also planning to use the camera to take pictures to support literacy objectives - as our first unit is instructions for making cheese

> sandwiches and the pictures would be a good visual prompt for the children giving oral instructions. Later in the term we have stories from different settings (space, magic carpet ride) so I was going to give the children some props and costumes to use to support drama, speaking and listening and group work. Reception Teacher, Hyde Park

The differing opinions could be accounted for by the differing ages of the audience, what is "messing around" for a 6 year old, could be perceived as a more constructive experience for a 4 year old. Even in purely ICT terms, using a computer to select a file for a reception level child would be considered an accomplishment. The different ages may also indicate why there was a higher level of integration in the reception class. Role play is more prevalent at this age, and there is more time allotted to free play, making the expansion of this resource more attractive. It was encouraging to see evidence that the reception level teacher was able to adapt the system to suit additional curriculum activities, for uses other than play, or for play in other subjects. Examples of adapted use cited by the reception teacher, included loading pictures and videos of The Lost Gardens of Heligan and The Beach to orient the children for future class visits. The media remained on the system to re-enforce the sensory and social experience of the excursion.

6.3 Discussion of Findings and Reflections

This section draws together the findings from the initial and long terms testing. The results are discussed in terms of how they answer key questions relating to the design framework establish in Chapter 2.4.

The primary question at this stage of the design practice was how well did the design framework reveal the potential for enactive learning in technologically mediated play? However, in order to answer this question I need to examine:

1. How well was the design framework applied?
2. In what ways were the spaces successful, and therefore validate the design framework?

6.3.1 Situating

Did the children's interaction with the video space show evidence of coupling?

There were concerns that the video space would not lead to an adaptation in the children's behaviour due to the lack of responsiveness, and in that respect this element of the design framework was not fully implemented. However, there were a high number of instances that suggested a situated presence in the video spaces provided a context, a background scene, for meaningful action. For example, there was a visceral sense of excitement when using the rollercoaster or flight of Mars movie clips in the compositing application. The children responded to both the primary and secondary motion within the video space, by reacting to, or imitating the movement. The children could use their whole body in their pretence, and the children reported that they were "somewhere else". These behaviours were sometimes fleeting, often mixed and messy; but they did repeatedly occur. The video space provided the children with a context for their pretence, and they expressed their presence in their situated action (i.e. throwing arms in the air when going over the top of the rollercoaster). Their perceived presence and situationally appropriate action gave the experience the required authenticity. In many cases they just pretended that the system had responded to them.

The question of mixing the realities in pretence was less distinct. The video space extended the

physical play, but the children did not appear to locate themselves in a combined space, as their movement and commentary solely referenced the media space. The children appeared to shift between the physical and virtual, acting in one or the other. The visual nature of the software they chose to use, meant their attention was taken away from their physical space, to a situation somewhere else. Consequently, rather then extending the physical space, the virtual environment offered an alternate place to play.

I would have preferred to build an environment that was responsive to the children's interaction, as the interaction could have been more meaningful. There were constraints from the environment that had to be considered here, particularly lengthy set up which this option would have required. However, given more time to develop a system, possible solutions might have emerged. I am mindful that I not yet mentioned my development skills as a significant constraint on the design choices. This of course had a considerable impact on what could be achieved. With more expertise to simplify the authoring aspect of the design, augmented virtuality systems that responded to movement, are not out of reach. The children's ability to embody and situate their action in the video space, suggests this is a worthwhile endeavour.

6.3.2 Meaning Making

Did the children's interaction generate new meaning?

One of the key questions driving this investigation was whether the children would be able to distort the meaningfulness of digital objects, using the same inherent mechanism they have to create and consume meaning in the physical world. However, during the evaluation, there were numerous instances of meaning emerging at the point of action / interaction, via coupling of physical movement to attributes in the video space. Meaning emerged, not just through the subject matter in the imagery providing a situation, but the movement of the objects and camera in the scene. As stated, the children responded (mimicked, interpreted and reacted) to both the primary and secondary motion in the video content, which was translated into a context for action. The children were able to distort the meaning of their presence in the video space to suit their desires (i.e. shoot at things) This interactional pattern showed that mimicry and imitation should be considered not just verbal shadowing, but also motion shadowing. Once a meaning was created, it was often repeated (i.e. repetition of poses), as themes persisted.

The children's interpretation of the distorted view of their bodies when using the video effects, gave the system affordances far beyond its capabilities (seeing brains and invisibility). Which suggested that there was space for them to be active in their pretence. The affordances were loose enough to be mutated, and as the technology was not fully immersive, there was still work for the child to do.

There were some parameters to early use where the reception children would be more absorbed by the projected image of the self (waving and looking), rather than reacting to their projected self within the video space. In these incidents, there was no pretence, only curiosity. However, when the system was evaluated once it had been in place for an extended period of time, this behaviour appeared to have stopped. This development in behaviour suggests, although playful action is immediate, it may take time for the children to locate the playful affordances, and it is possible that it was the children's curiosity that enabled them to reach this stage. If I had not tested the system at a later stage post deployment, I would have considered this implementation of the design framework almost completely unsuccessful for the reception level children.

6.3.3 Social significance

Did the video space provide a situated awareness for parallel and coordinated activity across a spectrum of social interaction?

There were episodes of co-presence in pretence within the representational space. However there were not enough distributed points of interaction, as the video space could be dominated. There was evidence of coordinated action, agency and experience within collaborative pretence. This behaviour supported the initial observations that the video space afforded social activity and common ground between participants. There were also occasions where the children would interact with the space independently of each other, which suggested it could support parallel action. The children were aware of each others' action in the video space, and in that respect the system provided a shared situatedness, with opportunities to observe other's behaviour (onlooker) and work collaboratively.

However, there were aspects of the design that upset the harmony of the group. What I should have, but did not fully comprehend, was that driving the experience (i.e. choosing the content) would remain to be the desired role. I had assumed the occupation of the video space would be

the experience, but in many instances the children appeared to prefer to select the movie clip. The dominance over the content control, meant that a lot of the social interaction pivoted around giving, or trying to give, the touch screen / mouse controller instructions. All of the participants were able to engage, but it was the control of the experience that was coveted. The lack of distributed points of control created a dichotomy within the group, and fractured their cohesiveness. In this light, the design framework held, but the implementation was not entirely successful. For the children, fairness was a right, but the set up of this system did not promote equal control.

6.3.4 Impact to the Environment

How well did the system fit into the context of use?

The location of the technology in the plays space and access during the free play sessions meant, from the children's perspective, the computer was to be used for play. The children had autonomy in use, as the teachers allowed them to truly play with the system. The children's existing habits remained intact despite having the technology, its presence did not deter other types of play, or constrain the scope of role play activities. The children's self-reported behaviour suggested the system co-existed and did not dominate the playtime, and therefore did not disturb the equilibrium of play activities in the classroom. When reporting play activities, the children were not fixated on the technology, but engaged with it as they would approach other play situations. The reported use of the role play space when not using the augmentation, was still drawn from traditional places such as popular culture and the home. Though use of the augmented play space was a confirmation of the design's success, if the system had been too compelling, it might have been at the sacrifice of other valuable play activities. The relaxed attitude of the children who had had the augmented play space in their classroom for six months, meant the novelty and the excited behaviour seen in the group during the evaluation was reduced to a more balanced approach to use.

The live video data, seeing and capturing distorted representations of the self, remained the most compelling feature of the system. These applications could be used by the children without support. In the initial testing, the children were encouraged and prompted to try different effects and video backgrounds, however in sustained use they tended to select backgrounds from narrow content choice. Popular choices were used repetitively over multiple play sessions. Whilst there was evidence of dramatic action when using the system, the children did not consider using the play

space to augment their existing role play. A possible explanation for this was that the children were not able to transfer this perceived use to an alternate context. It was also possible that the children did not wish to modify their existing socio-dramatic activities. They enjoyed the enhanced drama provided by these repeated role play activities. Children will only ever evolve an activity when the fun is waning, so they would not consider changing something that has a proven "fun" track record. The idea that children would load video backgrounds before, or during, this type of socio-dramatic play was a naive assumption of what I thought would enhance the experience, not the child's.

The design practice in this study had attempted to account for the environment to devise constraints and affordances for use, however in terms of adapting local practice it was actually the work done in the PD activities that had the most lasting impact. The media production workshops, particularly the stop motion, continued long after the play space was installed. Little of this content made to the augmented play space; rather, the teachers incorporated these techniques into their own practice.

Despite the children's autonomy, the teacher's confidence, and time to gain confidence, to use the system, had an impact on the children's use of technology. The system that was not used in the school where the play space was located in an open area. This role play space did not belong to a particular class, but was shared between three classes. Consequently, its place at the edge of classroom activity meant that no one took ownership of the system. The teacher who accepted the augmented play space into her classroom made much better use of the system for free play and other curricular activities. This shows the importance of the partnership between designers and teachers when making interventions into the classroom - both parties have to work at making the technology integrate in classroom life.

The final point that should be mentioned here relates to whether or not the children played, and clearly they did. It did not occur to the children that this was not a system for play, and they were given no instructions to use the video spaces. In terms of meeting the children's demands and recognition that this system was a play thing, the design was wholly successful.

7 | Conclusions

This study was a speculative and applied exploration of enaction as a theoretical approach to the design and analysis of young children's learning technologies. The contribution in this thesis was the development of a framework for design, which acknowledged the principles of enaction, and explored the realisation and manifestations of these principles in the wild. As a theoretical basis for design, enaction pays attention to the physical, social and perceptual attributes in the learning experience, and the learner's opportunities for agency and autonomy. The technologies produced in this research project aimed to accommodate enactive pedagogies in the classroom, via an investigation of social and situating behaviours in real and technologically mediated environments. The research, methods and design practice contribute to an understanding the embodiment of digital experiences in relation to young children's social and physical learning, and in particular learning in play. To shape the inquiry, this study was driven by the research question:

> Can the digital media artefacts and spaces in technologically mediated realities, afford sufficient embodied and situated presence to be embedded into enactive learning processes?

This research question was asked because of the complex processes it represents. If it could be shown that digital representations of spaces and artefacts were capable of affording sufficient presence to support social pretence in play, then technologically mediated realities could be seen as an embodied experience, capable of providing a platform for enriching young children's enactive learning. There were two threshold moves which needed to be made before the research question could be answered. First, theories of enaction relating to learning needed to be interpreted into a design framework. The framework identified three inherent learning processes which should be af-

forded by interactive technologies: (1) the action in interaction should be meaningful to the learning objective; (2) meaningful concepts should arise and be distorted through interaction; and (3) the mediated experience should enable learners to work collaboratively and in parallel, with a situated awareness of each others' activity. The second move was the application of the framework in my design practice. The design framework therefore influenced the outcome of research activities, which were in turn interpreted as models, methods and modalities for interaction.

Every experience is embodied, so the simple answer to the research question was *yes*. What was of interest in this study, and which validated its contribution, was that enaction as a theory of learning has not been fully acknowledged in the design of young children's classroom technologies. Therefore it was the quality of the experience in enactive terms that was paramount. If enactive processes are important to young children's learning, as this thesis argues, then children confined to desktop computers will have key aspects of their learning processes marginalised. The quality of the learning experience is impoverished as a consequence of the physical and social constraints of technologies in their learning environments.

The technologies designed and developed through the design practice looked for evidence of extending the coupling mechanisms to the digital representations of objects and environments. Key to enaction was to locate the concepts which emerged through bodily action, and the social construction of meaning through interaction. Play was selected as a vehicle for design as it has the principle quality of pretence - meaning is created, manipulated and consumed. The act of pretence demonstrates the projection of concepts between physical, cognitive and perceptual domains; and therefore, arguably in a small way, adaptation. In order for this phenomena to occur, the subject needs to able to couple the self with their environment, without coupling there can be no development. Though explored within a playful context within this thesis, coupling - the creation and distortion of meaning - is a mechanism in all learning processes. In terms of generating shifts in the use of technology for enactive learning in everyday classrooms - my impact, as expected, was very modest. The value of this study comes what can be learned from the application of enactive principles. As a stand alone categorisation of theories, the framework would carry less weight. My intention was to shift enactive theories of learning to a workable approach for designers.

7.1 Reflections on the Research and Design Practice.

The design practice was informed by ethnographic methods to establish the motivations and behavioural patterns in the children's everyday learning in the classroom. Findings from the ethnographic study were fed into the PD research, with the intention of locating and defining the shape of the technologies to augment the children's role play spaces. Through the phases of the design practice, continuing attention was paid to situating presence and co-presence in a range of play and learning events.

Findings from the initial fieldwork led to an elimination of components which were perceived to be problematic either for pragmatic reasons, or because they clashed with enactive principles of learning. For example, the sequencing or re-sequencing of formal narratives. Pragmatically, such activities required too much adult support to enable true autonomy, and were too prescriptive to satisfy an enactive framework - they required the child to pre-define their action. There was consideration at this stage to the spectrum of social groupings in play, and the fluid dynamics of playgroups. A portion of the fieldwork also evaluated the current application of technology, attitudes to its use and potential use, to determine suitable platforms for development. The technologies in place in the classroom were shown to be restrictive. The software installed on their classroom computers had few adaptive qualities, and were largely orientated around instructing the child. This study also showed computers in the classroom inhibit social interaction. They have limited affordances for multiple users, instead children are required to distribute the interaction of single user computers by channelling their agency via others. There were some serious constraints to use from teachers' perspective - technology did not have a completely favourable reception. It was often perceived to be getting in the way of them effectively doing their jobs, compounded by an ongoing and ubiquitous failure to support and train. The children had obvious (linguistic / conceptual) limitations but were highly motivated to use technologies. There were still concerns prior to this stage that the children may not perceive the playful affordances in design. However, it was clear from the evaluation that children assumed computers were for play.

The PD session took the findings from the fieldwork investigations, and aimed to further validate and narrow the parameters for design. The lens provided by the framework focused the design decisions in favour of behaviours which marked out enactive learning. To counter dominant behaviour, and

encourage natural and fluid social groupings, it was determined that multiple points of interaction and engagement were a necessary feature. To account for the short timeframes for play in the classroom, direct engagement was also considered to be an essential affordance of the system. Structured and sequenced play narratives were discarded, in favour of a single story space to support direct, immediate and parallel action. Finally, to retain autonomy and the demands on the role play space in the classroom, the content needed to be authorable.

To some extent, the framework was successfully applied, there was evidence indicating this research activity was a fruitful endeavour by revealing a productive direction for design. This study showed that technologically mediated realities could afford sufficient embodied and situated presence to be embedded into young children's mediated environments for play. When the children perceived themselves to be in the video space, their actions were meaningful to the context portrayed by the projected space. They were active in their meaning making - locating and distorting affordances, and they were aware of the presence of others. Under these circumstances the digital representations could not be considered to be an impoverished reality. When playing with the technologies developed in this project, children engaged with multiple and overlapping dynamics of social interaction, recurring themes which are prevalent in play, and cognitive and physical expressions of interpretation of the visual representations. Behaviour which demonstrated a coupling and distortion of the digital artefacts and spaces.

7.1.1 Co-design

A notable benefit of working closely with users in prototype development, was that as the research moved through iterations of design, each instance enabled a continuing dialogue. Teaching staff and children could find it difficult to comprehend abstracted technical solutions, so the prototypes generated in this project served as an ongoing contextualisation of the possible directions the eventual design solutions could take. Prototype development, in PD, therefore provides the common ground for an ongoing reflexive process of bridging the gap between designer and user. It is via designers and developers that the computer learns about their environment (Grudin, 1990, p.263).

From my perspective, it was a privilege to have the opportunity to apply interventions to teaching, learning and play practices, but it was a privilege that came with responsibility in an environment where resources were restricted. Technology is not a passive tool in the classroom, but capable of

having a considerable impact in its context of use. Disrupting the balance of play was a particular concern, as was increasing the work load of the teachers involved in the project. Only attempting small interventions contributed to containing possible disruptions. That said, I had to accept that disruption was inevitable, and actually came to realise that projects of this nature need teachers who welcomed the disruption. The project flourished when there was a tight collaboration between myself as designer / developer and an educationist (teacher). The two domains of practice and craft knowledge merging together through discussions and joint enterprise. The role of the teacher went beyond giving opinions, answering questions and demonstrating their practice. They were active in the design and structure of the research activities, sampling the participants via a selection from volunteers, and providing an explanation of the activity to the participants. Each these are pivotal aspects in the research design that will influence the outcome of research, and are outside the control of the designer.

The children's role in design operated in a space between my research agenda and motivations in design, and the teacher's decisions and judgment in shaping the activity. The children provided direct feedback and observable practices revealed through their participation. Creating appropriate PD activities for young children is complicated by its need to be simple. In this study, this is where the teachers were truly essential. Not just in designing a suitable task, but in clarifying the observations. It was important to locate techniques which would enable the children to express themselves adequately and comfortably. For this project, using the *drawing while talking* method in small groups proved to be an effective environment for young children to reflect and contribute ideas. This was a slight shift in practice which yielded significant gains, it was both beneficial to the richness and clarity of the data, and eased the children's participation in the task. In terms of data collection and analysis, the drawings highlighted the prominent aspects of the experience from the child's perspective. From the accompanying discussions, I was able to cross reference the comments made by the children to me and to each other, with the work they produced. The comfort for the children came from asking them to use drawing to express their ideas, a practice they are very familiar with. This limited the possibility of confusion, and meant the children could be autonomous. Also, being part of a group engaged in an activity meant there was less pressure to talk. Contributing an opinion was optional, and the task and the presence of others meant the children could be passive. Reducing the obligation to contribute through this method, meant the discussion of

ideas, opinions and justifications could emerge more naturally than had the children been in a time pressure scenario like an interview. More positively, in sharing the task with peers, the children, if they chose to, were able to have an efficient conversation using their own and each others' work alongside an understanding of the shared task, as referents to establish common ground.

Time was a critical factor in this study. The longevity of the study and design meant all parties had time to assimilate and accommodate knowledge of each other's practices and capabilities - time to make sense of each other. In the evaluation of the deployed technologies, longitudinal studies were conducted to establish how practices emerged over time. The compositing applications endured, and did not appear to disrupt existing play practices - play spaces were themed, the children engaged playfully with the use of objects and each other, the timeframe and rotation of use remained the same. There was autonomy, as the children were able to use the system without direct support from the teaching staff. When the play space technologies were initially evaluated, the novelty of the software meant there were managed expectations about the integration of the system in the children's role play. It was necessary to give the children time to familiarise themselves with the new technologies that inhabited their play spaces. It was thought that the children's curiosity and expectation of play would drive them to locate the playful affordances, which would ultimately extend their social role play. I had assumed the children would use the system in the same way they accessed other resources to frame their play (i.e. select video backgrounds, as they would select costumes to wear). This did not materialise, the children's existing role play activities were uninterrupted. The dramatic action when using the play space was framed by the available content, rather then adapted to suit their play. Without the longer timeframe, this assumption would have gone untested, and the enduring impact of the system unknown. The children's use over time further influenced the eventual affordances, and thus the form of the technologies created in this project.

7.1.2 Designing in the Wild

To ensure a degree of integration and fitness for purpose, it was necessary to consider solutions in viable rather than optimal terms. This intention to be viable was both necessitated and challenged by an attempt to accommodate the multiple, overlapping and sometime contentious factors which impact the use of technology in the classroom. There is messiness that can be difficult to avoid when working in the wild. The design framework was constantly challenged by the circumstances

in the environment, and every design decision was coloured by a varying degree of compromise. This can be trivial (i.e. placement of hardware depending on the location of power supplies); and significant, such as the need to enable the content of systems to change according to unknown themes. One of the compromises in the design was accepting the limitations of a lone practitioner. During the field study this had not surfaced as an issue. However, in the design workshops, the immediate priority was to manage the activity. This diversion of attention could be at the expense of gathering data. When working with children in design activities, there is a need for multiple researchers / supervisors to be present to ensure the children are supported, whilst also making sure adequate data is collected. If there is not time to gather data, then it does not matter how successful or insightful the session was - in research, the activity can be rendered useless.

When encountering challenges in the design practice, the priority was always to keep the project moving forward. This meant that pragmatics were likely to be victorious at the sacrifice of theoretical frameworks. This is not to say the design framework was insufficient, but that more work was required to meet the constraints of the environment. There is a need to be flexible and adaptable when working in the wild, particularly when working with children. Once an environment is selected as the subject of an inquiry, it is not just the needs of potential users to consider, but also their needs as participants. For example, in this project some design activities were popular and so the children were keen to volunteer. To accommodate high numbers of willing volunteers, I would often adapt timeframes or group size, which would mean reducing the scope or structure of the research activity. This compromise meant the specifications of the intended research design could be lost, but in exchange for higher sense of efficacy through participation, and hopefully some ownership of the outcome. To overcome the inevitable adaptations, there should be some resilience in the research design, and an acknowledgement that adaptations of this kind can yield different rewards.

Video spaces were select in design to increase the system's chances of integration, but this was a decision which compromised the responsiveness of the environment. This judgement in design highlights a key difference in research projects which are expected to result in tangible and sustainable technological products. Whilst a study without this constraint can pursue a purer research path, if the technology resulting from research is intended to survive in the wild, then there is a different hierarchy of priorities that are applied to resolve conflicts in design and research agendas. Ultimately it shows that in making the commitment to produce sustainable products, at times

research objectives and theoretical frameworks may have to be put aside. As a result, the cost of these compromises can challenge the integrity of the research. In this study, the expectations of quality of the embodied and social experience had to be re-aligned as a result of the limitations to manipulate and interact with artefacts in the video space. In design there are, of course, always degrees of compromise, and the intention must be to locate technologies in the common ground. Compositing video was a design solution to ease use, but if early testing had not shown observable presence, then it would not have been used.

7.1.3 Constraints on Integration

Usability issues persisted in the creation of the children's and teachers own media to use in the play space. The system did not achieve significant horizontal integration, whereby it would serve as a node of multi-sensory learning of cross curricula material. There were pockets of assimilation, but considerable time was required to enable the teaching staff to become familiar enough with digital media production techniques, before they could start to create media products. Although by the end of the project, there was evidence of the teachers advancing, they were still some way off being able to confidently manage these processes unsupported.

7.2 Final Reflections on the Design Framework

The technologies placed in the children's play spaces were designed to investigate the embodiment of digital objects and spaces, and to afford social presence. There was an interest in the co-existence of mediated realities with the physical world. Specifically, how the physical and representational artefacts and space were combined to create and distort meaning in pretence. There were a number of design decisions made to reflect the enactive principles defined in this thesis. Namely, I pursued real time applications to eradicate the need to predetermine (action) play, enabled immediate physical interaction to assist coupling, and created an environment which would be occupied by multiple users to enable a shared experience. The resulting technologies provided video spaces which extended the children's physical environment. The children's presence in the video space was evident in the adaptions to their physical and social activity, according to their perception of their bodies in the projected space.

There was evidence that the design framework was successfully applied, and that its application

could reveal local practices and behaviours from which technologies can emerge and be understood. A high degree of social and physical play behaviour was present when the children used the play space technologies. The compositing applications enabled the most immediate play, inhabiting shared representational spaces was met with observable social presence and pretence. The evidence to substantiate these claims was located in the children's agency which emerged through their perceived interaction with the visual representations. The shared visual representation also enabled a shared situated awareness and some co-action. Alongside direct social engagement, the visual representation of the video space supported a situated awareness for parallel play, allowing disparate play activities to spill and overlap with others' play. The design framework did provide a lens which focused attention on the constraints of a given environment, to determine the meaningfulness of action and repertoires of social and embodied behaviours. The findings of the applied framework were realised as parameters of use, and modalities of interaction.

In my implementation, the digital representations of the self in a virtualised media space appeared to have physical, perceptual and social opportunities. Providing there was a perceived connection between actions and reactions - a sense of self in the environment - the children's behaviour suggested that digital representations of spaces and objects were embodied though the same mechanisms that enable the creation of meaning in the physical world. Whilst this study is not definitive proof that children can embody digital objects and spaces outside of the context of play, there are strong indications that this is indeed possible.

The application of this framework outside of play is likely to require further work. Meaningful interaction is contextually bound and could be difficult to determine, particularly as new meaning will emerge through mediated action. Even when there is established behaviour, assumptions about how these behaviours will transfer can be misjudgement. In this study, the assumptions about the children's behaviour which formed the basis for meaningful interaction, did not fully anticipate how the activity would shift to take advantage of new affordances. The children did not integrate the system into their role play, but created new play situations. Though their behaviour had been examined prior to mediation, the true meaningfulness of their action emerged in their interaction. Consequently, design practices need to acknowledge that by making an intervention, behaviour will adapt. Designers are therefore tasked with designing for the predicted shape of a future user, this may emerge from existing practice, but will ultimately be different. Meaningful interaction will be

a continually shifting measure for engagement. Identifying alternate meaningful activities may be easier to conceive when the learning objective is observable in the physical domain, but is likely to be more complicated to realise with abstracted concepts. For example, determining what interactions are meaningful to teach mathematical equations are not immediately obvious. Further, new concepts for learners, where there is no existing repertoire of meaningful action, would present similar challenges.

Shared situated awareness was considered to be essential to enable the spread of novel affordances and understanding. The framework suggests creating collaborative systems where each member has a perceivable awareness of their own interaction, and are able to distinguish their action / reaction from others. This is a significant challenge in the design of multiple user systems. This study highlights that a shared situated awareness is necessary not just in collaborative activity, but also for parallel activity. Consequently, there should be support for a spectrum of social behaviours, from onlooker to collaboration. An awareness of others' activity, even if it is at the peripheral on their own, mean that the group benefit from individual's creation or location of new affordances. The social failures with the system I developed were predictable, given that this aspect of design did not meet all of the enactive framework requirements. Distributed interaction was not achieved, and thus there were issues with parallel action due to the system's affordances. This was in part due to constraints in the environment (use of everyday technologies, ease of use etc), and in part my time / skills in the development. Situated awareness to support group activity does not immediately present the same level of complexity, though is not without its challenges. My design approach opted for a single visual environment occupied by the whole group, so each member could see their action in relation to others. However, as the AudioSpace workshop demonstrated, accommodating multiple users in systems where interaction is distributed can lead to a breakdown in coupling action and the system's affordances. The same challenges are likely to persist in systems where maintaining a visual reference is not possible.

There is still some way to go until this framework can be realised in other contexts. The recommendation here is to continue to situate design and analysis within the context of use - focusing less on the technology, and more on understanding the everyday practices that encourage meaning to emerge. In the development of technologies for learning, if enaction is taken seriously, it is not just the cognitive activity which should be considered in design, but the perceptual and physical - the

action in the interaction should be meaningful, and not just an appendage to computer use. Clicking a mouse button is not enough. Better methods are required to uncovered the depth and breadth of bodily and social action in learning, but much can be gained from an understanding of conventions, habits and craft knowledge. There also needs to be an acknowledgement that even the most detailed account of existing practice will not be able to definitively predict how communities will adapt to accommodate technological interventions.

The design framework developed in this thesis proved to be an effective lens from which to develop technologies to support the social, physical and perceptual qualities of children's social play. It provided a benchmark for design and analysis, revealing the children's ability to embody digital representations of objects and spaces. As has been shown, this can be a difficult framework to realise. Comprehending the social and physical actions which are relevant to the learning experience, and then translating them in design to interactive technologies is no mean feat. Notwithstanding its ambition, and the inevitable compromises in practice, the framework endeavours to make physical and social interaction with technologies for learning meaningful to the learning objective, to capitalise on the inherent mechanisms we have to make sense of our world.

ETHICS STATEMENT

This study was complied in accordance the University of Plymouth ethical guidelines and adhere to the BERA Ethical Guidelines for Educational Research.(http://www.bera.ac.uk/publications/guides.php).

1. PROJECT TITLE:
Infinite Infants

2. EXPECTED DURATION:
3 years

3. IDENTITY OF FIELD RESEARCHERS AND ORGANISATIONAL BASE:
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4. PURPOSE OF STUDY:
The aim of this project was investigate enaction as theory of learning through play to inform the design of technologies for learning. A theoretical framework derived from relevant literature and prior work works towards developing design strategies and guidelines, which can be applied to the design of physical and social learning technologies. The target audience are Reception level and Yr1 children's, and the context for design is role play in the classroom.

5. SOURCES OF FUNDING:
This project was funded by Creative Partnerships, now Real Ideas Organisation (RIO: http://realideas.org)

6. SCIENTIFIC BACKGROUND:
This is an interdisciplinary study, drawing on social, behavioural and cognitive psychology, human-computer interaction, and young children's pedagogies. This study is a response to current thinking in cognitive science relating to the embodiment and emergence of knowledge via our interaction with physical and social worlds. The research activities were focused on exploring these frameworks in classroom practices in order to identify areas for potential technological interventions. The research was conducted though an ethnographically informed participatory design practice and usability testing of interactive digital media technologies.

7. DESIGN OF THE STUDY:
This is a three year study, with local Infant schools participating in research activities throughout. This is an applied research project, consequently as a result of a participatory design practice interactive digital media technologies will be developed. The intention is for the children to use the technologies in their social role play in the classroom.

In the first year of study the participants will be involved in observations and discussion relating to their work. The second year requires a higher participation from a smaller number of participants in design workshops. Participants involved at this stage will engaged in creative work using low tech tools (paper and pens) and evaluations of prototype systems developed through the project. Design activities will be kept within the

school's timeframe for lessons, rarely exceeding 1 hour. In the final year, the digital interactive technologies developed through the design practice will be installed in a number of classroom spaces. There is therefore an assumption that the children will use the design products on a regular basis.

Each stage of the project will involve different qualitative research methods and techniques. Observational data will be gathered throughout, as will field notes and recordings of discussions with teachers. Discussions and design activities with the children will start in the second year, and continue until the end of the project. There are likely to be other qualitative data, such as questionnaires and meetings, which will contribute to the breadth of research materials.

8. TYPE AND NUMBER OF PARTICIPANTS INVOLVED IN THE STUDY

Teaching staff from all participating school will be involved in this study, including class teachers, head teachers and teaching assistants. Additionally pupils from Reception, Yr1 and Yr2 classes will be involved in research activities. The final number of participants is difficult to predict, as the number will vary depending on the research activity, ranging from whole class to small groups, and be conducted over a long period of time.

9. VOLUNTARY INFORMED CONSENT:

In keeping with ethical guidelines, informed consent will be obtained from all participants with attention to the following points:

- Participation in the project will be on a volunteer basis. As the project involves young children (4 to 6 years) whilst in class, selecting participants from the children volunteering will be at the discretion of the teaching staff*. Therefore, immediate consent on the child's behalf is given by proxy of the child's teacher.
- Potential participants will be informed of the aims and objectives of the project, and will have the opportunity to ask questions before agreeing to participate. Information will be provided which explains: the research methods which will be used; who will have access to the data collected; how confidentiality and anonymity will be preserved; and how the data collected will be recorded, stored and used.
- Participants will be asked for their consent.
- Participants' responses will be anonymised and all data will be treated confidentially.
- The contact details of the project team and supervisors will be available to allow participants to comment on the project.

*Giving permission, or selecting children to be involved in research activities will be at the teacher's discretion. There may be sensitive reasons why an individual child may not be permitted to be involved in research activities, or have their image captured, which is outside the scope of this study. It is possible that a child will be permitted to be part of research activities, and but not allowed to be photographed. In which case, recorded material will be checked by an authorised member of the teaching staff.

10. OPENESS AND DISCLOSURE:

There is no deception or subterfuge required in the research design. Research activities aimed to be as transparent to all participants. Research findings will be presented to participants to ensure that their views have been represented accurately, and to allow their feedback to be taken into account in the evaluation stage of the project.

11. RIGHT TO WITHDRAW:

The participant(s) will be told they can withdraw from participation at any time, if they wish. This includes the right to have any data collected prior to their decision to withdraw, also omitted.

12. WORKING WITH CHILDREN:

This project will involve young children. There is a clear understanding that young children may not be able to fully comprehend their right to volunteer or withdraw from the research activities. In managing the children's consent, the teaching staff will also be active and / or present when explaining the nature of the research activity, its objective, the child's role and their right to withdraw. It is also possible that children involved in the research activities might not be able to communicate their wish to withdraw from the activity once it is underway. The children involved in the study will be monitored to ensure they are comfortable and engaged. If a child's behavior suggests they no longer wish to participate, they will be given the option to

leave the activity without prejudice.

13. DATA COLLECTION:
Data will be collected through: (a) observation of classroom lessons with teachers and pupils and small group activities with children; (b) discussions and meetings with teachers and head teachers (1:1 and small groups); (c) discussions with small groups of children during research activities and post task; (d) work produced by the children either in normal classroom lessons and design activities; (e) creative work expressing the children's reflections and feedback of technologies used in design activities; (f) documentation relating to the schools' structure, curriculum, lesson plans and use of technology; (g) diagrams and photographs of the school and classroom environment. Data collected from these activities will include field notes, video, photographs and the participants' work. Consent to be involved in research activities and recording activities are sought separately. The participating schools handled consent for the children's involvement (participation and recording) for this project. Teaching staff obtained written parental consent for the children's involvement, and have kept these onsite at the school. The data is analysed to consider how the findings relate to the design of learning technologies (within an enactive framework) and the pragmatics of the working environment. No quantitative data was collected during these activities.

14. DATA PROTECTION:
Recorded material will be stored on a single computer for the duration of the research, whilst the data is analysed, and then destroyed. No one outside the project will have access to any of the data.

15. INCENTIVES:
Participants will not receive any remuneration for their participation.

16. DETRIMENT ARISING FROM PARTICIPATION IN RESEARCH
There were no perceivable risks from involvement in this study, or procedures which would cause discomfort, distress or harm. All research activities will be discussed with, and guided by, participating schools, and will be conducted in the school environment.

17. PRIVACY:
The data for this project will be collected and presented anonymously, and it will not be possible to link the data to the participants. Aside from the children's age and teachers' class level (i.e. Yr2), no other personal data will be collected.

18. DISSEMINATION OF FINDINGS:
The results of this study may be published or presented at professional meetings, but the identities of all research participants will remain anonymous.

Appendix 2: Research Design Framework

Research Stage:	**Grounding**	**Identify areas for development**	**Design & development**	**Evaluation**
Objective	• Understand the domain - current teaching methods, resources and spaces. • *Focus on narrative and creative work, and play* • Scope use of and attitudes towards technology in classroom • Investigate play	• Identify potential contexts for design • Using familiar activity – with unfamiliar • Understanding how organize, opinions of play, construction of stories • Play at this stage in development • Low tech tools	• Test different types of everyday technologies and interaction • Social and collaborative practices / work • Skills capabilities and equipment installed • Attitudes / use to technology • Usability and system testing of prototypes, towards final designs… Using familiar activity – with unfamiliar *Prototype systems: skeleton techs* • Audio and physical action • Graphic and physical action • Composited video • Action in different planes: Foreground / background	• Conceptual testing: incorporation of digital layer to social and physical play (narrative structure / theme) • Collective presence in projected space
Participants	Rep, Yr 1 & Yr2 pupils and teachers Head teachers	Rep & Yr1 Varying groups	Rep & Yr1 Varying groups	Rep & Yr1 Varying groups
Data	**Overview.** Discussions with teachers Indentify aspirations and expectations for collaborative work Method: Discussion, interviews, obs, documentation • *Interview notes* • *Curriculum examples* • *Emails* • *Audit (2005)* • *Field notes* **Design of spaces for learning.** Places in the classroom / school • *Diagrams (classroom layout)* • *Photos* • *Field notes* **Classes** a. Literacy class b. Literacy class c. Art d. literacy assessment (puppet show) Method: Observation & subjective	**Participatory Design Workshops:** ***Story planner*** Activity: create written narrative using a bespoke resource created by the school for literacy development Method: Observation • *Photos* • *Field notes* • *Video (Transcribed)* • *Movement diagram* ***Branching Stories*** Activity: sequential narrative, collaborative story re-telling Method: Observation • *Photos* • *Audio (retelling stories)* • *Drawings* • *Field notes* ***Places We Play*** Activity: draw and discuss play in real	**Prototyping:** Cont… Participatory design Lots of approaches to constructing stories using digital media ***Foreground / background*** Activity: whole class, move foreground and background, capture audio with story. Method: Participatory & observational • *Photos* • *Drawings* • *Field notes* • *Video* ***Shared Digital Narrative*** Activity: Kidpad Sharing digital media space, distributed input • *Photo* • *Drawings* • *Field notes*	***Video Juke box*** Activity: Select background video – and tolerance of chroma key Physically augmented virtual (video) space Nb. Used in final toolkit Method: Participatory, observational & subjective • *Video (Transcribe)* ***Here / There*** Activity: use in free play Use of moving and still images Method: Observation & subjective Varied groups KS1 Method: Observation & subjective • *Use - Video* • *Interview - Video* • *Drawings* • *Field notes* • *Photographs*

	• *Field notes (all)* • *Video (a.)* • *Photos (c. & d)* ***Technologies in the classroom*** a. Discussion with T (IWB use) b. Discussion with T – everyday tech and use c. Discussion with T – everyday tech and use d. Observation – ICT class e. Discussion with T's – IT and digital media training f. Discussion with T's – everyday tech and use g. T questionnaire Method: Observation & subjective • *Field notes* • *Photos* ***Play time*** **a.** Observation – free play in class **b.** Observation – free play in playground **c.** Observation – free play in play space **d.** Observation – digital play **e.** Observation – free play **f.** Interview – free play g. T questionnaire Method: Observation & subjective • *Field notes (all)* • *Video (d & e)* • *Photos (all)*	and virtual spaces Method: Observation & subjective • *Photos* • *Drawings* • *Field notes* • *Video (on tape?)*	***Virtual Dressing Up*** Activity: Logitech video effects - physically augmented virtual space (video & motion tracking) Method: Participatory & observational • *Video, photos* • *Field notes* • *Interview with teacher (notes)* ***AudioSpaces*** Activity: Virtually augmented physical space Varied groups KS1 Method: Observation & subjective • *Video (Transcribe)* • *Field notes*	

Appendix 3: Rubin's Play Observation Scale (2001)

SUMMARY OF PLAY AND NON-PLAY BEHAVIORS

BEHAVIOR	GOAL OR INTENT
Solitary	to engage in an activity entirely alone, usually more than three feet (one meter) away from other children.
Parallel	to engage in activity beside (but not with other children, usually at a distance of three feet or less.
Group	to engage in an activity with another child or children, in which cognitive goal or purpose is shared amongst all group members.
Functional	to experience sensory stimulation through simple, repetitive muscular movements.
Constructive	to create or construct something.
Dramatic	to dramatize life situations or bring life to an inanimate object.
Games-with-rules	to engage in a competitive game - type activity following pre-established rules and limits.
Exploratory	to obtain visual or auditory information from an object.
Reading	examining, exploring books and related materials
Unoccupied	there is complete lack of goal or focus during this behavior.
Onlooker	to watch (or to listen to) the behaviors and activities of other children.
Transition	to prepare for, set out activity, or to move from one activity to another.
Conversation	to communicate verbally with others.
Aggression	to express displeasure, anger, disapproval through hostile means.
Rough-and-Tumble	playful physical activity.
Anxious Behaviors	display of wary/fearful behaviors.
Hovering	onlooking at a close proximity.

Appendix 4: Repertoire of appropriate behaviour

Category	Time	Definition & Method	Children's appropriate behaviour (rules)	Space
Register	20 min	Address each child individually Calm children in morning and after lunch	Sit quietly, listen to teacher	Floor
Establish task	10 - 20 mins	Gather all to establish new task Teacher-led activity: instruction, context and objective	Sit quietly, listen to teacher. Children speak in turn when selected.	Floor
Pick up task	2-3 mins	Continuation of existing project.	Quicker orientation, move to workspaces whilst work materials are distributed	Desk
Work together	20 mins - 1 hour	Whole class learning task Teacher-led activity	Sit quietly, listen to teacher	Floor
Work	40 - 1 hour	Individual / collaborative / parallel work dependent on activity / project	Move to (own) workspaces for wait for materials and instructions	Desk
Tidy-up	5 mins	Clean up after task	Finish current task, gather materials, moderate noise	-
Working with	20 mins - 1 hour	Small groups (3-5) work with TA / teachers Teacher-led activity	Follow adult to workspace	Desk
Home time	5 - 15 mins	Getting ready to leave, story / film motivator to quickly get coat, occupy ready children whilst helping others	Get coat, listen to story or watch video, quiet. Followed by queuing	Floor
Queuing	2-5 mins	Order before leave class	Stand in line, lead elected by teacher, quiet	By Door
Mixed	40 - 1 hour	Focused work groups to meet curricular requirements	Parallel multiple behaviour: 'Working with' and choice, waiting for allocation from teacher moderate noise	Desks, role play, sandpit, floor
Choice / Free	40 - 1 hour	Initial selection. Grouped in small groups, dyads or solo to engage in activity of choice. Outside work time	Raise hand to indicate request or preference, waiting for confirmation from teacher, then play (see 4.3. for detailed behavior), moderate noise	Desks, role play, sandpit, floor
Circle	20 - 30	Sit together as whole class to tell news	Sit quietly on floor in front of teacher, listen to teacher.	Floor

Time	mins	and stories	Children speak in turn.	
Sharing time	3-5 mins	Whole class – Children's news and events	(Post register - not a feature of every classroom) Teacher-led activity (select children to complete task), children speak in turn.	Floor
Golden	5-10 mins	Add time as reward for good behaviour	(Not a feature in every school) Choice, moderate noise	Role play, sandpit

Appendix 5. Orientation meetings / discussions with teachers: field notes

5.1. Field notes: Initial project meeting	
Method:	Open discussion with sponsors & Teachers
Date:	Sept 2005
Time:	2 hrs
Participants: (Various)	CP IDAT Heads and 1 teachers
Objective:	Discuss scope for Infinite Infants Project
Notes	**Sept - Oct** Complete PD… technical, flesh out concept, interactivity... Continue to update WIKI (upload latest and ask for comment) Make notes on current project description – conflicting aspects and areas to develop Get to grips with server Small evaluation with small group… try a variety of pilots (to determine final features) Gathering information from teaching staff about purpose of the system **Technical issues** (not exclusive, will be more as project develops) What are the constraints of the current technologies? HMC – Need some technical documentation to support the system in current state, if only commented code? Schedule for roll out of new modules – Timetable and list of features that will be developed for other VN projects… will this affect the set up of the server? How will these components add on? More to the interface design than skinning… menu search and retrieve features… The users will use the systems in a completely different way…. Need to make a clear distinction betweens areas that require assistance… Evaluation with schools… iterative (all design choices hereafter will need to be justified, evaluation documented et al… Peer design and evaluation To record what they have done… role play (mix real and virtual in story telling) Audio… record sound and have bank of sound (previously created assets to use) Need for system to develop beyond project life… Development in 2 parts: 1. Getting material into the system Increase number of scenes and assets Process of gathering and preparing material needs to be made easier… concerns about time to develop skills of teaching staff when already working in busy environment - fitting training around school timetable… RH – Are more workshops being planned, is there any supporting documentation the schools can refer to Consider use of mobile… No phones of any use, Bluetooth, wireless LAN alternatives… Blue screen (great for role playing) Themed assets… tie in with field trips, talks etc (Expand possible of how subject mater is bring explored.) Used windows Movie maker to capture video… use for still and audio Create our scene… 360 degrees (how to stitch together?) Present assets… post production by Tim 2. Interacting with virtual environment Accessing scene (themed as play areas) and selecting assets
Quotes:	XXXXXX School says: "We chose the title "Infinite Infants" to reflect the limitless opportunities for fun and exploration and the boundless imagination of young minds. The inclusive

	nature of the project aims to offer quality provision promoting active learning and positive engagement with cutting edge technology. "Our ultimate aim is to share "Infinite Infants" as a vehicle for improving the '3 C's' (Communication, Creativity and Confidence) with the global community".
Notes for school visits:	**School visits** **Time:** ● Discussion session with teaching staff – workshop / Design approach…? This has to be short and worthwhile… can't waste time ● Series Small evaluations with system… first one in a couple of weeks **Discussion with teaching staff** Design ● Children's creative work – examples and in practice ● What work are have they done using the computers, have is this managed (contextual inquiry) ● How they work together – collaboratively / cooperatively… anecdotal evidence of what works well ● Play areas and role playing – how is this organised? …Can kids do this freely / allotted times / reward for good behaviour… ● Usefulness of virtual environment over physical environment… ● Expectations about this will work in classroom environment and what it will be used for… opportunities for creativity and communication. ● Tie in curriculum… ICT EQ et al ● How pupils development is measured… Ofsted ● Is there a change in the approach taken by Ofsted in measuring ability? ● How will assets be created… current skills set among the staff – Possibly series of workshops to train (HMC / ArtyTechs or via RSC like organisation) teachers with supporting documentation ● Possible scenarios they would like to explore (these are harder to create… stitching) ● Training… develop simple online tutorial / deliver in the VN environment? – All (basic) aspects of creating and delivering digital media assets ● Advice for managing this space ● Essential components for interface ● Level of intervention of teachers when using system… uploading files **Delivering the system** ● Timetable for year …want to avoid OFFSTED inspection times etc ● Need to test system with white board prior to system ● Small evaluation with current system and user group (kids).. interaction and conceptual issues that arise ● Finally… Opportunities to roll out... space to create semi immersive area (perhaps create first here and invite small group to view and use) **Additional information** Update technical specifications for each school **Demo with whiteboard** Check before run… notes on use… Concerns… Height of board (designed to be viewable for whole class or for teacher use… will kids be able to reach all of the board?

5.2. Field notes: Orientation

Date:	Nov 2005
Time:	40 min discussion and tour Mid morning
Participants:	Head Teacher
Objective:	Purpose of meeting: introduction to school & discuss timeframe for R&D activities to develop concept and design of digital system for school
Context:	Discussion with head teacher Meeting held in Head's office Second meeting - had met prior in project meeting All head teachers involved in project initiation
Observations:	School profile – Infant section (Juniors are upstairs) has about 270 pupils, there are 9 classes (3 for each year). Children from largely educated parents (uni and local hospital catchment area) - comparable low school meals, highest number of children walking to school, although due to being employed in Uni & Hos means that they have a higher than average number of children for whom English is second language School is doing well in all core subject, though is lacking in ICT - thus interest in project involvement Head's interest in this project initiated as a response to Excellence & Enjoyment dfes document – enjoyment in learning - 3 C's – Communication, confidence and creativity. Hopes any technology project incorporates these qualities. Not about learning ICT per se, but become familiar for when have technology in near future for learning and eventually work - technology is expected to be a ongoing feature in our daily life. *Aspirations for design:* To enable learners to have experiences beyond their own setting – have a unique experience Increase confidence in using ICT, as groundwork for future school work (and beyond) freedom to be creative. Not so interested in developing ICT skills, more interest in developing confidence in using Shared resources between schools Children have access to tech without guidance Consider encouraging all forms of communication – English and second language Suggest develop workshop program for training teachers to use the system – I raise the problem of having to have to consider whole workflow - creating digital assets. Head asks for possibility of possible training as part of project Technical support from school's coordinator – who's time is extremely limited IWB's installed in the classroom – situated for staff and pupils Hope project will fund additional hardware and skills development among staff and students Expect to get broadband shortly & have digital (digiBlue) cameras, but no microphones or video cameras DigiBlue cameras light and small, but have fixed record duration and no VDU – they are in their boxes, neither teachers or children use Evaluation (from school's perspective) of success of technological intervention – creative work produced by the children, more use of technology in everyday learning, use for technology for play Aim to collaborate with teachers to look for place in teaching for digital media technologies, likely to be assigned a teacher, currently considerating working with Yr2 teacher Work towards working with small groups to develop ideas for technology *Design considerations* Need to consider all forms of language given foreign language pupils Design practitioner (me) to work with small groups of pupils to develop technology On tour, lots of displays relating to past projects (displaying work is a motivating factor), some temp etc - In main hall there is a data projector with pull down screen, a live copy stand - this is used for assemblies, talks and performance. Every Friday

	one class from the infant school (6 classes) takes the assembly - where they will read out texts, show picture. All classrooms have both indoor and outdoor windows Large amount of recycling of everyday materials Diagram: Layout of school
Additional data:	Audit for full inventory of ICT equipment
Notes:	There is some responsibility on part of practitioner when in school, that designer outside may not feel. This school has a very tight budget for equipment. Using up precious school resources - application has to be worthwhile Any technology must be resilient to technical fault and user error – no technical support High and abstract aspirations – no discussion of what type of technology they would like, it is difficult to find common ground here. However know what type of behavior and learning outcome User participation at very early stage - grounding Highly resourceful Project interest mix of opportunity (local incentive) and Govt. directive

5.3. Field notes: Orientation	
Date:	Nov 2005
Time:	30 min discussion and tour
Participants:	Head Teacher
Objective:	Purpose of meeting: introduction to school & discuss timeframe for R&D activities to develop concept and design of digital system for school
Context:	Discussion with head teacher Meeting held in Head's office Second meeting - had met prior in project meeting All head teachers involved in project initiation
Observations:	School profile – this school is located in a housing estate, all of the pupils live within a 3 mile radius of the school. School has good reputation and is ding well in Ofsted reports. In project work and eventual technologies, Head is very keen to make better use of the equipment in the school and more use in everyday teaching. They have limited support for IT in the school. There is a technician who they share with two other schools. And an ICT coordinator in the school (a teacher) who manages the day to day use. Technician responsible for procurement, through central suppliers, on instruction from school *Equipment installed in school* Limited applications for editing media - have sound editing, but none for video or images - no application on pupils PC - all restricted apps In school, there are a 3 - 4 small PC's in each class & dedicated ICT suite Windows XP 98 installed - e-learning credits for software only (both for teachers and pupils), hardware comes from main school fund and is acquired through advice from shared consultant School has purchased Digi-blue camera and microscopes - to try then as opposed to demand. Attempt to expand ICT remit, and new opportunities for learning IWB installed in everyday class, though is aware that not every teacher uses, or is comfortable with using. *Aspirations for project* More social use for computer. Would like - exciting, visual and auditory stimulating experiences for the children Where possible would like tech designs to offer cross curricular opportunities (they are moving to creative curriculum - and away from single subject lessons) Want the children to engage with for longer, hold a short attention span (reckons we gain one minute per year (+ 1 minute) Would like to make use of the IWB, use (numbers of teachers using equipment is highly varied (some everyday, some not at all)

	Happy to be involved in any research activities – have space and can work with small groups (likely TA available to help) Tour: Lots of displays, recent project completed by the children (these are often repeated with each year), large hall space. 6 Classrooms in Infant part, Each classroom has outside window, now all have inside window. Each classroom is spilt into sections, I Yr1 classrooms have more assigned space (role play, sand pit, reading corner), Yr2 and 3 are more formal classrooms with desks and work areas. There is a dedicated ICT suite, alongside using the computers the P's also use the Turtles (with the software) in this space.
Additional data:	Audit for full inventory Documentation: school initiatives, frameworks
Notes:	As Hyde, limited tech support, better use of equipment. Clearly feel the need to increase level of ICT, with integration with other subject maters, like the idea of extending the classroom, connecting to other spaces. Choice and application of technology left in my hands – link technology to their ideas Suggest further meeting to discus story tools used by the school – arrange meeting with Yr 2 teacher

5.4. Field notes: Orientation	
Date:	Nov 2005
Time:	20 mins
Participants:	Head Teacher
Objective:	Purpose of meeting: introduction to school & discuss timeframe for R&D activities to develop concept and design of digital system for school
Context:	Discussion with head teacher Head's office All head teachers involved in project initiation
Notes from discussion:	*School profile* – School is located on the outskirts of Plymouth. They have a slight wider catchment area then other 2 schools. School is doing well in Ofsted and has good reputation. The have about 180 pupils in 6 classes. *Aspirations for project* The Head is keen to expand community aspect, would like to have a resource that could be put in a public space. They are looking at a potential rebuild over the next couple of years and are thinking about expanding the current school to include more spaces that can be used in out of school hours. Feels it's important to familiarizing with technology at early age (in groups, peer working) – increase confidence as a foundation for later years education. Expectations are higher now, children use technology in the home, big push from educational authority to include more ICT Range of skills within the school very varied. ICT coordinator is Yr2 teacher Happy to be involved in any research activities - ICT suite is often available but won't always be able to provide TA Would like to make better use of the IWB (feels underused resource at present *Equipment installed in school* They are waiting for the whole school to be networked. Each class has a IWB for use with laptop. Don't have a technician - pay an hourly rate, so use sparingly. Try to sort out problems by using most knowledgeable staff *Tour of school* Lots of displays of work in all classrooms, and main reception area is crammed with posters about behaviour (see photos). Infant classrooms have more discrete play areas. In all classrooms workspaces occupy the central space in the room. Large tables for 6 – 8 pupils facing each other. The classrooms are extremely colorful.

	Yr 1. Classroom features include a reading corner with books, audio cassette player and headphones to listen to stories whilst reading. 2-3 children would use the corner at the same time, but would read book and listen individually. They do talk as they read, but are expected to be quiet and calm in this space. There is a playspace - current filled with building equipment (wheel barrel, helmets, high-vis jacket, spade and a few fake house bricks). The sand pit is in the play space with bucket, rake and spades. This theme is tied to a current class project. The sandpit is a constant feature in the classroom, and has only been placed in the playspace as it ties in with the theme. Previous themes include kitchen and ship. Yr 2. There are more workspaces and no play area. There is a reading corner with audio equipment, this doubles as a quiet area if children need some time out. On tour: suggest areas in hallway where technologies could be placed to maximize social use, They have a large hall for sports and assemblies. Children eat their lunch in the classroom. They have an ICT suite that is used by all years. There are small footprint PC's in the classrooms
Additional data:	Diagram of school layout Audit for full inventory Later email spec for machines: Machine spec. XP Version 2002 Service Pack 2, 567mhz, 192mb RAM
Notes:	Getting information about what equipment - wait to speak to allotted person - very slow moving

5.5. Field notes: Discussion with head teacher	
Method:	Discussion
Date:	Nov 2006
Time:	20 mins
Participants:	Head teacher
Objective:	Purpose of meeting: review of technology in the school, change in education currently being implemented
Notes from discussion:	IWB now installed in every classroom Wireless LAN working throughout the school - Each teacher has their own wireless laptop, which they attach to the IWB The school still has digital cameras – usb cams and (digi-blue) microscope – HT claims a couple of the teachers becoming more confident using. Mostly used for documenting event, collect visual data for project work Turtles are used in the KS1 classes Pinnacle 10 is installed on the T's laptops for video editing SWGFL – still managing network access Part of Learning Network NCSL.org.uk Expanding Innovation curriculum – creative - 10 learning attributes which cross all subject areas, focus on group project work, which covers significant part of term. Work broken into range of creative and academic activities (writing stories and making art displays). Keen to expand ICT (through infinite infants project work) for BECTA accreditation HT is very keen to the practical part of the project moving – what kit will be provided, where it will go. All teaching staff have personal laptop (thus large amount of teaching is expected to be delivered, research and processed digitally.
Notes:	During later film editing work – none of the teachers used Pinnacle 10 application – preferred options was movie maker
Early Analysis:	Accreditation (check BECTA criteria) how can designs meet this - doc??? In office???

5.6. Field notes: Discussion with head teacher	
Method:	Discussion

Date:	Nov 2006
Time:	15 mins
Participants:	Headteacher
Objective:	Catch up beginning of new term
Notes from discussion:	School this year in beginning a stage of real transition over next 3 years – 3 schools in the local area are being merged. They will all be located at Langley school which will be re-built in 2 parts (whilst the other is used). HT having to be consulted architectural build (currently grappling with issue about flight path from near by airport). HT, all T's and TA's must apply for jobs in when schools merge. Plan to have play access for community in new school – requested diagrams of requirements for play space technologies Network connection BT Ellipse package – southwest grid too expensive Now have wireless LAN installed throughout the school Part of Networked Learning Community (NCSL) – clusters of schools working together

5.7. Field notes: Discussion with head teacher	
Method:	Discussion
Date:	2006 Nov
Participants:	Head teacher
Objective:	To discuss (changes) technology in the school Direction school is going in – lead by HT
Notes from discussion:	Networked Learning Community (NCSL – National college for school leadership) Influenced by Guy Claxton (Bristol Uni, cog psychologist) Influenced by independentthinking.co.uk (neuro) & Ian Wilson QCA guidelines / OECD Humanistic approach to curriculum design – meta-knowledge Implementing Innovative Curriculum Cross circular subject teaching / activities – changing delivery of information – focus on divergent thinking Introduction of phonetic in literacy teaching for Govt. directive Focus on PSE (personal, social and emotional development) Influenced by 'every child matter' doc from dfes Approaches to learning in the classroom – learning tree showing different aspects to learning – voting – use of Roamer world physical hardware and software 'Our children are becoming very good at using Interactive Whiteboards, they are training me' carol Woodford school March 2006
Notes:	Innovative Curriculum sample

5.8. Field notes: Orientation. Habitats: field notes	
Date:	Nov 2005
Participants:	Yr 1 teacher Yr 2 teacher
Objective:	Discussion about design of classroom for learning
Notes from discussion:	Yr 2. Learning trees - objectives are placed on the tree and the pupils names are placed on the tree depending on achievement. The teacher believes this enable the learners to see where they are in relation o others and know where / what they need to achieve Spinning wheel - characters and setting - starting point for stories - sequence - descriptive language Game books - reading - decision based Problem solving? Play space is a pirate ship - small crows nest that the children could climb into with a skull and cross bones flag on a working mast. To dress up the children had 2 tri point hats, a captain's had and jacket, and there was a parrot

	Yr 1. Other classroom features include a reading corner with books, audio cassette player and headphones to listen to stories whilst reading. 2-3 children would use the corner at the same time, but would read book and listen individually. They do talk as they read, but are expected to be quiet and calm in this space. There is a playspace - current filled with building equipment (wheel barrel, helmets, high vis jacket, spade and a few fake house bricks). The sand pit is in the playspace with bucket, rake and spades. This themes is tied to a current class project. The sandpit is a constant feature in the classroom, and has only been placed in the playspace as it ties in with the theme. Previous themes include Workspaces occupy the central space in the room.
Additional data:	Photos

5.9. Field notes: Discussion ICT in everyday teaching	
Date:	Nov 2005
Time:	20 mins (after school)
Method:	Discussion and demonstration
Participants:	(Woodford) Yr2 teacher (6-7 yrs)
Objective:	Discussion about tech in class, mostly IWB
Context:	Key interactive media tool and space in the classroom
Notes from discussion:	IWB training - one inset day shortly after Promenthan Board installed (not all teachers were able to attend) and continuing support from ICT coordinator. The ICT coordinator in this case is another teacher with a dual role - and is the 'go to' person for all tech, cameras, scanners etc - this teacher arrived at the school with these skills. Time for additional training was raised as an ongoing issue. T considers herself to be confident in using the IWB, she graduated fairly recently and used computers during teacher training. She found the initial training session for the IWB helpful, but has had to put in a lot of additional time to really understand the IWB's features. T is aware not all teachers in the school are comfortable with the IWB, believes they are too too worried that something will go wrong during lesson and using unfamiliar tool during lesson can be fraught even if nothing goes wrong. T is also aware there is some pressure on teachers to make use of the technology placed in the classroom. T considers the IWB useful for enabling one than one child to work at the computer (IWB is connected to laptop which is perched on a little shelf to the side of the board and not accessible to children, T has difficulty working directly from the laptop - there is no physical Qwerty keyboard for the IWB, but there is a screen version - used with pen), as they can move around the screen and easy for more than one to access the large screen. IWB does not respond to multiple touch. The IWB does come with four different coloured pens so each user (up to 4) has a interaction device. When using the IWB, the children don't need help from T. There are a suite of applications - learning games (such as memory games - matching images, stop the different, grouping and matching objects / sounds) and drawing software for them to choose from. This is a popular choice during free play time, children perceive use of the IWB applications as an opportunity to play. It is a treat as it is often out of bounds in class. T does not use laptop for IWB - this is a self contained system. Using library of graphics. But will show images to set the scene for work and play movies T makes use of different screens / view in everyday teaching. T shows different screens saved from previous sessions - current project words to progress narrative (sequencing adjectives, words to describe setting and characters) T has tools for creating different layout, but is expected to create own teaching resources Can design screens from resource bank within system (ladder, bubble diagrams etc), and some preset activities (i.e. long vowel, grouping) & add graphics and

	sound. Captured screens are stored with date There is a lag when using the IWB touch screen, but T feels she has gotten used to it (waits without thinking about it, has gotten use to delay when writing) Tools on IWB: Reveal / hide sections, spotlight area. In numeracy section: dice, protractor, ruler, calculator Zoom, underline, write Draw shape Colour selector Navigation (projects with screens - select project & click through screens on main board or in visual sub menu) School on / off Settings - calibration etc. Switch to AV Main menu - visual : cut, paste, sequence T also uses the Pelican Interactive books (Big books) for structured narrative production. Create stories from scenes (has record feature for voice (connect own reading to writing) and sounds, preset scenes, simple graphic transformation and story writing hints. Books by popular authors. Events are sequenced into number based time line. T uses Internet for resources, downloads from range of teaching specific and information sites T plays short section of movie at end of day to settle the chidren while getting ready to go home (those with coats on go and sit and watch) - currently watching Polar Express. Helps as teacher's and TA's attention can be elsewhere assisting putting on coats, finding bags and water bottles Have digital blue cameras in school, but has yet to use them
Additional data:	Photos of screens (see below)
Notes:	IWB is a persistent chalk board, big screen for a computer (not to be underestimated) T level of skills vary - training in different stages No reliable IT support for everyday needs From photos... Writing is very shaky (text is not an option) Use of large screen - shared space for multiple users Limited usage - no creative / playful use - it's about finding the right application and learning it Passive media - focus attention Computers are perceived as opportunity for fun

5.10. Field notes: ICT discussion	
Date:	Nov 2005
Time:	20 mins (during Lunch time)
Participants:	(Hyde) Yr 1 teacher
Objective:	Orientation: Understanding what are familiar technologies for teachers
Context:	Meeting to discuss use of IWB and computers in everyday teaching T uses the IWB with laptop everyday, is comfortable with using technology having used computers through teacher career and through training (as a recent graduate).
Notes from discussion:	Primary uses of IWB: Used for enable communication in whole class activities Focus on written language and reading Found zoom on IWB particularly useful for focus attention to key information on the screen - in text and images The IWB is in the center of the classroom, with room in front for all the children in

	sit down, & stall for teacher to sit on. The laptop in on a specially built shelf, which has room for the laptop only (no room for mouse) - this is poorly designed and a point of contention. Originally placed here so as to be out of the way. Not an issue when using touchscreen - but not all application features avalaible When working independently of teacher, children are used to having to share computer and IWB. They prefer to choose which application they want to use and who they work with Children prefer software that is not too text heavy, cartoons with lots of sound effects Use computers in free time activities – 20 minutes duration Very popular choice for most of the children, they perceive using the computers as an opportunity to play Software most commonly used in the classroom: Sentence building and word recognition, story reading, Paint applications (TooSimple suite installed) The computers run restricted version of windows, internet (managed through the SWGFL), and applications. Computers situated in corner of the room. 3 PC computers in a corner of the classroom with two chairs per machine, facing the story tent, behind them is the sink. Single keyboard and mouse, 14 flat screen monitor. Children use sometimes use headphones when working and always work in pairs – single mouse and single keyboard. Sometime 1:1 with a TA rather than a peer. The children (in previous year - this is a fresh intake) used audio equipment (small dictaphone) to recording sounds during nature walks - the children or T would try to capture or make the sounds of the things they encounter. Comments that the most heavy use of technology is documenting work as evidence of classroom activities contributing towards assessment ('Sometime I feel like the paparazzi in here, camera flashing away!').
Additional data:	Audit of software in school
Notes:	There was also a chance meeting - when one Yr 1 teacher came and joined discussion towards the end. She mentioned she likes to audio a lot to set the mood / atmosphere in the class whilst the children are working (she is a big Door fan) - uses CD

5.11. Field notes: Discussion: using the IWB	
Date:	Feb 2006
Participants:	Yr 1 teacher
Objective:	Discussion about tech and applications used in the classroom
Context:	Short discussion in class
Notes from discussion:	There are 3 PC's in the corner of the classroom, facing the wall. They have a single keyboard and (roller ball) mouse. They have headphones, but are normally used without as the children work in pairs (and only one set of headphones per machine. The classroom has a IWB. Network to the T's laptop via ethernet, the PC's have no network connection. The IWB in the far side of the room, near the window. The IWB is touchscreen - with use of pens. It requires regular calibration, some of the children know this needs doing when the screen becomes less responsive. It is used everyday, through the day. There is no original whiteboard, the teacher has a small free standing whiteboard for writing on, around seating height. The children occasionally use IWB in free time play, usually learning games. Height is a bit of an issue (the screen is too high for the children to access the whole menu which is vertical). Are more likely to use the PC's for independent work

	PC's run a limited version of Windows - can access educational applications only. There is no shared drive in the school for sharing data, and the children do not save their work. At the beginning of each session, work is created from scratch. Work may be printed, but given the cost of ink this does not happen often. The PC's are used during the free play time and for 1:1 tutoring (usually with a TA), and during practical work across subject areas. During classes, often the whole class is broken up into different groups during on ability (infant classes aren't streamed and have mixed abilities). The computers would be an option for the more able, when T and TA's are focused on working elsewhere with pupils who required closer assisted learning - the children would work independently on the machines - though may be asked to use a specific application (i.e. numeracy game etc). The computers are a popular choice for free time For media creation the children use the Too Simple software suite - Paint package most commonly used, the tiling effect and mark making are popular. Other applications: rhyme animations & touch games Children also enjoy a 'Making faces' application (name?), in which the children can create expressions for characters from a range of presets (faces and features). To use: select a face, click to activate features from a palette and drag in place. Children enjoy audio feedback on movement The teacher considers herself to be fairly confident using the resources she has in her classroom (IWB, net, PC's and laptop). Used in all subject areas - literacy, numeracy, history, geography. The teacher has used Movie Maker in training, but does not know how to use a graphics application. She hasn't needed to use Movie maker in class work. Uses a lot of images to set scene, draw out language, all of these were sourced from the net. Uses Powerpoint for making presentations class.
Additional data:	Diagram - classroom layout
Summative:	A lot of experiences of technology are mediated by the teacher - factor in design Workflow for any media product is going to be a real challenge - use of found media? No workflow?

5.12. Field notes: Teacher training	
Method:	Open discussion
Date:	Jun 2006
Time:	30 mins
Participants:	3 Class teachers
Objective:	Reflection of incorporation of media into teaching practice How much to do they know / what can they do
Context:	Group discussion of training needs Short meeting after school 1 T describes herself as fairly confident in using the tech she has a her disposal, the other 2 claimed to not be very capable
Notes from Discussion:	***Current use of digital media and technology*** Large amount of documentation of work in progress or achievement – evidence for internal and external assessment Storyboard – ask learners to construct sentences from photographs from visit / event / fiction Inspiration and set the mood with images and films (from dvd, or net) Use of found media, and photograph (don’t often scan – likely to get images from the internet All feel the pressure to use more ICT in the classroom – confident one feels she accomplishes her quota, but reaming 2 do not. They know this will have to address at some point, but it not a high priority for them. All will have a back up activity in case the tech in the lesson fails

	Previous experience of having practitioners in the classroom Find special projects useful – new experiences of this type are always positive However, it can be a transitory opportunity - it can be difficult for the experience to have any longevity, practitioners often take equipment away, or whole work flow an issue – either don't have the skills, or don't have the equipment (or both) to replicate event ***Previous training*** 3 inset days - weekly staff meetings - additional w/shops Had Espresso training (rep) - media and teaching resource, but school considered subscription (£1000 per license) too high. Being proactive about finding – coxoschool Ken Corrish – continue camera training ***Training*** Devise new teaching program to develop skills to support and expand basic media production, that could be used in futures technologies in project and everyday teaching Use standard applications – PaintShop, Movie Maker Consider use of peer teaching (teachers are very good at this) Finding time for training: 45mins – 1hr sessions after school (possible on a month basis) 1:1 support on request, including support for classroom activities Combining media - adding sound to found / recorded footage Scanner - after school 3 session - Tuesday / Thursday 1 hr sessions - A. Digital imagining (scan / digital camera) - simple editing (PaintsShop Pro) B. Animation in Powerpoint / stop motion C. Video - Movie maker Expect up to 11 teachers T's to bring own cameras & laptops ***Aspirations for project*** Something that does not require support Something physical: T's currently engage with Brain Gym. Set of prescribed movement activities, part of 'Leap to life' (wake up shake up for early year). Done first thing in the morning to get everyone stimulated and ready to work.
Notes:	Need to improve ICT – working towards accreditation (handful holding back) In design - Minimizing need to learn new skills The expectation for change (high use of tech, and more diverse use) is imminent but slow moving These teachers volunteered as a route to gaining IT skills – refresh forgotten skills Later via email: Block - Thursday - 23 Sept / 25 Sept / 2 Oct (next term)
Summative:	Creation of system for interactive play space - used digital media – video Media in learning not only about teaching, but documenting teaching

Appendix 6. Inventory breakdown for schools

September 2005

Hyde Park school (270 students)

- Room 1 – 3 workstations (main room for project)
- Room 2 – 3 workstations
- Room 3 – 3 shuttle workstations and interactive whiteboard
- Room 4 – 3 workstations
- Room 5 – 3 workstations
- Room 6 – 3 workstations
- Room 7 – 3 workstations wit projector
- Room 8 – 3 shuttle workstations and colour printer
- Room 9 - 3 workstations
- Office – printer/ scanner
- Library – Server and workstation
- Resource room – 1 workstation

Notes:

No Internet

Promethean whiteboards

Computers networked together on LAN (Managed with PT Tech)

Will be having 2 fibre optic lines installed

Teachers all have individual (Win) laptops

2 MB line to be installed (approx. 2 months)

1 Stills Digital Camera

Langley – (125 students)

- Room 1 – 1 interactive whiteboard, 4 laptops outside shared with room 2
- Room 2 – 1 interactive whiteboard, 4 laptops outside shared with room 1
- Room 3 – 1 interactive whiteboard, 4 workstations outside shared with room 4
- Room 4 – 1 interactive whiteboard, 4 workstations outside shared with room 3
- Room 5 – 2 workstations
- ICT Suite – 15 workstations, 1 interactive whiteboard, colour laser printer

Notes:

All 5 Staff have wireless laptops

Already have broadband

SMART whiteboards

512 up to 1mb

Permanent line

Going up to 2mb next year

Wireless connection to the internet

1 stills Digital Camera

1 DV camera

Woodford – (200 students)

- Room 1 – 2 workstations
- Room 2 – 2 workstations
- Room 3 – 2 workstations
- Room 4 – 2 workstations
- Room 5 – 2 workstations, 1 interactive whiteboard, 1 printer
- Room 6 – 2 workstations
- Room 7 – 2 workstations
- ICT Suite – 16 workstations, 1 interactive whiteboard, 3 printers, 1 scanner

Notes:

Dial up connection

1 Promethean whiteboards

1 SMART whiteboard

3 Digital cameras

All teachers have laptops

Awaiting broadband information from technician

Appendix 7. Yr 1 literacy class using the IWB: Field notes and transcript

7.1. Field notes	
Date:	Nov 2005
Time:	Afternoon (first class after lunch)
Participants:	Yr1 class (aged 5 to 6 years) Class approx. 30 children Teacher and 2 TAs
Objective:	Observation of everyday teaching
Context:	Activity: T elicits sentences from whole class as controlled example, and then children write their own stories Written work is based on a book being read to the P's [Name of book? Check notes??] The activity is part of an ongoing project based on the book (with a Christmas theme) – there have already been a couple of art projects
Observations:	Around the IWB there are words relating to different aspects of grammar and vocab printed and placed around the IWB - there is a focus on connections & conjunctions - words are permanent to provide a prompt and reminder. Attention is focused on the IWB – T hand writes on board with pen 0 – 10 mins To start the teacher is seated at the front of the class next to the IWB. All children gather and sit on the floor (5 sitting on tables at the side where there is not enough room on the floor) in half circle around the IWB Teacher calls register (Good afternoon Y, Good afternoon Miss X) 10 - 14 mins Children are reminded of a story they have been reading, teacher shows them a story they started yesterday on the IWB. Today they are going to carry on the story. This is only the beginning of the story. Teacher reads what has been written (some of the children say some of the words with her). On Tape: 01:54 P's difficulty here is comprehending what the character would know at a particular point in the narrative, when they know the whole story – They know the letter is for Katie from Santa, but Katie does not yet know that the noise was the letter box.

	14 - 21 Asks the children what happens next. Asks child to suggest word, rather than them all calling out words. They put their hands up if they have an answer. Children seem largely keen to be involved - keen to speak. Getting it right - one pupil highlighted what he thought was a teacher's mistake (there was some humor or children in the error - 'Katie was snowing'). Correcting the mistake does seem to irritate T (unnecessary distraction) In addition to words to complete the story (vocabulary, sequencing events), ask for grammatical information and spelling. Not all errors corrected, some in depth, some not at all, some in part (i.e. adjectives) Get event information first, then describing words – she hears a noise, what type of noise? T has some difficulty stopping the children progressing the story too far Teacher is very animated - big gestures, acting out elements of the story when clear children are struggling with conceptual comprehension and language production As group, story moves at very slow increments, teacher keeps going back to last sentence to move story forward A lot of overlap speech and verbal shadowing (repetition) - children say words with or just after T as she reads the story, or says key words Completed sentences as whole class "... but before she could get down stairs she heard a strange banging noise. Katie thought the noise had come from from the letterbox. So she ran to the door to have a look. It was a golden letter with Katie's name at the top." Technology breakdown - user error, little difficultly recover back to original screen. One child shouts suggestions. T does seem a bit flustered – i.e. making errors even though knows it is the wrong action ‘why did I do that’ Uses the pen tool to write the words on the board, and navigate Asks the children to write their own stories, but only the beginning. she wants a cliff hanger (not sure if all understood this) - T uses of intonation and body language to illustrate dramatic stop 20 - 50mins Work without teacher guidance (these children are on the table specified for this) – T visits twice, looks over the shoulder of all and talks to 2 P’s Put on vocab books (easier to copy words) - one puts books up, and others copy, teacher asks them to put down, all but one do, book remains for x mins

	(Nb. These P's are distracted by the camera, not sure how useful this is) 50mins – 1 hr: The whole class is collected together (children sit in half circle around the teacher) and 4 of the children are asked to come to the front and read story. Apart from the children waiting to read own story, who seemed a bit bored, rest seem relatively focused on peer story telling, though not as much as during teacher led part at beginning. Asked to be quiet a couple of time Of 4, 3 had trouble reading own story back - struggling with particular word - prompted by teacher. In 1st, teacher complete half the story.
Additional data:	Video & transcript (introduction & story reading)
Notes:	After class: teacher demonstrated other features of the IWB she finds useful – capturing and organizing board work. Different templates laying out information: mind map, hierarchy, table In discussion T claims she very comfortable using the IWB (one of the most confident in the school) Multiple sessions captured which provides record of work and prompt for ongoing class work. e.g. Success ladder (photo) – tracking progress through curricula Narrative elicited entirely from memory – there were no visual aids despite having the IWB to hand – acted first Clarity – Shaky (lag in pen) handwriting doesn't help – normally for children handwriting is made very clear, so it can be copied.
Summative: (*after session*)	Teacher - use of body to convey meaning (acting story) P's different motion for inquiry or agreement Complete scaffolding of activity and ad hoc reinforcement of new knowledge - it would be hard for technology to be this sensitive and flexible. Time (with text) - very slow and hard work: Teacher led - 7 mins to produce 3 sentences. Most children produced 5 in 30 mins on own. Story making - Dealing with complex narrative structure, and technical aspects of language - sequencing information is problematic. Issues comprehending own text (high level of support meant the children were able to produce work that was beyond their own comprehension – careful about this in design!) Conceptual aspect of exercise: knowing the thoughts of another during a sequence of events, this was

	tough for P's to comprehend – states of minds of others at past point in time Streaming - When working on their own, the children are grouped according to ability - those requiring help are placed together with a TA – Is there steaming in play? IWB - Reminder for work over time / documentation – persistent chalkboard Although there is a lot of teacher talking time in the taught session - there is also a lot of verbal shadow. More error prone during class presentation P keen to participate in classroom work – even if do not have an answer Lots of disruptionin whole class exercise (drinks, bathroom, of topic questions)

7.2. Transcription. Literacy Class using IWB				
Time		Transcript		Action
1	00.0	P1	Before she could get down stairs she heard a bang	P suggests sentence
2	0	.	Lovely, *but*, joining word, *but* before.	T stress on 'but'
3		T.	(T starts to write in the board)	T Repeats words as she writes
4			(Various voices)	on the IWB
5		Ps.	she could get.	Ps verbal shadowing
6		T.	(T starts to write in the board)	T Repeats words as she writes
7			[	on the IWB
8			Down	
9		Ps.	Before she could get to her mum.	Ps suggestion out loud –
10		T.	[	finishing sentence
11			to her mum	T Repeats words as she writes
12		Ps.	She *heard*.	on the IWB
13		T.	[funny]	Ps verbal shadowing
14		Ps.	Oh a *funny.* (T turns back to class 00:36) What other words could I use,	T Repeats words as she writes
15		T.	um?	on the IWB
16				Ps suggestion out loud
17		Ps.	[	

18 19 20 21 22 23 24 25 26 27 28		T. T. P2 . T. P3 . T. Ps T.	a funny strange (3 children with hands in the air) What other word could I use instead of *funny noise*? (5 children with hands in the air) What could I use? (6 children with hands in the air. T points to child) A silly noise. A silly noise, hum:: (T points to another child) A strange noise. A STRANGE. (T writes in the board), heard a STRANGE BANGING noise. [strange (*quietly*) a strange banging noise. (*pauses, looking at the board*)	T Direct question Ps suggestion out loud T Direct question T Direct question T select answer from raised hands P Answer Ps answer not accepted – T's (-ve) intonation T select answers from raised hands P Answer Ps answer accepted – T's (+ve) intonation Ps shadowing T Repeats words as she writes on the IWB
29 30 31 32 33 34 35 36 37	01.04	T. P4 . T. P4 . T. P4 . T.	Okay, lets go back to our plan. (1 child with hand in the air) Mrs X, Mrs X, I can see a mistake. What's a mistake? Katie was snowing. was *snoring*, sorry that's my writing, P4 shall I rub it out and re-wite it for you. It was *snoring*. [Sn-or-ing] *Snoring*. Is that better P4? Yeah.	 P Distraction P thinks he's spotted error and tells T- T doesn't seem very happy about being interrupted. T's tone is a bit sarcastic (no answer expected)

		P4 .		
38 39 40 41 42 43	01.20	T. P5 . P4 .	Okay, so back to my plan again. [He was snoring. It said he was snowing (P5 & P4 laugh) (T select item from menu on IWB - different screen with previous work)	P who noticed and friend thinks it's funny that character in the story could be snowing – things not being what thing should be is humorous.
44 45 46	01:30 - 01:54		TAPE ERROR (*T talking to class, referencing the board)*	
47 48 49 50 51 52 53 54 55 56 57 58 59 60	02:25	 T. P6 . Ps. T. P7 . T. Ps T.	(T selects item from IWB menu, screen flips) So how are we going to link this now? (4 children with hands in the air. T points to child) She, she opens up the letter (...) and santa didn't have no red clothes - [(…) Yep, good idea, so she's opening up the letter okay, P7. She opens up the letter (goes quiet) Okay, so she opens up the letter. But she hasn't gone to get the letter. She doesn't *know* it's a letter yet. (T gestures to board) [(…) All she's *heard* (gestures to ears) is a *funny strange* noise.	 T Question T select answer from raised hands P Answer Ps suggestion out loud Not accepted T moves on. T select answer from raised hands P Answer – This has been confirmed, but is not right. Nb. Ps with raised hands don't always have answers. T Recap Ps suggestion out loud T Recap
61 62	03:01	 P8	[(…)	 T select answer from raised

63		.	Okay, yep (Gestures to P8) P8?	hands
64		T.	Please can I have a drink.	P Distraction
65		P8	Wait a minute until you go to your table. Okay. P9?	
66		T.	She thought the noise sounded like the letterbox, so she went to the	P Answer
67		P9	door and found the letter.	T Direct praise
68		.	I *like* that.	P Answer
69		T.	And she came (...)	
70		P9	(laugh)	T Repeats words as she writes
71		.	(As writing) Katie thought the noise had come from.	on the IWB
72		Ps	[	Ps shadowing T
73		T.	the noise (...)	Direct question
			How do you spell *the*, P10, *the*?	
		Ps		
		T.		
74	04:1	P1	T-H (phonetic) -	P Answer
75	5	0.	Well done, from the letter?	T Direct praise
76		T.	T-H-E (letters)	P Answer
77		P1	[	Ps suggestion out loud
78		0.	box	T Question - T select answer
79			So, she thought the noise had come *from* the letterbox. Right. So what	from raised hands
80		Ps.	did she do? (gestures to P11)	P Answer
81		T.	She found the letter.	P question for whole class – alt
82		P1	*So*, put your thumbs up if that's a joining word?	movement
83		2.	(8+ children put their thumbs up)	Ps answer
84		T.	What?	P asks for clarification
85			A conjunction. If that's a *conjunction*, a joining word.	T Clarify - Definition of
86		P1	(Almost all children with their thumbs up)	grammatical term
87		3.	Well done. It is.	Ps look around at each other
88		T.	(as writing on board) So she ran to -	peers
89			[	T Direct praise
90		T.	or runs, or runned.	T Repeats words as she writes
91		T.	Is it, *is it runs* P4?	on the IWB

92			No	P alternative answer
93		P4	Um. I asking *P4*.	T Direct question
94		T.	(T pauses)	Ps answer
95		Ps.	Is it *runned*, or is it *ran*?	
96		T.	(quieter) She ran.	
97			Cause the root verb is to *run* (T write run on the board). How do you turn	T Direct question
98		T.	that into the past? (Gesture to board and P4)	P Answer
99		P4	Is it *runned*?	T Clarify - Definition of
10		.	It's ran.	grammatical term
0		T.	It's ran, good boy P4.	
10		T.	So she ran (as writing on board) to the door to have a look. To have a	T Direct question
1		P4	look.	P Answer
10		.	[	T Direct praise
2		T.	(...) and to	T Repeats words as she writes
		T.	look at the name.	on the IWB
				Ps shadowing
		Ps		T Repeats words as she writes
				on the IWB
10	05:0	T.	She ran to the door to have a look.	Teacher acts out the section of
3	1	T.	P14?	the story – which the children
10				know – in order to get the
4				children to remember the
10				sequence of actions leading up
5				to certain point. T runs across
10		P1	Can I go to the toilet please?	the class and pretends to find
6		4.	Yeah sure. P15?	the object and exaggerated
10		T.	And, and she saw a little name at the top of the letter.	surprise.
7		P1	And what did it say?	T select answer from raised
10		5.	It said, it said, please help me, I'm trying to make a red suit -	hands
8		T.	Okay, okay, so that's what it's *going to say*. So she ran to the door to	
10		P1	have a look. P16?	P Distraction
81		5		T select answer from raised

09 11 0 11 1 11 2 11 3 11 4 11 5 11 6 11 7 11 8 11 81 19		T. P1 6 T. P1 6 T.	She, she couldn't read it because - I, just watch me. [(...) WATCH. I just *thinking* (T taps head) of my story. (T runs across the front of the classroom) She *runs to the letterbox to have a look*. That's *as far* as we've got. (T pauses)	hands P Answer T direct question P Answer Answer not accepted, T Recap, T select answer from raised hands P Answer T Acts P Answer T Acts
12 0 12 1 12 2 12 3 12 4	06:03	T. Ps. P1 7 T. P4 . T.	Okay, Am I missing something? YEAH. (4 children with hands up) She pick it out. She picked *what out*? I don't know WHAT IT IS. A letter Ah. IT WAS A LETTER (As writing on board) It was a letter. [(Various voices) Golden (Various voices) Golden	T Question Ps Answer P Answer T Direct Question P Answer T accepts answer - T Repeats words as she writes on the IWB Ps Answer

12 5 12 6 12 7 12 8 12 9 13 0 13 1 13 2 13 3 13 4 13 5 13 6 13 7 13 8 13 9 14 0		Ps. Ps. T. P1 8 T. P1 9. T. P1 4. P1 5. T. P1 5. P1 5. T. T. Ps. T. Ps. T. Ps.	 Oh, P18 (.) what is it? GOLDEN letter It was a GOLDEN LETTER (T click on arrows menu on IWB, screen flips). Oh (click on arrows menu on IWB, screen flips). I'm doing the wrong thing now. (Click on arrows menu on IWB, screen flips) A golden Going mad. (T clicks on X tool on IWB). It was a DO IT AGAIN. What happens there? (Tuts) That never happened before (T clicks on IWB menu 5 more times) Wait for it. *I've done that*. (T clicks 3 times on item in tool menu at base of IWB) (On the right screen, write while speaks) It was a golden letter. (Various voices) Letter - From Santa. With? (Various voices) With. (As writing on board) Katie's name at the top (Various voices) and Santa - wishes - with Santa's name at the bottom - someone's name at the top - space (...)	T Direct Question P Answer T Distraction: breakdown – error in navigation – T flips the screen when didn't intend to P Answer (again) T gets a little flustered Ps shout suggestions P Comment Children are curious P suggests T Repeats words as she writes on the IWB Ps Answer T Repeats words as she writes on the IWB Ps Shadowing T Repeats words as she writes on the IWB Ps Answer

141 142 143 144 145 146 147 148 149				
150 151 152 153 154 155 156	06:15	T. P20 T. T. P8 T.	Okay With santa's name at the bottom Shh:: (*T pause*) Right. (...) Yeah. It was a golden letter with Katie's name at the top. (*2 children with hands up*)	 P Suggestion T Control T Recap

157				
158 159 160 161 162 163 164 165 166 167 168 169 170 171 172	07:20	T. T. T. P8 T. P9 . T. Ps.	Okay, now's that's where I'm going to stop. Because if you remember the beginning of our story is only describing the setting and is introducing the first character (T counts on fingers), the main character in our story. Okay, she doesn't know it's from Santa yet (as gesturing opening the letter), because she's not opened it. okay. We're on a cliff hanger (gestures to board) and you'll find out what happens tomorrow (gestures away from the IWB). Okay. But you're going to have a go at writing your own stories (T holds up paper) Don't forget, just the beginning. So you're going to get to a cliff hanger (gestures down board) (T pauses) Okay. A stage where everyone will think. OH (grasps mouth) who's it from, what's going to happen next. Okay. So that's what's going to have? Where do you out the (...) Don't forget to use your plan. Don't forget to look in your little yellow books for your character descriptions. And your setting. Think about winter, What happens at winter. But you're going to do it on pieces of paper. That big? That's how big they are. (Various voices) YES::	T Recap T Instruction T acts exaggerated surprise stance and face P Question (Distraction) T Instruction (big paper means the work is going onto the wall) P Question T Clarity Ps positive response

173				
174 175 136 177 178 179 180 181 182 183 184 185 186 187 188	09:01	T. P14. T. P14. T. P10. T. P12. T. P45. T. T. P16. T.	But one thing you're going to do. Is you're going to use this paper (holds up paper). I'm just going to demonstrate on the (...) for a minute. You're going to leave a line in-between (gestures at IWB), because tomorrow you might want to go back and make some changes to your story. Okay. So I'm going to do some writing (mock writes on the board) okay, so my writing's just a bit like that. When I come to the end of that line, I'm actually going to leave a line. And do my next bit of writing underneath. Because tomorrow I might want to come back and think, no I didn't put enough describing words in my story. I need to write some more. So I got plenty of room to change, to put a line through my word (demonstrates putting line through mock word) and write a new word above it (...) (Holds up paper) don't give the story a name at the moment. Okay. (...) T. I want you to think of the name of your story when you've finished them (...) Okay. Yes P10 What does that say (P10 gestures to mock writing on board) (Laughs) It doesn't say anything P10. (...) It's just where I was showing you. You write on one line, leave a gap, write on the next line, leave a gap (...) So, put your thumbs up if you're happy to go away and start just the beginning of your story. (All children put thumbs up) What do we put in our story? (...)	T Instructions – demonstrates leaving a line T Writing on board whilst speaking T narrative structure instruction T narrative structure instruction P Question (Distraction) T Explanation T Question Ps Answer T Question P Answer T Question Ps Answer T Question P Answer T accept answer

189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204		Ps. T. P8. T. T. P6 T.	AND? (Various voices) *Full stops*. What else do we put in our story? Describing words Describing words. What else? Leave a space between our lines Leave a space between our lines yep.	T Question P Answer T accept (mild) answer – she is looking for grammatical answers, though this is not wrong, at right enough

20 5 20 6				
20 72 02 20 9 21 0 21 1 21 2 21 3 21 4 21 5 21 6 21 7 21 8 21 9 22 0 22	09:4 4	P7 . T. P7 . T. P2 . T. P8 T. P8 T. P3 . T. P1 2. T. T. Ps. T. Ps.	Adjectives. Um. Pardon, what did you say? *Adjectives.* Adjectives, what type of adjectives? NEXT. NEXT. What are they called? Sequencing adjectives. What else you going to put in? Use time sequencing. Yep there's time sequencing adjectives, yep. Or? (As gesturing left and right) I've got two sentences? Cliffhanger No, not a cliffhanger, but? Conjunctions. Conjunctions, brilliant. Right, These two tables here okay, you're working on your own (Various voices) OW::::: Okay for your beginning, so you need to work quietly. Off you go to your tables (Various voices)	P Answer T Direct question P Answer T Direct question P Answer T Direct question T Suggestion T Question P Answer – this is the same answer as previous, P doesn't realise so knows this is grammatical, but unclear of meaning. T accept (mild) answer. T Question P Answer – P answers previous question T not accept answer. P Answer T accept answer T Instructions Ps Negative response (this is work?) T Instructions

1 22 2 22 3 22 4 22 5				
22 6 22 7	10:13	T. T.	If you're in sentence group. You're working with Mrs Y. Okay. Off you go to your table. If your in (Miss X group)	T Instructions: Assigned to tables based on ability
22 8	10.30		Individual WORK STARTS	Camera switched off as was causing a distraction
22 9 23 0 23 1 23 2 23 3 23 4 23 5 23 6 23	43:25	 T. T. T. T. Y. T. Y. T. T. T. T. T.	*Children are seated together around the IWB* (ref diagram of classroom) *P1 name, (coughs*) *P2 name, P3 name* You should only be doing the beginning Um *P4 name,* can you get your story please? (*T click on IWB menu*) Mrs Y, would you mind getting me a drink please What would you like, tea, sugar, milk? Sorry I'm a bit (*mock cough*) No problem Right just wait a minute. I've picked the children i would like to hear their stories, thank you (*1 P hand in the air*) We'll read some more tomorrow when you've done a bit more to your stories Right. (*clicks 3 times on board*) Right	 T Recap T Distraction T Overview

7 23 8 23 9 24 0 24 1 24 2 24 3				
24 4 24 5 24 6 24 7 24 8 24 9 24 0 25 1 25 2 25	44:25	T. P1 . T. P1 . T. P1 . T. P1 . T. P1	Okay (*clicks 5 times on board*), *P1 name.* Come and stand by me. (...) Hang on, they're not listening to you. Their not listening cause they're not all sat on their bottoms with their legs crossed. (*T pause, cough*) On a cold morning Katie just couldn't wait to the next day. She was dreaming of a merry christmas. She woke up and she heard a (...). Is father christmas here already. (...) dowstairs. It was very dark. Dad what are you doing I thought you were (...) I thought you were father christmas (*over P1*) Katie wo, wo Wobbled back to bed. Her room when she came back to her room, Sh She stopped and heard (...). When she looked through her window she saw rudolf outside. She ran and ran (...) in bed. Mum, Mum, Mum, I saw saw (*over*) (...) Mum (*over*)	T Instruction T Control P Reads story T Reads Ps story P Reads story T Assist P Reads story T Reads Ps story – T Control P Reads story T Assist P Reads story T Reads word P Reads story

3 25 4 25 5 25 6 25 7 25 8 25 9 26 0 26 1 26 2 26 3 26 4 26 5 26 6 26 7 26 8 26		. T. P1 . T. P1 . T. P1 . T. P1 . T. P1 . T. T.	Mum saw nothing (*whilst pointing at the written work*) No wait look out of the window, quick, quick (...) (...) him let's goes downstairs Dad. You ate all of the christmas dinner (laughs) well done *P1's name*. Give her a clap (*All Ps clap*) Okay off you go then	T Assist P Reads story T Reads Ps story P Reads story T Reads Ps story P Reads story T Encouragement Ps Encouragement *Children have trouble reading back sentence they have written – high level of assistance whilst constructing – not language produced wholly on their own.*

9 27 0 27 1 27 2 27 3 27 4				
27 5 27 6 27 7 27 8 27 9 28 0 26 1 28 2	46:59	P2. T. P2. T.	On freezing night Katie heard Shh (*over to class*) a really loud noise. Katie got her slippers on and went downstairs. When she got downstairs she saw santa. Then she said what are you doing here. I got stuck down the chimney He got stuck down the chimney. Well done. So she left it on a bit of a cliff hanger. So at the moment he's stuck down the chimney. Well done *P2's name* (*P2 waits for few seconds looking a T before she sits down (? waiting for a clap?)*	P Reads story T Control P Reads story T Encouragement *This is a little sad - les praise although read her story better (T forgot?)*
283	47:41	P3.	(...) (*Too quiet*)	P Reads story
284	48:01	T.	(*tries to read the written work*) she was, she (...)	T Reads Ps story
28	48:1	T.	read then next bit and we'll probably work it out	T skips illegible work

5 28 6 28 7 28 8 28 9 29 0 29 1 29 2 29 3 29 4	8	P3 . T. P3 . T. P3 . T. P3 .	sad She was sad, okay, she was sad, why was she sad? she (*points at paper*) she (...)(*Too quiet*) christmas (...)(*Too quiet*) and, her mummy and daddy (...)(*Too quiet*)	P Reads story T Question P Reads story T Assists P Reads story T Reads Ps story P Reads story
29 5 29 6	48:18	T.	(...) up to christmas we get to listen to each other's story. If you don't get to read your story in the next time (points to floor). we will all hear each other's stories leading up the christmas. Alright. Off you go *P4's name*	T Recap – Focus Ps attention T Direct Instruction
29 7 29 8 29 9 30 0 30	49:03	P4 . T. P4 . T. P4 . T.	Whilst Katie was (...) one (*pause*) one one winter One winter day. that It was It was (...) frosty and cold. It was snowing	P Reads story T Assists P Reads story T Assists P Reads story T Assists P Reads story T Assists P Reads story

1 30 2 30 3 30 4 30 5		P4 . T. P4 .		
30 6			TAPE CUTS	

Appendix 8. Field Notes: Classroom observations: Field notes

8.1.	Literacy class	
Date:	Mar 2006	
Time:	15 mins	
Participants:	5 – 6 yrs Approx 30 pupils 1 Teacher 2 TA's	
Objective:	Digital media use in everyday teaching	
Context:	Whole class teacher led activity Activity: Write a story on the IWB about a recent class trip to the beach the previous week. To structure the story, T has a prepared sequence of photos taken by T during the class excursion. Mid morning class, straight after break (outdoor play in the playground). Have put coats away and gathered in front of the IWB at front of the class. T is at the front of the class.	
	Observations:	Notes:
	The application used on the IWB (built in) enables images to be placed at the top of screen and lines underneath to write (on similar to a standard exercise book for primary pupils). Navigate the images (thumbnails) from menu at the bottom.	Story making application Dynamic chalkboard – sequenced images, add text, edit text on fly
	The photos mainly show the train journey… walking to the station, getting on the train, showing ticket to the inspector and looking out the window.	The photos provide a shared reference for past events
	T elicits description of each image. Asks the Ps to remember what happened on their 'day out' Every word is elicited, led by T's questions or making the first sound of the word. Questions are asked directly, using the P's name. Children put their hands up, rather than shout out words. Words / sentences suggested by the Ps are repeated (stress) by T. Additional information elicited, spelling simple words (the, day), Grammar (joining words: and, then) and handwriting skills. Although T is writing on board, repeatedly asks the P's what he needs to remember to put between each word (' a finger space'). Whole class answer together – they enjoy the repetition, and are praised (sometimes personally) each time. When final sentence complete, the whole paragraph is read out to the class by T – verbal shadowing by P's (not necessarily whole sentence, key words) Two short sentences are produced during 15 minute activity	Digital photographs as memory prompt Important pay attention to every component in sentence structure, though not all grammatically defined Individual and group suggestions Model writing Speak with teacher (there is no prompt for this)
	T writes on board (writing is pretty shaky and low on the screen – T having to bend a little)	Pen / angle / height makes writing on board difficult (compounded by low writing skills at this level
	TAs sit at the back of the class, occasionally prompt child to turn around and concentrate, but are largely quiet.	
	The children seem to respond to seeing themselves (animated, moving around, talking to each other, pointing and laughing) in the pictures, not sure if this helps them remember the events better, but does obviously engage them in the activity.	Personal connection to media
	To get the P's attention before the next activity, children are asked to put their fingers on their nose, T demonstrates as he asks. Children are clearly used to this, and most respond quickly and are quiet – few remaining are asked by name.	
	After activity children have 20 minutes free play before lunch	
Additional data:	-	
Notes:	Teacher mediate collaborative learning There is lots of talk – though levels managed and off topic not allowed during TTT	

8.2.	Art class	
Method:	Observation	
Date:	Feb 2006	
Time:	50 mins	
Participants: (Langely)	Yr1 Class 1 teacher & 3 TAs	
Objective:	Creative classroom practices	
Context:	Activity: Art Class, make a Aztec mask from tissue and card Part of larger project – in previous sessions children have eaten and made Mexican food (corn bread, tacos, beans and cheese), played with the objects (there play space has a sombrero, a few ponchos, couple of large pieces of material with Aztec designs . This was the second part of an activity started the previous day – when the masks were started The mask were in varying state, some almost completed, some barely started At the back of the classroom there is a large display of Mexican and Aztec items – photographs of masks and ancient buildings and people (families sitting by their, largely traditional homes), flag, map, clothes (traditional dress), food, and a few simple words. There was also a table with books and artifacts (actual masks, pots). These objects have been gathered and stored from past years This is a class after lunch. The teacher has already called the afternoon register, and TAs are distributing materials as I arrive. The aim is to finish the masks before it is time to go home. The masks are intended for a display (called 'celebrations of learning') in the hallway facing the main entrance to the school	
	Observations:	Notes
	From context: larger project	Embodied learning – eating the food etc… Immersion in novel environments (through fragmented experiences)
	T gives short instructions (less than 2 mins) – they are completing the masks they started yesterday. The fact the work is destined for a display is notable (a motivating factor / reminder to 'best' work)	Presentation of work motivating
	The TAs distribute materials onto workspaces. Workspaces are tables to seat 6 – 8 children around the table facing each other. Tissue paper and chalk distributed across the table. In the middle of the table is a pot of (safety) glue, a large desk tidy with scissors and spatulas for smearing tissue paper of varying blues and greens. Also on the table are laminated photographs of the Aztec masks for the children to copy.	Shared workspace – parallel work rather than collaborative or cooperative. Resources are centralized, but little dispute as plenty of tools and materials for all
	T gives the children a restricted palette of coloured paper and chalk to use for their picture. T states that if all colours were given all colours would be used. She doesn't consider them able to deconstruct a visual scene. The control palette acts to help them will be able to recognize what they have produce bares some resemble to the original artifact. A reverse deconstruction?	Proscriptive learning – remove everything that is not useful (Restricted palette)
	The children are working from a template mask drawn onto the card, which acts as an outline to stick the tissue paper onto.	
	The children are directed to the photos by the TAs and T, but Ps do not appear to reference through their own initiative.	Learn to reference – guided to look at photographs (skills to deconstruct?)
	The children don't need instructions to work (this is ongoing), some require some encouragement to work a little faster, questions / prompts about next action ('what are you going to put there?') and there is lots of praise.	Verbal encouragement
	The children seem focused on the task, varying amounts of verbal shadowing – stating intentions (some a lot, some not at all), little of task talk that doesn't relate to materials or observations of each other's work. Lots of talk not directed at anyone in particular. Occasional request for help and additional materials	Speech - Shadowing
	The children do watch each whilst they work, the ones who describe their actions seem more focused – or – those that don't talk tend to look around (at others) more.	Onlooker – can see each others work in shared workspaces
	Primarily focused on own task, the children seem earnest in their work. Too much attention away from task is controlled by TA or T - there is	T good at not intervening – allow the child to do the

	roughly one supervisor per table, though not always commenting, children are observed at varying distance by T and TA .	activity themselves – scaffolding as much about knowing when not to support (allow autonomy within guided environment)
	The Ps actions seem quite purposeful, they appear to be aware of the goal. Many children work with complete autonomy.	Craft (glue, tissue etc) are familiar materials to work with.
	Complete masks are taken to the teacher for inspection.	
	Work is very slow, even at the end of the session 4 – 5 children have still yet to complete their masks, these are left in their unfinished state and is not considered to be a problem for T. It is more important that everyone's work in on display than the product is perfect.	
	Movie is played on IWB. TAs do tidy and (minor) completion of work to get it ready for display, as Ps get their coats and sit on the floor to watch section of film (continued through term)	End product important Digital media a pacifier
Additional data:	Photographs – final display Photos – back display	

8.3.	Science in the ICT Suite
Method:	Observation
Date:	Nov 2006
Time:	30 mins
Participants: (Langley)	Yr 2 class (6-7 yrs) Whole class
Objective:	Use of the ICT suite
Context:	Combined ICT and Science class. Using a screen based interactive digital media application (Flash?) to investigate the properties of different materials Classes are scheduled to use the ICT once a week (or more). It is a familiar space at this age.
Observations:	When coming into the class the P's quickly sit down and start clicking. P's individually seated at a single machine and given instructions by T to open a specific (physics flash game). Game. Purpose of application to select material (rubber, paper, metal, wood etc), place it in a virtual grip and test it for elasticity, absorption, strength etc. Very colorful, cartoon aesthetic, single screen, lots of audio feedback (clicking on items, moving, manipulation of materials), direct manipulation in click and drag UI. T has to repeat instructions. It was difficult for T to address the class as a whole – T had to repeat requests for attention and address P's individually to listen to what he was saying: initially because the computer proved to be too tempting and the P's wanted to engage straight away without waiting for instructions. The P's clicking making it obvious they're not listening. The orientation of the screen against the wall meant the P's would turn away from T, it was impossible for him to gain eye contact with the pupils and cohesion with the class seemed to be lost. To gain the P's attention, again, it was necessary for T to address the P's individually – " John will you turn around." "Emily stop doing that, and listen." Once the task had begun, there was very little dialogue between the children, and teaching tended to be more of an individual process with one-to-one assistance from the teacher. Difficulties and questions arose from using the application (difficulties clicking, selecting items with old roller-ball mice) rather than in understanding the virtualized task. T monitored, responded to requests but there was no scaffolding of the task. T considered this more about familiarizing the children with using the computer (screen, keyboard and mouse) than teaching physics.
Additional data:	Diagram of suite
Notes:	In addition to the IWB and laptop, there are 3 computers in their classroom, used on a daily basis by the children, using in pairs. This is an opportunity to have the computer per pupil. The children are expected to be quiet in the ICT suite & this was very quiet class No TA Seems a very impoverished experience – cognitively and physically dissident from the conceptual

	aspects of the task (testing physical materials). Mode of interaction far removed from task – however the focus (according to T) is too familiarize with the IT, the task itself should be educationally orientated but is not the primary focus in this task
Summative:	Engage the space with the screen – connect virtual and physical Link - The observed impact of shifting teaching methods from a lecture scenario to individual instruction was one of the significant outcomes of a recent report of technology in the classroom. Task physical and cognitively dissent – no evidence of talking about the science task, only technology task (mouse dexterity) Void of social engagement – task or off task talk. No verbal shadowing, There is no eye contact – even during direct communication

Appendix 9. Open discussion of IT in teaching: Field notes and full transcription

9.1. Field notes

Method:	Open discussion
Participants: (Various)	Katina 3 Teachers (2 SEN and 1 Art in Primary Sector) 2 Practitioners (Film & Photography)
Objective:	Attitudes and application of learning technologies To discuss recent collaborations on digital media projects Draw out challenges for using digital media technologies in everyday learning (particularly the use of the IWB)
Context:	Film practitioner had collaborated on 2 projects – 1 with the primary school (involving the art teacher) and another at an SEN school (with small group aged 14 – 16 yrs)
Observations:	(See transcription)
Additional data:	Video (Transcribed)
Notes:	The technology is far from perfect – uncomfortable for eyes, shadows with multiple moving in front. The training and purchasing managed through 'informed' members of the teaching team – these are the gate keepers (as Natasha) – need proactive teacher to move this forward. Primary schools can be at disadvantage here, secondary schools will have ICT subject specialist (as with all subject areas), primary schools may acquire knowledgeable member of staff,, but do not have subject specialists, they are primary education (or sen) specialists IWB and mouse and keyboard only interaction modalities Need to really understand technology to start to be creative (but can be creative with limited app… soundscapes in PowerPoint)

9.2. (a) Transcription (Tape 1)

Time	***Transcription***	***Notes***
00.00.00	M1: (…) it's that on the page making.. write things up on the board and then you can save the page and you can keep saving it for projects like that K:So is that one of the ways you used it in this project where you have this - well okay then here's the story board we were doing last week, we're going to think about what we're going to say in this scene (…) M1: Yes. We mostly used it really with power point (…) to do that sort of thing K: Right M1: But then you would show it up on there and they would have interactive stuff with a pen and, we'd scribble you can scribble on power point and save those so	
00.00.30	K: So you think that's one of the most useful features, the fact that I can just draw straight on it and that gets saved? M1: **Yes, you save all the comments and everything on it then. You save lots of things on that.** K: So I'm just wondering with the annotation quite to be to just make notes. And you M1: That makes a lot of difference it's instant. Y'know, if they say something about certain things you write it on there. Or they write it on there and save it. It makes a lot of difference.	Random documentation – grab data on fly
00.00.60	M1: it's instant. You'll not forget it. K: Do think it works well in terms of sort of teachers in classrooms. Do you think that the fact that I can use the touch screen as opposed to - if I'm when I'm lecturing at Uni I've got a laptop and and on the other side of the room and I'm sort of voice of god in the dark, y'know. They can't really see me and if I want to go reference something I'll walk around to the front and point to stuff on the projection screen. It's this constant little back and forth and I'm ..and I wonder with the interactive whiteboard one of the benefits of that	
00.01.30	K; is you're situated right the front of the class and (…) I can reference things without having to turn my back and go over there and back and just break that whole flow	

	M1: That's right M1: **What I find useful is I've been recording my voice, like a voice over, and comments and saving them onto power point on the screen. So you got stuff on there, and you can just touch it and it speaks.** K: Aah that's interesting. M1: **and it speaks and gets their attention … they are quite useful things and you can get … we have scientific and animal pictures on the screen doing ….and all this sort of stuff**	Leave sounds in space – Powerpoint soundscape > useful for SEN Focus P's attention
00.02.00	M1: ...to get their attention collect sounds and that sort of thing, collect animal sounds put them down on the power point and that sort of thing K: and you attach to the W1:...and they can have their voices M1: Yeah that's right we do that... we did that on the week of responsibility lesson a couple of weeks ago and we had Rachel's responsibility so we make a speech on the screen and you've got a picture of Rachel on the screen doing this and all this sort of stuff.	Media voice – generate and express: as drama, set scene for discussion
00.02.30	M1: and **all those sort of things really gets them involved** K: An electronic voice? M1: Yeah All their own recording K: ah recording M1: I had a chap in yesterday and he came in and talked about indecent phrases and y'know how you deal with that and that sort of thing so got him to record his voice onto the computer so that we've got that now and we can make a little display and have his voice speaking stuff with the activity all that sort of thing W2: makes it more real.	Audio recording – used as prompt
00.03.00	M1: Yes....and you can just touch it and remember when he came in and all this sort of thing,,,brings out...and they remember it much more W1:You could use it with widget then could you? She says not knowing much about it M1: working with symbols W1: W2: what's widget? M1: It's basically a words and symbols programme W1: Symbols M1:.....You've got ...and if you type in cat a picture of a cat comes up on the screen as well W3: : ahh is that quicker? For use - similar M1: It's a bit more involved W1:....or used for synonyms W3: we're not that far advanced	
00.03.30	M1: **every word will come up as a symbol if you want it to so you can just have symbols or you can just have words or you can have both and you can get them to speak it and stuff like that. So we use that so we use that a lot on the whiteboard** M1: More or less every work will come up as a symbol W3:...So you could that Do that as a....some sort of W2: what of – it wouldn't be the case in the Forest - multi lingual group of children all speaking different languages if it was visual they could understand much better. M1: Yeah that's right Multicultural teaching W1: mm mm	Assumption about visual language transcend cultural / linguistic ability – symbolic UI
00.04.00	W3: That very interesting..... so much potential K:..... W4: yeah W1: Yes they are going to be used in the displays don't we outside K:....Close to the wall ...it's like a digital version of that M1:Yes	
00.04.30	K; and that's just something you developed in power point not an application that come with... W1:what software did you use... M1: the microphone.... a free download W1: M1: **And it's quite easy to use straightforward and it's free just stick the microphone into the computer and just talk into it.....**	Innovative when understand whole work flow – easy when you know how.

	especial those that don't speak very well I've got one that y'know makes noises and he will talk into that rather than you	
00.05.00	M1: because he's not looking at you W3: Can you scan that document and put it on the whiteboard and somebody reads that document? M1: Yeah if you wanted to saving the main file and putting that up on the screen and you then can touch it and make it speak at the same time quite easily W4: ...sorry I know that I've been out of it...come back in something that we talked about right at the beginning with Lorraine...	
00.05.30	W4: .....was possibility of using video conferencing so we were talking about her delivery lessons not being in the classroom so very similar to what you were saying about focusing on screen …..and we were talking about doing that but it didn't happen...it would be a really interesting was of using it M1: I'd love to do video conferencing. I've wanted to do that for some time haven't got the kit for it yet.	Video conferencing
00.06.00	W4: Yes but you wouldn't necessarily have to use video conferencing to do that because you could just record yourself K: It's quite nice - One of the joys of doing that kind of networking is the response with kids. I've seen once they realize they can go like that (wave)and the person the other side will go (wave)...that's the real moment of magic you know what I mean to suddenly...it's interactivity M1: ...in the classroom in the past a little bit	Ideas – difficulties in achieving – the 'right' equipment for all parties in VC
00.6.30	M1: ….. but it would be nice with other schools K: Yeah yeah M1: yes...your son was in France last year and we could have linked with that school he was in and we could have talked to them if we had the facilities K: There's kit for it ...you're just looking at a couple of webcams really as long as you've got a decent broadband connection W1: We've got web M1: We've got web cam W1: I think the problem was their end with that, as well they didn't have the kit	
00.07.00	W4: Have you got links with schools M1: Not really no W1:....with that, at the time my son was teaching in France so M1: it would be nice W1: there is a link apparently with a school in Africa M1: In Gambia somewhere is it? K: So we...rolling out in a couple of weeks so we'll just use it...using ichat with like a ...or ….which is an open source...content management..and that' s got a shared whiteboard	Networking between schools – interest in linking to other cultures
00.07.30	K: So you have the video conferencing that has the chat...sweet little features for the kids, and then you've got shared whiteboard where they can all draw into a shared working space just to see how they can develop. It's kind of experimental work to see if they can develop connections... communicate across this network of course this something work when they are so small and I think just by seeing someone ..I find it a bit creepy when you see somebody,	
00.08.00	K: drawing on your computer M1: Yes we had that before we had that before W3: M1: we used to have a programme we haven't got it anymore for some reason...synchronize... and you could actually see all the computers in the school and I could actually access anything on the screen and write on it.....	
00.08.30	W1: Oh yeah he had lots of fun K: Of course they can be quite useful when you've got to help people and you don't necessarily get invited M1: that right K: I can't M1: if we are all working in a group ...in an ICT suite and you can see what we are all doing you can call one up and say look this is not quite right bla bla bla and use it as a teaching aid K:But it's such a hard thing to ...press the button what's the button y'know what's.... M1: That's right .	Networking fun
00.09.00	W4; I'm using a piece of software at the moment right, where that um, such a geek, that's exactly the same thing I'm actually working on my	Linking from remote places is 'weird'

	pc at home through my laptop. So Duncan's at home he'll be able to see me typing on the screen when I'm not there . W1: It's weird W4: It's really weird. But it's free you can try it it's called log me in W1: So what advantage is that? W4: I does mean you could..I could..if I was logged into a laptop in a school just up the road, I could actually	- unnatural state
00.09.30	W4: be typing something W2: Communicating with them W4: Yeah. You can do that in loads of different ways. Like you can have a whole network...like you were saying M1: That's right W4: I'm just accessing it over the internet W2: and you wouldn't have to fly off to New York or whatever to work in a school ...to conference with each other W4: Well that's there are so many pieces of software	
00.10.00	W4: you can use to do that kind of thing like really simple..Skype for instance are also so great you could use that K: I don't know...actually be able to set that up...it needs a nice clean clear picture there's a delay M4: yes a delay K: and it's can just crash , it's not very stable. I mean you can get through, it's cheap, but not very robust	
00.10.30	K: So the other thing I was interested with the - particularly what you did in..the whiteboard to use with this idea it being used as an environment where more than one person can work together cos there are not that many bits of technology I think that can be used for collaborative activities. And I think the the whiteboard lends itself to that...a bit more the same ..y'know a pc more so than a single monitor	
00.11.00	K: So was that something that obviously you use you could use in SEN do they tend to work together and W1: **Yeah we do oh definitely and it is a good way of differentiating as well isn't it because the material you have on the screen usually means that everybody can access something and again that's very important . So yes, it is used as a group activity** K: do you think it ..I could sit 4 kids around a piece of paper and get them to draw something	IWB enables multiple access points
00.11.30	K: **do you think the whiteboard itself would encourage more collaboration than using other forms of media?** W1: **Oh definitely. I mean you give ours a piece of paper and they could sit for however long and would not have interacted with that piece of paper at all, whereas they are all very keen to press something...** M1: That's right K: What about sort of with each other so the technology and W1: I'm just trying to think of those	Technology asks for engagement? Encouragement interaction
00.12.00	K:... One person working up here and .somebody else will work down here it's just that its a very large display and will support more than one W1: What do you think? when you use yours? Ours work together quite well. M1: We do a lot of paired work with them. K: Is it a harder thing to achieve in your area? W1: It depends on the mix of the students y'know how many autistic students we've got M1: They will not, they will not want to work	
00.12.30	M1: with anyone else. K: Right W1: Usually but having said that, our..I've got three M1: **You can pick and choose various pairings, for example ...and they will work together quite nicely Because they, they're used to that sort of thing. You do need to be very careful who you do pair in our situations...there is sort of friction. A lot of them will not want anybody else touching their work/** W3: And some like to be the teacher.	Not all learners (SEN) are able to work together T's manage P collaboration – not all collaborating is positive
00.13.00	W1: **We try to sort of harness their enthusiasm for that because if you've got one, a student who has a behavioural problem for example but who is really good with IT. We make then make sure that, that particular student does some the leading, and they feel very important then and then y'know you don't get so many of the behavioural problems and then others can come in** . M1: Yeah that's right W2: As and when W2: Do autistic children	Harness enthusiasm (IT as motivator) – focus for those with behavioral issues. Empowering for these learners – can teach others
00.13.30	W2: ….**communicate better through technology because it's not so personal**? W1: Oh yes	Disassociation with media communication – lack of personal

	W2 : So they can communicate at a distance M1: That's right. Well they're not reacting with anyone else, reacting with themselves, rather than – a lot of them won't want to talk to you and they won't make eye contact W2: But you can never....communicating with and you're at a distance through the medium would they prefer that? Either you're not there in body you're there....	means it a more useful means of communication
00.14.00	W2: only at the other end M1: Yeah a s a facilitator yeah but you are I mean they would learn more using the software and using interactivity themselves rather than talking to anyone, a lot of them. They get a lot more out of that sort of thing because they will not see it as a threat W2: Yes W1: I mean, I would say that for one particular student . I think he's become more social through the experience.	Teaching other peers – enable the development of social skills
00.14.30	M1: That's right. Oh yeah definitely that project K:.... confident with the technology has given him a sort of M1: **Comprehensive Interacting with other students rather than just being focused on what he can do. Its made a difference for quite a few of them with their confidence - we've have interacting with others...** W1: **And he will present what he has done, which is something, so he might be presenting to a group**	Teaching others is a route to confidence – needs to be in a comfortable context (Directed by T, Autistic prefer present to group, than 1:1, less confusing feedback – just present don't clarify)
00.15.00	W1: (…) **then - so it's not one to one, which is more challenging for him but** K: Oh really? W1: Yes. But he would actually - he is much better at presenting now, the same with Adam M2: Who Jake we're talking about? Yeah well he would get up in front of a crowd and talk (…) was better than mine wasn't he? He's very very articulate. K: That's it - for anyone else it's a stressful situation W1: Yes but we actually found several students particularly. Adam who has left was amazing	
00.15.30	W1: when you think Since September I am finding this one particular boy who's really come out of himself and had started I think through this process K: Oh really. Had anyone identified, before about that process enabled that to happen? W2: **I think he felt really valued** M1.: Yeah W1: Y'know, which again, I think it's difficult for autistic students to feel that and I don't know how K:. more (…) necessary M1: Part of group as well	
00.16.00	W1: **Yes he has become more in a group, I mean I'm not saying** (…) **he would still choose to be on his own. But I think it is easier to include him in the group situation** M2: I think we were having project meetings every week weren't we? Every day as we were doing it (…) changing it a little bit more...and that was happening in front of the participants M1: So it's very...variety we kind of change what we are going to do daily more or less to..	
00.16.30	M1: (…) accommodate what we thought they needed and what they thought W1: And what they came up with because things would come up all the time M2: That's good K: It's quite nice to be flexible W1: Oh we're very flexible M2: Yeah you have to be K: So apart from this technology not being specially for autistic children (…) apart from the technology not being threatening - is there anything else about I mean do you choose the specific type of software you use with them is there anything (…) about the software or the system itself?	
00.17.00	M1**: I tend to use a lot of framework software it's stuff I make myself to use. A lot of the software you get isn't that really that suitable unless you actually amend it. But the framework software they are (…) when you create your own - you've got that haven't you? And Smart Notebook where you can make your own pages and various pieces of work.** K: So is this like an authoring app?	Authoring
00.17.30	M1: Yes , basically yeah (…) software. (…) this is **much more valuable in a lot of ways than the pre-made stuff.** K: Yeah.	

	M1 **Because as you can adapt it to what your needs are.** **W3: You make it more specific.** **M1: That's right. Yeah, and you often find that special needs software is much too difficult in lots of ways and lots of disputes. You have to amend it if you can.** K: well the activity can be simple but the instructions.. M1: That's right.	
00.18.00	M1: Yeah. So I tend to make a lot of my own resources. K: What sort of resources? M1: Well I use **power point** a lot. K: OK. M1: **And Smart Notebook a lot and things you can put everything into it – sound, interactive movement and all that sort of thing. And video you can put videos into power point as well. Yesterday we were doing volcanos and they were on the internet**	Media production tools
00.18.30	M1: **and we got some avi files , video files and put them in. So you put those into power point so you can see the larva coming out of the volcanoes and all that sort of thing. They love all the interactivity so it makes a lot of difference** W1: (…) M1: well they are in my classes, extremely (…) K: Is that similar to the way that you W3: **Its very similar but we are using more internet but what I find the trouble is the Government has all this software, with all this technology**	Create materials – interactivity to show events
00.19.00	W3: **but no training...and most of staff are not familiar or are afraid** M1: **You still find that y'know people say oh teachers must know a lot of technology but you often find that they don't have the time** W3: **A lot of the time we pick up things by chance we get something thing we want and then we can't remember how we got it and we get frustrated** W1: And also with us we had a situation where we had training with you. This was before our school, as it was, closed. Then we didn't have the	Barrier: Lack of training, time to practice new technological skills Feeling pressured Learn by chance
00.19:30	W1: **We didn't have whiteboards so we weren't using the training that we had had. So by the time we had the whiteboards we had forgotten it, y'know.** K: Yes W1: **So anything now I think, more or less, I've picked up from you, or I picked up from what the students had already done with Stephan. The students teach me** W3: **We just learn from each other** W1: and we will have some more training at some stage W4: So do you think like that this project could have been a much better way to go than...training so instead of it being a one day course where you pay like	They forget because they don't use - training before the kit The learner knows more (this is troubling for a teacher – nothing to offer, produce feelings of low self esteem and low professionalism
00.20.00	W4: **£300 quid for a day working out how to use the whiteboard would it be better to spend the money possibly with, I don't know...an artist or someone to come in and do a small project** M2: Skills for W4: More appropriate way of W3: **It depends on the age group I think because if you are talking about secondary older children you can actually learn the skills while they are doing the project. But for primary children you have to give them the skills first**	Different type of training for T depending on learners – younger skills first then applied, older learn on the fly
00.20.30	W3: **before you venture on the project because what we found when we were doing it we were fumbling – if you had somebody in school to who knew about ICT and show us how (…) over time printers working everything. The problems we didn't foresee at that time and it was quite stressful. We found. Because we weren't sure how to**	Difficulties with whole work flow – when things go wrong
00.21.00	W3: **browse documents into the programme that we wanted to use and he managed and do that. So it depends on the age of the pupils, of the students really.** W1: I mean, certainly, through the project that we did I suppose the skills were introduced as they were needed, for the project, weren't they? That was the thing M2: Yeah yeah I **think we started off with the process of making a film, and then we went to little pieces ....one at a time**	How to break the production process down – project work do reveal aspects they hadn't had previous considered – threw up challenges
00.21.30	M2: and I said to them .... **have a little play around with them** M1: This was at the beginning. Yeah we brainstormed a project that was far too big M2: **That's it... you try and discuss drugs and alcohol...no you can't actually do that. In a day I mean . weeks and we need to do little bits at a time and trust that eventually..we would...and at some time during the project they would go aah..**	'Play' with aspects of the project – get to know the components Conceptual realization – threshold concept

00.22.00	M2: ...and they'd get the bigger picture and understand how the process how the product was going to get made, while making the product. What the, you know , the aims were, y'know, to try and deliver all that lot in the first session was impossible **so we just got the cameras out and had a bit of fun**. **Introduce each bit slowly** W3: I find the best way of doing this, is the hands on to start with and then find what problems there are M2: Yeah K: What....you did the mark making	Project over time Fun / Play is a route to deliver complex skills over time – get comfortable without risk (autonomy)
00.22.30	W2: Yeah that was all integrated into the whole project K: I just wondered coz you came in with something that was technology based and you used the technology in that way where as yours is a lot more of mixed media W2: Yeah W3: It was harder to to know how it could get involved in doing it and then there was more using photography - using a camera to pick up the images to and then import into the whiteboard ...and then interact with them. K: Were the teachers familiar ..	
00.23.00	K: ..enough with the technology W2: Well It was good having the TA W3: Sue, Sue she's not a TA but she was very good at computers.....these are some of the photographs that we took...so we started with visual first with the with the young children, can you read them through it, that was the introduction on the island W2: Explaining a bit It was to do with an Islands	
00.23.30	W2: so it was M2: Islands W2: **I set up an installation in the hall. Which it was like water, sand and stone. So that they could imagine ….and they had sound effects of seagulls and rocks and water and waves and they shut their eyes and lay on the floor.**	Creation of physical space (tangible objects, smells, sounds) – mixed sensory – setting the scene
00.24.00	K: Lovely W2: **They were really good. They really seemed to imagine themselves into the situation** . W3: But we had to give them that stimulus to start with. Other wise it would be difficult they are very young children, very difficult for them to imagine. You almost have to give it (…) with music K: and are these new processes for them? W3: This was, that with the paper mache that was the art part.	
00.24.30	W3: **That was the art and then with that we mix the technology together with the - and put it on the white board – the photographs were put on the white board and when you play it the images so on the island they could put** M2: W3: So that's the art bit W1: Lovely K: Its the kind of thing I was doing in a workshop yesterday and I realized the kids I was working with had only been in school for a few weeks and I realized suddenly that	Broadening the concept of mixed media
00.25.00	K: they can't...they had done stuff with a sound board...where they've gone and collected sounds so they were used to making sounds from things that they had seen ...and I was trying to get them to make sounds from nursery rhymes. But they couldn't take what they had understood in one context.. I suddenly realized that the whole design issue of metaphor completely breaks down. You just can't rely on them to transfer a set of skills from one situation to another.	
00.25.30	K: They have to see the whole thing all over again. W3: sometimes when we start with the new year ones… find out where they are M1: W3: Those were all the practical things and we needed it to be able to do the.... site W1: Because we had model making didn't we?	
00.26.00	W1: On one of our things...it had a cartoon element. M1: Yeah that was very good wasn't it ...we got Adam to do that W2: And Nathan. **That was one of the things we had but then there was the time constraints – but originally our thought process were (waves hand over head) way over there** W3: It was the same with us M2:I don't know if you guys have seen the whiteboard	Scope projects through experience -
00.26.30	M2: animation... I've got it on on my laptop I can show you actually. It's really really good but its… and I don't know how many months it took	Find ways round (viable route to

	the guy to do it..but software animation drawing something - taking a little picture and drawing a little bit more and take a picture and draw a little bit more ….and so I introduced that for one of the weeks… and they said “yeah that's really good let's do that” ...and that would take us about well most of next year .in school ... **so I've got a way of cheating (…) how we can do this a different way.**	solution – though there are better tools) – this is mutual adaptation?
00.27.00	M2: So we didn't quite do it the way she… maybe looks like K: I had a video camera connected up to the data projector. I had it on a coffee stand so its on a (…)facing down on a background image and I gave them the characters in the foreground image - and as they were saying the nursery rhymes they had to move the characters around the scene so we made a series of short films.... And you could see their hands but I liked the fact that that you could see their hands and making the noises and they did it.	
00.27.30	M2: It's the same as in this whiteboard animation at times you can see the guy's hand come over with a cloth to wipe off the bit that he doesn't want and you can go back in and you can see the sunlight coming through this window and going across the board as time is going past as he’s....and stuff W2: Ah that's really good W3: Again that took ages because some of the children didn't have the cutting skills they just knew from reception	Little touches can make a difference – what appeals? This could be an irritation for some.
00.28.00	W3: **and of course we had to have all the TAs ...and having found that doing the project were three (…) we were short on resources TAs as well. It was very tight We had to go and borrow TAs some from the junior section so they weren't very happy about that. So there are issues to think about. It takes time.** W1: Did you not sort of think, as I would have thought of - that this is also my literacy project? W2: Oh yeah and Geography	Extra resources with new projects are a strain
00.28.30	W2: and they got on the internet and looked at different islands across the world. W3: **We found really, that was after the SATS year one and year two... so after that it was stressful for us because again everything had to done very quickly we had about a week to finish it and we finished the island but not the books so. We made books as well** . So we had literacy…	Hasty – no time to digest (*Very sweet books which document the design process*)
00.29.00	W3: Geography. Then looked at Amoebas, looked at ….as well W2: Numeracy W3: and art W2: and history W1: brilliant W2: and then originally.... the idea was that everything that they did would be recorded in a book that they made so it would be bits from the whiteboard, actually y'know as photographs in books, and they made the letters....	Cross curricula work
00.29.30	W2: …. on the screen interactivity on the whiteboard. W3: The parent involvement as well they came back with information about islands and volcano M2: Is this for the book? W3: they're sweet.....we had things like you know things like cutting up letters W2: **it took so long** W3: Especially when you are cutting it looking through the magazines W1: you see this would be done... that would be a weapon W3: Maria we had to think of things like that	Learners need time to produce – active learning / production is a slow process
00.30.00	W2: that just comes as second nature doesn't it W3: Again that ...window ….is using a craft knife… so we had to think about that, ...all that when we were planning we didn't .. W2: We only had a week before hand to discuss what was printable K: I think you really need to go through the project don't you and then you find W3: Yes K: when you're trying for that.....not really W3: that was Sheila's ideas y'see	
00.30.30	W3: Made for older children W2: The children did do these W3: They did W2: .they were beautiful but they did mono-prints and actually that wasn't difficult to do ...cos you fold it in half and they just M2: …. W3: That. We had to discuss about that… how are we going to do it? M1: I'll have a look W3: They really enjoyed it they got a lot out of it. We didn't actually have enough time we didn't finish the book	

00.31.00	W2: No I'm not surprised it took so long W3: and some of them took them home to do finish it with their parents W1:...have a look at what you did W3; **It's just that if you don't get to finish it you haven't achieved....which I think is wrong...the children...they have had that experience that we can give them a lot** K: Do you think you can see a marked difference in their cutting out skills M2: (…)	Closure is important – sense of achievement in finished product (Not just process)
00.31.30	W3: The children that were ...last year have gone up with the year group W2: Purely by chance... W3: (…) W1: What was the name of the (…) W2: The sound effects from the island W1: So how long did you say then W3: ...factor	
00.32.00 - 00.32.34	babble	
00.32.34	K: So the white board that Sheila did W3: Yes they were photographs that was how we used it K: and what was the purpose M3: we ended up (…) and that's how we used it	
00.32.38 - 00.35.34	babble	
00.35.34	W4: Shall we go and have some lunch?	
00.35.35 - 00.39.32	babble	
00.39.32	M2: Take 2 W3: I know you do wonderful things with them so much wonderful things W1: Because very often (…) because you're more like a special school in the fact that we can manage, because the kids know us well….with the same tutor, probably because we can manage and once they get to secondary	
- 00.40.39	babble	
00.40.39	Wt: Support that's for very severe cases but otherwise, otherwise not. We've got children with cancer. .. is This all new to you? M2: Actually only just come into the conversation so....with the camera W3: Yeah, yeah. There's more … as y'know	
00.41.00	W3: there's a lot of special needs children in the Forest belt I suppose nationwide, nationwide and the ...schools are not getting any better are they? W1; As I say it really depends on the child W3: the ...recommend that boys parents go to the Arial school just to have a look and ... won't go.	There are broader concerns – technology is a minor priority for many i.e. accommodation of more diverse learner in mainstream schools
00.41.30	W3: and the boy can't cope because all the kids or which ever stuff they use and ….they don't follow them onto at secondary school ...they'd rather stay in primary school because again they...tap into other issues..they have to have..I suppose ...but the boys especially they have to have I suppose their pride isn't it? W1: Yeah	
00.42.00	W2: Do you think there are more children with special needs? W1: Well it's because of the inclusion policy. You wouldn't have seen them before, because they would have been in special schools. Just as, y'know, our school closed however many years ago - because the number of students on roll were increasingly dropped. Because those students were being sent to mainstream schools and many of them - perhaps they were fine, but many weren't.	
00.42.30	K: Is it partly because they are getting better at supporting them?	Perception of better support

	W1: No I think really it's the fact that y'know that there aren't as many special schools. M1: (…) schools W1: Which was a catchment M1: (…) W3: . (…) close you down W1: When I went to interview in 1994 at Dean Hall I can remember asking that I'd heard in the press that this school is going to close down and I was told that ..."No way will they close this school"	challenged (*Re-check tape – this important?*)
00.43.00	W3: No. We were hoping they wouldn't because we do need you, y'know places like that in the Forest. Its too far for them to go to Gloucester. W2: I think what happen was our school went up the list y'know and another school..didn't	Schools faced with closure
00.43.30	W4: small print W3: Do we have to sign them? W4: No K: These are the notes I made after I spoke to Elise ...and you had given her all the stuff that you had done and I went through the data list....a few work pads in there W4: Yeah there are work pads in there, all evaluation questions we did all the feed back from the (…)	
00.44.00	W4: the evaluation sessions that you did, so (…) K: These are actually some notes I made - and what I thought is - some of them are going to be wrong I expect that (…). So maybe if you could sort of say what you agree with , what you don't agree with. What you'd like to add. If you could do that. And I think I have sort of focused on primary, I haven't included the SEN aspects so much… so there might be more ...you could put in on that...And I think the idea is with all of this material is to …	
00.44.30	K: … develop it with , sort of ..a couple of case studies that were done....project in the schools and then develop that into an online resource ...just documenting the process you go through… and that could be quite useful especially from the discussion this morning about - Once I know about that process I can start thinking about other things I can do with it. We can document the process that you went through because then maybe after that (…) as an example for other people and then y'know maybe they can add bits to it.	
00.45.00	Even think about like setting up an online learning environment… something like that… that is an environment that you can take off the shelf – store online and put all this information ..it comes with it forums, logs, W4: Or places like, I don't know what it's called but there's websites like to teacher.gov W3: Is it a DFS? W4: Yeah	
00.45.30	K: with the focus of trying to bring together practitioners and educators in a way that is kind of fruitful for both parties really. Obviously (…) on interactive whiteboards and restrict yourself to that	
00.46.00 - 00.48.33	mostly silence	
00.48.33	W3: Do you want us to... K: I thought we'd just go through it together actually and if I make the changes. So do you think there was any more other purposes to the evaluation that we can add to this in terms of that first bit. Evaluation.	
00.49.00	K: Or maybe ….from your prospective why did you - what were the meta reasons for getting involved in.. M1: Well certainly for me it was to produce a **user friendly age appropriate resource at a level that my students can cope with** … M1: Yeah W1: really. K: Yes it's about having control over the...	Motivations for engaging in project (*had recently been involved in film project*) … User friendly Appropriate tech
00.49.30	K:.....learning material that you create.. so they are suitable for SENs. W1: **And y'know and a… fun... resource** M1: Yes K: Do you have any other motivations for (…) apart from (…) motivations..?	Fun
00.50.00	M2: I judge .my other projects by the participants – just want to get out of it I was just talking about a project with the Lido and unexpected outcomes, you know things that go beyond your expectations at the start little bits and bobs which …you can get hold of it (…) Which is how I evaluate my projects	
00.50.30	M2: I suppose that is the first half of the sentence ' the application asks you to critique the process. That is in relationship to participants I take it	

	K: Yeah be quite interesting from your perspective, as you see it stretching your remit – not remit but your practices a bit will enable you to involve more activities otherwise you could be doing just one type of thing… slightly different dimensions	
00.51.00	M2: Well yeah for my own… for me I've got to be interested in what I'm doing. So obviously if its going to be repetitive then I won't be. Obvious this is all about interactive whiteboards and I don't even use the interactive whiteboard. Once. Before this project so . K: Would you use it again? M2: Yeah I would do obviously the schools... K: I know, but if you had the money?	
00.51.30	K: for resources like that as part of your kit? M2: Yeah it has obviously to be a bit different than it is now. It's too big K: … large screen M2: Yeah that would be great that would be really good cos often I'm restricted, my projects are restricted to how many people I can get around the laptop… a film (…) editing projects on my laptop (…)	The big screen is more useful than IWB – in current context
00.52.00	M2: … everyone gets really excited but… six to eight people...its a bit more inclusive. So **I'm always struggling with that how many participants I can get involved with the projects. With your school 16 I had, 16!** W3: Yeah yeah M2: **So that was a real juggle. Actually most of …**	
00.52.30	M2: **...my time in schools is spent in logistics rather than actually passing on my skills** W3: Hopefully it won't now. M2: Yeah mostly.... when something in a few years time maybe when something is beginning to...be part of my arsenal would be great it really would K: Yeah I think that especially when they are **multi touch** like the whiteboard boards M2: Yeah absolutely	M2 practitioner comments: time spent managing logistics (*echos my practice*)
00.53.00	M2: Amazing to have – y'know oh what do you call it - when you get a group of trainees together and you have a brainstorm. That happening all the same time on the screen everybody putting in their y'know their five pounds worth… y'know worth at the same time... be fantastic to see K: So like a large table top devise we used to working.. M2: Yeah that would be nice.	Multi-touch is a dream
00.53.30	W3: Maybe should develop that M2: Yeah quick someone make one M2: Yeah so just the participants really W2: The same thing to interact so many children at the same time W3: Both the experiences are different. We're used to work in the children's (…) we used to (…) demanding up front in your face role ..	
00.54.00	W3: ...all the time we don't somehow you don't, you take it at face value. You do it every day K: Good for the kids, I think, to… to have… W3: An expert, an artist W2: And to have - **the marks they make translated into a, something that looks so professional – technological** . W3: So we need somebody an outsider, to come…	Gain from working with practitioners – work feel more proud of
00.54.30	W3: … in and say this is art, because when you do it with us - it's cutting skills, it's using paint and it's not art. K: I think obviously the whiteboards... I think W3: Still the human resource K: Still educator and practitioner W4**: and it kind of enables that experimentation because you don't feel worried cos you're doing it as a kind of** ...	
00.55.00	W4: … **team** K: Both sides think that I think W4: D'you think it's very different… that you had time to plan or time to… each other - Initially W3: **Because a lot of the time we don't have time to plan. Its good to sit down and talk through what we are doing and amend it.** W2: We still could have had more time W3: Oh yes, yes W2: But that could have expanded W3: But for David to come in, Ben is very good..	Reducing the risk
00.55.30	W3: ...at ICT but for you to come in - they look up to you. You're the expert not Ben - he is the other teacher… so they actually enjoy having you there as well M2: Its the same with (…) more time to pass on our skills to Ben (…) to be honest we do it much better. I don't know if it's the ratio of	

	teachers to children or (…)	
00.56.00	M2: ...just the way you - these two guys work. It's been really good in that our evaluation ended up with a whole list of things we wanted to do. It wasn't narrow in any shape or form was it? We left here with a massive piece of paper...wish list ...it wasn't the final ones.. we wanted to do which was a really really good way of working, Not a way of working, I've done that many times where...	
00.56.30	M2: **...many projects - teachers leave you to your own devices and you run your project and you feed back at the end of the day – maybe feedback at the end of the day it's at the end of the day – maybe it's at the end of a week...maybe it's the end of a project But with you guys it was everyday through the day we were being matched to each other...and it was changing and developing so it was all ways stuff...projects ..cos sometimes..**	Practitioner comments - getting staff interested – keeping informed during iterative changes
00.57.00	M2: ...**when you set up what you want to do you get these stepping stones and all you think of is getting to next bit and ticking that box and then moving onto the next one and sometimes you miss all the opportunities that you pass on the way.** W3: That's what we didn't do. We just went on didn't we? W2: **Just rolling on… like a cycle rolling on** W3: In fact we should have some stop thing – the children can't do that – just focus on it that's one thing we didn't do so we are learning. **Don't move too fast**	Working through challenges one at a time (*why above comment important*)
00.57.30	K: Yes W2: Trying to get everything done… weren't we? K: I feel so sorry for those kids, Come on hurry up move a bit faster W4: It's interesting; I said right from the start… the platform that I said was you can do what you want and your ambitions (…) are kind of so massive. I mean you could if you wanted to decided with the year 6 at Forest View you could have decided right that whole week, I'm going to intensively spend the whole week…	
00.58.00	W4: … with six children. And that's what we're going to do and that would have been fine. My only criteria really was that you try and incorporate the use of the whiteboard as much as possible and… M2: **Thing is - I didn't have that option** (…) W4: No they didn't give that M2: **you've got 16 I mean ...how to deal with them** W4: Its interesting at the beginning of the week I visited on a Monday didn't I? M2: Yeah W4: and that's when you all realizing what you planned	Not able to meet all criteria
00.58.30	W4: … and it was like oh my god I can't actually do this W2: Well I couldn't have done it without all of you as well M2: For me the project was so different, so so totally different. W4: The two different projects M2: … so far apart it was untrue… the aims were different. **With Forest View it was a lot of it was entertainment just entertainment – let them have a fun week**.	No specific learning factor with younger groups
00.59.00	W4: Because the week after felt a bit flat didn't it? W3: **It's like a (…) probably giving them experience** M2: Well yeah M4: enrichment maybe is that enrichment M3: Anther things like after SATs week they do something they go to South Fernly and they do outdoor activities so that was an alternative	Engagement as treat
00.59.30	M2: **What they first said to me was fun, which instantly to me says woo we want to get more out of a project than just have fun because you can get a clown into juggle if you just want to have fun. But actually when I'd gone into it more it was because there were reasons for that and stats – SATS and by having fun would mean you getting in the tools and there wasn't so much sit down and…**	For practitioner – fun
01.00.00	M2: … **we want them to get out into the playground and really run around using the camera, use the whole school, so ok actually that's** fine K: Is there less or is there more responsibility on you to create (…) film the kids doing something (…) and you (…) a short movie where as (…) M2: no no W3: You give them the skills don't you? M2: We'll back off and let them do their own. I won't bore you with the logistics 'cos there were a lot	
01.00.30	K: s This was (…) children	Performance

	W3: … and they came for him and they came through the schools.. W4: Year 6 is 11 to 12 M2: It worked, it worked in the end W2: Did anyone you see what they'd done in the end? M2: Yeah we had a big show and played it back to ourselves …	
01.01.00	M2: We showed each others films and stuff because no one had seen what anyone had done at all . K: And how many students? W3: You enjoyed it, you enjoyed it. M2: I did yeah. I did. W2: But you realized..... M2: **At the end of the day… what just happened?** W2: You don't have time to stop thinking M2: So so quick y'know K: ...students or M2: I was worried I wasn't able to deliver it …that was - that's the main worry.	Time factor
01.01.30	M2: ……I just how am I going to do this, this is s too much. I was just worried that I wasn't going to be able to deliver it K: and that was over a 7 week period W1: An 8 week period M2: **Couldn't handle it.**	A practitioner's process does not neatly fit into learning model
00.01.46 - 00.02.07	babble	
00.02.07	M2: Its just harder doing that with so many I'm not used to working that way *(missing data)*	
	K: The thing about technology now I think now its teaching kids about technology *(missing data)*	
00.02,26	end	

9.2. (b) Transcription (Tape 2)

Time	***Transcription***	***Notes***
00.00.00	K: With recent investment and then education (…) given this investment there is an assumption that you should be using it (…) and then just before (…) performance levels and there's just so much in the press about absolute all. But actually there's zero changing..y'know with exam results or whatever (…) testing K: But for SEN would you say that's the same level of issues it seems to ..although you seem to be a little bit better supported although a lot less resourced...	
00.00.30	K: you've got a lot less resources than you seem to need W1: **I mean we do have better recent resources don't we? Because we are a new school as well** , K: Yeah W1**: But the resources to use are not available to us**. K: Right W1: **IWB and mouse and keyboard only interaction modalities**. **Need to really understand technology to start to be creative** K: Right W1: and that takes us (…) resource from that K: Touch screens, monitors what sort of amendments? W1: What have you got? Have you got touch screens	Limited interaction Need to understand before can be creative
00.01.00	W1: … and monitors? M1: No we have only got one touch screen in I think. We're very short on that sort of thing. K: Is it because funding goes into… I mean does it come out (…) obviously you get the same sort of budget that most schools get. Is it because you have to divide yours up slightly differently - you're going to put railings in?	The physical aspects of interaction have been overlooked

	M1: Yes that's right, **access and mobility and all that sort of thing are priorities aren't they** W1: And we've got some students with very high needs so....	
00.01.30	W1: (…) obviously if part of the budget is spent on (…) it might be spent on one particular student there (…) I am just thinking of some of the.. M1: Yes that's right . We don't have an awful lot of money to spend on technology really. K: Right M1: **Just basic needs really isn't it?** W1: Yes K: I suppose in that respect - there's a lot of funding going into that kind of school anyway where as you wouldn't have that kind of level of specialized stuff(…) used in quite the same way.	
00.02.00	M1: Yes that's right K: Ok. And then in terms of this sort of motivation for study - obviously the interactive whiteboard (…) interventionist approach, where you are thinking about working along-side practitioners. But I think that kind of covers that. And then assumptions about whiteboards in a classroom . I mean this could extend to much more use of technology as well...	
00.02.30	K: ...really yeah where you've got projectors and other bits and pieces you use M1: I'll tell you one thing it's brought into focus. K: Yeah M1: Which is not that that necessary to do with this, **but the use of the interactive whiteboard has brought into the fact that we much better off having back lit ones because of the actual projectors getting in the way.** All: Yes M1: All the time.....	Current IWB – cheap alternative (front lit projection) is not optimal solution – but viable with costs. There are trade offs
00.03.00	M2: **(…) and anything that you are doing. It really brings it home to you when you are trying to do something like that. And you keep thinking we should have those back lit ones because they are much better because you don't get (…) you can't get in the way** . W2: **Yeah, because you can't stand in front and draw**	
00.03.18	- babble - M1: **the pupils and students will get in the way of each other if they are up on the web board at the same time** W2: and if you're working on the surface M1: that's very difficult K: Have you seen back projection? M1: Not actually K: Because the other problem that you would have with that...	
00.03.30	K: (…) would be that you would have to bring the screen forward so obviously you have to get the data projector behind the screen M1: Yes W4: You can get specialist… you can get portable back lit ones but they're basically they are like a huge TV on wheels M2: T.V. K: Are they still touch screen? W4: Yeah. The more recent projectors that I've seen in XXX school this term, Is the actual projector it's just higher and it just angles down -	
00.04.00	W4: like y'know, it's like way above your head on the ceiling. And it's… I don't know how they do it. M2: (…) lens M1: It would have to be a steep angle wouldn't it? K: the thing is as soon as you back project you need something that's somewhat transparent and then, to make that thing show up. M1: **I find the biggest problem with interactive whiteboards is getting in the way.** K: **and getting that light in your eyes** M1: (…) W4: Well that came up when we were talking, when were talking...	
00.04.30	W4: … right at the end of the week W3: **Your eyes get tired at he end of the day. The children are told not to look into it, into the light and if possible we don't sit there – we sit there in a way that we don't face it** M1: **That's right but if you have two students working together up on the whiteboard they're both in a way. There's shadows everywhere and they can't see what they're doing** W3: yeah it's difficult for signs… shadow M1: and then… higher up the wall, and then they they can't reach the top of the whiteboard and so I mean it really is quite a logistic….	Barrier: Light on IWB
00.05.00	M2: … problem.	Barrier: Height on IWB

	W4: **I've seen that in really tiny...Well in year one when I was at Forest View, and I came in just to see how they were using it generally. And it's amazing the difference in height between some Year 1s - and some other Year 1s - and the tiny ones can't even get to halfway up the board.** M1: **And you say oh put some steps up and then you've got health and safety.** W3: That's right, that's right. W4: Yeah. M1: Or I think I'll put rails around it - and then you can hang on, they can't move now.	
00.05.30	W3: Year 2s have gone to Year 3 and the board is not that much higher... **so you are struggling to calibrate them?** M1: **Quite a lot of problems.** W2: **We had them and some of them are positioned for use by wheel chair users** . M1: Yeah. W1: But then... M1: **but then you've got this great big chunking thing along the floor, so the wheel chair can't get near enough to the board and the kids can't reach so you think ah...**	
00.05.57	- babble -	
00.06.00	M1: It really is a problem a lot of the time. M2: For me when I came trying to plug in the camera and do different things with that we were wasting a lot of time. M1: You do waste a lot of time M2: A fair bit of time. K: Don't they come with sort of rails you can pull down and up and change the height? M1: I wish (…)	Time consuming
00.06.21 - 00.06.26	- babble -	
00.06.26	M1: if you move that up and down then you've got to move the projector up down and it's right above up here…	
00.06,30	M1: ... then you're got to have a movable projector to be W3: (…) W3: I had one K: Oh I see, of course W3: **The thing is in my new classroom has got - well not a new classroom but a different classroom - the projector comes off a very high ceiling and it was blowing the other day and so the projector was moving and it was unsafe because ...looking at the board because the, the, everything was moving on the board.** M1: There are a lot of things for those to be better than they should - well they should be better than they are really.	
00.07.00	M2: **Technology will catch up in a couple of years time they're developing this screen** - they're going to put out of – out of mobile phones. It's actually a flexible screen like a piece of paper - you've probably seen this. You can roll it out, and it's a, that's a touch screen - you can use on your mobile. So you would be able to use it like an old projector screen. You can pull it down that's your interactive screen so it's a matter of waiting really until...back projected ones.. W4**: Its going to take ages that sort of technology and they just use really really thin sensors** .	What for tech to catch up
00.07.30	W4: Like it's derived from - you know when you walk into a shop and there's an automatic door? You know the sensor pads that are in that mat to make the doors open? That's were it's derived from. K: Some kind of pressure pads W4: Yeah and well yeah, I mean it's .. M2: It's fibre optics isn't it? W4: Yeah , fibre optics M2: So you're talking about very very tiny switches which is all it is really. M1: The thing is really it's only the case of working around on that type of technology but it does get a bit difficult at times.	
00.08.00	K: Well usability is a key issue. W1: (…) K: (…) and then you start thinking about the technology again don't you? And stop thinking about (…) M1: That's right W4: And that's what this project did was to highlight - trying to move away, even though the focus wasn't right, trying to move away from that idea of technology. Because you do get stuck on it, and it is frustrating. And it's sort of having a project where it's as much about how you move	

	around it....	
00.08.30	W4: ..and how you work around it and then you actually use it. M1: Yeah yeah. M2: Right. W4: So with the year one - with the Forest View projects the mark rating yeah and when I was there you were trouble shooting constantly (…) but that was sort of part of the process anyway W3: We encounter problems every day but not as much as that one. W2: We were overcome by it. W3: Yes. K: ... W4: **That's when you realize...basic things that the school should have anyway which is all the computers being linked up to all the printers**,	Failing on simple stuff
00.09.00	W4: ...and W3: Yes. W4: everyone having a memory stick all the time, K: Doesn't happen. W2: But you don't know what's missing until you do something M1: I think that our project was so good that you forgot about all that after a while, and then you just enjoyed it for what it was. M2: Can I just perhaps add an assumption?..... K: Yeah sure. M2: My assumption was I though they weren't being used in the schools.	
00.09.30	K: Oh Right. M2: **Because they are not in the schools - most of the schools that I work in, and they are just there and they are being used as blackboards. And I have had heard many teachers moan to me that they would much rather have a shed load of more pencils and pens than have another whiteboard that they don't use and don't know how to use.** K: Do you know why they don't use them? M2: Sorry? K: **D'you know why they don't use them?** M2**: What reason – hard to answer. But I suppose the same problems**.	You can put the technology in the classroom, but can't make the T's use it
00.10.00	M2: **… that we are talking about is no training on them. Y'know fears** W3: Is this Forest View that you are talking about? M2: Oh no. M1: I'm not prepared to say	
00.10.19 - 00.10.21	- babble -	
00.10.21	M2: These were assumptions, assumptions before I went into the school. My assumptions have come from - I've never worked in either of two the schools before, so they come from all all the other schools I worked in.	
00.10.30	M2: My assumption was that well we would be starting from rock bottom. We'll be starting from scratch when we went into the schools, and then, then we'll start learning about how to use whiteboards because this project says we are going to do that. Well let's start using this whiteboard. Well actually both schools had already got into using the whiteboards and there were some skills there already. K: I think the trouble is a lot of the projects we end up working on are with schools that are quite proactive and so we see the best ….	
00.11.00	K: of the bunch really. Certainly the schools I've worked with (…) and use all their technology but you've obviously been M2: These are CP schools K: Oh are they? M2: Yeah K: Oh ok W3: Coz the teachers actually need some sort of training with the K: That's another thing, **what sort of training do you actually get?** W3: **In ..day one ..one staff go for a course and she comes back...** K: **and feeds that back ?** W3: **and then we have the computer suite so everybody sits at the computer and she takes us through it.**	Training: teach one and distributed Positive aspect of social teaching
00.11.30	W3: **Well of course if you don't practice it you don't use it you forget how to use it**	Training Peer T as gateway – good

	K: **That's quite a lot of stress on that individual staff member as well really… did she volunteer for that?** W3: **She was confident she has left the school now** K: **Right** W3: **But she started us off ...to us all and she was very good..... some people well they have got the knack of picking these things up and she did very well.** K: **Yes** W3: **She did give us confidence as well** K: **She's. (…) The point being is that she's still not the expert. People asking her questions and she…**	for dissemination - voluntary If training (and tech reliance) invested in individual T – they can take this with them
00.12.00	W3: **She can… she can answer. She's very good. And the bottom line is that she has left us** . K: Right… and another problem for you really all the knowledge. And you guys...is it similar for you? W1: ... before. We had some twilight sessions didn't we, we sat (…) starting M1: I done some (…) as well haven't I (…) K: **So you do them inhouse?** **W1: Yeah**	
00.12.30	M1: **I've always done it.** **W1: ...and you go to other schools** **M2: Yeah I go to other schools.** **W3: You go to other schools as well.** K: Oh that's great. W3: You're really popular Steve. M1: Speak to Howard. M2: Your people can call my people. W2: You'll get head hunted now . W3: What's your surname Steve? M1: Carney c a r n e y ….Ask Howard Jones here if you need a reference W4: The thing is that's a really M1: Be glad to get rid of me....	
00.13.00	M1: I'm sure W4: I think it's a really good point actually, because I've talked to lots of the schools I work in and they're saying **" … oh we really need an expert in this.." and "We've got an expert in this.."** and can we not share that? and..one thing I was talking to Berry Hill Primary school, just up the road, about - which is all the work that they've been doing for the last few years with me ....has been around digital media and photography. And then they're doing something on animation now. Y'know - and they're experts, bringing curriculum and digital media together. And they were talking about running,	Sharing resource
00.13.30	W4: **yeah, courses for other teachers in the area, in exchange for their teachers do some stuff around P.E. or y'know. There's a real opportunity kind lost and everyone goes to places like Upper Cove spends £200 on a day and there actually there could be a lot less...sharing** W3: ….I won't call you at home.	
00.14.00	W3: It's just y'know good to know that there is somebody they can help us M1: (…) K: So when you have the training ..obviously the in house stuff is maybe a bit different (…) where the person goes out. What sort of stuff do they show them? Do they - is it the mechanics of it? Is it the W3: No it's just how to use it – certain programmes, we don't delve into K: Do they compartment it - centred around selected bits of software? M1: that's my school phone number W3: Thanks very much K: Selective bits of software? W3: Sorry? K: It's all centred around selected bits of software?	
00.14.30	W3: Yes there's some software which are specific to different year groups. We usually get now – Sue does that ..she looks through it ..you've met Sue haven't you? M2: Yeah W3: **she looks through the software and she just advises us..it's better than reading it ... it takes too long to read and then she tells**	Rely on advice only

	us how to use it, where to find it and we go straight to it. K: Right. So if you wanted to use...say something you'd found online and you wanted to use that - having gone through.....	
00.15.00	K: (…) the process with her (…) do you then (…) W3: Yes but what we normally do is do it at home. Find resources at home, and then - K: (…) **Then she takes her skills with her again** **K: Right, but now she's gone** **W3: No not Sue that was Joe but Sue's there** **W4: Imagine if Sue wasn't there.** **W3: I know. I know.** **K: So people obviously are reliant on you to...** **W1: Oh definitely. I mean you are called out an awful lot aren't you? To come and to …**	Heavy reliance on others for support (there is no formal structure for support!)
00.15.30	W1: **...help. I mean I've learnt a lot because Steve has worked with my group and we overlap sometimes and…** K: Do you think you maybe get more from those sessions working with Steve on the whiteboard stuff, than you do from sitting around having an hours training. D'you think that is a more useful way or d'you think you need the balance of both? W1: The balance of both. But certainly, I mean obviously, things crop up that may not been covered in training.. and	Training: mixed practioner and specific skills training
00.16.00	W1: then when you're y'know because it's specific sometimes isn't it? Even if you've had the training...I automatically think that I can't do it ...goodness knows I should know how, be able to do it K: I suppose also him watching you do things I think very often with technology you develop strategies of your own to get round things ...you know one process and you can bend that process. Whereas I expect you watch her do stuff and think well actually...	Low confidence is barrier
00.16.30	M1: (…) K: Well I'm tentatively saying that (…) you might want to try - but that kind of feedback would happen W1: I (…) A very long way round (…) why don't you just press that button K:.. Yes that's right. W1: that sounds very logical K: (…) having that person there W3: It does give you the confidence as well K: Yeah W3: Knowing that you can turn to him. K: Because I think that if you don't have Sue there… you'd be less reluctant W3: We just leave it behind and then go back to the blackboard.	
00.17.00	K: So in-class, sorry, in-school expertise. I mean, so many of the schools I've been with don't have… One school has one person and the two other schools had no one. They have this guy that goes round, all the schools and the schools phone him up and he'll turn up the next day or next week. W3: Might be too late then K: yes I think just having that support W1: **I think probably that something you see in Secondary schools. They've always had a subject specialist. I mean I'm saying,**	
00.17.30	W2: **I was in Secondary doing Food Technology and Textiles, so because we're all in Special now - we probably all have our own subject areas as if we were in Secondary.** K: Yes that's so much better. W1: **So we share that. Whereas I go to courses where somebody's telling us might be about food and thinking well I don't know why I'm here but it's because, especially Primarys, there wasn't this specialist.** K: So you would have an IT guy in the Secondary school so you can divide the support.	IT skills less of an issue for secondary?
00.18.00	W3: You need a technician there don't you? K: So in a Primary school and SEN you don't specialize. Oh that's a really interesting thing actually. W3: So in other words more money should be put to Primary schools... training K: Its the training isn't it? .. I think that's shouting out quite loud. W3: Every school has got them. W4: **But there is so much more emphasis on technology and in ICT these days there just doesn't seem to be the budget** ...	
00.18.30	W4: **….for training.** K: well its still fairly new as well. I think. W3: It is and I think before you came here to groups with it ...they change it.	Lots of emphasis on IT – it is not just a subject area – relevant to all T's in all subject areas

	M1: **The thing is, the training for ICT is that everybody wants it. Its not like history or something. You're saying well the history co-ordinator will go on that course… everybody wants to go on an ICT course you can't afford to send people on courses for that many people** K: **I suppose it comes back to that point of not teaching technology for technology it's teaching it for…**	
00.19.00	K: **integrating it for teachers?** M1: **That's right. Whereas if you went on a history course then hopefully it will teach you the ICT bits as well. They use ICT with the history or whatever else and you could pick that up but that doesn't happen.** W1: **Yeah. No it doesn't happen you get the content then you still need the skills. Which as I say we've got – we've always got from you. And then you also point us towards resources don't you as well?** M1: Yeah K: A real partnership as well… if I've got this ideal	Subject specific training needs to include relevant technologies
00.19.30	W1: Yeah or I find this website that is good M1: **Right, right, and then I just put it on the circuit for people to use.** W1: **So we do share in that way.** K: I mean in recent graduate teacher training study that's come out - PGC and stuff, is there more emphasis on doing that? Are you seeing it? W1: I don't know. My son is just doing a PGCE K: the new wave of teachers coming in do they seem a lot more confident with doing this stuff? W3: Yes K: I'm just thinking, is it something that	Sharing knowledge
00.20.00	K: …is being addressed at the training level and we've just to wait for… W1: I think the kids go in anyway with way more expertise than we ever had I mean lets face it so K: (…) W1: Yeah. So they always share. W4: **I wonder how it's being taught though? How the technology in teacher training is being taught. Whether it is about** M1: **Well they don't teach you how to teach. They never taught me how to teach...**	Older generations struggle – deskilled?
00.20.30	M1: … **when I went to college**. W3: No. It was just lectures wasn't it? And then you got out and do your work experience.. M1 ...a blackboard or anything W1: Did you do PGCE? or did you do a Cert. Ed.? M1: Degree. Yeah W1: **You see. So I did the Cert. Ed and we were taught to teach**. K: Is that the 730... one? W1: **No no. When I did it it was a three years for a Cert. Ed. and four years for a B.Ed. Well I did my degree a bit later. But we were taught to teach ...we were told that you should be able to teach anything**	Different training routes Assumption that anything is teachable (social learning view?)
00.21.00	W2: Because we were taught to teach. Half a day doing food half a day doing textiles and the rest was...theory and practice of teaching K: so here's your method...and you can W1: Yeah (…) a few years ago M1: (…) K: They do quite a lot of practice now don't they? W1: They do, do more practice now than we did. M1: Yeah but they they don't teach you how to do teaching practice they just …. off you go.	
00.21.30	W3: **They send you out to do work experience in school. That was the time when you actually learned. If it's a lecture hall - it just goes in one ear and out the other.** M1**: I mean we never had a teacher coming in and talking to you about techniques of teaching or anything like that.** W3: **No I think it's all down to experience really.** M1: **You just had to learn yourself.** W3: **Yeah. Thrown into the deep end.** K: like restrictive teacher talking time.	Need 'active' environment to learn to teach
00.22.00	K**: No little kind of, little phrases, no little strategies given to you at all?** M1**: No, not how to telling you how to deal with behaviour** K: **No planning?** M1: **No. You had to learn, oh they told you how to write it down.**	

	W3: **Oh yeah, all paper work.** W1: **I think they probably do concentrate a lot on the paper work. I mean we did have tips, that's to say y'know, my teaching practice was practical.**	
00.22.30	W1: So you had to be really organised to get through it. K: A lot better W1: **And Health and Safety. And making sure the discipline was good, because otherwise anything could happen – because you were in there on your own,with twenty kids cooking.** K: Yeah... W1: Which we don't have now. M1: So hopefully perhaps they do teach you how to use the interactive whiteboard and the technology W3: I think they do but very briefly. I don't think they go, delve into,	
00.23.00	W3: too much into… M1: (…) W3: They probably give him the web sites y'know for History or Geography W1: Well it would depend on the student. I mean thinking of Dan my son, he's (…) K: (…) digital cameras W3: **They seem to pick it up so quickly** W1: **They pick it up very quickly** M1: **They'll all be coming into teaching, hopefully.** W3: **I mean technology dependant, possibly, y'know.** W4: **There'll be another thing.**	New teaching graduates, supporting older generation (organic progression over time - supporting system – schools educate themselves – mix reflexive new and old)
00.23.30	W2: **So that when it all goes wrong, have we got the confidence...** M1: Have a virtual teacher. There's your a hologram of your teacher there… K: I've never really got this technology dependant stuff, because we are all using technology - washing machines, cars, y'know and I think to say the kids are going to become too reliant on technology well they are going into a society that is wholly reliant on technology and maybe that's kind of what they need to be W1: **Having said that as a teacher how many times do you have where it's not working.**	
00.24.00	W1: **And you've suddenly got to kill time for a while, whilst everything** K: (…) that W1: You do need the skills for being able to fix it, y'know, right? K: Yeah W1: (…) Sort it out M1: you get a power cut...ah W1: yeah M1: Server has gone down. W1: We're not doing that K: Yeah. I use a lot of (…) being able to get a lot of media in there, and showing films and showing…	Technology failing
00.24.30	K: ... pictures W1: Oh yeah K: … and I think also, with, I mean children are born into a world now where they – there's kind of - so many communities, y'know, MySpace and communal broadcast yourself and everything . So to be part of that W1: Yes.... K: And wanting to be part of that, I think they - it's something they need to learn. W1: **Oh yes and it is y'know , as you say, it's certainly a way of, well of teaching them. Because they are already tuned to media** ,	Give them skills to interact in media / networked world
00.25.00	W1: **and y'know if you give them a chance on that** K: I bet they've all got mobile phones? W1: Oh yes M1: Not in school W1: (…) I store these in my drawer (…) everyday, but yeah (…) W4: So lots of technology being developed at the moment around hand held learning K: Yeah	Not allowed to use mobiles in class – a distraction

	W4: and the idea of having your own personal well y'know ...that's an example the way it's going y'know, having laptops and y'know and palm K: PDAs	
00.25.30	W4: Yeah, PDAs yeah. **And there was a – I went to a hand held learning conference last year it was a really interesting little project and some (…) somewhere I can't remember exactly where. They basically did this kind of pilot scheme where each child in the school had their own palm hand held device. And actually their attainment went right up, because they were constantly doing stuff all of the time. And the thing that really - that surprised everybody,**	Impact on new device – reported study (no details)
00.26.00	W4: **… was the how the parent – how much more the parents got involved, and understood and knew what was going on in the school. Because the kids were coming home and showing them. And then they were doing the homework together because it was sort of a bit more fun and they – and they could send their teachers their homework from home and then get that kind of - instant.** M2: Have you heard of that 'Laptop for Everyone'? K: $100 laptop. Yeah. I think it's primarily for developing	
00.26.30	K: ….countries. M2: Yeah it is yeah. It's a fantastic idea. They've made a really robust laptop, K: They rely on A wind up W1: Oh really? K: they relies on W3: Is it? How does it run? I mean, it's for developing countries is it? M2: It's supposed to be virtually indestructible because obviously it will have to travel W2: Is it solar powered? M2: a few miles, and it's going to survive a bit and W2: Oh wind up? W3: and obviously maintenance is quite hard, not at hand that often so K: Also I think it's got a device in it that what's the name of the system .. I can't remember the name of the system you might know a bit more about this...	
00.27.00	K: - where they to get the networking you… they broadcast from one machine... from one to the next machine M2, Yeah yeah to get one great big area K: so... for they develop the network W2: Ah. I see. M1: Piggy-back stuff K: But the PDA stuff. There's some nice stuff coming out of Sussex actually. Sussex University. It's a group called The Interact group led by a lady called... Rogers but they do activities where they are given PDAs with sensors on them and they go out into woods or something and they'll go and take readings …	
00.27.30	K: ...from the woods. Y'know, light and temperature, humidity. Temperatures like that, and they'll bring those back into the class room - and load those temperatures into a virtual environment - and then they will use those – that data they've collected to see what happens to that virtual environment over time. So it's mixing information - that they can go and gather – the same way you make a questionnaire or something like that – you go gather information from the real world and put that into a simulated world. And then so then, will give you an idea about y'know...	Exciting new opportunities – little evidence of this in the classroom
00.28.00	K: ...start changing around the parameters and things and see the impact of different consequences. There's some nice little projects going on. W4: There's loads of stuff going on. But there seems to be quite a big M1: (…) K: GPS device W4: **Yeah. There seems to be quite a big jump between y'know, the schools that are really excelling, like pushing the boundaries of technology.** K: These are still quite innovative things. W4: They are, they are, exactly. W2: **The microphones that we had through … I forget what they were called.**	
00.28.30	W3: **Dictaphones.** W2: **Dictaphones. They weren't really that sensitive to work with easily.** K: **No. I think...were you taking them outside as well?** W2: **Yes and talking with a group was difficult.** K: **Yeah. Very often you need the right sort of mike for the job don't you really?**	Yet… still struggle with everyday (quite old) technologies

	M2**: Yeah. yeah and it's .. You've got to learn something else there haven't you? The skills - and yeah.** K: But I think the false ability of the dictaphones....	
00.29.00	W2: That would the idea W4: A dictaphone K: To go for a walk and record the sounds of the walk (…) so even then the quality W2: Yeah fantastic K: (…) quality M2: I like your one where you can actually chat to it - where as y'know with the old Dictaphone on a tape, transcribing it was, well your worst nightmare. I've still got to do that. But with yours you can stop it, and give it a name can't you? And move onto the next one so, K: Oh really so you can tag it? M2: So you can actually grab a moment and say that's that and then yeah W4: Well one thing	
00.29.30	W4: the project they were talking about was still the things that what you were saying about. **Getting these PDA things that had microphones. They had everything that you could possibly shove into a tiny little plastic box. And they were going around and collecting - and sounds and they also were linked into the internet so that they could...** There's this project that's going on in Bristol. Where you can leave bits of media in a place and then when someone comes through that area, they'll...	Convergence of functionality – web / record features
00.30.00	W4: they'll pick it up. Their mobile device will pick it up. K: The Mobile Bristol HP project? W4: Yeah the Create-a-scape. Create-a-scape? It's a free bit of software where you that Hewitt Packard have developed. **And it's yeah, so you can go to a landscape and without disturbing that landscape with a big screen on a tree, or whatever, you can go through it with this kind of PDA, you'll get – it'll turn up on your PDA.** M2: So there's nothing to support in that landscape at all? It's just	HP project – locative media
00.30.30	M2: going by GBS? W4: No K: (…) enter take that into an environment and then as they move around that environment that information is delivered to them… in locations that are so rare (…) can't M1: Oh I'll have some of that. W4: Well have a look on the website it's free bit of software that you can download called Create-a-scape. K: Is it one of their ipaq? W4: Yeah or you can just drag it on. You don't have to have an iPaq You can do it on K: A laptop. W4: A laptop yeah, But they have this one of their first projects they did was called Savannah. It was about..	
00.31.00	W4: ….. lions and their environment. And they developed the, their playground, into the lion's landscape. And they'd do those research on - and they were creating the resource as they were going. So as they were doing research on these, on their environment, they were updating the environment outside. And then they were the lions with their PDAs. And then the way that they acted – like movement – or going towards things or not going towards things	
00.31.30	W4: - the piece of work, this virtual landscape, was responding to them. So if they acted in a wrong way then they died. So the more that they get to know the way the creature is and moves and, M2: The longer they survive. W4: The longer they survive. K: It's quite interesting. There's a virus one and you spread germs depending on who you... various diseases	
00.32.00	W1: K: That would be great for you. M1: The what? W1: The one when they spread germs. M1: Oh that ...the school.. W1: What's the piece of equipment that the kids have hand held and you can do a survey and then everybody votes. It's a bit like if you were in your armchair at home? K: a double clicker? W1: I don't know what it is.	Voting system – connected to some IWBs

	M1: We've got that **voting system.** W1: Have you got that? M1: I haven't set it up properly yet because I just found it.	
00.32.30	W1: (…) M1: (…) W1: Well I used it on a course. Because and it's good for base line assessments and to say where I started off this project and I asked him...20% …..and you've got to do it again at the end. M1: (…) K: What's the name of it? W1: Those thingy, whatsits, that they hold in their hands M1: Something to do with a voting system some promethium whiteboards.	
00.33.00	K: What sort of technology do they use? Do they use (…) or something? M1: No. It works on the interactive whiteboard and comes up on a ..voting thing.. and they choose and you can see how many things of them got them right and all that sort of thing. W1: We'll have to use that next time. M1: I can't remember where it is. K: Like you said W1: …... a hand held	
00.33.30	M1: Something to do with Promethean software which is, they do interactive whiteboards. They are the ones with, you use a pen to ..hard interactive whiteboards, not like soft boards. K: Ok M1: **and they have a voting system. I can't remember what it's called... some things to do with a vote. We've got some of those things, and they are little rectangular things that you choose, a-b-c-d- or whatever it is, just like 'millionaire'.** K: **A bit like a play station.** M1: **Like on 'millionaire'.** W1: **It is that's it. It was probably....**	Media crossovers
00.34.00	W1: **...based on that.** W2: And you can see how many voters on M1: Yes that's right. W1: **Its very good for citizenship... and performance as well.** W2: What does PDA stand for? W3: Personal digital assistant...one of those - one that dictates M1: I'll try and dig those out K: It might be - if you're interested in that project, that Elise said,it might be worth giving Hewitt Packard a call. Because they are always really interested. M1: Oh its HP is it? Is it Create a scape or Create or scape? K: Create-a-scape..	
00.34.30	M1: A -scape K: (…) I don't know if that's right . K: But I know that people like that are always interested in partners M2: GPRS.. K: Well interesting possibly M2: Give everybody text if there is a moving amount of space others can unsuspecting can text them, it would be quite interesting because then you don't know its coming , you don't know whether the prepared yourself for this you can just walk around K: Right. I think M2: I can see it know what I mean	
00.35.00	M1: Have your little ...with you M1: ...might be a little programme where you run around and get shot K: ...and you phone up and say where am I? W1: That's right. That would be good. K: Oh you're there.. M1: Elise is it Create a landscape or create a space?	

	W4: Create a scape	
00.35.30	W3: I'm sorry we have to go soon. K: No worries, no worries. Can we very quickly if we can, because they've got to go - have you got just five minutes? W3: Yeah K: OK very very quickly. If I can just go through the questions, and then - maybe if you then if could have a look at it and then comments or anything you'd like to change tell Elise and she will forward it onto me. Ah - definitions of creative media. ah yeah. Areas of confidence gained. Yeah that's what I was quite interested in specifics - about ….	
00.36.00	K: ……the students becoming a lot more confident. I think we covered some of that. I just want to sum up in terms of specific areas and you were talking about being more comfortable in presenting to class. M1: Yeah that's right yeah. W1: Yeah. Yeah K: **But what about with your little ones?** W3: **Ah self confident. They're not afraid. It gives them the opportunity to try out the technology. Well they use it anyway** W2: **They seem to like showing off to the others.** W3: **Yes it's socializing, it's verbalizing…**	Young P's confident
00.36.30	W3: **... what they are doing as well. And they just like the idea of standing in front of the whiteboard.** W2: **It seems to motivate them to do research in a way that I've never know older children to be so - they're so keen.** K: Is that because they could use the whiteboard before research? Or because..? W2: They just connect with the internet. K: **Oh ok. And do they tend to work alone on that? Or would they be in pairs?** W3: **In pairs.** K: **And was that a…**	
00.37.00	K: **... co-operative pair or a..?** W3: **Its got to be a cascading one. We need one who is good at computing and the other one.** K: But they were all looking for the same information? W3: Yes. W2: Yeah one would have the ideas and the other would have the W3: Do all the work. W2: Technical. K: Changes over time I just wondered what you've done differently, really. What would W1: What would we? K: Since you've done the project. I …..	Mixing abilities – managing collaboration
00.37.30	K: ….don't know if you've had much time to do .. M1: **I don't think we've had much time have we?** W1: **I do use use the whiteboard** K: I just wondered since you had exposure to the particular creative processes that with us… while you and David were there. **I wondered how that had fed – or whether it had fed into the work you were doing** W3: **Not all the same way. Yes we still use it to manipulate (…) I've used it since then to manipulate (…) pictures, autographs…**	What have they done since working with practitioner?
00.38.00	W3: **and save it and add on more information to it.** M1: **That's right it's made me, it's made me incorporate more, no different, types of technology within – within the software that I've been creating I think. It's made me use the sound a lot more and music a lot more and** K: So more… more breath of media? M1: Yes. K: **Yeah well multimedia**. W2: **Multidimensional.** W4: Can I ask a quick question? K; Yes. W4: If, if you were a teacher....	Positive - more awareness
00.38.30	W4: …. kinda looking on an internet .. ..thinking right how can I, well possibly use whiteboards a bit more? And then came across our case study - what kinds of things, do you think, would be most useful for that teacher to see? Y'know what would draw them in to the case study? 'coz what we're talking about is putting something together that would y'know, the audience will hopefully be other teachers.	

	W1: **Well, if it was me, and they gave me medium term plan...I'd be in like a shot.**	
00.39.00	W1: **Because us teachers...don't know what we're looking for** K: What's a medium term plan? W1: **Well that would be like a six week term** M1: **Teachers are looking for something they can use in the classroom.** W1: Mid term plans. M1: so they always look for something that they can use in the classroom, either a planning thing or something they can actually download to use. K: Right. Yeah W1: When I look for things – I look for.... M1: I think when teachers look on the internet for stuff. they always look for something they can use in the classroom, for their planning..so they'll either look for some....	Not just the technology - but a plan of work – broken into activities to integrate, worksheets to assessment (off the shelf lesson?) – that is also adaptable
00.39.00	M1: …. planning documents or something to give them - something that can save them some time or something they can download to use. K: Right. M1: That's what they like. The main thing that teachers do look for. K: So in that plan would be would be, would be a structure? W1: **There would be a six week structure with possible activities to use**. M1: **Activities to use**. W1: **Worksheets to go with it**. K: Right. M1: **That's what teachers look for**. W1: A**nd then other resources might be y'know like other video clips**	
00.40.00	W3: Worksheets M1: **I don't think many teachers look on there to find some sort of document to explains things and talks about findings and things like that** M2: (…) W3: **No. They want to get on with it.** M1: they want to get on with … for a start K: if its done in a generic enough way to be useful for all different types of schools W2: And you're going to personalize it? W1: Yes M1: **As long as you can change stuff yeah** W1: We just want a starting point and the odd idea	
00.40.30	W1: … video K: Resources W4: Because one thing we are talking about later on in the year. Well April,.. if we get more funding - is to have a digital media event in which we could present this project. I mean it's a long way off - but yeah - present this project. And so do you think it would be, more useful to accompany that presentation with a workshop. Where you can show – you can actually do something yourself, quickly, that's similar to..	
00.41.00	M1: Yes so they can actually access something and think, oh I could do this - in the classroom. W4: Yeah. M1: Yeah. W4: **So d'you think you could respond more to see how other teachers stand up and talk about the project than reading it?** M1: Yeah. W3: Yeah. M1: (…) W1: You also want to listen to somebody who has done it. So often you get people who y'know just… somebody to say well....	
00.41.30	W1: you can do it. W3: ...as well and done it. M2: I don't know about you guys but I don't necessarily trust complete strangers implicitly. My first - say someone's telling you that yeah - you can do this it's really easy. Go and do it. There's a block there for me between, saying that and you actually doing it and believing that you are going to do it W2: if you actually do it on the spot yourself	

	M2: tell you really W1: oh yeah definitely M1: and the workshops...seemed to be doing something.	
00.42.00	M2: Actually doing it yourself (…) K: Especially when somebody has got to the end of a process and they seem quite experienced and confident with it, and you see it from the other side M1: yeah, yeah K:... where as if you get somebody in there who isn't so... M1: **I think teachers… A lot of teachers are very easily daunted especially where technology is involved** W3: **we don't like (…) do we really** K: **You've got such a huge teaching load** M1: **Small steps, small steps** W2: **It needs somebody who understands that you might not understand instantly**. W3 **And then we expect the children…**	Misalignment – small steps for T and same for P's
00.42.30	W3: **to do... to learn quickly** K: Just in terms of specifics of the whiteboard. Have you noticed any – in the time that you've had it, the years that you've had it. Have you noticed any change in your teaching practice? In that other, when I've read about teachers and technology in the classroom they talk about how the teaching could be a lot better teacher centered how you can - and you know its more one to one teaching - coz you people (…) doing some activities	
00.43.00	K: - and I wondered if, maybe not that specific..maybe a bad example, but I just **wondered if there were any shifts in your actual teaching practice? That with the inclusion of the technology that you structured the class itself slightly differently?** W3: **Classroom management is slightly different because of it.** M1: **You've got to make sure you've got plenty of room by the side of each white board so you can stand out the way for a starter. And if you are left handed or right handed as well you need to make sure that you are aware that if you are left handed …**	
00.43.30	M1: ...you can stand to the left of the whiteboard. K: **Logistics?** M1: **That's right and otherwise you are going to stand in the way. And all of those sort of logistic things that you need to be aware of and make sure its easily accessible by all the pupils when they come up to the whiteboard, because often you find tables in the way… and bits and pieces.** W1: **I think now I would look to have a small interactive activity within more of my lessons**. M1: Often. I often use them at the beginning of a lesson because …	IT has had impact – change in logistics
00.44.00	M1: if I focus – a quick focus of stuff and a quick introduction and activity like that... and then they go to other things and then you can have a (…) greenery (…) at the end as well. K: **So its really about that focusing**. M1: **Yes. A focus thing. yeah.** W3: **For us, most of us, we use it for after, when they have finished their work, they can use the whiteboard. Because there are again Maths lessons there. Quizzes for example** W3: **Is it a treat?** W3: It's …	Interactive tech to focus attention Treat / incentive to work faster – keep quiet whilst others are working
00.44.30	W3: **Its an incentive to work faster.** M1: **I think if you have a whole lesson on whiteboard stuff then a lot of the students will get a bit restless. Because they are not all doing it at the same time. If two are doing it then you've got… so several of them not doing anything at all. So you want to make sure that you've got everything, everybody involved in something. So you need to sort of be aware of that.** W3: Stagger it M1: On my whiteboard lesson today....	Whole class focus difficult to maintain
00.45.00	M1: ……all about Geography or something like some that go for it or don't get involved with it and you miss them - because you're concentrating on what the ones that are the front are doing, because you are looking at what they are doing...go to sleep or worse. K: Go to sleep.	
00.45.43	– babble -	
00.45.43	W2: It was good for me because I am so much a hands on person. I would not have thought of using it at all so it was really good for me. K: It didn't constrain the way you worked?	

	W2: No. It showed how it could expand really. K: Oh that's interesting.	
00.46.00	W3: I think you adapted to that very well. You adapted anyway. You didn't say - “oh I can't do that” W2: No it was interested - because it was so busy I didn't feel I did enough. But then W3: It happened. W2: and we made our book... such a time constant. K: (…) and I think as we start writing it up we'll probably send you guys some stuff. W3: Sure.	
00.46.30	W4: XXX have you got a direct e-mail? Because I have only got XXXX through XXX W3: Through the School? Through the School? W4: Do you have an email? School e-mail W3: No I don't use the school e-mail W3: 'monpreston...my personal e-mail W4: D'you mind if we, it won't be tons of stuff	
00.47.00	W4: Can you spell it so I don't W3: Preston – p-r-e-s-t-o-n W4: Preston...at..? W3: @ yahoo	
00.47.30	W4: yahoo. Oh it's disappeared. Tell you what I'll do it the old fashioned way. M1: …….. M2: ah an example of technology wasting time K: I just wondered also if the film stuff that you did whether you exposed the whole of that process..the making of the film M1: Not the editing K: Not the editing. So the editing was the one bit	
00.48.00	K: bit so if you had to redo it M1: We had stuff like that already (…) M2: (…) M1: For our (…) M1: We did some yeah. M2: But I took it away K: What about (…) M2: . (…) K: But I suppose as you became more competent in that shared experience...process M1: We could do our own then. K: What about in terms of the sort of technical issues in terms of …	
00.48.30	K: tech - colour - resolutions M2: Yeah. There were so many different things we were trying to cover there K: Students (…) then aspects that you passed on as the teacher M2: yeah well obviously you got a screen here… bite sized pieces and stuff …	
00.49.00	M2: ...that they need to know. And we wanted them, always to be a part of the decisions that are being made. So whenever there was a decision being made we would explain the process (…) made about so obviously… y'know codec and things like that K: (…) M2: What they need to know, it takes them a long time to understand, yknow the project had a time scale. So yeah it was generally bits (…)	
00.49.30	M2: we were going to make a visual effect on the product, K: Oh right M2: ….for that and they did need a time to stand, (…) otherwise they wouldn't feel like it was theirs. And **the fun bits that's the bits that they got. But the boring bits I kept to myself.** K: I think part of the problem is working different schools is mostly that its really accessible and then you are going to hit a problem where (…) there a lot of	Practitioner keep aspects of work flow to self
00.50.00	K: ...information on there M2: We did create a base where they've got windows, movie maker which... there's no point in me going in there and teaching something like Premier or something like that. (…) capturing that – all that process... so we did a project where we only used Movie maker....and showed	

	them things so they can now ...very shortly....	
00.50.30	M2: they can now make a short film themselves so W2: Bye. M2: ...somewhere to start from W2: Thank you . K: Goodbye thank you for coming take care. M2: (…) W4: Sheila W3: You were awesome Katina. K: Thank-you.	
00.51.00	W2: Was actually teaching acting (…)	
00.51.10 - 00.51.14	((Inaudible dialogue))	
00.51.14	M2:: …..all skills in one go K: (…) M2: We could make one film rather than several and shot it to ….standards ...all about that, exactly how everything should be done	
00.51.30	M2: (…) an editor thing	
00.51.31 - 00.52.06	- babble –	
00.52.06	M2: (…) explain things to them, there is no point in going in there and trying to stuff all you are about to do the next eight weeks. So you do a little bit at a time...show off what we've done so far… K: So when they started (…) interactive board maybe	
00.52.40	- babble –	
00.52.40	W1: Its something they have used they were familiar with the whiteboards, that now whether they actually W3: Sorry, Elise, if you remember can you drop off the Dictaphone W4: Yeah I'l do it. W3: Thanks very much because I need to use it for other subjects W4: Yes sure W3: Thanks . W4: Ok.	
00.53.02	W1: We did actually have a lot of input into other areas. Because that's how it was y'know. M2: There was lots of different… y'know like designing flyers and things like that and M1: Yeah they did that already... invitations as well....we didn't show you those but they did the designs and everything didn't they? W1: I mean, I can just think of them filming and the, y'know, sitting on that bench, and you were trying to draw out of them what …	Broad range of media from single project
00.53.30	W1: to say and to get ideas, y'know because we didn't have a script. M1: No K: Yeah W1: and they would come up with it and then, y'know, and then you would develop it a bit more into one direction. And we'd all have a go y'know. K: Yeah K: Yeah, I think once you've been through that a few times then it's a lot easier… and to get them up to write a script initially would have been quite tough. W1: Yeah. Oh definitely M2: Reminds me of (…)	
00.54.00	K: Story boarding is one thing script writing isn't.. M2: **We had a got at story boarding. But that was a struggle as well really wasn't it?** W1: **With some of them it was wasn't it?** M2: **Once they started a story ...they kind of lost where they were going with it and trying to get a middle or an end or** W1: **And when we had to choose the locations - things like that.** K: Did you get them to draw it - was it like a drawing story?	Film production issues

	M2: Yeah. We drew the storyboards. We then took them...and tried to get stories out of what everybody had done..	
00.54.30	M1: (…) M2: from what everybody had done some were ok to work... **we took different aspects of different stories and put them all together** K: Because you can do it with some sort of sound footage. I've done that before with like lower level classes because when they struggle to put this thing together they just go and find a whole load of pictures M2: Yeah. We put some uh - we put some examples on the board didn't we? Shots that did work, shots that don't work M1: Had to (…) the shots M2: Yeah. Framing stuff yeah and head room and made it funny y'know.....	Not work collaboratively - cooperatively Sorted rushes as group
00.55.00	M2: Tell me what's wrong is funny y'know and (…) we can highlight how not to do it a lot better. Did we make films at your school? M1: You did Yeah W1: Yeah you did M2: **We tried to make a film... conventionally...which is a lot better I find it a lot better way to get it across** K: Yeah M2: **How to it right. Rather than doing one right and then not** K: Yeah I think that drama is a great way I mean...certainly with the little ones. I would have thought the same with yours, where it helps to think…	'Do it right first' – using conventional methods as starting point
00.55.30	K: … about the world from somebody else's perspective, so, takes them away from a slight ego-centric view that children can have really. W1: Oh yes. K:.. Y'know places them something else… then motivates them .. M2: ...apart from - **they were more confident in their roles that they were given, than they were when they come out of that role.** W1: Oh yeah. M2: **Once they got the hoodies up and the sunglasses on.** K: Did you use the whiteboard at all to do that kind of live, so that you were, sort of, seeing on the screen?	Confidence in role play – embody character (*older role play*)
00.56.00	K: Did you have the cameras film and then go in show that? M2: We'd show back what we had filmed on the whiteboard. M1: Yes we did. W1: They were watching it on the camera. Weren't they at one point? M2: They plugged in what they were filming and then watched that and then they watched it on the screen....they did the cameras themselves M1: **Straight away we put it up on the whiteboard, so it was immediate.** K: I think that scale makes a huge difference if you were talking about feeling sick before y'know and I think the scale and the movement - and there's a lot of you get a very different perception...	Immediacy
00.56.30	K; ...very different view from when it's large to when it's small. Everything's a lot quicker when it's larger, I think, and they are just sitting there with that scale. M1: (…) really camera (…) the whiteboard, but we have a lot of trouble with the technology M2: You've got to explain it to us, that do you need some instant, y'know M1: instant feedback M2: Instant feedback so … it's one thing saying lets do some software by taking some pictures… it's no good just…	
00.57.00	M2: … taking pictures – you need put those together and show them up on the screen pretty quickly so they can put the two together W1: ...about that they want to see it straight away M2: We didn't actually do that in the end did we? M1: We did some ...stuff didn't we? Smoking and drinking M2: At the end of the afternoon – no that's not going to work ….can't hold them still enough to do it. K: Could you not have just filmed it	
00.57.30	M2: (…) M1: (…)	
00.57.42	M2: Well there was a lot we could have taken out. 23 frames out of the 24 or something like that or stamp it to made it look like it was drawn. Which is what we did. I don't know what did we get them to do? Any sort of flick a book things?...How it would have taken a very very....	
00.58.00	M2: long time to do one shot by one shot frame by frame like that M1: (…) M2: So you cheat and do it really quickly pictures put them all together la la la la la bang bang bang there's your flicker book its in digital ..and you can put that on a movie M1: Adam had made a movie a to go onto YouTube wasn't he? (…)	

	K: oh yeah W1: he makes them at home M1: he made some M1: so he showed us K: Are they doing more stuff on their own now then as a …...	
00.58.30	K: consequence of....? W1: Well Adam was M1: Well he was W1: Well Adam's left now and… M1: No not so much now I've W1: It's just again, its certain students have got particular interests and something fires them M1: Yeah. W1: ...and he was one of those students. K: That's lovely when that happens when you've found the thing that gets them going. One of the things I'm think of doing with the interactive whiteboard is some green screening which is… do you know the chromakey? So you have a person at the front…	
00.59.00	K: ... and then you have a clear background they use them a lot in special effects in movies. M1: Yes K: So you have a one colour background mainly between green and blue and then you move the colour from that back ground and place it with the film? W1: Right K: there's a - just developing - I'm using a programme called Mac MSP but it just enables you to do that on the fly so you could do it with a live video feed coming in and then you've got a video background that's on the screen that they can see green screen that's like a live movie and that's producing....	
00.59.30	K: some interesting results in terms of narratives and interactivity and stuff. If I just finish off these questions a little bit then we can go - it a bit late isn't it? I think, you've recorded this today haven't you ? M1: Yup. K: Excellent. So I think a lot of this M2: Smile. K: I think a lot of this… in discussions we had this morning really.	
01.00.00	K: I think it's mainly, its going to end up boiling down to this key issues again that get raised a lot with these sort of projects in terms of training and resources, and then the benefits obviously of working alongside practitioners,	
01.00.30	W4: And it not necessarily being about a practitioner who is technical K: No. The stuff that Sheila was doing was really interesting where she was… she talked about it, they were taking pictures of their islands, their imaginary islands. Taking pictures of those and then showing them up on the screen and then getting everyone to comment - about that kind of sharing of work. W4: And they did this layering thing where they had the images of – the photo up and some child decided to draw on their island to add stuff and some children decided to …	
01.01.00	W4: physically add stuff. So they had that choice of . K: Using the mixed media. W4: It was mad though. A crazy week, so much stuff yeah that was produced, but it was great. K: I think seeing their work I think that's where the confidence has come from in seeing themselves in there really. That seems to be with all the students of any age or ability. W4: All that - showcase - to think …	
01.01.30	W4: ...that because I wasn't. I didn't come in to hardly any of this...only the sessions that happened at your school. When I first came and I met the students, Adam was showing me all of his stuff and he was obvious really quite good at digital media already. But when I think of what they were like when I first met them and what they were like at that celebration screening. I mean it was just amazing and they were so proud weren't they? They were just bursting with pride weren't they? They were just so proud of what they had done, seeing themselves up there.	
01.02.00	W4: It's just amazing to see that. W1: Yeah I mean I certainly looked at certain of them in a different light even though they are in my class. And I had already had them for a while. W4: Yeah you saw a different light.	

	W1: ...and you see a different side. M2: Laura has a leading role in at least two of those films which is y'know. M1: For her M2: Incredible for her W1: Brilliant yeah	
01.02.31	End.	

Appendix 10. Questionnaire: Technology in teaching

Short Questionnaire [March 2006]

ICT in the classroom:		
1. **How do you use ICT for class activities?** • Can you give a typical example of how ICT is used in your classroom?	A	Laptops and IWB. A group using internet programmes on laptop
	B	Set up computers for children and teachers
	C	Maths – number lines and square, Number board games. Literacy – playing with sound stories, phonic games. Creative – PC paint programs
	D	Interactive tool whilst delivering lesson objectives. ITPs / Teaching programmes. Children interact / use – structured activities
	E	During the whole class input – showing objective of lesson for all subjects. Numeracy – interactive activities / games. Literacy activities, reading, writing
	F	Promethean board – flipcharts to learn phonic, 100 square for counting etc. Class computers for children to complete paint or games linked to lesson.
	G	IWB, laptops / PC, Video camera, bee bots roamers, digital cameras, avatar
	H	-
	I	A child chosen activity. Planned lessons with IWB
	J	I use the whiteboard. It is used for sentence writing and simple programs
2. **Does ICT save you time? If so, how?**	A	N/A T.Assistant
	B	No
	C	No
	D	Should do…
	E	Yes – Easy to find games / activities on the Internet. Easy to save resources which can be used again – easily edited. Easy to search for documents. Easy to share with others – good as 3 classes per year group.
	F	Yes – planning. Also, can save various flipcharts for revision
	G	Planning. Access to the internet for resources. Easy to use for teaching / learning activities
	H	Not usually. Word processing & saving files of planning are useful. Other functions often take more time. Often unnecessarily complicated
	I	-
	J	ICT Does not save me time due to the lack of working equipment
3. **Does it change the way you plan your lessons?**	A	N/A T.Assistant
	B	No
	C	Sometimes
	D	Knowledge of application of programme / links / images does enhance teaching for teacher / children
	E	Yes – if laptops are working I aim to have a group working independently on them using 2 simple software
	F	Yes – include more activities using ICT
	G	It is becoming more important, particularly internet access through IWB & laptops. Although over-reliance on ICT can be a problem if there is a technical issue so I always plan a non ICT alternative
	H	I am now happier to plan to avoid it
	I	-
	J	N/A
4. **Has the IWB had any impact in the classroom?**	A	Positive. Yes. Technical difficulties. Input & plenary
	B	Yes (*next to impact*). Teaching literacy and Numeracy. Creative work

• What is it used for? What is easier? What is more difficult?	C	Yes (*next to impact*). See 1
	D	Delivery of lessons. Support for delivery of teaching objectives. Frustration with the lack of personal knowledge / expertise when 'things' do not seem to be working - negative attitude of tool for children.
	E	Used for: - introducing objectives, introducing concepts activities for whole class inputs. Easier for: - planning and finding resources. Difficult: - when it doesn't work! Having trouble with bulb on projector so switches off after 10 minutes.
	F	Used for children to practice handwriting, stories etc. Very useful for this.
	G	Massive impact – makes practical demonstrations much easier. Involves children. Lessons can be difficult if technology fails.
	H	Scanned big books can be useful. Not always easier.
	I	Literacy / Numeracy – Getting the children involved and interacting with the lesson and learning
	J	It is very useful in the classroom. However does need configuring a far bit
5. **How do the children use the PC in the classroom?** • How frequently? Individual / pair work? 1:1 work with TA or teacher?	A	(*Next to Individual / pair work*) Older machines – laptops used more
	B	Everyday. Sometimes 1:1 with teacher. Mostly individual and pair work
	C	Daily choice of individual / pair work. Occasionally 1:1 with teacher
	D	An area for development
	E	1. IWB daily – used in whole class input with children coming out to answer questions – show workings. Pairwork with TA to complete ICT areas. 2. PC daily, individual or paired to play Literacy / Numeracy games. Weekly – individual to complete ICT areas
	F	Individually or in pairs. Children come up to the Promethean board to demonstrate
	G	At least weekly – individually / paired and in groups. Working with adults and independent research
	H	Frequent breakdowns
	I	Daily – individual & pairs. TA & T – Termly and when needed
	J	Infrequent use of PCs due to machines not functioning
6. **Where do you find images, sounds and movies to use in your lessons?**	A	N/A T. Assistant
	B	-
	C	Through IWB
	D	Bank, Net, Personal, Avatars – developing use of camera
	E	www.audio - for free music. Coxhoe school website – links to all school area. www.sparklebox - for downloads. Google for images. BBC
	F	Usually via the Activprimary programme
	G	Mostly from Google although I do find the SWGFL filters ridiculous things
	H	(*Next to images*) Internet
	I	-
	J	We have problems with internet access in our room, We use the Main building computers to print any internet images.
7. **How do you create images, sounds and movies to use in your lessons?**	A	N/A
	B	-
	C	Usually IWB
	D	Camera – beginning – early steps. Downloads of photographic images. Net
	E	Photostory 3 – to make videos. Digital photos. Scanned in work.
	F	Usually via Activprimary, sometimes via the internet
	G	Photostory. Digital camera. Avatar
	H	With frequent difficultly, waste of time & regular disappointment
	I	-
	J	We often set up laptops on a Friday afternoon and when they work, we use Powerprints to insert images and text
	A	INSET training – mostly for teachers although TA's welcome

8. **How much training have you received for using the ICT equipment?** • How adequate is the professional training?	B	A couple of insets
	C	I'm sure it is more than adequate but I'm a bit slow to catch on!
	D	During career – not as much as I would like. Always need to 'keep up' with developments. 'Time' for delivery and implementation is always an issue.
	E	Training at university. INSET – Ken Corrish LA consultant – webcam, Photostory 3. Very happy with the training (because I feel quite confident using the IWB)
	F	Previous training for SMARTboard. Very good training in my previous school (I have only worked here since February so haven't received any training here yet)
	G	I could always use more training because I do find it difficult to remember how to use programs unless I use them daily
	H	-
	I	Training given when new equipment arrives
	J	I use ICT a lot and have qualifications at Level 2. There is still training needed to improve my understanding of some programs
9. **If you could have any technical resource for teaching and learning, what would it be?**	A	N/A
	B	Computers that work consistently
	C	An onsite technician
	D	On site IT technician! 24/7!
	E	Simple video recorder for the children to use (Digital Blue not liked)
	F	? Perhaps a primary games package to use when teaching Numeracy / Literacy?
	G	-
	H	-
	I	-
	J	Laptops at class stations and wireless networking that work effectively

Appendix 11. Play with Computer: Field notes and full transcription

11.1. Field notes

Method:	Observation & short discussion
Date:	
Time:	Afternoon
Participants: (Various)	N= 2 Yr 1 class
Objective:	Observe collaboration with single device
Context:	Pres-selected well behaved children asked to participate in observation 3 small computers (only 2 working), with room for 2 (tiny) chairs.
Observations:	Counting game – In this application select a number, and the application places the highlighted item on the screen. Turn taking was amicable
Additional data:	Interview – Using the computers P1 and P2 have been using the computer for 15 mins, playing counting games K. Can you tell me a bit about working on the computer? P1. Well it's really good. Sometimes it doesn't work K. Why doesn't it work P1. Because sometimes people keep turning it off and changing the programmes K. Okay. And what's you favourite game on the computer? P1. All of them K. All of them. So what's this one about? P1. Er. It's like a counting game. And all you do is like count and play games and things K. Do you find it easy working on the computer? P1. Yes K. Is there a difference between working the computer at school and working on the computer at home P1. Well anyway, my computer's only got ( ) K. It's only got? P1. It's only got paint and () on it K. Oh okay. P1. ( ) K. Oh right K. Is it more fun that writing? P1. All we have to do () K. Okay well that you very much
Notes:	Often work with most capable children Children often work in pairs on the computer
Early Analysis:	Co-pilot – one give instructions There is no audio Counting – no concept check / record of progression

11.2. Transcription

Time	Transcript		Action
			P1 and P2 sharing the computer. P1 has the mouse Both are looking at the screen
00:00	 P2 P1 P2	 In those boxes. (Too quiet) – No *that* one.	P2 opens application – menu of different counting games on screen P2 runs finger across the bottom of the screen P2 points to middle graphic on screen
00:05	P2	Click on that. That one's first.	P1 clicks on centre graphic and opens VE environment P2 points to graphic at the top of the screen Triggers first stage of game (select a number and the character climbs the ladder – rungs climbed correlate to number selected)
00:10	P1	We're going to go to 10, aren't we?	P2 doesn't respond to P1's question
00:15	P2 P2 P1	If. No Yeah: (Too quiet) of him. We can go higher than 10	Response to P1 moving cursor to wrong object on screen Response to P1 moving cursor to right object on screen
00:20		(00:04)	Both looking at screen

	P2	Yeah look =	
00:25	P2 P2	= he's going onto the clouds (laughing) He's going round (smiling)	P1 looks briefly at P2 – back to screen
00:30	P2 P1	Now I'll give him (Too quiet) Yeah::	
00:35	P1 P2	Now the number 10, now the number 10 [He goes really high	 P2 tracks graphic on screen – moving upward
00:40	P1 P2	Yeah:: higher than you ( ) [Oh do this bit (.) there	 P2 runs finger down the screen
00:45	 P2	(00:04) And there he can have =	Both looking at screen P2 points to graphic on screen
00:50	P2 P1	= let's have 9 Yes	
00:55	P2	Put it in there (00:04)	P2 points to graphic on screen Both looking at screen
01:00	P1 P2 P1 P1	That goes up Ahh (slightly disappointed) 5, 6, 7 [5, 6, 7	 P2 points to graphic on screen P2 points to graphic on screen
01:05	P1 P2	9, 8 Yeah 8	P2 points to graphic on screen
01:10	P1	8	
01:15	P2	9 9 9 (.) do 9	P2 points to graphic on screen
01:20	P1 P2	(Laugh) (Laugh)	
01:25	P2	Do it (.) do it with 9 (00:03)	 P's watching screen
01:30	P2	Look how highs he's going (smiling)	
01:35			P2 looks at camera, P1 looks at camera P1 and P2 look around the room P1 clicks on the icon and screen changes
01:40	P1 P2	( ) Click on the skipping rope	 P2 points to middle graphic on screen
01.45	 P2	 So ( )	(00:04) P1 and P2 look at screen P2 runs finger across the bottom of the screen
01.50	P1 P2	( ) [( )	
01.55	P2	That (.) 10	P2 points to number on screen
02:00	P2	No. That one ( )	P2 points to graphic on screen
02:05	P2 P2	*Yes* (00:03) 10	
02:10	P2	Very good jumper	P2 P1 looks around the room
02:15			
02:20			
02:25	P2	8 8 8 8 8	P2 points to number on screen
02:30			P2 looks at screen P1 looks around the room
02:35	 P2	(00:03) And then after this game	 P2 looks at P1
02:40	P2 P1	( ) Um	
02:45	P1 P2	( ) Yeah	P2 and P1 look
02:50	P2 P1 P2	( ) ( ) [Yeah	
02:55	P2	Can I have the mouse please	P1 gets up and P2 takes the mouse from her set

03:00	P1 P1 P1	Click on ( ) ( ) And then click that	Still standing, P2 points to graphic on screen New screen P2 points to graphic on screen
03:05	P1 P1	No not that That's really hard you know	P2 moves finger round the screen
03:10	P1 P2	Now you sit on my chair. I'll sit on your chair Yeah.	 P2 moves
03:15	P1	What did you do? Um ()	P1 moves to P1's chair
03:20	 P1	[( )	
03:25	P1	The red one the read one	P2 points to graphic on screen
03:30			
03:35	P1 P2 P1	Do that and move it that way ( ) ( )	P2 points to graphic on screen, and traces across the screen
03:40	P2	No	
03:45	P1 P2	Do windows I'll do ( )	P2 points to graphic on screen, and traces across the screen
03:50	P1 P2	Go on do ( ) ( )	P2 points to graphic on screen, and traces across the screen
03:55	P2 P1	( ) [Do ( )	
04:00	P1 P1	Do that one. Do that one there.	P2 points to graphic on screen, and traces across the screen
04:05		((Off task))	
04:10			
04:15	P1	And now do those. Do the arms.	P2 points to graphic on screen, and traces across the screen
04:20	P2 P1	The squares are up there Not there	P2 points to graphic on screen, and traces across the screen
04:25	P1	Do the same body and then the arms	P2 points to graphic on screen, and traces across the screen
04:30	P1	You do that (.) okay	P2 points to graphic on screen, and traces across the screen
04:35	P1 P2	That's (where the triangle) [Do (.) do the circle and (one triangle)	 P2 points to graphic on screen, and traces across the screen
04:40	P1	One circles (00:03)	P2 points to graphic on screen, and traces across the screen P1 selects a circle
04:45	P1	And one triangle (00:03)	P2 points to graphic on screen, and traces across the screen
04:50	P1	No no (.) click on that click on that and get (the men)	P2 points to (arrow) graphic on screen
04:55	P1 P2 P2 P1	It's cool isn't it Yeah Where's mine? You did all of them.	New screen – menu of objects created On different screen P2 point to all the objects in the menu
05:00	End. [children continue using computer for 30 mins]		

Appendix 12. Play time observations and discussions: Field notes

12.1. Field notes	
Method:	Observation and discussion (with teacher)
Date:	June 2006
Time:	30 mins
Participants:	Yr1 classroom (approx. 30 pupils) Teacher 3 TA's
Objective:	To observe a free play activity in the classroom: social interaction and use of social spaces in play Overview Type of activities – resources and behaviour
Context:	The children had been working on a whole class literacy session. The play session was in the last half an hour before lunch Places to play in the classroom – there is the role play space, the story tent, a large train set which is used on the floor, a table with materials to make bangles, games on the IWB and Lego – they can choose, but this is managed by T for popular choices, and spaces / activities are delegated depending on request. 2 TA are working outside the class – 1 with 2 P's, 1 with 1)
Observations:	T announce they now have 'Choosing Time' – the children immediately start to ask for certain toys / activities, there is also a little discussion between P's. T quiets (fingers on noses), when quiet, children are asked to raise their hand when the activity they want to do is called. There is some very enthusiastic hand rising, regardless of the competition for use. T calls out names to allocate play activity. Play is a negotiation – P1 & P2 both request IWB - "Yes X you can play with the whiteboard, but Y you played with it yesterday and I think some else should be able to have a go." In all the activities, the children work in groups of 3 to 4 – with the exception of the IWB which is used in pairs. About 3 children move from their allocated group - 1 boy moves to the role play, 2 girls move to the bangles. T seems aware of this. But does not move them back. The children on the IWB start using a memory game (matching images which are turned over one at a time (they appear to have done this before), but still seems to be enjoyed (more of a race than memory). The audio feedback, or succeeding, makes them laugh. The pair move around the board, there is some directional talk: 'that one, that one'. One girls sits down at a PC (she was not allocated this but is not challenged) ● The role play space is a kitchen – There are plastic toys, kitchen unit, a cardboard box with the front cut out and side decorated to look like an oven. There are some old saucepans, a couple of plastic spoons, plastic plates, tea cloth, aprons, small cardboard boxes and plastic tins of play food. Throughout the 20 mins, there is lots and continuous movement through and in the space. The children start by moving things around - 1 P stirs a spoon in the bowl on the cooker. I P putting containers in the oven. Towards the end of the session, 1 P, who to moved from trains to the role play space, picked up the oven and put it on his head (upside down) with his face in the window. Announcing, quite strenuously, 'I'm on TV, I'm on TV, Look, look *name*, I'm on TV.' In character: mock talk whilst shaking head like exaggerated announcer. Fluid dynamics on own, as whole group (all attending when pretended to be on TV with head in a box) The train set is laid out on the floor and needs assembling. There isn't large amount of space. I P very absorbed. T watches over to monitor behaviour (and also talking to me), but does not instruct or guide the children, other than (occasional) comment to individual P's to quieten when noise or action (rough and tumble) is at a distracting level. Some children have complete autonomy when playing. There is 1 TA is working with the children doing crafts, but watching and talking, more than doing. Girl at computer is still playing alone has looked up a couple of times to watch others, but otherwise wholly occupied with screen (
Notes from Discussion:	Children normally do activities throughout the day in 20 mins chunks. The children play in class at least once a day, she considers it to be important to develop social behaviour. T looks for ways to integrate learning with play – choice of

	objects to play with, and the way they are expected to play with it (and with others). She mentioned that play, in this form (free as opposed to structured), is phased out as the children move through the school, but believes T's try to retain an element of play in all activities – how things are presented, creative activities. Whilst most of the children play, there may be occasions when this time is used for some 1:1 time to do supplemental literacy or numeracy. This would be done outside the classroom (there are workspace in the hallway, or the ICT suite is used) – the other children playing would be too big a distraction. For T, play for the children, though in part about the activities they are allowed to do, means to choice – though there are a fixed range of toys and spaces which can be used, popular choices are rotated During time not allotted to play, some children who finish work early are allowed to play while they wait for the others – this frees T's time to focus on more needy Adult modeling new play, i.e. themes for play space – the children do not know intrinsically how to use these items – they are taught Year 1 is a particularly difficult time for pupils, as their domestic space is supplemented with the academic environments of the classroom and playground. Not only are they parted from their primary carer, but there is an awful lot of routines and rules to learn, a bewildering amount of people, and high demands on their social behaviour and intellectual activity. Consequently it can be, for the first six months as least, overwhelming. the research activities needed to be sensitive to fit in with regular activities and not disrupt emerging patterns and habits. The children are now familiar with the terms used to mark out sections of the 'Choosing time', 'circle time' (sitting quietly in a circle a few children will come up a talk about an event – esp. if they have done something special) Storybags here…. Activity: Telling stories with the story bags – book and toys… Play whilst listening to story – take home to use on own or (preferably with parent) … Place to enact a story
Additional data:	Diagram Photos of playspaces
Summative notes: (*after session*)	Short timeframe for play – something that can be used in 20 mins Role play - Not just organization language, but defining Playful affordances (interpretative use of object) – on TV Recognize a need to make learning 'fun' Play as reward – lost sometimes - if slipping academically Play is a negotiation – options with constraints and management of resources Items to investigate different types of play: construction (Lego), mark making (drawing, painting etc) and pretend (centred around activity i.e. kitchen utensils, dolls) ● Use of objects is both mimicry (pots and pans) and pretence (oven as TV) ● Use of Pc can be isolating as a solo activity – attention is taken away from the class From discussion with teacher: the computers are a popular choice in play time – computers from her opinion are a chance to play *Working towards framework for analysis:* Activities and structure of play, patterns in behaviour Differences in collaboration in different types of play Exchange of speech and communication through non verbal actions – exchanging and generating ideas, overlap in speech, decision making, process and production (sharing of task) Reflect on process and practice of working with children as design partners: structure of delivery and data collection. Ephemeral technologies to work with play – loose narrative / subjective interpretation

12.2. Field notes	
Method:	Observation In the play house
Date:	June 2006
Time:	20 mins
Participants:	N = 3 - 5 (Reception Class)

Objective:	To observe free play in the role play space How was play organized What are variants and invariants in play?	
Context:	Free play time in the classroom Role-play space has a Nursery Rhythm theme – One wall is decorated with green netting and flowers so as to look like a garden. On the other wall there is a blue netting and finish, also there is a little netting over an internal window (to look like sky?). In the middle of the play area there is a table with the plastic tea set. There is also a small dressing rail with some dressing up clothes. I was sitting in the corner with a notepad, I tried to be inconspicuous but difficult (feel like a giant) – children chat a little and ask a few questions ('why are you here?'), but generally ignore me. I didn't ask questions Design of playspace changes every 2 months	
Observations:	**Activity**	**Interpretation**
	● 0 – 5mins ● P's choose to play in the role play space (managed by T) – it is couple of minutes until everyone is organized, through not for role space – walk straight in and use. Time is taken up allocating an option for all (some negotiation – popular choices IWB and sand pit rationed) 5 - 7 mins ● P's quickly start picking up the objects – P1 and P2 move towards and sit down at the table, pick up the plastic tea sets and P1 start to pretend to pour tea. The others, P3 and P4 are pulling material out of the dressing up box, putting on hats and draping cloth over heads. P3 makes a cloak and starts to run around the space with arms extended. This disrupts the P1 and P2 at the table. ● The noise attracts attention of P5 not assigned to role play space and he moves in (not sure from which activity) – watches and laugh as jumping P3. 7 -9 mins P2 leaves table to play with the train set outside the role play space, P5 is looking through the dressing up box (to find large enough material for cape). P1 left at table is not happy with loud play, and moves to dressing up box and starts to look through. P3 sits down at table and makes loud tea making / drinking noises with exaggerated movements (Over pretence?). After less than 30 secs, P3 gets up and moves out of the role play space (leave cape on floor) to goes to IWB watching to 2 P's using it. 9 -11 mins The P1 and P5 look through the dressing up box, put out a couple of hats – one cap is too big and falls over P5's eyes. This is funny and repeated (pushed up, so it falls down again.) The laughter attracts attention of P2 on train set. P2 moves back to playspace and looks through box for hat. P's with oversize hat are still laughing and draw attention (P2) to this. 11 – 15 mins	Choice in activity important, though not entirely autonomous Language: draw their attention something, make plans, enact play narrative, and state intention Flux – movement between play spaces during play time Choice not fixed

	P 1 picks up large cloth and lays it on the floor, and tells P5 to lie on it and go to sleep. “You’re a cat and I’m your mum and now you must go to sleep’. P5 lie down and pretends to be a sleeping cat. P1 repeats the instructions 3 times, while P5 continues to be a cat. P5 doesn’t question this ((no negotiation)). They do repeat the action of the cat going to bed and going to sleep. This activity continues for 4 mins. Some play talk ‘go to sleep now’, but mainly action. P2 leaves the role play space. 14 – 17 mins P3 returns to the space and picks up cape and starts to swirl around - minor disruption to P1 and P5, P2 returns to role play space, first watching and then looks through dressing up box and pulls out a scarf and also starts to twirl. P1 and P5 watch and laugh, particularly when P3 stops and is a bit dizzy. 17 - 20 mins Activity stop – line up for lunch – stops place fingers on nose, when quiet line up	
Discussion with Ts	T outlines that the role play space is used daily in this classroom. The nursery rhymed theme is connected to other class work, and expressed by the children through various means – they are learning to sing the songs, and have draw pictures as a measure of their comprehension. Previous themes have include a building site, a hospital and the Moon. The hospital theme was linked understanding the work of Florence Nightingale, and featured bandages small (child friendly) medical equipment and beds along with nurses and doctors outfits. The children also produce drawings of pictures that were placed on the wall. The teacher talk about the space in the adjoining classroom, which was orientated around Mexico, again also linked to other aspects of the children’s learning. Later when I when into the staffroom, the teachers and TA from this class were preparing a special lunch for these Yr1 children of re-fried beans, cheese and tortillas, so they could also experience eating as a Mexican. They had previously dressed up, and the clothes would still be available, though they would not be dressing up whilst they ate today. For the teachers this made sense – they thought the children would find these concepts easy to understand if they did them as separate activities – doing them together asked the children to deconstruct a large amount of information. Doing them separately would make these aspects of a complete learning experience more identifiable.	
Additional data:	Drawings of places we play Photo of role-play space	
Notes:	● Fluid dynamics of the players – move in and out of the space, on a couple of occasions (notable events – in this case events considered to be funny - examples) came together as a group, otherwise play in dyads or solitary. There is a little shift in participants of pairs. There some parallel play, but due to small space not being aware of others in the peripheral is perhaps unavoidable. Solitary play tended to be a pre-occupation with objects – serving tea Costumes (very mixed) sheets, scarf’s (used interpretatively) – objects with malleable affordances – cloak, bed. ● Mix of meta talk and pretend talk – intertwined with action and language ● Short and repetitive narratives - Cat and mother game – organizing – cat sleeping – meta language and play language iterative, some refining of instructions, but also repetition of same meta language A lot of imitation ● Highly animated behaviour from all the children – the boys tended to be louder. Classrooms / schools are communities - once rules are laid out, in early years at least they are maintained by the group - lining up etc.	
Summative	Description of the stories in play – play talk, organizational, fluid dynamics of group	

	Design of spaces – Play in learning (objects tie into theme) Objects with malleable affordances – opportunities – playful affordances

12.3. Field notes	
Method:	Observation of digital Play
Date:	March 2006
Time:	20 mins
Participants:	N= 4 , Yr 2 (6-7 yrs) – 2 girls and 2 boys Gifted and talented group
Objective:	To observe a free play activity with classroom computers: social interaction with tech
Context:	The children were told they could play with the computer for 20 mins. They were asked to use the IWB and the computer attached. They were asked to play together, but could use any application they chose. The later instruction was met with happy faces. The activity was set in the ICT suite, rather than a classroom (less disruptive to the class as there were formal lesson, and to us) The IWB is quite high and the children can only comfortably access the lower third – not issue here as touch screen didn't work with the app
Observations:	The children chose Grannies Garden application – there was not so much a discussion by the children where a decision was reached, but rather as an simultaneous request, which was made to me, 'can we play…' – rather than to each other. Grannies Garden is a problem solving based application designed for KS1-2. That has been around since the 80's, though updated since. The user is on a quest to rescue the missing children of the King and queen. There is a virtual space (flat colour, cartoon style) which the user can navigation using the mouse. There are tasks that need to be performed, and a wicked witch who must be avoided. Some of the characters and features are slightly animated, and objects integral to the game, can be selected The application didn't work with the touch screen, Information is given as animation and text. User must type in some answers. The children have used this application before – some more knowledgeable than others, in the first few stages two of the children knew exactly where to go to pick up the required item to move the next stage. They were keen to move the game forward, rather than explore further a space that was familiar. The input device (keyboard and mouse) is separated from output (IWB) - the screen was located about 4 ft from PC. Whist the children played an interactive narrative game, the children had to relay information from the screen to others on the keyboard. The IWB intended for T, to demo computer use to P's in suite. As the application didn't work with the touch screen, the children became part of feedback loop from the visual screen to the input device. The distributed location of the hardware created the information gap in the activity and forced the participants to collaborate. It also appeared that because the pupils were highly motivated on completing the task and exploring the virtual narrative space, though there was a little frustration at the slowness, there was little conflict. The children work as a group for the entire 20 minutes – in 2 dyads (girls using the PC to nav) boys at the IWB. Boys often move to PC to direct nav. There is some dominance from the boys (who have more experience of using the game) and control A lot of conversational / metatalk - 'go there' click on the house'
Additional data:	Diagram of ICT suite Photos of suite
Notes:	Structure play / game – better suited to these children
Summative:	Collaboration – both as consequence of layout / and hindered by it - exploration and shared strategy Single media space Distributed interaction – multiple points Whist watching children play an interactive narrative game, it was observed that because the screen was located in a different place in the classroom, the children had to relay information from the screen to others on the keyboard. In this scenario,

	the children became part of feedback loop from the visual screen to the input device. The distributed location of the hardware created the information gap in the activity and forced the participants to collaborate. It also appeared that because the pupils were highly motivated – playing favourite game. Children disengaged...

Appendix 13. Play observation: Field notes, interview, transcript and motion study

13.1. Field notes	
Method:	Observation and discussion in role play space
Participants: (Various)	Yr 2 (6-7 years) Gifted & Talented group
Objective:	Observe collaborative free play Attitudes and reported play
Context:	Hidden camera – slight obscure view Children (selected by T) first sat down in playspace for short (5 mins) discussion of play, followed directly by 15 mins of free play
Observations:	Watching others and copying – use of the xylophone and the wool as pancakes – shared interpretative use of objects – parallel when group brought together with xylophone Draw attention to notable events – things out of the ordinary Affordances and playful affordances - Playful affordances of play objects – wool as noodles, wool as pancakes – suggested initially through action (point at which recognized movement as being meaningful – 'oh pancakes' What can this do, approach to use? A lot of peripheral awareness of other's activities – C2 getting chopstick when other have their – copying (need to see others and self in (virtual) spaces Return to points of interest Shifting and movement – changing dynamics – each child (with exception of C1 and C4 coupling – some interaction but not shared – C4 pulled the xylophone away when C1 tried to use it when he was holding it) – play with every one of the other 3 during this period. Sifting to different object, or use of object through us of others – C4 started, C3 copied C4, C3 informed C2, C2 copied C3 – spread through group Varying types of play – though some trends with particular subjects (C3 onlooker) Idea and approaches to use of object spreads around the group if children don't fully interact – parallel play Positive and negative behaviour – generate on multiple
Additional data:	Photos of Space Transcript Video recording (Didn't directly observe as didn't want to impact free play)
Notes:	The children selected for this study (Yr 2) are slighting to old for this type of play – in interview they don't use these spaces and more
Early Analysis:	Multiple points of interaction (within single space – vary groups and arrangement Return and revist places points of interest

13.2. Discussion about play				
	Time	Transcript		Notes
1 2 3 4	00:10	K. C2. K C2.	Everyone comfy? Okay (.) so I want you to tell me about playing in the role play space We don't have them You don't, not in your classroom? No. We did last year. We don't play here any more	4 children (C1 - C4) sitting round table in playspace, expect c4 is standing "Too hungry to sit" Playspace is themed as china

5		K.	When you used to play in here, what did you do?	Spaces are everyday, functional (domestic) environments – playing at everyday life, playing at being an adult? Limited memory of themes (know they have had space, under the sea themes – perhaps Q not understood – I.e. think I'm talking about the role play space outside the classroom – or, didn't comprehend the themes)
6		C2.	We didn't play in here because there was nothing here	
7		C4.	(*Over C2*) No, we used to have kitchens	
8		C2.	Yeah	
9		C4.	and play kitchens	
10		K.	Okay	
11		C4	(*Smiling*) And once the baby died	
12		K.	(*Laughs*) Why did the the baby died?	
13		C4.	Of cancer	
14		K.	That's terrible, wasn't it. So what else to you do? You play kitchens, what other things do you play?	
15		C4.	Nothing else.	
16		C2.	No, it's just kitchens	
17		C4.	Ok, garden centre	
18		K.	Okay	
19		C2	Oh Yeah	
20	00:35	K.	And did you enjoy it?	
21		C2.	Yeah	
22		K.	What was your favourite thing to do there?	
23			*(C4 does karate kicks and "High-ya" towards camera 00.40 - 00.50)*	
24	00:50	C2.	(*Laughs*) Um my favourite, my favourite was in the kitchen because um:	Playing with real things is a notable feature
25		C4.	the baby died	
26		C2.	No because we could like have, like little, like kitchen and we could phone, we could, we've got a	
27			little phone for the kitchen	
28			[	
29		C4.	It was an actual REAL phone	
30		C2.	It's a real phone	
31		K.	A real phone	
32		C2.	Yeah	
33		K.	Oh okay. And what other things to you like to play?	
34	01:10	C4:	Oh that's hard. Touching the ceiling (*jumps up*)	(*C1 puts hand up, K fails to notice*) K not always good at regulating in collaboration (forgot about protocol of raising hand, not used by others – I just though C1 was quiet)
35		K.	Is that	
36		C4.	but I can't	
37		K	Is that a game?	
38		C4.	No	
39		K.	What do you normally, how do you, if you had, if I said now you have half an hour to play, what	
40			would you do?	
41	01:25	C4.	Oh	
42		C2.	Oh, it's like, put on a little Patomine and tell you, yeah?	
43		K.	Okay	
44		C4.	I'd probably do a hindu thing	
45		K.	A hindu play?	
46		C4.	Yeah like Hindu's	Ideas not led by interpretation of space (didn't play Hindu game) - random
47		K.	What's a Hindu play?	

48		C4.	Plays where you do about god. And I like it	connections – what they want to do rather than denoted by space and objects (age?)
49		K.	Oh fantastic	
50	01:45	C4.	I did it before with the *(...?)*	All get involved in discussion at this point – area of common ground – non speaking, non individual. Show not speaking is not a lack of willingness to participate in group activities.
51		K.	Wow	
52		C2.	Yeah we did, didn't we	
53		C4.	Yeah	
54		C2.	All of us done it, all of us done it	
55		C4.	I know how to meditate (*sits in a meditation position and starts mediating*)	
56		K.	Can you do, you're suppose to put your legs (*gestures placing foot above leg*)	
57		C3.	Like that (*Tries to moves legs to mediation position*)	
58		C1.	(*Tries to moves legs to meditate position*)	
59		C3.	(*shakes head*)	
60		K.	(*Laugh)*	
61	02:00	C3.	He's meditating (referring to C4)	Mark out real & non real items
62		K.	What about you two (*Looks at C1 and C3*), what about, I've forgotten your names now	
63		C3.	(*Name*)	
64		K.	And (*Looks at C1*)	
65		C2.	(*Name*)	
66		K.	What do you like to do when you play?	
67		C3.	We play in the shop, we've got a *(...?)*	
68		K.	Oh okay, your shop. Is it like a real shop?	
69		C3.	(*nods*) it's just got empty boxes	
70	02.20	K.	Right	Real world spaces
71		C2.	One day	
72		C1.	I	
73		C2.	we'd been up there for *(...?)* afternoon and we played, and we had like, um, a dressing up shop	
74			there and we had like um, ah a stamp shop too	
75		K.	A stamp shop, wow	
76	02:35	K.	Have you ever, cause they all seem like place you would go to like you have a kitchen in the home	Difficulty keeping discussion on track – articulate in their terms – from practitioner perspective (v poor Q) Difficulties with hypothetical
77			don't you, and you have garden and you go into shops	
78		C3.	I don't have a garden	
79		K.	You don't have a garden,	
80		C3.	A balcony	
81		K.	A balcony. But do you, do you ever play in places	
82		C4.	*(Stops meditating)* I've stopped meditating	
83	02:50	K.	places that you don't go to	Trying to find out if they play in places they don't visit (v poor Q)
84		C2.	Um	
85		C4.	I do	
86		K.	Go on	
87		C4.	The london eye	
88		K.	Oh okay. But in your playspace, in your classroom?	
89		C4.	I thought (...?) for the london eye I did	

90 91 92 93 94 95	03.05	C1. C2. C1. K. C1. C4.	(*pretends to eat plastic food with chop sticks*) In the classroom I like playing like, I like playing with (*Puts down chop sticks)* (*To C1*) you can play with this (*Picks down chop sticks)* (*Starts to play with plastic plates and pretends to eat*)	Solitary play – C1 not talking. Thinks this is wrong (distracted) – pleased can continue Group dramatic
96 97 98 100 101	03:15	C2. K. C2. K.	I like playing like, I like colouring Colouring But I can't do (..?) Oh (*C1 & C4 Pretending to east plastic food*)	Play is preference
102 103 104 105 106 107 108 109 110 112 113 114 115 116 117	03:30	K. C4. K. C4. K. C3. K. C4. K. C4. C2. K. C2. K. C2.	So what's this, what do you think you're suppose to do here then? (*gestures to space and objects on table*) Dunno No, in this space, normally? (*Gets up and jumps to try and grab tassels from Chinese decorations*) Jump (*speaking to C4*). Go on (*speaking to C3*) (*Shrugs*) you don't know. What's all this (picks up wool from a bowl on the table), what's this for? Noodles, Noodles And Chinese, Chinese stuff What about that? (*points to fan*) That's a Chinese fan (*pretends to fan herself*) So what, what's, do you think this space, if you have shops and gardens and kitchens we don't have time, we don't have this (gestures to space)	Theme of space not recognizable (fans, food etc) – they have to think about it Recognize the pretence in context – this isn't questioned – K drew attention to theme Not time for play – C's difficulties with hypothetical – empathy difficult here (from my imagination, not theirs) – discontinuity this phase is over
118 119 120 121 122 123 124 125 126 127 128 129	04:00	K. C4. K. C2. K. C2. C3. C4. K. C2. C4.	Oh okay, so where's this suppose to be China Okay Yeah China (...?) Right. So what do people do in China? Um::: (*Shrugs*) (...), They do Chinese dancing, they do Chinese dragons, they do noodles So if I said you've got five minutes to pretend you're in China. What would you do? Um:::: [Actually in China?	 Not always easy to get an opinion Pretend you're 'actually' in china
130 131 132 133	04:30	K. C2. C4.	Actually in China Um:::: [Woh, I'd eat scrambled eggs (plays with chop sticks)	Play more about satisfying self that adhering to rules defined by space Subjective want overrides theme of space –

134 135 136 137 138 139		K. C4. K. C4. K. C2	Scrambled eggs? I love them Okay And I hate noodles Well do you want, Lets eat them, lets in eat them (Over)	personal dimension higher than phsyical
			End – move to free play activity.	

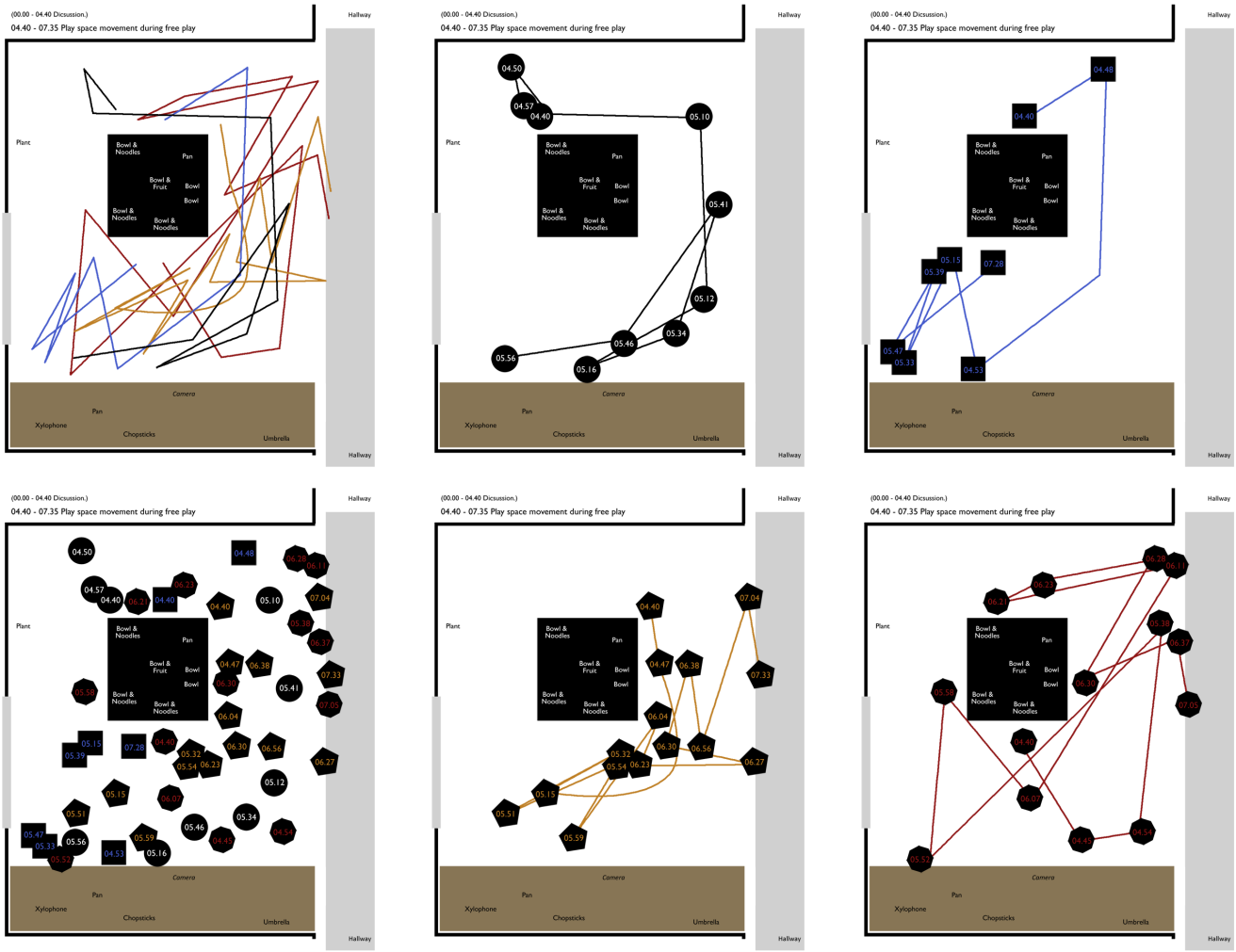
13.3. Free play transcript					
Time		**Transcript**		**Play type**	**Notes**
1 2 3 4 5 6 7 8 9 10 11	04:50	K. C2. K. C2. K. C3. C2.	Do want to just play to play for five minutes whilst I fix my computer Yes (C3 Smiles, moves towards table) And then (gets up and walks around table) Oh how can eat all of them (to C4 who is pretending to eat noodles) we'll do something else (...) on that one (C4 get up) Oh you can eat Chinese (C1 and C3 look up, still seated at table)	C2 Conversational [+ve] C4 Parallel / Dramatic C4 Transitory C2 Conversational	Attempt by researcher to present this as free time Ps start to play before instructions are completed.
12 13 14 15 16 17 18 19	05:00	C1	(C1 and C3 seated at table) (…) oh (…) (C3 pretending to eat chicken, C1 watches and laugh) [At same time] (C2 and C4 move towards and start to play the Xylophone at other side of play space – as play C1 and C3 look over) (C1 gets up and walks towards the table where C2 and C4 are playing the Xylophone)	C3 Dramatic / C1 Onlooker [+ve] C2 & C4 Group / Functional C1 & C3 Parallel with C2 & C4 C1 Onlooker	C1 and C3 playing together C2 and C4 playing together Whole group – notable object grabs attention of all (xylophone)
20 21 22 23 24 25 26 27 28 29	05:10	C1. C3. C3.	See if there's any more chicken (C3 moves towards table) Chicken (laughs, pretends to eat) (C4 picks up Xylophone and waves it at C3 head) (Ducking) Oh (C2 sits down on opposite side of the table to C3 and pretends to eat noodles – wool) (C4 puts the Xylophone on the table and starts to play) (C1 and C3 move to table and start to put up and look at items)	C1 Conversational C1 & C3 Group / Dramatic [+ve] C4 Rough & tumble [-ve] C2 Solitary / dramatic C4 Solitary / Functional C1 & C3 Group / Exploratory	C2 and C3 playing together C1 and C3 playing together C4 dominates use of object to 5:50
30	05:2	C1.	What's that there	C1 & C3 Group /	Tape obscured by C1 – sound only

31 32 33 34 35 36	0	C3. C3. C1.	(…) (…) That one's broke (C1 and C3 still picking up and looking at items) (C4 plays Xylophone) (C2 eating noodles)	Conversational & Exploratory C4 Solitary / Functional C2 Solitary / Dramatic	
37 38 39 40 41 42 43 44 45	05:30	C1.	(C1 and C3 still picking up and looking at items) (C4 plays Xylophone) (C2 eating noodles) (C2 gets up from table) (C1 watches C4 play the Xylophone whilst standing up.) (Laughs) (C3 sit back down at table and examines chopsticks) (C1 walks away with chopsticks) (C2 sits down at table)	C1 & C3 Group / Exploratory C4 Solitary / Functional C2 Solitary / Dramatic C2 Transitory C1 Onlooker C3 Parallel / Exploratory C1 Transitory C3 Parallel / Transitional	C1 and C4 playing together A lot of peripheral awareness of other's activities – C2 getting chop stick when other have theirs – copying
46 47 48 49 50 51 52	05:40	C4.	(C2 digs chopsticks into noodles like knife and fork – pick up the whole lot and pretends to eat) (C3 moves back over to table) (C4 brings the Xylophone and shows it to the camera, C1 hits the Xylophone with her chop sticks, C4 pulls the Xylophone away) You'll break it even more (C4 takes the Xylophone back to the table)	C2 Solitary / Dramatic C3 Transitory C4 & C1 Rough and Tumble C4 Aggressive [-ve] C4 Transitory	
53 54 55 56 57 58 59	05:50	C4.	(C3 moves back to table with chopsticks) (C1 hits chopsticks together) (C3 looks around) (C2 gets up and starts to play with Xylophone) (C4 moves over to the table and picks up the plastic pan with the noodles and flips it slightly, C3 watches) Oh	C3 Transitory C1 Functional C3 Transitory / Onlooker C2 Solitary C4 Dramatic C3 Onlooker	C3 and C4 play together
60 61 62 63 64 65 66 67	06:00	C4. C3, C4. C3. C3. C4.	It's a pancake (looks at C3) (Laughs) (C4 gets up and moves around to the other side of table – where more room) I've got a pancake Woh, C4 making pancakes (C4 move over to far side of the play area, C2 watches) (…) (…) to do with	C4 Conversational C3 Conversational C3 Onlooker	C4 Playful decoupling – the pretence is suggested by something – here the movement (flipping) the plastic pan – action before defining with verbal language C3 draw attention to notable event, praise to C4
68 69 70 71 72	06:10	C3. C2. C4.	(Laughs) (C4 puts takes wool from pan, and put it in a plate on the table) (C1 and C2 play on the Xylophone) What's the (…) you can do it Oh lets have a go	 C1 & C2 Group / Functional C4 Conversational C3 Onlooker	C4 – looks for better object for the pretence C1 and C2 play together C2 request to C4

73			(C4 looks over table)		C4 non compliance
74		C1.	(Laughs, still playing the xylophone)		
75		C2.	(Laughs, still playing the xylophone)		
76	06:20	C2.	(…)	C3 & C4 Conversational	
77		C4.	Yep		
78		C4.	I've got the jam tart		
79			(C4 picks up plastic tart from table, and puts it in his plastic pan)		C3 attempts again to draw attention
80		C3.	(Laughs, and looks at C1 and C2)	C3 Onlooker	(from C1 & C2) to notable event
81			(C4 starts to flip the tart like a pancake, after a few goes the tart falls	C4 Dramatic	
82			out of the pan, he picks it up off the floor and puts it back on the table)		
83			(C3 is still watching C4)		
84	06:30	C1.	(…) with this (Still playing the xylophone)	C1 Solitary / Functional	C3 Draws attention of others to
85		C2.	(…)		something notable – sharing
86			(C2 turns round to watch C4)	C2 & C3 Onlooker	meaningful (events)
87			(C4 picks up the pile of wool, and start to fill the in the pan, the bits of	C4 Dramatic	
88			wall fly everywhere)		
89			(C2 picks up Chinese umbrella)	C2 Solitary / Functional	
90		C4.	Doh, yes	C3 & C4 Conversational [+ve]	
91		C3.	C4, C4 (Smiling)		
92			(C4 puts down pan and walks away)	C4 Transitory	
93			(C3 picks up the wool from the floor)		
94		C4	Let me (watching C2 with the umbrella)	C4 Onlooker	C4 request to C2
95			(C4 takes Chinese umbrella from C2)		C4 dominates use of object
96	06:40		(C4 puts the wool back into the pan)		
97			(C3 gathers wool from the table and puts it in a plastic pan)		
98		C3.	C1		
99	06:50	C3.	C2, I'm making pancakes	C2 Conversation	C2 and C3 play together
100			(C3 flips the pan, and wool spills out of the side)	C3 Dramatic	C3 again drawing attention to
101		C2.	(Laughs, watching C3)	C2 Onlooker [+ve]	notable event
102			(C3 pick up pan, gathers up wool and puts it back in the pan)		C3 Invitation to play to C2
103			(C2 start to collect more wool from the table)	C2 Transitory	
104	07:00		(C2 stands up, starts to flip wool – as pancakes)	C2 & C3 Group / Dramatic	C3 Sense of accomplishment – this
105		C3.	Hee, I've got it	C2 & C3 Conversational [+ve]	pretence is not easy to achieve –
106			(C2 starts to lightly flip pan with wool)		there is skill
107	07:10	C2.	I keep dropping it		
108			(C1 is still playing the xylophone)	C1 Solitary / Functional	
109			(C3 and C2 are still flipping wool in pan)	C2 & C3 Group / Dramatic	
110		C3.	I got it, woh. (Drops wool) Oh I dropped it. (Picks up wool)		
112		C2.	(Laughs)	C2 & C3 Conversational [+ve]	
113		C3.	Are you going to try some?		C3 encouragement to C2
114		C2.	Okay I'll try (lightly flips pan, wool falls out)		
115			(C4. Is off camera – twirling the Chinese fan)	C4 Solitary / Functional	

116 117 118 119	07:2 0		(C2 puts the wool back on the table, and the pan next to the camera) (C4 is twirling the Chinese fan) (C3 is still flipping wool) (C1 is still playing the xylophone)	C2 Transitory C4 Solitary / Functional C3 Solitary / Functional C1 Solitary / Functional	Occupied in own activities
120 121 122 123 124	07:3 0	 C2. 	(C2 watching C4, who is twirling fan) (laughs) (C3 is puts down wool and plate) (C1 playing the xylophone)	C2 Onlooker C4 Solitary / Functional C3 Transitory C1 Solitary / Functional	
125 126 127 128 129 130 131	07:4 0	C2 C3 C1	Can I? (talking to C4 – C4 doesn't look up) (C4 moves – more space to twirl) (C2 moves to table with objects and xylophone) (C3 joins C1 playing xylophone) (laughs) [(laughs)	C2 Conversation C4 Solitary / Functional C2 Transitory C1 & C3 Group / Functional	
132	07:5 0		End		

13.4. Movement in playspace during free play: Diagram

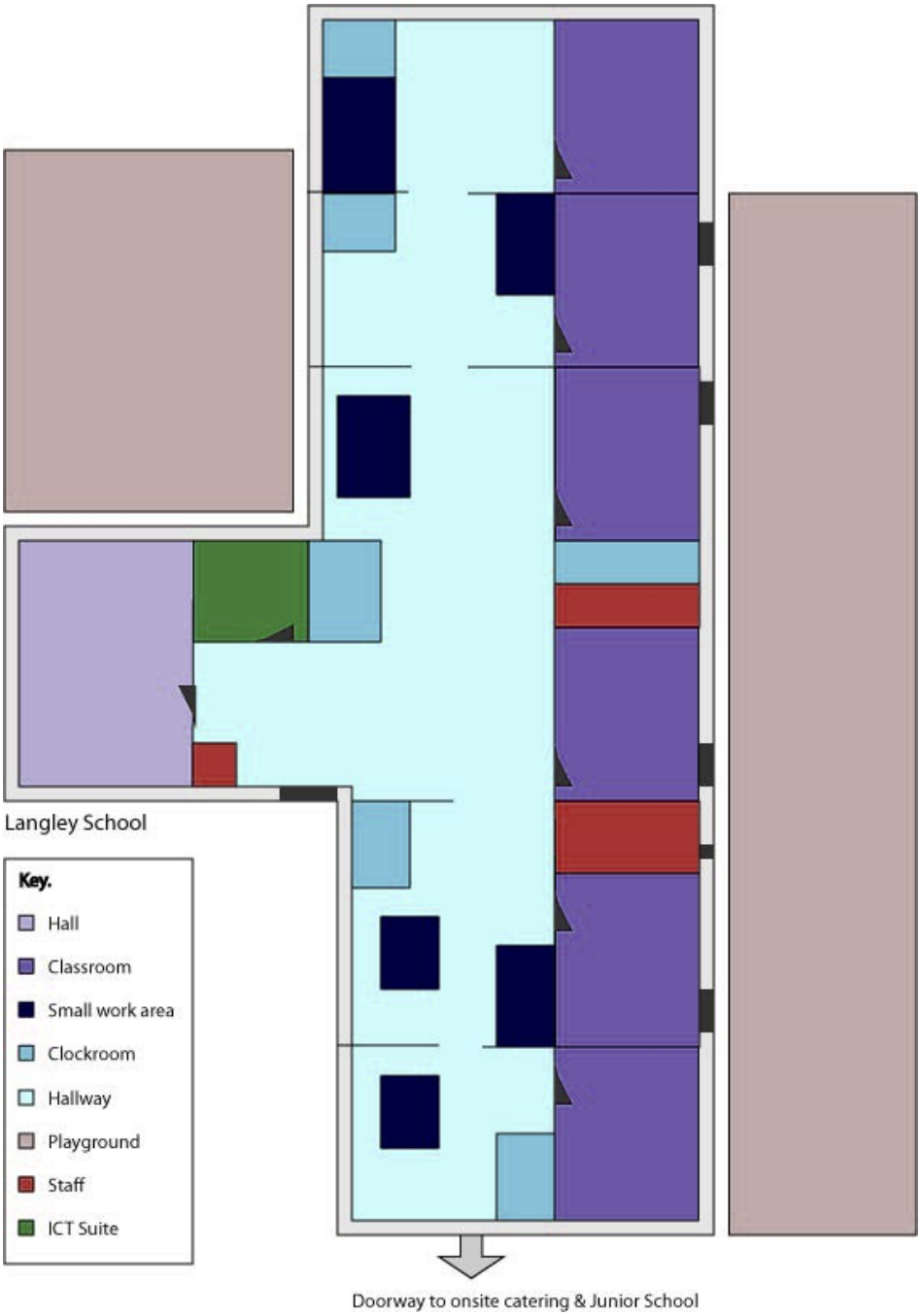


Appendix 14. Play in class: Questionnaire

Play in the classroom:		
1. How old are your pupils, and what type of play do the children in your class engage with?	A	-
	B	4 and 5 year olds. All areas
	C	4 – 5. Across the curriculum
	D	Y1 (5-6yrs) role play – use of IWB – children and teacher! Lessons etc
	E	Year One 5 and 6 years. Structured play: - pattern making, puzzles, drawing. Child initiated play: - PCs, role-play, Sand, drawing, Mobilo / lego (construction sets) cars, trains
	F	4 & 5 Yr. Duplo, Startgear, role-play, outdoor activities, paint, drawing, compute activities etc
	G	6-7 Structured 'play' opportunities also free play activities.
	H	5 / 6
	I	5/6 – Construction / social & role play
	J	5 & 6 years. Imaginative play, use of tactile toys. Puppets, sand and an outdoor play kitchen
2. How much play is there in your classroom?	A	-
	B	Ongoing
	C	Every session approx 2/3 chn will be playing
	D	Daily – opportunities for rotation of activities and 'play'
	E	Every Friday pm. Every Wednesday am.
	F	Lots!
	G	Less opportunities for play than in Yr1 / Ey. Less space no designated play areas.
	H	Enough
	I	Adequate
	J	There is a lot of free time for play
3. What effect does group play have on individual and social behavior in respect to learning?	A	-
	B	Children learn through play
	C	Important in that it helps chn to listen to each other and take turns fairly
	D	Huge impact – children learn ' social skills' and our learning trees are always being referred to in the ways the children understand 'we should be with others'.
	E	Helps develop social skills – sharing, turn taking, speaking, listening skills, co-operation. Helps develop language. Helps imaginative experiences
	F	Learning to share & co-operate with peers, take turns, listen & communicate with each other.
	G	Promotes co-operation and collaborative working. Negotiation skills etc
	H	Positive
	I	Positive most of the time but can be a time for conflicts
	J	There is a lot of good play and sharing atmosphere

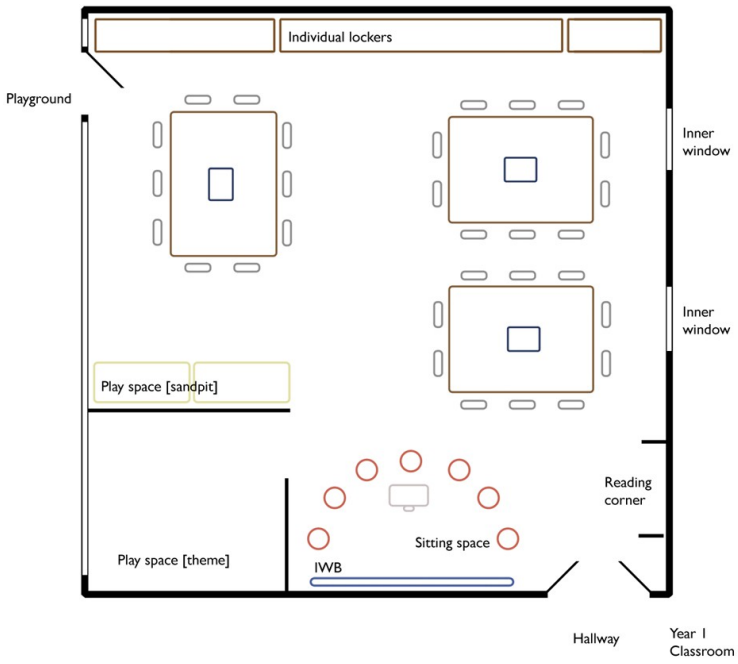
Appendix 15. School and classroom layout: Diagram

15.1. Infant school layout

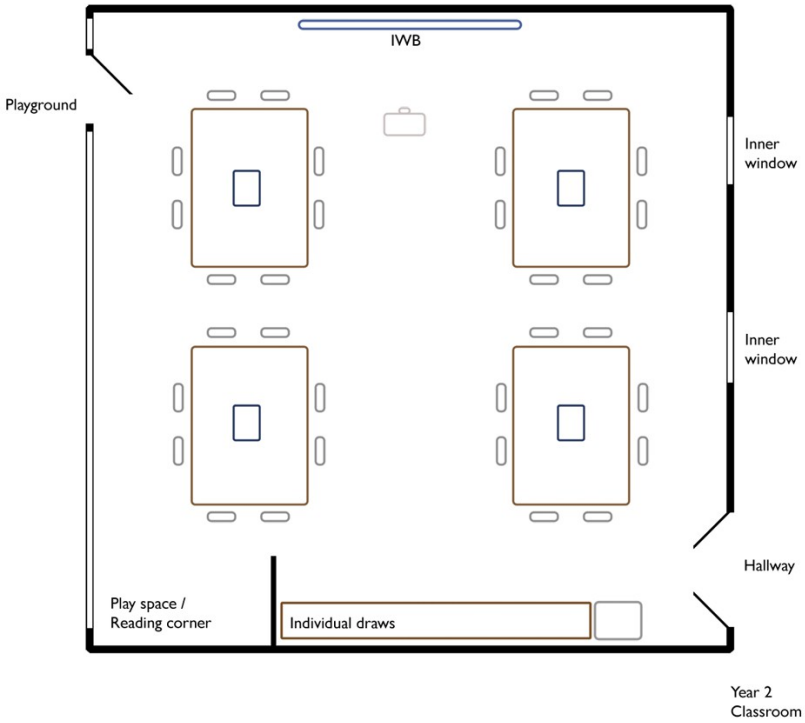


15.2. Infant school layout 2

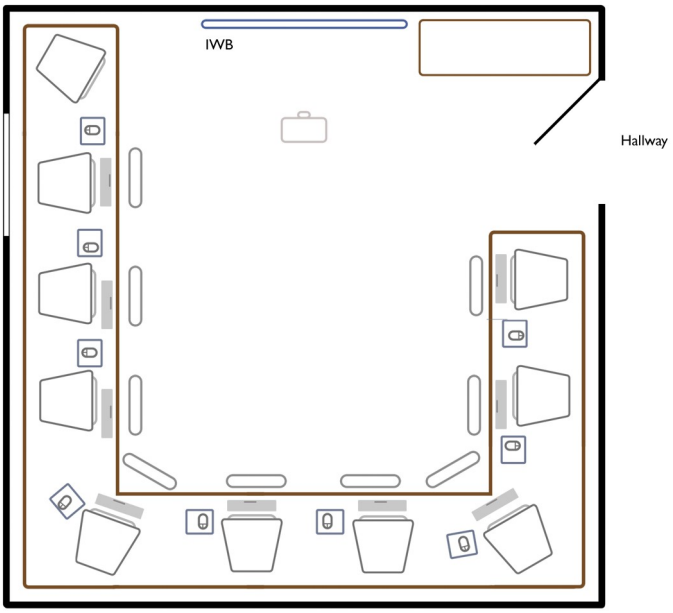
15.3. Year 1 classroom layout



15.4. Year 2 classroom layout



15.5. ICT Suite



Appendix 16. Story planner: Transcription

Story planner (Woodford School)			
N = 3			
Time	Transcript		Notes:
00:00		(All children have pictures)	P1 almost constant verbal shadowing own action (making a decision) – P2 listens in, and watches but does not fully engages, more observes
	P1.	Um:::	
		(P1 and P3 holds character in up to the middle of the board, P3 watches P1)	
	P1.	Um: where should I put her?	
		*(*P3 holds character in up to the right of the board, P2 is standing looking at P1, P1 is looking at the	
	P1.	left of the board)	
		I putting her (.) no actually I'll put her in the house (laughs)	
	T.	(P3 is standing next to P1 placing her characters next to the places P1 puts hers)	T directs attention to additional elements to use; text is looked at but not placed in the scene but laid on the table (perhaps use later when they write their write stories?)
	P1.	P1 in the pockets look.	
	T.	*Huh.*	
		Remember that you've got the words to help you.	
	P1.	(P3 walks to look in pocket and take out words)	
		I putting her (.) I putting her in with (.) with the (cats) (puts character on bottom of board, P3	
	P1.	continues to watch)	
		(P3 takes text out of pocket)	
	P1.	I need the blue-tac.	
	P3.	(P1 takes out a sentence from the pocket and shows it to P1)	
		Hey::	
		(Reads 2 words from text - then puts it back in the pocket)	
	P1.	(P2 and P3 take out 3 - 4 sentence from the pocket and lay them out on the table.)	
	P3.	((Too quiet))	P3 verbal shadowing (intention / decision). Other 2 P's attention elsewhere – to self
		Right (.) put her there (takes a character from the bottom of the planner). Put her (.) um: walking on	
		the pier (puts character on pier on planner)	
00:50	P1.	She's walking on the pier, she's walking on the pier P2	P1 comments to P2 on the character P3 has placed in the planner.
		*(*P3 puts a character in the middle of the planner)	
		(P1 takes character from right of planner and walks to left)	
	P1.	Katie (.) Katie can be climbing the tree.	
		(P2 and P3 look at where P1 has placed image on board)	P1 and P2 are playing with the characters (they are meant to be fixing them in the scene), animated movement against the scene.
	P1.	No I want one.	
		[	
	P2.	((Too quiet)) Floating away (*moves image across the board*)	

		[	P2 begins to voice intention to P1
	P1.	(Laughs)	
	P2.	(Still moving image around) No (.) I'd put her in the house (to P1)	
	P1.	Yeah.	
	P2.	(Here)	P1 makes suggestions to P2
		[	
	P1.	Stick her over *there*.	
	P2.	((Too quiet))	
01:20	P2.	(Still moving image around) There (.) there (.) there (puts character in middle of the board, in sea) (.) there. (Laughs)	Character placed where is shouldn't be (in the sea is silly)
		[	
	P3.	She put her in the sea.	Until now, P1 and P2 work together, P3 work in different place on board and separately, brought in here – draw attention to the character in the sea. Use of humor to bond the whole group.
	All	(Laughs)	
	Ps.	(Jumps to put image high on the board) I'll put her in the holiday home (.) I think.	
	P1.	[	
		Look she's. (Points to character in sea, looking at P1)	P1 voice intention – questions not directed
	P2.	I can't reach the holiday home.	
	P1.	*Where's* the holiday home.	P2 responses to P1's comments
	P1.	(P2 points to the planner)	
		Hey where's Katie?	P3 helps P1 without a request – see's her struggle as can't physically reach top (P1 is much shorter)
	P1.	I'll put Katie in the holiday home. (P1 stretching to reach, P3 takes the image and being taller easily	
	P1.	sticks it to the board at required height)	
01:44	T.	Do you want to get the whiteboard and do what we normally do (.) why don't you get (.) go and get a board each.	T prompts Ps to move to next stage of the activity.
	T.	(P1 and P2 disappear to get boards)	
		And then *you start* making up your own stories (.) don't you?	
		(P3 disappears to get board)	
		((Ps Off screen))	
	P1.	Actually (.) I'm going to get a big one.	T prompt finding boards to write on
	T.	There's *another big board here*.	
	P2.	((Too quiet))	
	P1.	((Too quiet)) Oh yeah (.) I forgot my whiteboard pen. (Goes back to get pen)	
		(P1 & P2 too quiet to hear, but are chatting, little laughter)	Dyad interaction
02:06		(P1 and P2 return with boards)	P1 talking to self as writing
	P1.	((Too quiet))	

02:11		(P3 returns with board)	
	P1.	((Too quiet))	T prompts Ps to use additional components attached to the planner (sentences)
	T.	[	
		P2 in the end one (.) are there any more characters in that end (.) or is that just more words?	
		(P2 and P3 look in end envelope below story planner)	
	P3.	That's just more words.	
		[	
	P2.	That's nothing. (Looking in the envelope)	Ps not interested in putting the words on the board, though P2 and P1 take a couple back to the table to help with sentence construction.
	T.	There's nothing in there (.) alright.	
		(P2 and P1 look in middle envelope)	
	P2.	What's in that one?	
	P2.	Just words.	
		(P2 take a sentence from pocket and puts on table)	
	P1.	This one's (.) words.	P2 corrects P1. P3 queries the correction, P1 agrees with P3. P2 carries on with own task.
	T.	That'll be endings in there I expect (.) where you want to end the story.	
	P1.	It says end -	
		(P1 takes 2 sentences from pocket and puts on table)	
	P2.	Middle. (Looking at the evelope)	
		(P3 moves and points to label next to envelopes)	
	P3.	But *that* says *end* and t*hat* (.) *settings*.	
	P1.	Its end and settings.	
		[	
	P2.	This is for the beginning (.) middle (looks away and takes more sentences from the end evelope)	
02:41	P1.	(Looks at board on table) *Oh* (.) has someone rubbed it off.	
	P1.	(Starts to write on board). Okay (.) one day ((Too quiet)) (Speaking to P3, moving the sentences on the table, but not looking at the sentences) ((Too quiet))	P1 Verbal shadow, quiet to self P1 talking to P3 – P3 looks but does not respond P2 working on own work
		(P2 turns to look at planner)	
	P2.	((Too quiet)) (P2 moves around looking at planner)	
	P2.	In ((Too quiet)).	P2 voice as thinking what to write, checks board when thinking (stands near)
		(P2 is writing on board near planner)	
	P1.	In a ((Too quiet)).	
		(P2 moves back to table, puts board on table)	
	P1.	Right. (Turns to planner and takes off character) Is going:::	P1 direct request for help from P2 doesn't respond. P1 then asks P3, P3 tells her the answer.
	P1.	(To P2, holding up character - P2 ignores her) Is this Granny Mailer?	
	P1.	(To P3, holding character in front of P3) Is this Granny Mailer or Granny Island?	

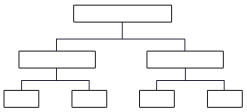
	P3. P1. P1. P2.	Granny Island. Granny Island (goes back to planner). Granny Island is going to land (.) cause she's got land (.) I (.) land. (Places character on planner) (Both P2 and P3 and busy writing on boards) (P1 turns back to board on table, P2 takes board to planner) (Whispers) (to P2 as pass by) (Whispers) (*to P1 as pass, laugh*)	P3 voices intentions
03:36	P2. P1.	(Speaking to P1) Where is Katie? (P1 starts writing, P2 is walking around with board) She playing with the cat cat (P2 starts to write on board) (Speaking while writing) ((Too quiet)). Granny Mailer? (to P3) Granny Mailer (P3 shakes her head). *Granny Island* (.) Granny Island (starts to rub out work from board)	Reference resource P1 voice intention, ask question, verbal shadow
04:01	P1. P2. P1. P1. P1. P1. P2. P1.	Granny Island (*starts to write*) Granny Island is? (*Point to character on planner*) Is that (.) is that Mrs McCall Is. (*Turns to look at P2 and planner*) (P3 looks at P1's board) Mrs McCall's on the pier. (Looking at the planner) (00:03) (*While writing*) Island is:: on land. (All P's writing) Because. Because (.) be-cause. ((Too quiet)). (*Turns back to planner*) Because she's got island on her name.	P1 voice intention – planning what to write P2 asks P1 direct question. P1 gives her an answer P looks at planner, thinking of sentences P3 looks at P1's work P1 voice intention – planning what to write P2 references planner when writing
04:39	P1. P3. P1.	(While writing) because she's got island (erases word from board) ( ) (While rubbing out work on board) Land (while writing) land.	P1 speaking while writing and correction
04:35		(All P's writing) (P1 speaking quietly whilst writing)	
05:04		(*All P's still writing*)	
05:10	 P1.	(P1 puts pen lid on and turns to planner, turns back and tries to balance pen in hole in board, it fall, tries again, it falls, then turns back to planner) (Picks up character and moves on planner) The baby is um:: (.) going to be in the folder. (Puts character in an overlap in the planner display and turns to P2) Baby's disappeared. (P2 and P3 continue writing on their boards)	Locating playful affordances P1 hides character in display P1 announces action – P2 and P3 do not response
05:32	P1.	(P1 move over to table) There's no baby here (turns back to planner) (P3 Looks up from writing to board) (P1 laughs, P2 looks up and turns round)	P1 announces action, looking between P2 and P3 and planner (physically and verbally draw attention to playful action.

	P3.	Where is he?	
	P1.	He's there (walks over to planner and points to fold). He's in there (.) he's disappeared	
		(P2 walks over and looks in fold)	
		(P1 and P2 laugh, P2 still looking in fold)	P1 and P2 laugh together. P3 investigates but doesn't laugh and then returns to work.
		(P2 takes the character out of the fold and stick it to the planner)	P2 puts character back to right place
	P1.	No.	
		(P3 walks over to board)	
		(P1 takes character to left side of planner)	
	P1.	((Too quiet))	
		(P3 takes character to far right side, and then sticks to the middle of planner)	T prompts Ps to read stories out loud.
	P1.	((Too quiet)) and the kitten.	
	T.	So (.) do you want to read yours out?	
	P2.	(Looks up)	
	T.	*Go on*.	
06:10	P2.	One day (.) oh. (starts to write on board). I put *playing* Katie. (Laughs and looks at teacher)	P2 attempts to read story, (gets shy, embarrassed) and walks off. T lets her go without finishing
	P1.	((Too quiet))	
		(P2 looks at P1, still laughing, puts down board and walks off)	P1 makes comment to P2 (relating to reading?)
		(P2 and P3 still writing)	
	T.	Well that's good (.) it's good to read it out loud.	T prompts P3 to read story
	T.	P3? (T looks at P3)	P1 verbal shadowing
	P1.	(While writing) ((Too quiet))	P3 acknowledges but does not respond to request to read story out loud
		(P3 looks up at T, smiles and then carries on writing)	
06:38		[Tape End]	

16.2.	Story planner: field notes
Method	Observation: Children independently create story using a bespoke resource
Date:	Feb 2006
Time:	20 mins
Participants: (Woodford)	3 girls, 6-7 years Teacher
Objective:	Interaction with story planner and each other – shared media space
Resource:	Description of resource: The Storywall is a permanent feature in Yr2 classroom, used in pairs, theme changes every term to tie into subjects in curriculum. Storywall used at Woodford Primary School for children of all ages. This resource has been used for sometime at the school,

Context:	Activity: Group construct story from story planner, first place the characters and then write a story on mini whiteboards. The teacher supervises the activity. 3 is thought to be the This is a literacy tool developed by the school, and is used throughout the Infant school They have done this activity many times before, and the participants were chosen by the teacher because they are good at using it. Underneath the planner there are four envelopes, 3 contain keywords to help the children write their stores The character images are placed in the scene from which a story is written. The scene is based around an ongoing project theme (i.e. a book) As a class activity this would be used by the teacher to elicit a plot for a story, write story as a group, written on IWB Pupils may have felt a little pressured when both T and researcher observing, which may account for the lack of decontextualised talk Activity takes place in an empty classroom, other children are engaged in an outdoor activity,
Observations:	T did prompt four times, (i) to use the key words in the envelope, (ii) to see if there were more characters in the envelope, (iii) to start to write story (as normally do, and (iv) to read story out loud The characters are not just fixed to the scene but moved around, whilst an ad hoc narrative is constructed The children engage more with each other when using the shared space, than when writing (own space) Children are reminded to use key words but don't use them when writing For P1 a lot of verbal shadowing from one whilst placing characters and writing story It's funny (animated behavior, laughter and all focused) to put characters in places they shouldn't be (P2 character in the sea and P1 baby in the fold in the display) - do and inform others Few references (turn and look at – table they are writing on faces away from the story planner) to visual space when writing None were happy reading their stories back
Additional data:	Photos Stills sequenced Movement diagram
Summative	Single media space Shared visual reference - single space - control over characters - ideas from moving characters around the space - Worked on separate stories in same space – two different conceptual spaces within space media space Dynamics – whole, pair, solo shifting seamlessly – with each other and resource - multiple points of interaction (all need access) Compare how much time spent talking to each other at different stages Playing with resource (granny in the sea and disappearing baby) – joy from using something in a way not intended

Appendix 17. Branching stories Field notes

Method:	Observation	
Date:	June 2005	
Time:	2 hrs (PM)	
Participants:	10 Yr 1 pupils This group were defined as the higher ability group. Classroom Teacher and Teaching Assistant	
Materials:	Paper based drawing materials Game book as example Internet	
Objective:	Collaborative development of multiple branching narratives – possible context for design Design considerations for multi-authoring creative (narrative) technologies Creative strategies for creating content – traditional and digitals methods for creating content (this should extend the work done with Tim last term)	
Context:	T and K discussed structure of the activity before the class start, the structure was suggested by T who took the lead in setting up the activity and monitoring **Theme:** Great fire of London: The story of Thomas Farynor, the King's baker, and his escape from the fire, which started in his house. It a story the kids were familiar with and has been a recent topic of study in class	
Procedure:	The class teacher gave an example of multiple narratives using a game book. She explained that there are lots of possible stories within the single book. The story will depend on decisions made by the reader.  The teacher read from the beginning, when she can to a decision point she asked the children to vote where they should do next. At the next decision point the children had to roll dice to determine the direction that would be taken, the children understood this to be leaving the decision to chance. The children were given a starting point and worked in groups of five to develop the next stage of the story. The teacher elicited possible alternative narratives from the groups and then asked the children in their groups to work together to draw and write what would happen to Thomas Farynor when he had escaped from his burning home. The groups worked collaboratively on a single sheet of paper. The teacher also gave a small group of children additional information about the fire from a website she had sourced previously. This was an interactive timeline that showing key events in the Great Fire of London. When the groups had completed the first stage a member of each group read the story they had created to the class. They were then split into smaller groups of 2/3 and asked to complete the next part of the story using both images and text. When they had finished, a few were selected to read their stories to the class.	
Observations:	When the teacher read the story from the game book, the children quickly became restless and distracted. This may have been because the story was a little too advanced for this age group. However, when it came to the point they had to contribute to the decision making in the story, their attention and interest significantly increased. They became quite animated, and continued to remain interested throughout the exercise with less disruptive movement and chatter (the children were quieter), and looked at the teacher As the children were given a theme, there was little discussion about what story they should tell – but did announce intentions. To decide on the direction of the story, they worked in groups, with the teacher leading the discussion. She elicited the storyline, and asked the group to agree on the direction. The final decision was the one taken by the majority. Though the children were not asked to assign roles, they were able to organise themselves within their groups to decide who should do the writing and who should do the drawing. The children were able to organise themselves fairly efficiently though there was not much democracy – extrovert children took the lead and delegation. 'You and **** do the writing, and **** and I do the drawing'. The boys did tend to dominate the decision making process, and assigned the less enjoyable task (writing) to others rather than nominating themselves.	Inactive - Active Task production managed by T Assign roles – little negotiation, some tension

	The children were able to work on a large single sheet of paper cooperatively providing there were enough resources to share (i.e. multiple pens of the same colour). After an initial group discussion with the teacher about what would be drawn, the children worked on separate parts of the picture. There was little negotiation amongst the children about who was responsible for different aspects of the drawing. They worked independently on sections, with some prompting by the teacher and teaching assistant about how they should progress with the image (to encourage, suggestions and hurry up) There was little discussion about the work once the children had started the task, they tended to discuss other topics, such as television programmes, stories from the playground. There was a little speculation on might have happened to the character in the story, but no discussion which would have asked the children to justify their actions (i.e. why are you drawing that?) The teacher decided when the drawing was finished and when the children should move onto the next stage of the story (this was in part a result of time constraints). Solo work – again the children set about working quickly. The children writing did appear to struggle more with production. Drawing was easy. More off task talk from children drawing – writing requiring more concerntration? Test production needed a lot more guidance than draw – less language produced and high distracted behavior The children were quite shy about reading their stories to the class, but were interested in recording their voices, and (although required a little prompting to be quiet) were happy to listen to others stories. The children were given 2 hours to complete the task, however this was not long enough, and had to be extended for an addition hour to complete the task. The classroom teacher noted that this type of activity would normally run for a couple of days.	Shared space – but work in separate aspects – though produce complete picture Time frame set by teacher Shy during performance (could have been my presence)
Additional data:	Work completed by the children – Place in sequence Photographs of the children working collaboratively in groups to create images and written text Audio (lost?)	
Notes:	The children required a fair amount of guidance to complete the task – this is the first time they have worked this type of activity. It is possible that future activities of this type would require far less assistance… this is something that could be explored in the second session They are able to work both collaboratively and cooperatively on group tasks – however there should perhaps be a method for making this process more democratic, so that it is not decided entirely by the dominant members of the group. Boys have a stronger tendency for this type of behaviour, whilst the girls were more accommodating. The task required a full set of tools (in this case pens) for each of the participants – having to wait for certain colours made them impatient, causing aggravating behaviour or losing interest in the task Children's stories remained very close to events, there were not wild interpretations of the story, attempts to be accurate (memory, rather than imagination?)	
Additional Session:	Second session: Finish story and record additional sounds to add to the narrative (also re-record audio from previous session due to low quality of first recording). Audio recording – noise in background, hesitation when start to record and errors. Very quiet reading voices (confidence).	
Key elements:	Working in a single frame – events drawn within the same picture) like a tapestry Ease at which children use visual media to communicate Collaboration appears easier than keeping on task Use of Internet for ad hoc information – children watched teach got to site, shown images and given additional information Branching narrative within comprehension, careful with level (language / concept) of content – distracted if don't understand – did not asked for clarity, just switched off.	

Appendix 18. Places We Play: Field notes

Method:	Task, Observation & Discussion	
Date:	Nov 2006	
Time:	I Hour (am)	
Participants:	N = 6 Yr 2 Gifted & Talents group	
Materials	Paper based materials (including large paper sheet to connect spaces)	
Objective:	Draw out conceptual understanding of digital spaces and how these relate / contrast to physical spaces Discussion play activities and attitudes	
Context:	The teacher allotted this group once I explained what was going to ask the children to do The children were asked to consider where they play, who and what they play with, and what they like to do. A short discussion was had with all the children, after which they were they instructed to draw pictures to illustrate the places and activities they do when they play. When they had finished to first image, the group had another discussion: here they children were asked to consider a place inside the computer where they might play. They were then asked to complete a second picture to illustrate these places and activities. When all the pictures had been finished, the children were asked to arrange all of the images on a large, single sheet of paper. When the images had been fixed in place	
Procedure:	Children work in small groups to develop ideas (20 minutes), illustrating ideas with drawings, which will be used in presentations to explain and justify reasons. Paste pictures together to connect places, pictures and annotation to describe how to navigate between spaces To set the scene, elicit from the children things they do when they play, where they play, and what they like playing with in terms of people and objects. For the first part of the workshop the children work independently to develop ideas, and illustrate ideas with drawings but in a social working environment – with shared workspace and tool. The second part of the workshop the children must work together to connect the “spaces” together physically The shared document is annotated and the children discuss how they might navigate between the individual virtual and digital spaces Paste pictures together to connect places, pictures and annotation to describe how to navigate between spaces Instructions: Describe a space inside the computer where they can play, get them to draw pictures and annotate images with thoughts and ideas: What should this place look like? Sound like? What should they be able to do there? Once they have generated some ideas through drawing pictures to illustrate activities. Explain we need to connect the places together. Ask the children how the spaces might join together, how could you move between spaces (i.e. go through a door, window, answer a question, give a password….) Try to elicit ideas, if children are having difficulty with concept then give a few loose ideas. Paste the pictures together and draw in the connections.	
Observations / discussion:	Children comments Children were ask the difference between play and work – workings boring, writing’s boring, play is doing what I want to do, ‘I like drawing’ (Can drawing be working?) “Yes, but I like drawing’ Places drawn: Computer – Crazy Taxi, PS2, Hogwarts (twice), Brats (virtual dressing up) Physical beach, snooker table (twice), football, cricket, dressing up (Star Wars) Social comments - ‘I play with my Dad’ / “me and my brother made a big sandcastle” Use computers on their own, different with games machine When asked to connect places together, click on google, jump over water, follow path, long dark tunnel, Hogwarts to football ‘kill Mordor(?) to get to football, walk along path, sneak past police and drive to snooker, Bratz	Work tiresome, re-configuration of activity depending on context Do not discuss social elements to PC use Connecting spaces – variety of ways of moving between physical movement,

	‘swimming through a cold lake’ Dominant behavior from one child during the final part of the activity, though room and tools for everyone to use	action (task) or computer navigation How do they share the single space – fine when working on own, but cannot take turns
Additional data:	Annotated drawings produced by children Photographs of the children working	
Notes:	Use drawings and discussions to develop architecture and function for the virtual playspaces? Ideas generated from discussion to suggest metaphors and conceptual understanding of navigating between digital spaces?	

Appendix 19. Foreground / Background Spaces: Field notes

19.1. Activity 1 Nursery Rhyme stories	
Method:	Participatory and observation
Time:	2 hrs (whole session)
Participants:	10 reception pupils 1 Teachers & 3 TAs
Materials	Paper, pens. Data projector, camera & copy stand Capture and playback software
Objective:	Real time generation of stories
Context:	Classroom
Procedure:	Children draw pictures with assistance The equipment was set up with a live camera feed to capture the animated scene, which was projected on the IWB to show process in real time. K has a prepared – demonstrates to the children how to move objects Press record as children move foreground objects around the background Children not moving objects (observing on projection screen) are asked to make the sound
Description.	Ps had no problem drawing their favourite rhyme. This is related to a current class project, so have spent time recently learning common nursery rhymes (singing, reading etc). The children's drawings need a lot of support. Many of the drawing unusable (despite many demonstrations) – could not cut them out as either had background included. K and TAs cut out images. Some Ps asked to draw multiple drawing to get the right. Ps engaged, but were really hesitant when moving objects on the screen, watching the screen when working, rather than what they were doing on the paper. Seem a bit unooridnated. Slow to move and so narrative didn't really flow. K Demonstration of moving objects / capture stop motion was difficult for the children to grasp, require constant step-by-step instructions. At no point did the P take a photo, or move an object without a prompt from K or T. Ps seemed pleased (no laugher, but smiles) with playback. Playback did not appear to increase comprehension of activity – still required guided action. Ps asked to made sounds (despite working on similar project 'sound walks') required substantial guidance to produce sounds. Multiple takes and move to quiet space due to loud background noise,
Data:	Children's drawings
Notes:	Limited interaction and heavily managed use of the equipment and activity. This activity was done at the beginning of the term, with a new class. T commented that they would have worked better later in the term when more familiar with the classroom There was no playfulness with the camera – no off task. Ps were focused (this was work)

Foreground objects

Background objects

19.2. Activity 2. Good Behaviour	
Method:	Participatory
Time:	2 hrs
Participants:	8 Yr 1 children – in pairs Yr1 Teacher
Materials	Paper and Pens Camera on tripod
Objective:	Investigate telling own stories via time based media (based on familiar processes)
Context:	Activity done in separate classroom – other Ps working on separate project
Procedure:	Ps created drawings in a previous session. PSD is current theme in other work. Ps had prepared stories prior to capture, and written stories (briefly) – organised by T in previous session Ps worked in pairs, one moving the objects, one taking the photos Children able to make foreground images that were cut-out-able, and background images with foreground elements not present (t reported no problems with this concept) Sound was planned but in the end there was no time for audio recordings
Description:	K demonstrated process to each pair (demo and taking pictures took about 20 mins per group). The camera was generally the preferred task. All of the children moved the foreground objects too quickly. T described the need for 'baby step' – Ps, K and T do small (actual) steps to show how little movement was required – this appeared to be successful for a short while. Ps needed time to understand the 'stop motion' - they wanted to move the objects constantly as an animation. Multiple takes for each shot required – background moving (though taped to table, Ps could be heavy handed), hands in the way, objects moved to far / not enough. Almost all Ps deviated from prepared stories – adding additional elements at the end of the story, when short written story had been completed. Camera controllers recognised their pictures when showed after session (before collated) – took ownership… "Where's my one." "Those one's are mine" "They're

	mine.”
Data:	Annotated drawings produced by children Photographs of the children working Complete animation
Notes:	T commented that she was surprised P worked so well – expected them to get listless as process is slow and did not so progress as happening (K collate off site)

Appendix 20. Virtual Dressing Up: Field notes

Method:	Participatory and observation	
Time:	30 mins	
Participants:	4 Yr1 (3 boys. 1 girl)	
Materials	LogiTech web cam, Mac laptop	
Objective:	Evaluate the use of augmentation in video space	
Context:	Used software in the playspace, though focus is on the laptop. No teacher supervision As no video recording, transcript on done on fly as children using the system – main dialogue only captured	
Procedure:	Children shown the system (1 has used this before at home with parent) K steps back to allow children to use the system without support	
Observations / discussion:	00.00 – 02:30 *K explaining system. Whilst setting up P2, P3 and P4 drift off to use playspace (playing with objects)* *K encourages P1 to stand close to the cam – so objects can attach.* *P1 standing in front of cam – K selects object. P1 tilts head as objects attach.* *P2 joins in laughing, but can't get into cam view* 02:30 *All Ps stand in front of cam, K steps back to outside of the playspace* P1. (*Using trackpad*) P2. Can I do that? Can I do that?- [P1. (Laugh) P3. (*Pats P2 on the head*) P2. (*Laugh*) P2. Can I do that now? P3. (*Pats own on the head*) P2. Can I do that now? I can (*laugh*). Can I do it now? [P1. N::O. In while. *Ps laughing and pointing as objects attach. Touch place on face where digital object is.* 03:00 P2: Can I have it now P1? (P2 pushes P1 out of the way and take control of the mouse) P3. Can I have it now? Can I have a go? P2 selects object - Ps laughing P3. Click on that (points to screen directing P2) P3.Click that P2. The red face? *P2, P3 and P1 standing in front of screen. P4 drifts off to playspace and starts to play with objects on the table*	P2 asks P1 9 times to use the track pad (though in camera view) Eventually P2 pushes P1 out of the way (mild aggression) P4 loses interest – cannot get access to camera view Some competitive to 'get' the object

	03:30 P1. Click on the nose again. P3. ArH:::: This time P2 got it *Ps (except P4) laughing and moving in front of cam – trying to get the digital object to attach to them* P1. That one's got a blue face P2. Look at my eyes 04:00 *P2 and P3 standing in front of screen. P1 moves back and picks up umbrella in playspace.* *P2 and P3 pointing and laughing at screen.* P1: Where is it now? P2: (*in robot voice*) Oh:: I am coming to get you. *P1 returns. P1, P2 and P3 waves hand in front of cam.* P2: (*in robot voice*) I'm a robot. I'm coming to kill you *P4 playing in the background, others Ps laughing in front of cam* 04:30 P3. Oh I wanted to be a rock start *P1 using track pad* P2. I want to be a rock *P1 select alternate object* *P1 , P2 and P3 laugh and make 'Arh::' noises* P2. I want it to be on me *P3 hit head when object attaches. Object moves to P2, P2 hits head* *P1 using the track pad.* 05.00 P2. Can I do that? Can I do that now? *P3 laughs as object attaches, hits head* *P2 continues to request track pad access from P1.* *P3 laughing (a lot)* *P4 playing in the background in the playspace – occasionally looking up at others Ps* *P2 pushes P1 out of the way.* 05:30 *P3 and P1 instructing P2 to select objects* P3: Click on that (*points to screen*). Click on that now P3. Click down. P1. The red face. P3. Put it on me P2. I've got a mustache *P1, P2 and P3 laughing* P3. Put it on me. P2 put it on me. *P3 (lightly) hits P2 on the head as object attaches.* 06:00 K. (to P4) Do you want a go? *P4 nods* P3. I haven't had a go. *K moves P2, P1 and P3 out of the way so P4 can get access to the laptop. P3 and P1 complain – they haven't*	Ps are having fun Voice in keeping with character K intervene to let girl have a go Again. Challenge to control of the mouse. Ps think they have control of objects, though only calibrated once - need to change tracker on the fly K intervenes for fairness 'A go' is moving

	had a go. P4 moves in front of cam, P3 takes control of the track pad. P3 selects object – attaches. P2. You get to have that one. (*Complaining voice)* *P3. Laugh, and selects multile objects (3-5 secs with each object)* P2: Ow::: 06:30 P2. Click on that one. *P2 pushes front, past P4 and points at screen* P1. The red face? P2. Yeah. *P3 selects the red face.* *P3 and P1 laugh* *P3 touches face when object attaches, object disappears.* P2. Click on that. Click on that. Do tha::T. DO THAT. P1. Do the bottom (*pointing to the screen*) *P4 is now behind the other Ps – with no access to screen, peers in from the back* P2. There [P2. There there there. YEAH(*as object selected*) 07:00 *All Ps laughing.* *P3 moves to select different object* P2 (*pointing at screen*) Hamste:::::r. NO. Do the robot. I am a robot. P1. Do the robot eye. P2. (*complaining*) I like the robot. P2. Lets see which one. Which one it comes to. *Object attaches to P3* P2. OH NO 07:30 P2. Doctor (..) is coming to get us *P2 pointing to screen* P2. What is that. OH OH go for that. That's a hansetr face. Click on that. P1. Click on that P2. CLICK ON THAT. Click on the old man's hat. P1, P2 and P3 shout as object appears 08:00 P3 steps back P3. You click on it (*speaking to P2)* P3. No you don't click on it like that *P4 drifts again.* *P1, P2 and P3 laughing in front of screen, ecited waving hands in cam.* K. (*speaking to P4*) Do you want a go. *P4 nods* K. Come on then boys. Do you want ot ket P4 have a go? *K moves P1, P2 and P3 out of the way*	the mouse, not the object attaching Touch / hit face when it attaches Directing mouse controller Quiet members marginalised. Directing mouse controller Peer support – instructions on how to use Instructing peer –

	08:30 *P4 moves in front of cam, and selects objects* P2. You have to smack you face to get rid of it *P4 selects another object, object attaches.* P2. You have to smack you face to get rid of it *P1, P2 and P3 watch P4.* P3. I like that (*speaking to K, gesturing to system*) *P4 looks to K for help – K steps in to show how navigate menu* P2. RABBIT. 09:00 *P1 and P3 playing with flowers in playspace – distracted as dye is making their hands go green.* P2. Rabbit. (*Jumping up and down*) boing, boing *P4 has mouse.* *P2 waves and (lightly) hits P4 head as objects attach* *P1 and P3 jumping and running around the playspace behind P2 and P4* 09:30 *P2 (continues to) wave and (lightly) hits P4 head as selected objects attach* P2. Go for something else. *P4 steps back from screen, P4 steps in to take control of mouse.* *P4, P3 and P1 playing in playspace. P2 has sole control of the track pad.* *P4 selects multiple objects (cowboy hat, glasses)* 10:00 *P4 using system, P3 watching. P4 spends more time with each object. Movement (gesture, stance) in keeping with character features* *P4 attaches heavy eyebrows, P3 wipes P4 forehead to make them disappear* P3. Give me that. P4. Ow::: *P3 laughs* *P4. (annoyed). P3 P3. U had it. Arg:::* *P3 moves back to playspace. P4 using system alone.* 10.30 Activity closed. Ps return to class	face smacking to make object move. Dominant behaviour.
Additional data:	Photographs	
Notes:	Objects Only appear for a couple of seconds - tracking not reliable Dominant behaviour – some marginalised.	

Appendix 21. AudioSpaces: Transcript

	Time		Transcript	Action	Notes
1	00.00	K.	You know how to use the computer a lot		
2		P1.	Yeah		
3		P2.	I have one at home		
4		K.	You have one at home. Who has one at home?	Raise arm	
5			Okay.		
6			Who has used one at school?	Raise arm	
7			Oh, so you've used them a lot		
8			Okay, I'm going to get you to record some sounds on the computer.		
9			Who would like to use the mouse?		
10			You were first.		
11			Okay, and there's a camera here. I want you guys to stand in front of the camera. Perhaps one		
12			person could help her with the mouse. How about Jonathan?		
13	00.30	K.	Right so, you have to use the mouse -	K point to mouse	
14			and you're using it up here -	K move over to IWB and point screen	
15			If you just press the Play button for me -	K move to laptop and indicate using the mouse to click	
16				on the correct button	
17			Right um (.)		
18			Let me just do this bit first actually.	K step to laptop	
19				K Use the mouse to click on the correct button	
20				P2 in moving around in front of the camera	
21			It's a bit complicated.		
22	01.00			K load sound folder to app in admin section	
23				Children standing and watching	
24		K.	Okay, we're going to first of all.	Steps back and bumps into P2	
25			Oh, sorry darling.		
26			Okay you two if you could come and stand here there is a camera here.	Indicating to C3 and C4	
27			First of all I want you to click on the start button for me	Speaking to P1	
28		P1.	Start.		
29		K.	Start. Click on the start.	Start set up screen appears on the IWB	
30			Okay so you've got lovely yellow T-shirts on. So what I want you to do is I want you to		
31	01.30	K	click on the yellow t-shirt there [K points to area on IWB] for me		
32			So with the mouse, put the mouse somewhere. Can you see when you put your mouse over		
33			different colours? That the colours are there. So on the yellow bit.	Point to the tracked colour and live video shown in the	
34		K.	(00:04)	UI	
35		P1.	Yellow		
36		K.	On the yellow bit		
37		P1.	That's over there. Okay them click on the next bit for me.		
38		K.	That bit		
39			Yep.		
40			Okay. Now what we're going to do		
41	02.00	K.	Is I'm going to get you to make a shape. Okay. So you've got one, two, three, four DOTS. And	K make a shape – points to four places on screen	
42			with those dots you're going to make a shape. So where should she make the first shape.	(mapping shape)	
43			(00:02)		
44		K.	Can you?		
45			(00:02)		
46		K.	Maybe over, what your name, P2? Maybe over near P2, So wave P2 so she knows where you		
47			are?		
48					
49		K.	There you are.	P2 waves	
50			So maybe make a shape here.		

51		P1.	( ) (Laughs)	K points to four places on screen around P2	
52		P2.	(Laughs)		
53				K points to shape button	
54	02.30	K.	So now click on here.		
55		P1.	On there?		
56		K.	Yep. Then you need to one, two, three, four.	K points to four places on screen around P2	
57			(00:09)	P1 moves dots to around P2	
58		K.	Okay. Then click on the button that says make shape.	P1 clicks on make shape button	
59			(00:03)		
60		K.	So we've got a shape over Alfie. Maybe you'll do one over P3?		Repeat process to reinforce
61		P2.	P3.		
62		K.	P3. So click on there again		
63		P1.	On there?	K points to dots	
64		K.	On that there.		
65	03.00	P1.	Yes.		
66		K.	And then. Er: Do one, two, three, four on P3.		
67			(00:10)	P1 moves dots to around P3. On completion P1 smiles at group	
68					
69		K.	And then make the shape		
70			(00:03)		
71		K.	That's it		
72			Okay now what we're going to do. Is we're going to make some sounds. So that. We're going		
73			to make a sound so that when P2 moves-		
74	03.30	K.	it plays one sound. And when P3 moves it plays another sound. First we have to make the		
75			sounds. So if you click on that on there that says *sounds*	K points to button	
76				P1 clicks on button	
77		K.	Okay. Make new sound.	K points to button	
78			(00:03)		
79		K.	So we need to give the sound a name. What sort of sound are we going to make?		
80			(00:05)		
81		P1.	P3		
82		K.	P3. Shall we call it P3?		Difficulty with file name
83		P1.	Yeah		
84		K.	Okay. Can you use the keyboard?		
85		P2.	I can use the keyboard	P2 moves forward to keyboard	
86	04.00	K.	Okay. Let's just um:=		
87			[	K. moves to check keyboard is assessable	
88		P2.	I can use the keyboard		
89		K.	So you need to type in P3's name		
90		P4.	I'll tell you how to spell it	P4 spells out name read from P3's name badge	
91		P2.	Look it		
92			[		
93		P4.	Get it		
94		P2.	C		
95		P1.	K?		
96		P4.	NO C		
97		P2.	C (phonetically)		
98		P1.	I done it.		
100		P4.	A	Looking at keyboard	
101		P1.	A (phonetically)		
102			(00:02)	P2 moving between P3 to llok at badge and P1 typing on the keyboard	P2 checking for errors
103		P1.	Yeah.		
104		P4.	A. S.		

105			[		
106		P2.	S.		
107		P1.	S.		
108		P4.	E.		
109		P1.	E.		
110		P4.	Y.		
111	04.30	P2.	Y.		
111			(00:03)		
112		P2.	Click on next. Next.	Points to next button on iWB	
113			(00:02)		
114		K.	So now we're going to make the sounds. First we have to press the?		
115		P2.	Play button		
116		K.	No.		
117		P2.	Record		
118		K.	That's it. Okay so press that button. So maybe P3 make a sound.		
119				P3 claps – from other side of the room	
120		K.	Okay.		
121				P3 claps	
122		K.	Okay shall we see what the sound sounds like. Click on the play button.	K point to play button in UI on the IWB	
123	05.00		(00:07)		Sound barely audible
124		K.	Very quiet. I think we should that again.		
125		P1.	Yeah	K moves over to PC	
126		K.	Cause it's not very loud. Maybe if P3 (.) P3 if you say your name. If you come and stand here		
127			and say P3.	K stands near microphone	
128			(00:02)		
129		K.	Really loudly		
130		P2.	P3 over		
131			P3 (quietly)		
131		K.	Okay we'll try again, shall we		
132		P2.	Press record	P3 shakes head	
133		K.	Do you want to say it? No. Okay them perhaps?		
134			[		
135		P4.	Shall I say my name? P4 (very loud)		
136	05.30		(All Ps laugh)		
137		K.	Okay click stop. Then play and see how loud that is		
138			[		
139		P2.	(((Laughs)))		
140			(00:03)		
141		K.	Can you hear it?		
141		P2.	That's not very loud-		
142		K.	No I think you need to stand here.	K stands near microphone	
143		P4.	I can hardly hear it-		
144		K.	Yeah. Come and stand here next time. So you're next to the computer.		
145		P3.	Okay can I		
146		K.	And we'll try it again		
147		P1.	Wait. I'll go to record		
148		K.	Really loud		
149	06.00	K.	P4 (Loud)		
150		P4.	All right. P4 (loud)		
151			(All Ps laugh)		
152		K.	Go on then play		
153			(00:05)	Recording playback K and P4	
154			(All Ps laugh)		

155			[		
156		K.	Okay		
157		P1	Why don't we do P4s?		
158		K.	Okay now if you click on the play button	K points to button in UI on IWB	
159		P1.	On that		
160		K.	This one down here		
161	06.30	K.	Then hopefully when we go past here	K wave hand in marked out space – no sound	
162			If you stand with your yellow		
163			(00:04)	No sound played	
164		K.	It should play it		
165		P2.	On.		
166		P4.	On it.		
167		K.	No it's not playing. It should.		
168		K.	Look can you hear it over there.		
169		P2.	No.		
170		K.	Oh.		P2 has been observing P1 use the mouse (they were selected as a pair
171		P2.	Can we have a go on the computer now and they do the mouse.		
172		K.	Yeah. It's not going to play though. Do you want to swap round then?		
173		P4.	Yeah		
174			[		
175		P3.	Yeah		K – thinks at this point there is s system error – move activity along as children becoming distracted
176	07.00	P4	Yeah, go on then	P3 and P4 move to mouse and keyboard	
177				P1 and P2 stand in front of live feed and wave	
178		K.	Okay shall we start form the beginning then. If I start it from the beginning then you can make	K click UI back to 'make shapes' screen	
179			new shapes		
180			(00:06)		
181				P1 and P2 wave	
182		P2.	I'm not in the picture.		
183		P1.	Yes you are. You are. You're pushing me out of the way. Hey P2s pushing me out of the way.	P1 and P2 pushing each other in front of camera – K	Camera needs
184		K.	Is he?	has back turn resetting system	wide view to
185		P4.	Why have you got a recording camera over there?		ensure visual
186		K.	I'm recording what you're doing so I can make this better		presence – conflict
187			[		over being on view
188		P1.	Oh:::		
189				P1 crossed arms annoyed, uncrosses and re-crosses	
190	07.30	P1.	That's not fair.	P1 stands out the way of the camera still annoyed	
191			(00:03)		
192		P1.	You. You don't	P1 push P2 out of camera view	
193			(00:04)		
194		P2.	We're both there.	Stopped pushing	
195		P1.	And I know you're there		
196			[		
197		K.	Okay click on the start button.	K moves away from mouse. P3 has control of mouse	
198		P4.	Start button. Click on the start button		
199			[		
200		P2.	Star:::t		
201		P3.	Start. Oh. No-	P4 takes control of mouse	
202		P2.	Star:::t		

203			(00:02)		
204		P2.	In the corner.		
205		K.	You have to get the mouse all the way over. Get the mouse over. There it is.	K moves to help, then sits back as P4 moves mouse to button	
206	08.00	P2.	Come on.		
207			(00:04)	P3 as live feed come up in IWB takes control of mouth	
208		P3.	(Laugh)		
209		K.	So choose a colour. Maybe the colour of P1's t-shirt.		
210		P4.	Double click. Right move it onto the yellow. That's it.	P4 giving P3 instructions (P3 has mouse	
211			(00:04)		
212			( )		
213		P4.	( ). Yeah. Are you ( )		
214		P2.	That's it.		
215		P4.	( )		
216		K.	That's fine. You can see the colour you've selected it a little bit green But that's fine.	K ref IWB	
217	08.30	K.	You might want to get it more yellow. Maybe find a yellower bit.		
218		P3.	((too quiet, speaking to P4))		
219		P2.	((Laughs))	P2 is bending down pulling a funny face in the cam	
220			[		
221		K.	((Laughs))		
222		P1.	Stop it P2.	P2 is wiggling in front of the camera	
223		K.	Are you tickling him?		
224		P1.	No.		
225			(00:02)	P3 gives the mouse to P4. P3 step back to watch P1	
226		P1.	STOP IT.	and P2	
227		P4.	Right let's see can I find the yellow.	P4 moving mouse to select colour	
228		P2.	He he he ((Laughs))	P2 is dancing in front of cam	
229		P4.	Guys I can't (.) I'm trying to trying to get you.		
230		K.	I think you have to stand still.		
231		P4.	There you go.	P4 Checking roll over colour	
232			[		
233		P2.	I'm not in the picture		
234		K.	You have to move over a bit		
235		P2.	Oh yeah.		
236	09.00	K.	P1 is taking up most of the room	P1 and P2 stand still so P3 can capture the right	
237		P2.	There	colour	
238		K.	That's it		
239		P4.	Is that (.) so shall I click now?		
240		K.	Yeah.		
241		P2.	Look.		
242		K.	That's fine.		
243		P2.	Do it.		
244		P3.	((Too quiet speaking to P4))		
245		K.	Okay then what next?		
246		P4.	S-spaces.		
247		K.	Yep		
248		P4.	This is-		
249		K.	So what so you do now?		
250		P4.	That one.		
251		K.	Yep.		
252		P3.	Can I?		
253		P4.	Yep right. Make a (.) make one for me. Click one two three four. The triangle, the square and	P3 moves to take back control of the mouse	
254			the (cat) ((Laughs))	P4 giving instructions to P3	

255	09.30	P3.	P2 stop moving.		
256		P2.	(Laugh)		
257		K.	You need it (a bit higher)		
258		P4.	Yey:: ((Laughs))		
259		P2.	No you need to do it again.		
260		K.	That's fine. That's it. Then maybe one over P1.		
261		P4.	P1		
262		P2.	Me, me		
263			[		
264		P4.	P1		
265		K.	Maybe over his face?		
266		P3.	((Laughs))		
267			[		
268		P2.	((Laughs))		
269	10.00	K.	So what next?		
270		P3.	((Too quiet speaking to P4))	K points to make shape buttons	
271		P2.	Take it.		
272			(00:05) ((All Ps laugh))		
273		K.	If you go down a bit more.		
274		K.	That's it		
275		P2.	((Laughs))	P2 bending down look in cam	
276		P3.	P2 (loud)		
277			(P1 and P2 laugh)		
278		P3.	P2 get up properly		
279			(((Laughs)))		
280		P3.	P2 get up properly.		
281			(00:02)		
282		P3.	That looks silly.		
283			((All Ps laugh loudly))		
284	10.30	K.	Okay click on one of the colours. Maybe (.) either one on P1 or the one on P2. So maybe click		
285			on one of there one's. On the screen	K ref IWB	
286			((All Ps laugh))		
287		K.	Maybe that one. There. So you select it. That's it. Then you -		
288			((P1 and P2 laugh))	P1 and P2 bending down look in cam	
289			[		
290		K.	can attach a sound there		
291		P4.	Shall I delete that?		
292		K.	Um. Make a new one.		
293		P4.	Okay. Make a new one	P4 giving instructions to P3	
294	11.00	K.	So give it a name. So who did we click it over? Is it over P1?		
295		P4.	What do you want to call it?		
296		P3.	P1.		
297		P4.	What do you want to call it?		
298		P3.	*P1.*		
299		P4.	P1.		
300		P3.	Yeah	P4 typing	
301		P2.	M ((phonetically))		
302		P4.	M ((phonetically))		
303		P2.	E ((phonetically))		
304		P4.	E ((phonetically))		
305		P2.	G ((phonetically))		
306		P4.	Um:: G ((phonetically))		
307		P2.	A ((phonetically))		
308		P4.	A ((phonetically))		

309		P2.	N ((phonetically))		
310		P4.	N ((phonetically)). Right click on next. Okay. Ah.		
311	11.30	K.	So now you have to go to the computer and say your name really loud.		
312		P1.	Me.		
313		K.	Really loud.		
314		P1.	Okay. P1 ((very loud))		
315		P4.	((Laugh))		
316		P1.	That one went right to the top.		
317		P4.	Louder		
318		P1.	No. NO::-		
319		K.	Okay. Let's see how loud it is.		
320		P1.	Shh.	P1 and P2 move closer to the speakers	
321		P2.	Can you hear it?		
322		P4.	No.		
323		P2.	It's not there.		
324		K.	Maybe do it again		
325			[		
326			((P1's recording plays))		
327			((All Ps laugh))		
328		P4.	That was so cool		
329		P1.	That was me		
330			…		
331	12.00		Do it again.		
332		P1.	P1 ((very loud))		
333					
334		P1.	I went up to there.		
335		K.	Let's see how loud that was.		
336			(0:05)	All Ps gather around speakers	
337			((P1's recording plays))		
338		P1.	YEY.		
339			((All Ps laugh))	P2 claps	
340		K.	That was much better.		
341		P4.	P2.		
342		P2.	Now my turn.		
343		K.	Okay-		
344	12.30	K.	So click on P2's colour now. That on there.	K ref IWB	
345			[		
346		P4.	You type (and I'll …)		
347		K.	That one there.	K ref IWB	
348		P4.	You're in the way.	P4 push P3 out of the way to take control of the	
349		P1.	Shapes.	mouse	
350		P4.	It that P1's.	P1 jumping around	
351		P1.	Yeah.		
352		P4.	Click on (). No no no no.		
353		P1.	That one	P3 takes back control of the mouse	
354	13.00	P4.	Are we calling it P1		
355		K.	No I think it's going to be P2		
356		P2.	((Spell out p2's name)		
357					
358	13.30	K.	You could just do that	P1 stands in front of cam to capture name	
359		P4.	Right record	All Ps crowded round microphone	
360			Record P2		
361		P4.	P2 come over here and use the ( )		

362 363 364 365 366 367 368		P2. P1. K. P1.	P2 ((Shouting name)) Stop [Stop. And play [Play	 All Ps gather around speakers	
369 370 371 372 373	14.00	K.	…. Okay let's see if we can get the sounds to play. Click on play for me. If you walk past with your yellow t-shirt ((P2's recording plays)) It just says …	K points to button (IWB) LUNCH BELL RINGS	
374 375	14.30		Okay. Thanks kids that was great End 14:47		

Appendix 22. AudioSpaces: Field notes

Method:	Participatory and observation	
Participants:	Reception, n=4	
Materials	Playspace technologies (Mac mini, web cam, data projector, microphone, touch screen)	
Objective:	Assess use of AudioSpaces in the playspace Creation of sounds and active areas Connection of movement to sound	
Context:	Installed in hallway playspace (anticipate noise issues)	
Procedure:	Children work with practitioner to create sounds, children are encouraged to create sounds which relate to the objects and theme (China). Children then asked to play (K claims to be busy, so steps back from the activity) in the playspace	
Observations	00:00 – 11:00 Concept and example of software given – demonstrated with sounds (K's own) loaded onto the system before the start of the activity. K guides the children step by step) to create sounds and mark active areas via UI. Record sounds – first recordings are random sounds and too quiet. When asked to be louder, they shout. Children sounds are their names or squeals and squeaks. K asks children to think of sounds that relate to playspace. Children look blank (shy?), and struggle to think of sounds. K prompts ideas by picking up objects and asks what sound item might make (slurping noodles, whooshing the fan, clicking the chopsticks). Multiple recordings are made – children hesitate when record button is pressed, have to be readied (count down, with sound ready) – they appear to enjoy making sounds. Focused in activity, and laughter when hear sound preview. Once sounds are heard back, children are keen to make more. For second recording K asks children to record each other's sounds. K demonstrates marking areas, explaining that 'this' sound will play in this area. Children take turns to mark areas - support required to place markers: marker placed by children are too large and there is no tendency to place markers over 'meaningful' aspects of the environment (random), though once markers placed understanding connect the sound to the relevant space. 11:30 Start play. Initially P's stand still (unsure what they are meant to do?) children encouraged to play – this is presented as free time, K moves to side of space and looks busy (making notes). Ps look at screen and wave at cam, watching on projection. Sounds triggered with movement. 12:00 P1 picks up fan and waves it in front of cam – observing	Difficulty in creates appro. sounds Multiple sound recordings made 'Meaningful sounds' concept not understood by Ps K has to prompt play. Lag and overlapping sounds

	view and triggers. P2 and P4 watch P1, P3 turns away and looks around playspace for alternate object. P3 picks up chopsticks and hits them together, and then turns back to group. P1 , P2 and P3 sway and move in front of cam, moving back and forth – sounds triggered. Some discussion (inaudible) between P1 and P2 as they move to occupy more of the playspace. P3 starts to run round table in playspace – triggers sounds. P2 and P4 watch and laugh. P1 joins in. All 3 P's running in circles round playspace, laughing and triggering sounds. P4 watches Ps – onscreen and in physical playspace 12:30 P1, P2, and P3 run and jump around the playspace, the sounds (whoosh and slurp) in the playspace are triggered, but there is overlap and a delay (due the lag in playback and multiple triggers). P1 and P3 look at the screen, P2 watches P1. P4 watches others from the edge of the playspace, laughing watching the screen. 13.00 P1 moves close to the cam, puts her face (pulls funny face) so fills the whole of the camera view, triggered all sounds repetitively. P2, P3 and P4 watch projection screen and laugh. P3 requests time in front of cam ("I want a go"), P1 reluctant, but steps back. P3 puts face in cam. P1, P2 and P4 watch screen and laugh. 13:30 Request for quiet from neighbouring teacher – P's go very quiet. K intervenes to turn down audio playback. P's watch. K moves out of playspace and asks children to carry on playing. Ps hesitate to engage again. P1 start to sway in front of cam (trigger sounds) – P2, P3 and P4 watch P1 from the screen. 14:00 P2 , P3 move to display table (chatting) to look and select objects to wave in front of cam. P4 moves over to table and picks up chopstick, very hesitantly waves in front of cam – movement too small and no sounds are triggered. P4 continues to wave, watching himself on projection screen. P2 swirls in playspace, but out of camera view – no sounds triggered. 14:30 P2 runs towards cam and hold face in camera view – triggering all sounds. P4 is pushed aside. P1 and P3 turn and watch P2 on projection screen. P2 starts to pull funny faces (other P's laugh) – P2 puts face in active regions P2 starts to move back and forth in front of cam – triggering sounds. P1 joins in, then P3. P4 watches,	Continuous lag and overlapping sounds Over lapping sounds Camera view needs to be wider / higher? P4 yet to move in space – watching others Children & T are distracted in next door classroom – noise from system and P's excited behaviour P enjoy the overlay of graphs on face Ps behaviour and noise, with system noise too diatracting

	swaying - similar movement, but outside of the cam view 15:00 P1, P2 and P3 start to run and jump back and forth in front of cam – watching themselves on the screen. Laughing and making ‘pow’ noises. P4 watches laughing, but does not join in. Ps actions becoming increasing exaggerated, there is a little (good natured) pushing between P1 and P2. All Ps watching the screen as they move. 15:30 Second request for quiet from T – K close activity Children reported enjoying themselves, but bit quite after telling off. They could not think of how else they might use the system 16:00 Children return to class	
Notes:	There is no evident connection to different motion and space to sound Too many sound triggered as active region too close together – need a bigger space, or small active regions. Visual image of self too compelling, more focus on looking at image on projection screen – less focus on physical playspace (novelty may wear off over time)	

Appendix 23. Prototype: Transcript

	Time		Transcript	Action	Screen	Notes
1.	00:05	K.	You are and if I turn.	K turn the main lights in classroom off		
2. 3. 4. 5.	00:10	P4. P3. K.	(*Laugh*) [(*Laugh*) (*Laugh*)	P4 look at PC screen. All of Ps look at IWB.		Playful action – distorted self image
6. 7. 8. 9. 10. 11.	00:15	P2. P4. K. K. P4.	Hey:::: [Hey. So, who's face is that? Can you see on the screen? (…)			
12. 13. 14.	00:20	K. K.	Who's face? (00:02) So what you got in here?	 K walks over to IWB		
15. 16.	00:25	K.	On here, over here. (00:02)	K gestures to the control panel, speaking to P3 and P1		
17. 18. 19.	00:30	K. K.	You know you've got video? (00:01) You've got different effects. Um::-	K ref IWB		
20. 21. 22. 23.	00:35	K. P3. K.	Different ways you can look at the video. So if you can click on that one for me. (…) click on (…) Actually click on – (…)			
24. 25. 26.	00:40	K. P4.	Er::: That one. (00:01 Comic (…)			
27. 28. 29.	00:45	K. P4. K.	Comic book. Comic man. And then click on that button there for me.			End of guided use K give directions
30. 31. 32. 33.	00:50	 P3. P1.	[Play. This one? Play. (00:03) (*Laughs*)	 P4 smiles P1 looking into cam – moves head, pokes out tongue	New screen – video showing comic effect	 Playful action
34.	00:55	P3.	Ah:: You're in a comic book.			
35. 36.	01:00	P2. P4.	That doesn't look like us. Ah:: P1-			
37. 38.	01:05	P4. P2	You're sticking your tongue out. Ah::			
39. 40. 41. 42. 43. 44.	01:10	P1. P4. P1.	Is that? That's me. Is it? UR:: (*Laughs*) [UR.	 P2 points to IWB P2 moves to look at PC		Playful action
45. 46. 47.	01:15	P2. P4. K.	OH:: (*Laughs*). There's me – What's that That's just (.) that's just a picture of you playing	P2 turns to look at screen and points P4 looks towards video camera		

48. 49. 50.	01:20	K. P2. K.	So I can look at that later. But what's that printing? Oh, I don't know the printer (…)	P4 and P2	Printer near video camera starts	Distracted by camera video recording
51. 52. 53.	01:25	 P2. P1.	 (…) That's me.	P1 pokes tongue out (00:05) P2 and P4 talking quietly off camera	P1 taking up the whole cam view	Playful action
54. 55. 56.	01:30	P2. P4.	No. There is. There (.) there is (.) like their in a film. (laughs)	P2 points to screen K moves over and takes mouse from P1 P4 moves closer to IWB and points at it		
57. 58.	01:35	P2. AL L.	Ur:: (*Laughs*)	P2, P3 and P1 crowd around cam and poke out tongues		Collab humor
59.	01:40	P2.	Oh (.) that was so funny.			
60. 61. 62.	01:45	P2. P4.	Ur: (*Laughs*) Can we try a different one?	P1 pokes tongue out (00:07)		Direct others
63.	01:50	K.	Try (.) try clicking on one of the different ones.	K sits down away from group		K give directions
64. 65. 66. 67. 68.	01:55	P2. P4. P4. P2.	The last one. How 'bout that one there. Arh:: (*Laughs*) [(*Laughs::*)	P4 points to icon on IWB		Making suggestions Collab humor
69. 70. 71. 72. 73. 74. 75. 76.	02:00	P4. P2. P4. P2. P4. P2. P4.	That one. Yeah. Okay that one. Try the bottom one [Just click it Try the bottom one ((*insistent*)) Quick quick- Try the bottom one.	P4 points to icon on IWB P4. Moves to stand near P1 (P1 has mouse)		Making suggestions (conv)
77. 78. 79.	02:05	P2. P4.	Come on. They. Ar:: (*Laughs*) [(*Laughs::*)	P2 and P4 looking at IWB (00:10)		Collab humor
80. 81.	02:10	P2. K.	(*Laughs:::*) So girls. Just. Oh sorry.	K gets out the way of the teacher		
82. 83.	02:15	K.	Do you want me to jump out the way? So girls if you jump out the way for a second.	(To teacher)		K supervise
84. 85. 86.	02:20	K. P2.	The boys can have a bit of a play. Hum::	P3 moves to look at IWB and pokes out tongue		
87. 88.	02:25	Ps.	(Noises and laughing from all)	P4 and P2 now in front of PC, P4 has the mouse		Collab humor
89. 90. 91.	02:30	K. P4.	That's quite scary. Can we click on a different one?	Comment to P2 face on screen P2 poking out tongue and swaying in front of the cam (00:05). P1 copies movement		
92. 93.	02:35	P4.	How to I get the last one?	P3 swaying – moving away from screen (opposite movement to P1)		
94. 95. 96.	02:40	P3. P1.	(*Laugh loudly* 00:05) [(*Laugh loudly* 00:03)	P2 sways close up to camera		Collab humor - Laughing at others use
97. 98. 99.	02:45	 P1. Ps.	 Oh P2. (*Laugh*)	P2 sways back and forwards to cam	Composited image switch – normal video no effect	

100.		P1.	No			
100. 101. 102.	02:50	K. P.	Try clicking this one here. That one that says Mars. (…)	K points to button on IWB		K give directions
103. 104.	02:55	K. P3.	That's it Just play. Press play			
105. 106. 107. 108. 109. 110. 111.	03:00	P4. P3. P1. P4. P1.	Oh. (*Laugh* 00:04) [(*Laugh*) [(*Laugh* 00:03) What's that?	All Ps looking at screen P1 points to IWB	Compo image goes green Change to green screen effect – Mars film	
112. 113.	03:05	P4. P3.	His head is off his t-shirt (laugh)	P4 points to IWB		
114. 115. 116.	03:10	P4.	(laugh) His head is off his t-shirt (All laugh 00:03)	P4 points to IWB, moving closer P2 moves head and touch neck (where effect visible.		
117. 118.	03:15		[*Inaudible*] (*Ps Laugh*)	P2 starts to jump up and down and wave his arms		
119.	03:20		[*Inaudible*] (*Ps Laugh*)	Ps crowded round screen		
120. 121. 122.	03:25	T. P4.	P2 you could do something more sensible. (…) really nice What's happened?	T watching Ps and screen P2 stops jumping		T intervention
123.	03:30	T.	Say something sensible.	Ps look at T		
124.	03:35		[*No dialogue*]	Ps look at screen (unsure)		Pretend flying
125.	03:40	P4.	We're going round the wo::::rld	P4 holds arms out and sways		

126.	03:45	P4.	We're going round the (.)	P4 holds arms out and sways		
127. 128.	03:50	P2. P4.	It's going round the room- Ra-ra	P2 runs round the room, jumping P4 face in camera		
129. 130. 131. 132.	03:55	P2. P4. P3.	That's so funny How about I try a different one (.) like (.) er:: [We're in the planets-	P2 turns to look at P3		
133.	04:00	P2.	Yeah that one.	[*Camera obscured*)		
134.	04:05	P2.	You just (.) er (.) been on that one		Compo image – no effect	
135. 136. 137. 138. 139.	04:10	P2. P3. P2. P3.	((Laugh)) [(Laugh) Ur:: ((laugh) Do that one at the top.	P2 sways back and forth in from of cam P3 and P2 watching via screen		
140. 141. 142. 143. 144.	04:15	 P2. P2. K.	[Do that one at the top. Stop (.) stop The one at the top doesn't work. No no no that doesn't work.			
145.	04:20		[*Inaudible*]	P2 points at PC screen		
146.	04:25		[*Inaudible*]	P3 jumping up and down in front of screen		
147. 148. 149. 150. 151. 152.	04:30	P2. P4. P2.	Do the third one. Four. Black and white. ((*All Ps loud laugh*))	P2 speaking to P4 P2 speaking to P4 P2 sways back and forth in from of cam	P4 and P2 in cam P1 Change to ghosting effect Ghosting effect now evident	 Collab humor

153. 154. 155.	04:35	P2. P4.	Dee, dee, de, da (singing 00:03) (All Ps laugh) That is wicked	Singing while dance in front of cam. P3 starts dancing P2, P3 and P1 dancing – same motion as P2	P4 and P2 in cam	
156. 157. 158.	04:40	P3.	I'll get in the camera	P3 push P2 out of the way and stands in front of cam P2, P3 and P1 dancing	P4 and P2 in cam P4 and P3 in cam	
159.	04:45	P3.	Look::	P2, P3 and P1 dancing		
160. 161.	04:50	 P2.	 Let's do it again.	P2, P3 and P1 dancing		
162. 163. 164. 165.	04:55	P2. P4. P2.	Let's do something else. Alright [Let's do something else	 P2 points at PC screen		
166. 167.	05:00	P3. P2.	No do that one. No. don't. Do that one.	P3 points at PC screen	P1 cursor over plain video option	
168.	05:05	P3.	Oh I'm in the camera	P1 distracted by the video camera	Comic book	
169. 170. 171.	05:10	P3. K.	Guys you're the camera. Guy's you're in- If you stand slightly to the side.	P1 stands stands in front of video camera K moves P1 away from the camera		
172. 173.	05:15	K. K.	Otherwise all I see if the back of your t-shirt. If I put that there.	P2 and P3 dancing K moves camera over		
174. 175.	05:20	K. P3.	You can see it. If I put that round there. Oh wicked.	 P1 peers into video camera		
176. 177.	05:25	P2. P1.	Dong, dong, dong, dong, dong. Can you see?	P2 jumping P3 and P1 both peering into video camera		
178. 179. 180	05:30	K. P3. K. P3.	So if you were going to play with this what would you do? Oh I know What would you do? Go all over the place			

. 181 . 182 .						
183 . 184 .	05:35	K. P3.	Go all over the place. And mess with it all day.	P2 and P3 pre-occupied with video camera, obscure view	Prompt to try other effects	
185 . 186 . 187 . 188 .	05:40	K. K. P4. P3.	Having you clicked on this one? This one here That one No	K points to IWB		
189 . 190 .	05:45	P2. K.	That one Yeah.			
191 .	05:50	P2.	Wo:::			
192 .	05:55		[*Inaudible*]	P3 obscures view camera view		
193 .	06:00		[*Inaudible*]			
194 . 195 . 196 . 197 . 198 . 199 . 200 .	06:05	P4. P3. K. P3.	We're see through I haven't had a go on the mouse. Cause I haven't had a go. I haven't had a go on pressing- Okay swap round [Cause she had a go on the first one-	P3 demand for mouse		
201 . 202 . 203 .	06:10	K. P3.	Okay Cause she ( ) P1			
204 . 205 . 206 . 207 .	06:15	K. P3.	Do you want to let P3 have a go? And then you can play with the camera [UH HO-	P3 takes control of the mouse	Select Mars	

208 . 209 . 210 . 211 . 212 . 213 .	06:20	P2. P4. P3. P4.	Er oh, we're going round the moon again. Turn it around We're going round the moon. [We're going aound the moon. WO::	P3 has face in camera view. P1 and P4 can see themselves in the distance – standing still P2 holds out arms (like a plane) and swings side to side		
214 . 215 . 216 . 217 . 218 .	06:25	P2. P3. P2.	We::: We're going round the moon again- We're going to (.) crash Er oh. We're going to fly away. Wee::: [We're in a space ship	P2 holds out arms (like a plane) and swings side to side P3 pushes face into cam		
219 .	06:30		Tape black			
220 . 221 .	06:35	P4. K.	Yeah. Well we're going to put this in your classroom for you to use in your playtime.			Place selves in space
222 . 223 . 224 .	06:40	K. P3.	So I'm just making sure it works properly. [YAY HEY. I'm in the moo:::n.	 P3 swinging side to side		
225 . 226 . 227 . 228 . 229 . 230 . 231 .	06:45	 P2. P4. P3.	[(Watch it) when you haven't got a t-shirt. Your head's flying off. [What so we can (.) watch it? ((Laugh))	 P4 speaking to K P1 moves to get in better view of the camera		
232 . 233 . 234 . 235	06:50	P4. K. P3. P2.	Why do you have to make sure it works properly? Cause otherwise it might break. [I'm going to the moo::::::n. [She got (.) no.			

. 236 . 237 . 238 .						
239 . 240 . 241 . 242 .	07:00	P2. P3.	Her heads off and she hasn't got a t-shirt on ((laughing)) No.	 P3 pushes face into camera		Conflict over control of the mouse and camera view
243 . 244 .	07:05	P1. P3.	(It's my go) I know but you had the first one. And you wouldn't share it with me	P1 moves to the other side to P3 to get into the camera view		
245 . 246 .	07:10	P2.	And we're flying round the moo:::n	P3 has mouse and is in camera view P2 waving arms in background of camera		
247 .	07:15	P2.	We're flying round the de, de, de. Flying round the moon (laughs)			
248 . 249 . 250 .	07:20	P2. P4. P2.	Yeah:: Hey:: Oh on (.) not that one that's boring (…)		Change to bitonal (red and green) effect	
251 . 252 .	07:25	P4. P2.	Stupid. (Laughs) What about (.) what about that one I like	P2 moves to Pc and changes effect P2 steps back	Change to comic effect	
253 . 254 . 255 . 256 . 257 .	07:30	K. P4. P2. P4.	What's that one like? What does that look like? Err::- [P3 Yeah P3 (.) with a big something			
258 . 259 .	07:35	P2. P4.	With big lips- ((Laughs)			Playful
269 . 261 . 262 .	07:40	P3. P1.	WO::: WO WO We We Okay can I have a go now?	P2 swinging in front of camera P3 change view to ghosting and pokes tongue out in camera view P1 moves close to P3	Change to ghosting	

263.						
264. 265. 266. 267. 268.	07:45	P3. K. P2. K.	No::::: Okay so take turns. Maybe a couple of minutes and then swap again [I like this. Okay?	Pushes P1 out the way and shakes head Swaying in the backgound		Conflict
269. 270. 271. 272. 273.	07:50	P3. P4. P2. P4.	Yeah but she's already had two goes ((Laugh)) [((Laugh)) That's so funny	 P2 moves forward – poke tongue at camera		
274. 275. 276.	07:55	P2.	I'm dancing round the moon	P2 dancing in front of cam	Screen goes blank – K intervene Screen back - bitonal	
277.	08:00	P4.	Yeah that one's boring	P4 looking at screen	Change to ghosting	
278. 279.	08:05	K. P4.	Do you like that one Yeah	P2 obscures camera view (face in lens)		Video camera is a distraction, though enjoying playing with camera.
280. 281. 282.	08:10	P2. P4. P2.	Hey. What That is wicked. Let's see			
283.	08:15	P2.	You put your eye there.			
284 285. 286.	08:20	P2. K. P2.	You lot (.) you lot Hang on. I need to use that (…) It looks good			K flick through effects - preference
287. 288. 289.	08:25	K. P3.	Okay so I want to ask you a few quick questions. What?		Change to comic book	
290.	08:30	 K.	((Bell rings)) What's that bell? Is that lunch?			

291 . 292 . 293 294 . 295 296 . 297 . 298 299 . 300 .		P2. P4. P2. K. P2. P3.	No no. [Its assembly. [Assembly. And do you want to go to assembly? No. [No.			
301 . 302 . 303 .	08:35	K. P2. K.	Oh okay. We don't have to- So, if you were going to play with this (.) how would you like to play with it?			
304 . 305 . 306 . 307 .	08:40	P2. P4. K.	Um:: Good. Very good. Okay. Um. Why would you like to play with it? Here.			
308 . 309 . 310 . 311 . 312 . 313 . 314 . 315 . 316 .	08:45	K. P1. K. P3. P4. K P2. P1.	Here? Here. (Laugh). [In the computer room? Um. At home. Yeah at home. At home? At home. Yeah, At home.			
317 . 318 . 319 .	08:50	K. P1. K. P1.	If you were going to play with it in the classroom (.) how would you play with it? On the whiteboard. [On the whiteboard? On the whiteboard.			

320 . 321 .						
322 . 323 . 324 . 325 . 326 . 327 . 328 . 329 .	08:55	K. P4. P2. P1. K.	Okay. In your classroom do you have a little play space? No. [No. [No. [No.			
330 . 331 . 332 .	09:00	P2. P2.	Not in our classroom Look show her (.) look	T has walked in. P2 talking to P4.		
333 . 334 335 .	09:05	P4.	Watch this. Look. Watch this. Go on show them. Go on. Click on play just click on one.	P2 talking to T P2 talking to P1 P2 walks over to T and points at IWB		
336 . 337 .	09:10	 P2.	(00:02) Click on play. See it goes onto different ones.		Change to Ghosting	
338 . 339 . 340 . 341 .	09:15	T. P4. P4.	Wow. Move P1. De de de. See. See	P1 sways in front of the cam		
342 . 343 .	09:20	P2. P4.	And it's fading away look. It fades away You can see through her a bit	P1 sways in front of the cam		Creative interpretation
344 .	09:25	P2.	Hello. You can see through me	P2 dancing in the background		
345 . 346 . 347 .	09:30	 K. P2. P4.	[That one won't play Oh wicked Wicked	P1 clicks on option at top of menu (system fault) Giving direction to P1		

348 .						
349 . 350 . 351 . 352 .	09:35	P4. P1. P2.	That one's good [No the other one Oh.	P2 ref menu	Change to comic	
353 . 354 . 355 . 356 357 . 358 . 359	09:40	T1. K. T1. P1. P2.	That's good isn't it. Its suppose to be like a comic book Yeah. It looks good He he he [Argh.	K taking to T		
360 . 361 .	09:45	P2. T1	You can see our brains It makes them looked wrinkled			
362 . 363 . 364 . 365 .	09:50	K. T1. K. P2.	When I'm using it I can see all the lines Look it makes her look old Yeah You can see our brains			Creative interpretation
366 . 367 . 368 . 369 . 370 . 371 .	09:55	P4. K. T1. P3.	And me. When I'm doing it I can see my double chin. ((Laugh)) [((Laugh)) It looks like (.) like you eyes look freaky.			
372 373	10:00	P3. K.	Your eyes look (.) your eyes look freaky Yeah. I think teeth look strange as well			
374 375 376	10:05	K. T1. K.	You can see your teeth in them look. Oh Yeah Scary teeth	Children lean into camera and show teeth		
377 378 379	10:10	T1. P3.	Very clever [You look like vampires			

380		P4.	Ha ha ha	Grouped round camera		Collab.
381	10:15	P1.	You're squashing me P3.			
382		P3.	We:::::::			
382			[			
384		P2.	We::::::			
385	10:20	T1.	Doesn't that make her look old?	T talking to children		
386		T2.	Oh.			
387		P4.	What? What?			
388	10:25	P4.	Look click on different one. Show her a different one			
389			[			
390			Right.			
391		P2.				
392	10:30	P3.	Show your teeth			
393		P4.	Click on different one. Show Mrs X			
394		T2.	It really reminds me of um. Aha			
395			[			
396		T1.	Aha			
397		T2.	You know when they did that			
398			[			
399		P2.	*Look at this.*	P2 and P4 point to Laptop		
400			[			
401		P4.	LOOK. This is one is different.			
402	10:35	P4.	Click on a different one.	P2 and P4 walk over to T3		
403		P2.	Mr X Loo::k -			
404		P4.	Click on (.) click on one	P4 runs over to laptop		
405	10:40	T3.	That looks like the Aha video doesn't it			
406		T2.	We just said the say thing-			
407		K.	Yeah			
408		T2.	We're on the same wavelength			
409	10:45	P2.	Hey hee.			
410		T1.	Put it on the black and white one (.) I like that the black and white one-			
411			Oh we're in it.			
412		T2.	Oh			
413		T1	Who's tongue it that. Is that P3.			
414		T3.	(…)	P3 poking tongue out in camera view		
415	10:50		((All Ps Laugh))			
416		P2.	No that's P1s.			
417			Wait a sec try it on there.			
418	10:55		[			
419		P2.	Click on the black and white one.			
420		K.	Try it on there.			
421	11:00	T1.	Ghost.		Change to ghosting	
422		T3.	Yeah.			
423		K.	Oh no that one's not.			
424						
425	11:05	K.	Bit like a trail.			
426		T3.	Cool.			
427		P3.	Don't.	P1 talking to P3 – P1 is trying to get assess to the cam		
428						
429	11:10	P3.	Do that one where you can see your brains.		Change to comic	
430	11:15	P4.	Ha ha ((Laugh))			
431		P2.	Now you can see your brains.			
432			[			
433		P3.	*You can see your brains*.			
434			((Ts and Ps laugh))			

435		T2.	Oh look at your face.			
436 437 438	11:20	T2. T1.	Look at your face Yeah look. ((Ts and Ps laugh))	P4 jumps in front of camera and pulls face		
439	11:25	T1.	No your (pop)			
440 441	11:30	T2. T2.	That's heat sensors (.) is it. Oh.		Change to comic 2	
442	11:35	P4.	Do the one when we go round the world	P4 ref menu item in IWB		
443 444 445 446	11:40	P3. T2. K.	Yeah do that one when we go around the world. What mars flight? That's. Click on the mars flight one.			
447 448 449 450 451 452 453	11:45	T1. P3. K. T1. P3. P4.	Next one. [That one. That's it. Click on that one. That's it. Click Play.			
454 455 456	11:50	K. P3. P2.	And it's (.) I've got to play around with it- Look look Look we're going around the wo::rld. We're going round the moo::::::n.			
457	11:55	P2.	We're going round the moo::::::n. Here we go			
458	12:00		(*No dialogue*)			
459 460 461 462 463 464 465	12:05	K. P2. T2. K. T3.	The idea was to develop technologies that could be used in the playspace. [We have got any t-shirts To be creative Yeah Sh			
467 468 469	12:10	K. T2.	Simple technology that they could use that they incorporate into their play That's good			
470 471 472	12:15	K. T3.	So eventually you should be able to load all sorts of videos So we could load a football pitch in the background and they could be [	T3 mimics football moves		
473 474 475 476	12:20	K. T3. K.	Yep, yep. Or if you go on a field trip to the beach- Yeah. If you've got some footage of the beach you could that into the background			
477 478 479	12:25	T3. K.	Yeah and they could use it in assemblies (.) like if you had this in front of the assembly If you want.			
480 481 482 483 484	12:30	T2. K. T2. T3. T2.	Yeah. Or plays. Yeah. Yeah. They could do a (fantastic …) Yeah.			
485 486	12:35	T2. T1.	We could transport them in a Tardis Yeah ((Laughs))			
487 488 489	12:40	P3. P2.	We::: [We::::			

490		T1.	Oh no that scary when it invisible			
491	12:45	K.	So can you talk to me about how you found playing with it?			
492	12:50	P4.	It was fun.			
493			[			
494		P3.	Fun.			
495		P2.	Yeah fun.			
496		K.	It was fun.			
497		P2.	It was fun. It was fun			
498	12:55	P3.	Fun. Fantastic (.) fantastic			
499			[			
500		P4.	And it was good.			
501		P3.	No no no (invisible) It was (invisible)			
502	13:00	P2.	It was invisible			
503		K.	Invisible. It made you invisible. Did you like that bit?			
504			Yeah.			
505		P1.	[			
506			Yeah.			
507		P3	{			
508			Yeah.			
509		P4.	I like this bit. Where you can fly around the moon			
510		P2.	(…) other places. What other places could you have in the background			
511	13:05	P2.	Mars.			
512		K.	Mars			
513		P2.	And Jupiter			
514			[			
515		P1.	Tescos			
516		K.	Tescos (laughs)			
517			[			
518		P1.	((Laughs)			
519			[			
520		P4.	((Laughs))			
521		P2.	Jupiter			
522	13:10	K.	Okay			
523		P2.	Saturn			
524	13:15	K	That was yeah. That one.			
525		P1.	And because we go invisible sometimes	Talking to K		
526			P4 that one			
527		P2.		P2 gesturing to button IWB, taking to P4		
528	13:20	P1.	And because it goes bar::: bur::	P1 waving arms around		
529	13:25	P2.	P4 up there.	P2 runs over to gesture towards PC screen.		
530		P1.	We::: We::::		P4 repeatedly clicks on the top option in menu	
531		K.	That one doesn't work.	P1 waving arms around		
532		P1.	Why? Why?			
533		K.	It's not one			
534		P2.	Why doesn't it work?			
535	13:30	K.	It's a different. It's cause it's not working			
536		P1.	[			
537		K.	My head-			
538		P2.	I'm looking at the computer-			
539			Okay			
540		P1.				
541		K.				
542	13:35	K.	Okay. And you like that one don't you		Change to comic effect	
543			[			
544		P2.	Yeah:::			

545 546 547 548 549		 P3. K. P1. P2.	[Yeah::: Okay. Hey::: Right P2 (.) Right P4. (…)	 P2 moves over to PC		
550 551 552 553	13:40	K. P2. K.	Which is the last one that you liked the most? Oh (.) oh (.) oh (.) oh (.) oh (.) oh (.) Go on.	 P2 runs over to gesture towards the IWB		
554 555 556 557	13:45	P2. K. P1. P2.	That one The water colour one Yeah the water colour one Click on it. Click on it.	 P1 tapping IWB P4 clicks on option		
558 559 560 561 562 563 564	13:50	K. K. P2. K. 	Excellent. Water colour - Okay (loud voice). [We can see our brains Okay. Thanks kids [	P4 changes screen	Change to water colour effect	Creative interpretation of representation
565 566 576 577	13:55	P2. P1. K.	Oh P4 don't (.)go down again. Go down Oh we like the Mars one You like the Mars one. Yeah.	P2 runs over to P4 on Pc		
578 579 580	14:00	P2. K. All	Oh brains. We can see our brains You can see (laugh) your (laugh) (Laugh)	P2 runs back to IWB, waving arms and pointing		
581 582	14:05		Okay thank you everyone (tape end)			

Appendix 24. Guided use: Transcript

	Time		Transcript	Action	Notes
					Two groups arrive for evaluation – time spent organizing them P1 had requested to use the mouse as starting.
1. 2. 3.	00:40	K. Ps.	So what do you think this picture here looks like. (*points to icon on project and then to web cam in playspace*) Yeah / Yes	All Ps sitting watch K and the screen P1 sitting at table, holding the mouse	K giving explanation of system to group – volunteer to use the mouse for demonstration
4. 5. 6.	00:50	K.	Yes. Well this is the camera. So this (*point to icon*) is for the camera. So if you click it once. (*Speaking to P1*) Click again. (*Speaking to P1*)	 P1 clicks once P1 clicks again – pulls confused face	
7. 8. 9. 10. 11.	01:00	P1. K.	It's stopping. [Oh there you go. There you all are down there. If you all wave. (*Speaking to all Ps*) Okay so you can see yourselves. Right so can you see if I stand in front of it.	 K wave. All Ps wave – smiling and laughing K stands in front of the cam	
12. 13. 14.	01:10	K.	You can see the jellyfish where I am. Stand away. So the jellyfish is on me. So if you click here with your mouse (*Speaking to P1*)	 K steps back away from the cam K stands in front of the cam	
15. 16. 17. 18. 19.	01:20	K. P1. Ps. K.	You can see the jellyfish is behind us Oh [Oh. So if one of you stands up.	P1 clicks on chroma (in preview win)	
20. 21. 22. 23. 24.	01:30	K.	Stand up. Would like to stand up. One person. Okay you were first. (*Points to P2 in front row)* Everyone else sit down (*speaking to all Ps*). And you come and sit here (*gestures to place in front of cam*)	All Ps stand up (including P1 using the mouse), couple with hands in the air	
25. 26.	01:40	K. P3.	And then you with the mouse. If you click on (.) on her t-shirt. Oh you can see her.	P2 gets up and stands in front of cam	
27.	01:50	K.	See she has gone all blue now.	Ps and K look at the projection screen	
28. 29. 30. 31. 32. 33.	02:00	K. P2. Ps. K.	And I'm all blue. (Laughs) Ha:: (Laughs) You can all stand up now do you want to have a play? (*Speaking to all Ps)* Off you go.	 Ps get up P3 and P4 wave at the cam, other Ps stand and watch	Explanation finishes – all use
34. 35.	02:10	K. Ps.	Maybe is I just borrow that for a sec (*Laugh*)	K takes mouse Ps waves and walking forward and	K intervention: adjust key colour

36.		K.	If I just click your t-shirt	back from cam	
37. 38. 39 40. 41.	02:20	K. K. P4. K. Ps.	Who's got the yellow t-shirt? Who's got the black t-shirt? P3 I'm going to click on his. LOOK (*Laugh*)	P3 turns and raises hand P4 leans forward to touch P3's t-shirt	
42. 43. 44. 45. 46.	02:30	Ps. P1. P2. P1. K.	(Laugh) Click me. Click on me. It's on me. It's on you	P5 standing close to cam – smiling	Lots of Ps smiling and laughing
47. 48. 49. 50.	02:40	K. P6. K.	You've got the red. You go and stand at the front with the red t-shirt. (*Points to P1*). Go on you stand at the front. How do you click on it? So. Hold the mouse there	 P6 takes control of the mouse	
51. 52. 53. 54.	02:50	K. P6. K. P6.	And you see this little picture here? What on? You see this little picture here? Yeah.	K stands up to point to projection screen K points to projection screen All other Ps waving at cam	
55. 56 57 58 59	03:00	K. K. P5. K.	Where's the mouse? Go on move the mouse [Go: on. So if you click the mouse now. Click once.	K moves over to the computer – moves the mouse to locate it	Lose the mouse
60 61 62	03:10	K. P5. K.	So you can see. You can see it's on her t-shirt now. Can I have a go. (*Speaking to K*) Yes everyone can have a go	P1 (t-shirt selected) grabs t=shirt	
63 64 65 66 67	03:20	K. P3. P4. K.	So click on a colour. So who's got a bright t-shirt on [P5. P5. (*tapping P5 – mild insistence in voice*) [Me. Okay the yellow one. (*Speaking to P4*) So if come and stand at the front.		
68 69 70	03:30	K. K.	So you click on. Click on it here (*speaking to P6)* (00:03) Click on this square. Then maybe click on his t-shirt, or her t-shirt, or his face	K indicating on projections screen	K instructing – repeat demonstrated process
71 72 73	03:40	P3. K. P5.	Or me. Or me. I can't see me. (…)Tape Do you like that one? The blue?	All Ps dancing (swaying and jumping) together – moving in content	Dance movement – ripple imitation: 1 child, then three more, then last two – look at screen and copy
74 75 76	03:50		(*No dialogue*)	P1, P2 and P3 poke out tongue Ps laugh Ps waving and jumping	
77 78	04:00	P4. P3	Pick me up. Can we see that one?	P3 picks up P4	One P, then another pick up P to get a better look

79 80 81	04:10	P P	Can we see what's behind? I've got black (.) yellow hair	P request / direct mouse action P pretend playing the guitar	
82 83 84	04:20	K. K.	Do you want to try something different then? Yeah Okay close this one down. Bye yellow	Ps watch screen	
85 86	04:30	P2.	Can I have a go please?	P request mouse Open Video Effects	
87	04:40	P4.	That's me	Ps pretend to play guitar	
88 89 90 91	04:50	P2. P2.	Where is it (00:04) Whe:::re	P2 takes mouse K points to screen	
92 93 94 95	05:00	K. K. P2.	It's up there Can you see it? (*Nod*)	K takes mouse and positions cursor in middle of screen	
96 97 98 99	05:10		(*No dialogue*)	P1 moves to take mouse Change App to Video effect Ghosting movement with glow effect Ps watch screen	
100 101 102	05:20	Ps. P4. P2.	(*Laugh)* *Dring, dring dring* *He's a. He's a monkey*	P5 making monkey movements P4 Pretend to play guitar – look at other during pretence	
103 104 105 106	05:30	P1. P3. P2.	(*Laugh)* [(*Laugh)* Whoo:::	P1 clapping P3 hand P pointing to people in image and space P2 moves Up and down – move to make swirly	
107	05:40		(*Inaudible*)	Distracted by other class	
108 109 110	05:50	P5. P2. Ps	I want to see myself swirly Swi:::l (*Laugh)*	 P1 Curtsey P2 pull face and pretend to play guitar	Move according to interpretation of representation
111	06:00	P1.	Ah magic. It's magic. Touch it. It's not. It's a wall. (00:02)	P1 presses the wall	
112 113 114 115	06:10	P1. P2. P1. P3.	It's a wall it is. It is. Yeah. And how does that get on there? Hm:?		
116 117 118	06:20	P4.	Must have been the sunshine through and make (.) somebody turned must have turned this on, and the sun might have brighten this up. (00:02) I don't know.		
119 120 121 122	06:30	K. P4. K.	((Thinks they are talking about the drawings on the wall)) That's painted on the wall. Painted? Tinkerbell. Tinkerbell and Captain Hook are painted on the wall.		

123		P1.	No we mean how can that get on?	P1 Points to screen on wall	
124 125 126 127 128 129 130 131 132	06:40	K. P1. K. P5. K. P5.	Oh that comes from here. Er:: Magic? The image is- [I knew that. is projected. [I knew that. I knew that.	K Points to data projector on ceiling - Children turn round to look at projector K stand on chair and places hand in front of light of data projector	
133 134 135 136 137 138	06:50	P3. P2. P1. P1. K.	Magic. [Magic. That's magic. Yeah. Press that button Do you want to click that?		
139 140	06:70	P2. P1.	Yes. Click it	P2 is struggling to find cursor so K takes control of the mouse	

Appendix 25. Free play 1: Transcript

	Time		Transcript	Action	Grouping	Type	Notes
1	00:00			P2 is holding (Chinese) umbrella over her head	Solo	Drama.	
2				P3 is looking at objects on display	Solo	Exp.	
3				P4 is not in sight (sitting at table)	Solo		
4	00:05	P1.	It's not raining	P1 points at P2s umbrella	Group (pair)	Trans.	
5	00:10	P2.	I know ((laughs))	P1 picks object off display	Solo	Exp.	
6				P4 joins group at display	Parallel	Trans.	
7		P1.	OW::	P4 returns to table	Parallel	Trans.	
8	00:15	P1.	OH	P1 starts to play xylophone		Const.	
9		P3.	No I want that	P3 takes chop stick and hits xylophone	Solo	Const. /	
10				P2 is watching screen	Onlooker	Exp.	Watch (others) screen
						Exp.	
11	00:20	P2.	P1	P2 taps P1 on the shoulder	Group (pair)		
12		P2.	((Laughs))	P2 points to screen, P1 looks up at screen		Exp.	Watch (selves) screen
13	00:25		((P1 and P2 Laughing))	P4 moves to display	Parallel	Trans.	
14				P2 turns round looks at objects on table turns back to	Onlooker		
15				watch boys			
16	00:30			P2 turns to look and table and looks round the play	Onlooker	Trans.	
17				space	Solo	Trans.	
18			((P1 and P2 Laughing))	P4 looking at objects on display	Group (pair)		
				P3 and P1 play xylophone		Const.	
19	00:35	P4.	Yeah. I ( )	P4 picks up plastic chicken and pretends to eat	Solo	Drama.	
20			(00:03) ((P2, P3 and P4 Laughing))	P1 hold up umbrella watching self in screen, P2, P3	Group (4)	Exp.	Watch (self) screen
21			[	and P4 watch P1	/ Onlooker		
22		P4.	This is a boomerang		(3)	Drama.	Ignored utterance
23				P4 wave chicken in the air			
24	00:40	P4.	(a minute)				
25		P1.	Oh ho.	P1 looking up at screen with umbrella, open and close	Para.	Exp.	Watch (self) screen
26			((P1 and P3 Laugh))	on screen			(Play with representation)
27			[				
28		P4.	Boomerang			Drama.	
29				P3 play xylophone	Solo	Const.	
30	00:45	P4.	This is a car-rot, this isn't a muffin it's a boomerang	P4 holding object in front of P1's face	Group (pair)	Tumble	
31			turkey. ((Comic voice))	P2 sits down at table and pick up a doll	Solo	Exp.	Pair
32				P3 play xylophone	Solo	Const.	
33	00:50	P1.	No it isn't.				
34			((P1 and P4 laugh))	P1 turns around to table, looks at P4	Onlooker		
35		P4.	( ) Yum yum	P1 pointing at P4s doll, then starts to look around		Trans.	Ignored utterance
36		P1.	Oh.	P3 play xylophone	Solo	Const.	
37	00:55	P4.	( ) Chinese foo:d	P4 picks up chopsticks and waves in the air	Solo	Func.	Solo
38				P1 is looking under the display	Solo	Trans.	
39		P4.	Do you want some Chinese food	P4 hitting chop stick together		Func.	Ignored utterance
40				P3 play xylophone	Solo	Const.	
41	01:00		[	K intervenes (P3 playing xylophone to loud and asked			
42		K.	Sh:::	by neighbouring class to quiet group)			
43		P4.	Chinese food. Chinese food. Chinese food.				
44			[				
45		P1.	Oh::	P4 watches P1	Onlooker		
46	01:05			P1 takes box (game) from under display		Trans.	

47 48 49 50		P4.	Noodles. Noo::dles	P4 sits at table P1 places game on table, P2 turns round and sits next to P1 P2 puts doll in basket and stands up	Group (3)	Trans. Trans	
51 52	01:10	P4. P1.	P1 what you doing That'll six er:: Six			Game	Children engaged with board game
53 54 55	01:15	P1.	So I get another go. Oh Two	Dice rolls on floor P3 picks up the dice			
56	01:20	P1.	Ah. Two. I have to pick up the two now			Game	
57 58 59 60 61 62	01:25	P4. P2. P4. P2. P4	Can I have a go? My turn. Can I [One Can I have a go?	P1, P2, P3 & P4 play game at table	Group (4)	Game	
63 64	01:30	P4. P1.	Doubles Four	P1, P2, P3 & P4 play game at table P1 watch P4 roll dice		Game	
65 66	01:35		(*muffled voices – P's talking over table*)	P1, P3 & P4 play game at table P2 turns away from game	Group (3)	Game Trans.	
67 68 69	01:40			P1, P3 & P4 play game at table P2 puts basket under display and pulls cover across (to hide basket)	Group (3) Solo	Game Const.	
70 71	01:45			P1, P3 & P4 play game at table P2 looks at objects on display, picks up plate		Game Trans.	
72 73	01:50			P1, P3 & P4 play game at table P2 get under displays with basket and plate		Game Drama.	
74	01:55			P1, P3 & P4 play game at table			
75	02:00			P1, P3 & P4 play game at table			
76	02:05			P1, P3 & P4 play game at table			
77 78	02:10			P1, P3 & P4 play game at table P2 gets out from under display			
79 80	02:15			P2 walk out of play space P1, P3 & P4 play game at table			
81	02:20			P1, P3 & P4 play game at table			
82 83	02:25			P2 returns to play space and sits at table	Onlooker	Trans. Game	
84	02:30			P1, P2, P3 & P4 play game at table	Group (4)	Game	
85	02:35			P1, P2, P3 & P4 play game at table			
86	02:40		That's not fair	P1, P2, P3 & P4 play game at table			
87 88	02:45		All gone Hey ( ) one (.) one	P1 turns to look up at screen P2, P3 & P4 playing game	Solo Group (3)	Trans.	
89 90 91	02:50			P1 picks up sticks , looks at screen and waves P1 starts to play xylophone, P3 looks up to watch P1	Solo Solo / onlooker	Exp. / Finc. Const.	Watch (self) screen Watch (other) screen
92 93 94	02:55			P3 watches P1 P1 play xylophone	Onlooker Solo	Const.	
95 96 97	03:00			P3 turns to look at P4 and then around room P1 play xylophone	Onlooker Solo	Trans. Const,	P3 thinks P1 should not be playing xylophone

98 100 101	03:05			P1 waves stick in camera view, and then continue to play xylophone P2, P3 & P4 playing game	Solo Group (3)	Exp. / Const. Game	Watch (self) screen
102 103 104	03:10			P1 plays the xylophone P1 picks up umbrella and holds up to screen P2, P3 & P4 playing game	Solo Solo Group (3)	Const. Exp. Game	Watch (self) screen
105 106 107	03:15		((Laugh))	P1 turns to group and opens umbrella P1 holds the umbrella over P3's head P2, P3 & P4 playing game	Solo Group (pair) Group (3)	Trans. Drama. Game	
108	03:20			P1 leave the umbrella balanced on P3's head	Para / Group (pair)	Tumble.	
109 110	03:25			P4 picks up umbrella and puts it on display P1 picks up umbrella and puts it down again		 Trans.	
111 112	03:30			P1 starts to play xylophone	Solo	Const.	
113	03:35			P1 looks up at screen and turns to group	Onlooker	Trans	Watch (self) screen
114	03:40			P1 runs to table and pretend to eat wool (noodles)	Solo	Drama.	
115 116 117	03:45	 P3.	 ((Laugh))	P1 pretend to eat wool (noodles) , P3 watching P1 P4 walks over to display and looks for chopsticks	 Onlooker	 Trans.	
118 119 120	03:50			P1 puts down wool and turns to display to play xylophone P4 takes chopsticks to table and sits down P2 walks over to display	Solo	Const. Trans. Trans.	
121	03:55			P1 plays xylophone		Const.	
122 123	04:00			P2 looks objects in display ((Disruption from passing class))		Trans.	
124	04:05			((Disruption from passing class))			
125 126 127	04:10	 P4.	 *Wa la*	P1 plays xylophone P2 and P3 play game at table P4 jumps up and waves chopsticks in front of screen		Const.	
128 129 130 131 132	04:15	P4. P1.	Ding ding ding ding ding ding [*WHO HO* ((P1 andP4 laugh))	P1 and P4 wave chopsticks in front of screen P2 and P3 play game at table	Group (pair) Group (pair)	Func. / Drama. Game	Watch (selves) screen Playing in the air - Place object in camera view
133 134 135 136 137 138	04:20	 P4. P1. P4.	((P1 andP4 laugh)) No. [((Laugh, fighting noises)) Hey You do it ( )	P1 and P4 wave chopsticks in front of screen P4 Leans over and bashes his chopstick with P1 P2 and P3 play game at table	Group (pair) Group (pair) Group (pair)	Func. Drama. Game	Playful social interaction Place object in camera view
139 140 141 142	04:25		((P1 andP4 laugh)) ((No dialogue))	 P4 puts chopsticks on tables turns and picks up chicken P1 plays xylophone P2 and P3 play game at table	 Solo Solo Group (pair)	 Trans. Const. Game	
143 144 145 146	04:30	P4. P1.	Turke:::::y [Don't fight. ((Laugh)) [	P4 waves chicken in front of screen P1 hits P4's chicken with his chopstick	Group (pair) Group (pair)	Func. Drama.	Watch (self / other) screen Place object in camera view

147 148		P4.	((Laugh)	P4 puts down chicken P2 and P3 play game at table	Solo Group (pair)	Trans. Game	
149 150 151 152 153	04:35	P4. P1. P4.	Rest of it- [((Laugh)) [Rest of it.	P1 picks up noodles P4 picks up plate and holds it under noodles	Solo / Para	Trans. Drama.	
154 155	04:40	P2.	P1 ((loudly)) ((P1 and P2 laugh))	P2 taps P1's shoulder and points to camera P4 holds noodles on plate up to screen	Group (pair) Solo		Watch (selves) screen Place object in camera
156 157 158 159	04:45	P4. P1.	((Laugh)) Hey They're film-ing	P1, P2 and P4 distracted by video recording P1 turns back to table P2 watching P3 at table (playing game) P4 move back to table	Group (3) Solo Onlooker Solo	 Trans. Trans.	
160 161	04:50		((No dialogue))	P1 plays xylophone P2 looks and video camera and table – watching P3	Solo Onlooker	Const.	
162 163 164	04:55	 P4.	 HI-YA. HI-YA. Hi. YA	P3 turns to watch P1, gets up and moves over to displays P1 plays xylophone looking at screen P4 mock karate moves in front of screen	Onlooker Solo Solo	Trans. Const. Drama.	 Watch (other) screen Watch (self) screen -
165 166 167 168	05:00		((No dialogue))	P3 turns to watch P1 P1 plays xylophone P2 sits at table playing game P4 picks up chopsticks from table	Onlooker Solo Solo Solo	 Const. Game Trans.	
169 170 171 172 173 174	05:05	P4. P3. P1.	Bo bo bo do do Can I do that? Put my umbrella up.	P4 waves chopsticks on screen P3 looks at objects on display, looks at P4 (screen), and turns to table P1 plays xylophone P3 speaking to P2 P2 watches P1	Solo Onlooker / solo Onlooker	Func. Trans. Const. Func.	Watch (self) screen Watch (other) screen Request for object
175	05:10	P2.	Is that it? Who ho.	P1 pick up umbrella opens it. P2 speaking to P1	Group (pair)	Drama.	
176 177 178	05:15	P1. P1.	This is nice. Out of the rain now. Wa::	P1 holds umbrella above his head, and swirls	Solo	Func. Drama.	
179 180	05:20	P4.	I'm going to be in the game.	P1 closes umbrella, and looks at objects on display P3 plays xylophone	Solo Solo	Trans, Const.	
181	05:25		Evaluation end - system turned off				

Appendix 26. Free play 2: Transcript

	Time	Sp.	Transcript	Action	Grouping	Type	Notes
1 2 3 4 5 6	00:00	P1. P2. P3. P2. P3. P3.	*Look at them* OH::: No you just have to do this. [HAW HAW. HELLO.	3 Ps jumping in front of screen, waving arms and swaying. P3 Standing on box to be closer to screen	Group (all)	Func.	
7 8 9 10 11 12 13 14	00:05	P4. P3. K. P3. P1.	BIG EARS. [((Laugh)) So. [ROO ROO ROO ((Laugh)) [((Laugh))	P3 Standing on box to be closer to screen, waving arms up and down.		Exp.	
15 16	00:10	P3. K.	Ha ha ha. Gets. Who's the other one	K loads P3s drawing			K intervene to load images
17 18 19 20	00:15	P3. P2. P4. K.	Yea:::h That one (.) that one. WO::::: So do you want to put your-	P2 pointing to icon on screen P4 jumping around K encourage to use own images as background			
21 22 23 24 25 26 27	00:20	 P2. K. P4. K. P1. P4.	[That one's small. Do you want to draw some other pictures? Hey is that mine Do you want to scan them in? That's not yours. Who's is that	P1 and P4 looking and referencing screen P2 jumping up of off box			
28 29 30 31	00:25	K. P2. K. P2	Who did this one? Me. Do you want to put it on there? Yeah.				
32 33	00:30	P4.	This is mine.	00:33 P3 Solo use of system – jump backwards off box, smiling in camera			
34 35 36	00:35	P3.	Hm. Hm. Hm.	P2 Solo use of system - waving P3 punching towards screen (mock fight) P1 watching P3 use system	Solo Solo Onlooker	Const.	
37 38 39	00:40	P1. P1.	Let's do a (.) let's do a wrestle fight on TV. *Look its TV.*	P1 Speaking to P3 P1 Speaking to P4 – P4 joins pair Pair use of screen end - Group (3) use (looking at each other)	Group (pair) Group (3)	Drama. Exp.	Creative interpretation of video space
41 42 43	00:45	P1. P1.	TV ((loud)) (00:04) ((Fighting noises)) Wrestle match.	P1, P3 & P4 pretending to fight (play punching)	Group (3)	Drama. / Tumble.	
44 45	00:50	 T.	(00:03) Ah ah ah ah. Play fighting	00:53 Told to be quieter by passing T. P stop activity (look of being told off)			Disciplined; Too excited for class – rough and tumble
46 47	00:55	T.	Don't hit each other. Be gentle with each other. Come on	Ps move back to screen			
48	01:00	P3.	WO:::R	P3 stand on box, to be near camera, making monster	Pair -		P1 responds to P3's sound

49 50 51		 P1. P3.	[((Explosion noise)) ((Laugh))	faces P3 mimics explosion with arms (looking at camera view)	onlooker		and action.
52 53 54 55 56 57	01:05	P3. P1. P3. K.	We::: OH::::: (00:02) Oh look (.) look a little flower. It got a ( ) So is there anything else you want to take a photograph of? That you want to put in there?	 P3 swaying slowly in front of the camera		Tumble. Exp.	 K intervene, load images
58 59 60	01:10	P4. P1. P4.	Where's mine? Where's mine? There. It's on the telly.	Group use of screen end Pair use – 1 P use screen, I P control mouse	Group (3)		 Interpretation of system "telly"
61 62	01:15	P3. P4.	That's mine up on the telly. That's not mine.	Pair use – 1 P use screen, I P control mouse			
63 64	01:20	P4. P1.	Where's mine. Where's mine. Shall I move the mouse?	Camera obscured			
65 66	01:25	P3. P1.	Pukka pukka pukka pukka puk. Yea::::h P3 stay still (.) stay still.	P3 Holds out arms in a pose P1 (mouse) instructing P3 (screen)	Solo Group (pair)	Func. Const.	Mouse controller directing subject in video space
67 68 69 70	01:30	P1. P3. P1	P3 go over there [Yea:::H Like if –	P1 (mouse) instructing P3 (screen)	Group (pair)	Const.	
71 72	01:35	P1.	I need to get. Go on the mouse. (00:02) Go on the mouse. There's a (.) see it there	P1 (mouse) instructing P3 (screen)		Const.	
73 74	01:40	 P1.	(00:03) Get down	Camera obscured		 Const.	
75 76 77 78 79	01:45	P1. P1. P3.	Put your face in the mouse. No a little bit clo- Ha ((Laughs)) [((Laughs))	Camera obscured		Const.	Playful with interaction and feedback
80	01:50		((P1 and P3 laughing))	P1 and P3 Repeat cursor on face action		Drama. / Const.	
81 82	01:55	P3. P4.	Watch my face is going to be on the mouse I'm going to.	Speaking to P4. P4 runs over. P4 jumps to run of camera view, tries to grab mouse	Group (3)		
83 84	02:00	 P4.	((P3 and P4 laughing)) I'm going to.	P3 and P4 jumping to grab cursor, as P1 moves mouse			Group use - Pair at screen, single mouse user
85 86 87	02:05	P4. P4.	I've got you mouse. ((P3 and P4 laughing)) I've got you.				
88 89	02:10	P4. P1.	Got you mouse. Got you. Go mousy go Shall I delete it?	P4 reaching to catch cursor. P3 pushing P4 back (playful away from cursor, not conflict)			
90 91 92	02:15	P4. P3. P4.	No. Get out of the way. No AHA. NO::::::	P4 speaking to P3, neither respond to P1 Runs round P3 to grab the cursor on the other side			
93 94 100 101 102 103	02:20	P4. P1. P4. P1.	We want mouse [Let P3 go – We::::: [Let P3 go over	 P4 Run left to right to attempt to grab cursor			

104 105 106 107	02:25	P1. P4. P1.	Um. Oh. OH P3 Look. Look on your jumper (.) look on your jumper.	P4 Jumping left		Trans.	
108 109	02:30	 P3.	((P4 and P2 fighting noise)) OH	P4 and P2 jumping on left of screen – play fighting P3 on screen right moving hand to mouse, jumping to catch		Tumble Func.	2x pair in parallel
110	02:35	P1.	*Look on you mouth. Look on your mouth*.			Func.	
111 112 113	02:40	P1. P4.	P3 do down. Look Ew::: ((P3 and p1 laugh))			Exp. / Func.	
114 115 116	02:45	P1. P2.	Look on the Langley bit (.) look on the bit (.) look on the Langley bit Oh:::	 P2 Jumping on left side (independent)	Group (3) Solo		Parallel –solo and pair
117	02:50		((P1, P2 and P3 Laugh))	Camera obscured	Group (3)		
118 119 120	02:55	P3. P2. P1.	Watch it's going the other way. See Hu:::h ( )	P3 Wave left arms to track cursor	Group 4		
121 122	03:00	P1. P3.	*Don't P2*. *Look I've got it. I've got it*	P2 is trying to play with P1 – P1 has the mouse			
123	03:05	P1.	*Get off.*	P2 move over to P3			
124 125 126 127 128	03:10	P3 P4. P3. P4.	WOHO:::::: [( ) I'm dancing (.) huh- See him on TV (.) see him on TV	 P2 grabs P3 jumper to move him out the way		Trans, Func. / Const. Drama.	
129	03:15	P1.	*Thank you*	P1 leave mouse and moves to front of screen	Solo	Exp.	
130 131	03:20	 P4.	((Too Loud – no words) *Wait.*	P1 dancing and jumping in front of camera P4 pulls P1's jumper	Solo	Func. / Drama.	
132	03:25	P4.	*You're on TV P1*. Wrestling	P4 holds up fists	Group (Pair)		
133 134 135	03:30	 P1. P3.	(00:02) Wrestling P1 I can?	P1 looks unsure P1 gets off stand and holds up fist – mock fight	 Group (Pair)		
136 137 138	03:35	P4. P3.	Watch the TV- P1 look at the back of your head (00:02)((P1, P3 and P4 Laugh))	 P1 and P4 Play fighting	Group (3)	Exp.	
139 140 141 142 143 144 145 146	03:40	 P4. P1. P4. P3.	(00:03)((P1, P3 and P4 Laugh)) He's the wrestler. Dee. Dee dee. Da [((P3 and P4 laugh)) Get out of the way. Get out of the way [((Laugh)	 P1 places face close to cam P4 pulls P1 from view		Func. / Drama.	Conflict when sharing cam
147 148 149	03:45	P1. P3.	Wrestlers. Huh. Huh P1 I can't see	P1 punching the air and play fighting with P4			
150 151 152	03:50	 P1.	((P1 and P4 fighting noises)) I'm going to jump ( ) [	P1 and P4 loudly wrestling			

153		P4.	( )				
154 155 156	03:55	P1. P4.	Hello:::: [((Laughs) Hello::::	P1 waving in cam view, flashing hand quickly in front of the cam to get a flashing image P4 flashing hand in front of cam		Exp.	Playful interaction Pair - mimicry
157 158	04:00		((P1 and P4 laughs))	P4 flashing hand in front of cam, P1 running back and forth behind P4 like an airplane			
159 160 161 162 163	04:05	P1. T2. T1.	IT'S FLASHING Sh::: [Boys. Boys. I'm sure you meant to be making all that noise.		PLAY END		P's too loud for nearby classes Quieter by teacher
164 165 166 167	04:10	 T2. T1.	[All of that noise- Yeah. I now it's exciting and I know that it's fun but just a little quieter here please.	Ps (gently) disciplined by teachers in neighbouring class			
168 169	04:15	 K.	((P1 and P4 laugh loudly)) Boys. Boys.	P1 and P4 placing hands in front of camera			
170 171 172 173 174 175 176	04:20	K. P3. K. P4. P1. K.	One last thing I would like to do is- Take a picture. I'd like you to stand over there. ((Laugh)) [((play fight noise)) Hang on. Hang on. Go back a bit.	Camera obscured			
177 178 179	04:25	P1. P3. K.	And me. I want to see- That's it.				
180	04:30	P3.	I want to see.				
181 182	04:35			P1 and P3 look at camera P4 jumping at front of cam			
183 184 185 186	04:40	P4. P1.	Nobody's on TV Get the mini one. Look I've got a camera	P4 dancing in front of cam P3 grabs the video camera recording the session K intervene and take camera – halt recording			Children too overexcited to continue work

Appendix 27. Long Play Observation 1: Transcript

	Time	Sp.	Transcript	Action	Group	Type	Notes
1.	00:00			P1 at touch screen	Solo	Exp	
2.		P3.	IT'S THAT (…)	P2, P3 and P4 looking at screen	Group (3)	Conv	
3.			(*P2 turns from projection screen to touch screen*)			Trans	
4.		P1.	Um::: (*looking at touch screen, finger ready to select option*)		Parallel		
5.			[			Agg	Conflict over access to the
6.		P2.	No let me do something. (*Pushes P1 out of the way)*				touch screen. [Control]
7.			*(P3 clicks on touch screen, P2 moves P3's hand and selects option to*		Solo		
8.			*change background media)*				Difficult for K to not be
9.		P1.	Oh no. P2 won't let me have a go. (*Speaking to K)*				involved when present in the
10.		K.	Will he not?				playspace. [Prac]
11.	00:05	P2.	ITS -	P1 & P2 at touch screen	Group (2)	Exp/Ag	Conflict [Control]
12.		P1.	P2 STOP PUSHING:	P3 and P4 looking at screen, waving	Group (2)	g	Groups working in parallel
13.		P2.	It's an MP3, it's an MP3-	snorkels in direction of screen.		Func	(projection / touch screen)
14.		P1.	Shut up. No::::				
15.	00:10	P3.	(*P4 holds snorkel up – looking down sight following the dolphins on the*	P1 & P2 at touch screen	Group (2)	Exp	Snorkels used as guns to
16.		P4.	*screen*)	P3 and P4 looking and jumping at	Group (2)	Drama	shoot the dolphins in the video
17.		P4.	Shoot them	screen, waving snorkels in direction			background [CI]
18.		P3.	The dolphins. BANG. BANG. BANG.	of screen and pretending to shot			Parallel groups
			BANG. BANG				
19.	00:15	P4.	I'm whacking them with my gun	P1 & P2 at touch screen	Group (2)	Exp	
20.		P4.	BANG BANG (*waves snorkel in front of the web cam, hitting it and*	P4 bash wall with snorkel	Group (2)	Drama	
21.			*knocking it from it's stand).*			/	
22.			(P4 *looks at cam on floor*) Oh. (*Picks up cam and looks at K*) (*Laughs*)			Rough	
23.	00:20	K.	I'll do it. It should just stick on.				System not robust enough
24.	-		*(K fixing cam to wall, children watch)*		UnOc	Cons	
25.	00:35			P2 changes dolphins to crabs	Solo		Change content on system
26.	00:40	P1.	That's such (...)	P1 discussing content with P2	Group (2)	Conv	Conflict subsided – P2 in
27.			[		Group (2)		control of touch screen
28.		P4.	WO::::::::: (*waving arms at the screen*)			Func	Parallel groups remain
29.			[				
30.		P3.	OH:::: Look at that.	P3 waves snorkel at screen		Exp	
31.			[				
32.		P4.	Cra::::B	P4 pretends to shoot crab		Drama	
33.	00:45	P3.	What's tha:t?	P3 waves snorkel at screen	Group (2)		
34.		P4.	Shoot them. (*Holds up snorkel)* Shoot all of them. Bang bang. BR:::::::	P4 pretends to shoot crab		Drama	
35.			(*noise of a machine gun*)				
36.		P3.	No P4. These actually shotguns (*P3 grabs P4's arm, and holds up*			Conv	P3 stops P4 playing to modify
37.			*snorkel*). These actually shotguns.				play
38.				P3 hold snorkel like a shotgun			
39.	00:50	P1.	What are they?	P1 looks at screen, talking to K			
40.		K.	Crabs.	P3 and P4 quiet conversation	Group (2)	Conv	
41.		P1.	Crabs they are. CRABS	P1 looks at screen and mimics crab			
42.				motion			
43.				P4 pretends to shoot crab, P3	Parallel	Drama	
44.				watches P4	Onlooker		
45.	00:55	P1.	What they doing? Why are they going like this (*mimics crab getting up and*			Func	Imitation (motion)
46.		P3.	*down*)	P4 leans in to P3 talking quietly,			
47.		P4.	P4 like this (*holds snorkel up to P4, upside down*)	looking and pointing to screen			
48.			(…)				

49.		K.	[They're stretching (*talking to P1*)				
50. 51. 52.	01:00	P1.	They're stretching::	P3 mimic crab motions, after 1 stretch, P4 mimics crab motion	Group (2)	Func	Collaborative imitation (motion)
53. 54. 55. 56. 57. 58.	01.05	P3. P3. P1. P4. P3.	He:y. (*Laugh*) Why don't you record it and play it back? (*Speaking to P2*) WOOO::: (*Laugh*)	P3 and P4 mimicking crab, motion more exaggerated with each cycle P1 turns back to touch screen P3 and P4 jump in the air	Group (2) Solo Group (2)	Func Trans Conv	Enhanced, exaggerated for playfulness. Collaborative action with no discussion. P1 attempting to pilot the activity (agency via)
59. 60. 61. 62. 63.	01.10	P4. P3. P1. P4.	Chuck, chuck,, chuck (In my …) Now that's (…) Shoot them. Bang. Bang	 P4 pretends to shoot crab, P3 watches	 Group (2) Parallel / onlooker	 Conv Drama	P3 and P4 loud
64. 65. 66. 67.	01:15	P3. P1. P3.	That's how you reload a shotgun [Stretching. He's stretching Like that. (*looks at P4*)	 P1 looking at screen P4 watches P3	Group (2) Solo	Conv Trans	P3 - Snorkel held like shotgun resting whilst giving explanation
68. 69. 70. 71. 72.	01.20	P4. P3. P1.	That's (not) [Yeah. It is. (*Looks down at snorkel*). Lets do something (*speaking to P2*)	 P2 opens video menu to change background	Group (2)	Conv	 Change content on system
73. 74. 75. 76.	01:25	P4. P2. P4.	P2 do the number two. (*Waves snorkel at projection screen*) Do number two up the top (*excited)* (…) start again (*speaking to P1*) Oh P2 now now	P4 indicating on the projection where to click	 Group (2)	Conv Conv	Request for video file
77. 78. 79.	01:30	P1.	Let's do something (*louder*) (*Dialogue inaudible*)	P4 looks at projection screen, P3 turns to look at p1 and P2 P1 using screen – 3 onlooker	Group (4)	Conv	Whole group together to discuss changing content
80. 81. 82. 83.	01:35	P4. P1.	See if there's any animals P2 (*demanding tone*)	 P4 turns back to projection screen	Group (2)	Conv	Return to parallel pairs Conflict Screen changes to sea (crashing waves)
84. 85.	01.40	P3. P2.	Wo-oh. If I press that one	P3 jump as waves crash	Group (2)	Drama	Motion in response to content
86. 87. 88.	01:45	P4. P2. P1.	It a sheet of water. Bang bang bang bang ban::::::::g (l *oud*) See I'm solving it P1 P2:::::: (*loud and annoyed voice*)	 P4 turns around to watch P1 and P2	Group (2)	Conv	 Conflict – has distracted other pair.
90. 91. 92. 93. 94. 95.	01.50	P2. P1. P3. P2. P2. P3.	That's a stingray (*speaking to P1*) Yeah. That's a giant one. Yeah. Stingray. That's a giant one.	 P2 turns to join P3 and P4 P1 using touchscreen alone	Group (2) Group (3) Solo	Conv Exp	Load stingray clip
96. 97. 98. 99.	01.55	P4. P2.	Shoot it. Shoot its wing, wings. Cause its (.) thats what (freaks) them [Sting (.) ray (*speaking to P3 and P4*)	P4 pretends to shoot stingray P2 watches P3 and P4 talking P1 selecting content to change	Group (2) Onlooker Solo	Drama Conv	Parallel activity
100. 101.	02.00	P4.	Look. Shot it, shot it. Bang	P3 (lightly) hits P2 on the head with his snorkel, shoot at the screen, and	Group (3)	Conv / drama	

102. 103. 104.		P3. P4.	Bang Shoot it. Bang.	then shots P2. P4 shoots at the screen P1 using touch screen alone,	Solo	Const	P1 back to the group
105. 106. 107. 108.	02:05	P4. P3.	I'll shoot it tail. Bosh. I'll shoot you. (*speaking to P4)*	P4 shoots at the screen P3 shoots at P4 on screen, jumps up at screen P1 and P2 using touch screen	Group (2) Group (2)	Drama Conv	 Parallel activity
109. 110. 111. 112. 113. 114. 115.	02:10	P4. P3. P2. P4. K.	Yeah to that one. (*speaking to P1 and P2*) Pow pow pow pow (That) (Too quiet) [POW. You have to close the window first	P4 looking at screen P3 waving snorkel, occasional shooting P1 and P2 using touch screen, talking quietly P1 and P2 repeat clicking screen	Group (2) Group (2)	 Func Const	 Change content in progress P1 and P2 talking quietly off camera K intervention
116. 117. 118. 119. 120.	02:15	P3. P4. P3.	Pow pow pow (2.) Look at the shadow. Hi hi hi – wo:::h	P3 continually shooting at screen, P4 watching P3. P4 reference to snorkel shadow over projection P1 and P2 using touch screen	Solo Onlooker Group (2)	Drama Const Func	 Content change
121. 122. 123. 124. 125.	02:20	P3. P4. P3. P4.	Wo::h HO Shoot them (*Gun noises*) [(*Gun noises*)	P1 and P2 using touch screen P3 and P4 shooting at screen	Group (2) Group (2)	Const Drama	 Seagulls on screen
126. 127. 128.	02:25	P3. P4.	One that a (cute) one. Single (point) (*Laughs*) [(*Gun noises*)	P3 and P4 shooting at screen P1 and P2 using touch screen	Group (2) Group (2)	Drama Const	P1 and P2 applied chromakey feature
129. 130. 131. 132. 133.	02:30	P3. P3. P4.	I shot one. Pow pow. Pow. Look (.) Look at that one.	P3 shoots at screen P3 and P4 looking at screen P1 and P2 using touch screen P2 gestures to projection screen with snorkel	Group (2) / onlooker Group (2)	 Const	 Change content in progress
134. 135. 136. 137. 138.	02:35	P4. P4. P3.	Look at that that one Can we do another one P1? P1 (*loud voice*) [(Shoot them) (*Waves snorkel at P4's feet*)	 P3 and P4 turn away from screen and gather round touch screen	Group (4) / onlooker	Conv / Trans	
139. 140. 141. 142.	02:40	P4. K. P4. P1.	He won't let me. (Speaking to K) P1 P1 do you want to let someone else do it for a while. Yeah But. But look what I've already chosen. (pointing the touch screen)	P3 turn to K to request turn	Group (4) / onlooker	Conv	K intervention
143. 145. 146.	02:45	K. P4. P3.	Oh wow. NO look. It's my go. Wo:::	 All Ps gathered round touch screen	Group (4) / onlooker	Conv	
147. 148.	02:50	P3. P2.	Birdy birdy bird Oh::	All Ps gathered round touch screen P1 click on UI	Group (4) / onlooker	Conv	
149. 150. 151. 152. 153.	02:55	P4. P2. P4. P2.	Two. We want two That's our (…) Pick two. [Maybe the fifth one.	All Ps gathered round touch screen P1 click on UI	Group (4) / onlooker	Conv	 P1 still using touch screen but driven by P4
155. 156.	03:00	P4. P1.	Pick (…) one What that one?	 P1 click on UI	Group (4) / onlooker	Conv	

157. 158. 159.		P4. P3.	Yeah that Shoot the -	P3 and P4 turn back to projection screen and start to shoot	Group (2)	Drama	Content changed to jelly fish
160. 161. 162.	03:05	P4. K.	Come on let's shoot the jelly fish (2.) What do you click on now. So that we can see ourselves	P2 joins P3 and P4 – shooting jelly fish P1 stays at touch screen	Group (3) Solo	Drama Const	K intervention
163. 164.	03:10	 P4.	(*Disruption – Ps off camera*) No. Four. Number four is the best one	Camera knocked by passing group - P's off screen	Group (4)	Conv	Small group leaving reading corner – walk through playspace
165. 166.	03:15	 P4.	(*Disruption – Ps off camera*) I want to do number four. Number four.				
167. 168.	03.20	P4. K.	Yeah that one. P1 (annoyed voice). I'm trying to look and your (…) Number four?				K intervention
169. 170. 171.	03:25	K. P4. K.	Which ones number four? Down. I don't know-				
172. 173.	03:30	P1. K.	There's no number four. I don't know if there is a number four. No you just-				
174. 175. 176.	03:35	K. K.	Just click on one of them. And then click on open. (3.) That's it.				
178. 179. 180.	03:40	P4. P3. P4.	P3::: Do you want to see. Hm:				
181. 182. 190. 191.	03:45	P3. P4. P1.	When I doing the (…) Hm [Please can I click on one of them -				
192. 193.	03:50	P1. P4.	the next (.) the other time (.) Ple::ase P3 P3 -	P4 leaves group			(Minor) conflict over use_
194. 195. 196. 197.	03:55	P4. P4. P3.	I've got a normal gun now. Look inside it. What?	All Ps gathered around touch screen P3 clicking on screen P4 runs over to P3 and hold up snorkel (with sand inside)	Group (3) / onlooker	Conv / drama	
198. 199. 200. 201. 202. 203.	04:00	 P4. P3.	(P3 and P4 *Look at snorkel)* Bullets and sand. Bang bang bang. [It's coming out the other end.	P1 returns to classroom for another activity P2 has sole control of the touch screen P4 shoots at the screen, P3 watching	 Solo Group (2) / onlooker	 Const Conv / drama	
204. 205. 206.	04:05	 P4. P3.	 I know it's bullets. (Laugh)	P4 holds up snorkel, sand pours out on to floor – P3 watches P4 P2 using touch screen	Group (2) Solo	Exp Conv	One P remaining – others have drifted.
207. 208. 209. 210.	04.10	P4.	We do that thing with it first. Do you want to see.	P3 and P4 move to sand pit with snorkels (off camera) P2 move to projection screen and watches	Group (2) Solo	Conv	
211.	04:15		(*No dialogue*)	P2 jumps in front of projection screen	Solo	Func	
212.	04:20		(*No dialogue*)	P2 jumps in front of projection screen	Solo	Func	

213. 214. 215.	04:25		(*No dialogue*)	Large jelly fish appears, P2 stops jumping, looks a bit unsure. Watches screen and take a step back.	Solo	Func Trans	
216. 217.	04:30	K. P2.	Are you going to try a different one? (*Nods*)	Turns and returns to touch screen P2 selects another jellyfish movie	Solo	Trans	
218. 219.	04:35		(*No dialogue*)	P2 returns to projection screen and jumps – trying to catch jellyfish	Solo	Drama	Attempting to catch content.
220. 221.	04:40	P2.	Yeah	P2 jumps to catch jellyfish, in front of projection screen	Solo	Drama	
222. 223.	04:45		Ding dong, ding dong.	P2 jumps to catch, in front of projection screen	Solo	Drama	
224. 225 226. 227. 228. 229.		K.	There you go.	P2 stops jumping step closely to projection screen and touch jellyfish on the screen. K modifies key option in UI (foreground disappears P2 stops and step back.	Solo	Exp Trans	K intervention -
230. 231.	04:50		(*No dialogue*)	P2 walks away from projection screen and hides in doorway peering out.	Solo		Scared by content
232. 233. 234. 235.	04:55		(*No dialogue*)	P2 peers into playspace, Waves hand in space, and then moves head only slightly in camera, before stepping back in.	Solo		
236.	05.00						

Appendix 28. Long Play Observation 2: Transcript

	Time	Sp.	Transcript	Action	Group	Type	Notes
1. 2. 3. 4.	00:00	P2.	I'm going to play on the computer. Wo::::	P2walks into the playspace P2 stands in front of camera P2 holds out arms	Solo	Trans Exp	PhotoBooth is currently open from a previous session – with video effects running
5. 6.	00:05	P2.	Look. There's two of me.	P2 sways P2 stands so disappears	Solo	Func Exp	
7. 8. 9.	00:10	 P2. K.	 Is there anyone else who wants to play? (*Speaking to K*) No just you at the moment.	P2 stands on bench to get close to cam. K presses camera feature	Solo	Const	
10. 11.	00:15		(*Laugh*)	 P3 comes into playspace	Solo		
12. 13. 14.	00:20		(*No dialogue*)	P2 swaying in front of camera P3 presses camera feature, moves to stand on chair in front of camera	Group (2)	Func Const	 All 3 Ps crowded around cam
15. 16.	00:25		(*No dialogue*)	P1 moves into playspace and, moves and stands on chair in front of camera	Group (3)	Const	
17. 18. 19. 20.	00:30	P2. All. P2.	Chips. (*Laugh*) No. Bungee.	 All Ps jump off P2 jumps back up and bench P1 jumps back on bench	Group (2)	Func	
21. 22.	00:35	P1. P2.	Give me the (…) (*Laugh*) Stop it. (*Laugh*)	P2 jumps back on bench P3 watches	Group (2) Onlooker	Func	
23. 24. 25.	00:40	P1.	Stop it. He:::	P1 and P2 sway in front of the camera, pulling each other P3 watches	Group (2) Onlooker	Exp	
26. 27. 28.	00:45	P2. P1. P2.	Get in. (*Laugh*) (*Laugh*) Look. Look. Look look.	P2 pulls P1 in front of the camera P3 watches P1 and P2	Group (2) Onlooker	Func / Rough	
29. 30. 31.	00:50	P1. P2. P1.	Superman. (*Laugh*) Let's do that again. SUPERMAN.	P2 does superman pose P1 watching P2 does superman pose	Group (2) Onlooker	Drama	
32. 33. 34. 35.	00:55	P1. P3.	Take a photo. I can't get.	P2 holds superman pose P1 lends over P3 presses capture button (As image is taken)	 Group 3	 Const	
36. 37. 38. 39. 40. 41.	01:00	P2. P1. P2. P2.	POW. (*Laugh*) [(*Laugh*) No now just me. Get down.	P1 and P2 push and pull each other P3 watches P1 and P2 P1 jumps onto the floor P2 pulls strongman pose	Group (2) Onlooker	Drama Const	 Lots of onlooker from UI controller
42. 43. 44. 45. 46.	01.05	P2. P1. P2.	Look (*Laugh*) [(*Laugh*) Let's do that again. WO::::	P1 jumps onto box next to P2 in front of camera P3 watches P1 and P2 P2 and P1 pull strongman poses P1 and P2 hold pose.	Group (2)	Trans Drama	
47. 48.	01.10	P1.	Take a picture.	P3 presses capture button P1 and P2 hold pose.	Group (3)	Const	

49. 50. 51.		P1. P2.	BE:::OW [(*Laugh*)				
52. 53.	01:15	P1.	Now just me. Get down.	P1 pushes P2 off stand, P2 jumps P1 holds star pose	Group (2)	Const	
54. 55. 56. 57. 58.	01.20	P3. P1. P2.	(*Laugh*) [(*Laugh*) [(*Laugh*)	P3 walks round to front and puts hand in front of the cam P2 jumps back on stand	Group (3)	Const	All 3 Ps around cam
59. 60. 61. 62. 63.	01:25	P3.	Get that one.	P2 jumps down and moves to touch screen. P3 moves back to touch screen. P3 select different video effect and press capture P1 and P2 holding poses for the camera	Group (3)	Const	
64. 65. 66. 67. 68. 69. 70.	01:30	P2. P1. P2.	Hu::::r. OW::: Now me.	P1 and P2 holding poses for the camera P3 walks round to front and puts hand in front of the cam P2 jumps down and moves to touch screen. P3 moves back to touch screen. P1 holds star pose in front of cam	Group (3)	Const	P1 has not yet given up prime position in front of the camera taken at start. P2 and P3 alternate using the touch screen.
71. 72. 73. 74.	01:35	 P1. P2.	 Take a picture (00:03) Go on take a picture	P1 holds star pose in front of cam P2 and P3 touch screen P1 shaking arms impatiently P3 moves back to cam	Group (3)	Const	
75. 76. 77. 78.	01.40	P2. P2. P1	I'll take a picture. A picture. No way.	P1 holds star pose in front of cam P3 walks next to P1 P2 pushes capture button P3 tries to get on stand next to P1	Group (3)	Const	Minor conflict
79. 80. 81.	01:45	 P1.	 Two , three. Picture. (*Laughs*)	P1 holds star pose in front of cam P3 moves another chair next to stand used by P1	Group (3)	Const	Picture taken before P3 can get in place - system (camera view) dominant by P1
82. 83. 84.	01.50	P1. P1.	Take another picture. He::::: Oh::	P3 gets on chair next to P1 P2 pushes capture button P1 pulls strongman poses	Group (3)	Const	
85. 86. 87.	01.55	P1. P3.	(*Laughs*) Here P1	P1 pulls strongman poses P3 places hand in front of the light, making shadow on projection screen	Group (3)	Const / Exp	Playful affordances - shadows from the lights
88. 90. 91. 92. 93. 94.	02.00	P1. P2.	I am old. I am old I am old	P1 hangs in front of cam. P2 moves from touch screen to projections screen. As P2 moves, P3 jumps down and takes control of touch screen P3 presses capture button	Group (3)	Const Trans Trans Const	P2 does hesitate as realizes just given control of touch screen to P3
95. 96.	02:05	 P1.	 I am superman	P3 moves to front (away from touch screen)	Group (3)	Trans	

97. 98.		 P2.	[NO NO Put my hand in. Put my hand in.	P1 waves arms in front of cam		Func Const	
99. 100. 101. 102.	02:10	P2. P1. P2.	Put my hand in. (*Laughs*) [Oh yes. BO:::	P1 pulls P2's arm in front of cam. P3 moves to back to touch screen	Group (3)	Const Trans	
103. 104. 105. 106. 107.	02:15	 P1. P2. P1.	 Super (.) Superman (*Laughs*) [*Laughs*)	P3 press camera to capture P1 pulls superman, then strongman poses P2 leans across as photo is taken	Group (3)	Const Drama Func	
108. 109. 110. 111. 112. 113. 114.	02:20	P2. P1. P2. P1. P2.	(*Laughs*) [*Laughs*) That's weird. (…) to me. [Huh::: (*pushing*)	P1 and P2 pushing each other (lightly) to make different poses for the camera P3 press camera to capture	Group (3)	Drama / Func Const	
115. 116. 117.	02:25	P1. P2.	Oh:: (*noises as holding pose*) [Oh::: (*noises as holding pose*)	P3 press camera to capture P1 and P2 pushing each other (lightly) to make different poses for the camera	Group (3)	Const Drama / Func	P1 and P2 holding elbows together to make elbow shapes
118. 119. 120. 121.	02:30	P2. P1. P2.	Superman. Superman. [HO::: Superman. Superman.	P1 and P2 pushing each other - more aggressively now	Group (3)	Rough	Development of conflict – K intervention (no teacher supervising) change task to distract children
122. 123. 124.	02:35	 K.	 Can you show me something else for a minute?	K moves over to touch screen, joined by P3 and P2. P1 still waving around in front of cam			
125. 126. 127.	02:40	 P3. K.	 Can't you do it with your finger? Maybe tap tap (*gesture indicate tapping screen*)	K shut down Photobooth P3 takes control of the touch screen P1 unoccupied			 UI ACTION OFF CAMERA Open HERE App
128. 129. 130.	02:45 02:50 02:55		(*Dialogue round screen too quiet*)				
131.	03:00	K	Bit faster than that. Tap tap (*gesture indicate tapping screen*)				
132. 133.	03:05	P3. K.	I'm trying (*annoyed*) No. Let's use the mouse.	P1 still in front of cam. P3 and P2 round touch screen.	Group (2) Solo		
134. 135. 136.	03:10	P1.	Oh. Its video. This is the (…).	P1 dancing P2 moves away from touch screen, back to cam	Para	Func Trans	OPEN HERE APP
137. 138. 139.	03:15	P1. P2.	What are you doing? (*Speaking to P3*) (00:02)) What you wanna do (*Singing voice*). Is you wanna do a (…)	P3 using Here UI – open file P1 and P2 looking at screen P2 gets up on chair (in front of cam)	Solo Uncc	Const	
140. 141.	03.20	 P1.	(00:03) Colouring in. Are you colouring in? (*Speaking to P3*)	P1 and P2 looking at screen	Uncc Onlooker	 Conv	
142. 143. 145.	03:25	 P1.	(00:04) Oh oh oh oh oh (*excited*)	P3 selecting file to play P1 jumps up and down and waves arms in the air	Group (3)		Visual image of video files on screen
146. 147. 148.	03:30	P1. K. P1.	That one. Which one? There:::::: No that one.	P1 leans forward to point to file on projection screen	Group (3)	Const	

149. 150. 151.	03:35	P1. K. P1.	No. Which one? The flowers? No. Up. Up. Up (*Gestures up)*	P1 and P2 looking at projection screen			
152. 153. 155.	03:40	P2. P1. P2.	He he (*Laugh*) Oh (.) what is that all about? I'm going to be sick	P3 selects flowers for background.	Group (3)	Const Conv	
156. 157. 158.	03:45	P1. P2.	What's that all about? It all (…) [Oh look you can see you in the flowers	P3 applied chromakey – flowers appear in the foreground P1 sways in front of cam	Group (3)	Const Conv Const	Apply settings
159. 160. 161.	03:50	P1. P2.	(*Illegible noises & laughing*) [(*Illegible noises & laughing*)	P1 and P2 swaying, and slight pushing in front of cam P3 using touch screen	Group (3)	Func Const	
162. 163. 164.	03:55	P1. P2.	(*Illegible noises & laughing*) [(*Illegible noises & laughing*)	P1 and P2 swaying, and slight pushing in front of cam P3 using touch screen	Group (3)	Func Const	
165. 166. 167. 168.	04:00	 P2.	(00:04) Can you-	P1 pulling strong man poses P2 jumps down and runs round to the other side of P1 P3 using touch screen	Group (3) / onlooker	Func Trans Const	
169. 170. 171.	04:05	P2. P2.	Can you see yourself? (*Speaking to P1*) (00:02) Is it a film? (*Speaking to P1*)	P1 pulling strong man poses P2 watching P2 P3 using touch screen	Group (3) / onlooker	Func Const	
172. 173. 174. 175. 176. 178.	04.10	 P1.	(00:03) Oh::: sharks (Excited)	P3 open content menu on UI – change background P1 and P2 watching screen P1 points at projection screen (preview image of video) and jumps up and down P3 using touch screen	Group (3) / onlooker	 Conv Const	Change content
179. 180. 181. 182.	04:15	P2.	Oh big sharks. OH BIG SHARKS. Big sharks. Big sharks [There::: (*insistent)*	P2 moves round back of P1, dancing and jumps onto chair in front of cam P1 points to UI on screen P3 using touch screen	Group (3) / onlooker	Trans Conv Const	
190. 191. 192. 193.	04:20	P1.	Dolphin No. No	P2 jumps down and runs round to the other side of P1 P1 pushes projection screen P3 using touch screen	Group (3) / onlooker	Trans Conv Const	
194. 195. 196. 197.		P1.	No don't do Dolphin. Stop doing dolphin.	P1 waves arms in front of projection screen P3 using touch screen P2 watches P1	Group (3) / onlooker	Conv Const	
198. 199. 200.	04:25	 P1.	 Stop doing dolphin.	P3 open content menu on UI – change background P2 watches P1 and projection screen	Group (3) / onlooker	Const Conv	
202. 203. 204. 205.	04:30	P1. P1,	Do a different one. (*annoyed, crosses arms*) Do the crab one.	P1 watches projection screen P3 clicking through menu P1 dancing side to side (like the crab) P2 turns to look at touch screen	Group (3) / onlooker	 Const Conv	Minor conflict Memory of movement of the crab
201. 206.	04:35	P1.	Crab one. I want you to do the crab one. [	P3 selects the Sea video P2 pushes P1 to get of the stand in	Group (3) / onlooker	Const Conv	

207.		P2	Get off it's my turn now	front of the cam			
208. 209. 210. 211.	04:40	 P1.	(00:02) Can we do the crab one?	P1 turns to face P3. Hold arms up like a crab P3 moves from the touch screen (swirling) to the cam	Group (3) / onlooker	Conv	
212. 213. 214.	04:45	P1.	Ple::ase	P2 pushes P1 out from in front of the cam. Push pushing P3 moves back to touch screen	Group (3)	(mild) Agg Trans	
215. 216. 217. 218.	04:50	P1. P1.	Crab one. Crab one (00:02) YE:AH.	P1 and P2 pushing each other in front of the camera P3 using touch screen P1 points to projection screen	Group (3)	(mild) Agg Const	
219. 220. 221. 222.	04:55	P1.	YEAH. OH::	P3 selected crab background video P1 jumps down from stand P1 mimicking motion of crab on floor P2 and P3 watching projection screen	Group (3) / onlooker	Const Trans Func	Crabs appear
223.	05:00						End of evaluation period

Appendix 29. Long play discussion 1: Transcript

		Transcript	Notes
1.	K.	I want to ask you a few questions about using the play space using the area out here. How often do you use it?	
2.	P1.	We normally play on that to take photos	Use: Image capture
3.	K.	Ok. What else do you do out here?	
4.	P1.	Play kitchens, sand and dressing up	Use of other role play spaces
5.	K.	All right. What about the others what do you do out here?	(K - Include all participants)
6.	P2.	Um some playing Mums and Dads	Socio dramatic play Contexts… domestic
7.	K.	Mums and Dads. So what other play do you?	(family) – though little distorted (dogs scare
8.	P1.	and babies and dogs	babies)
9.	K.	What?	
10.	P1.	Babies and dogs	
11.	K.	Babies and dogs?	
12.	P2.	That's what we play	
13.	K.	What's babies and dogs then? Can you tell me a bit about that?	
14.	P1.	No. Families. Mums Dads brother sister babies dogs	
15.	P2.	And cats	
16.	K.	And cats and so does everyone play?	
17.	P1.	Me and Isaac was the Rotweillers and we were scaring James	
18.	P3.	and I play with the I play Mums and Dads I play with that (*points to the projection screen*) and I play with the kitchen and the sand	
19.	K.	Oh ok	List playspace in list of play items
20.	P1.	We all play with each other.	
21.	K.	So why do you think you play?	
22.	P1.	Because then we don't have to do any work, all day	Report social play
23.	K.	And do you play everyday? Go on.	Play – when not working (play as leisure, not
24.	P2.	Because we do work…we get free play	learning)
25.	P1.	Only on Fridays we get free play	
26.	K.	Right. What about the rest of it?	
27.	P1.	and Saturdays	
28.	K.	And Saturdays?	
29.	P1.	think	
30.	K.	So what's different about-	
31.	P3	Saturdays is days off. They are Alfie	
32.	K.	What do you think-	Peer correction (work / play time)
33.	P3.	they are	
34.	K.	What do you think is different about playing with the computer	
35.	P1.	I like the pictures. I like the roller coaster the sea and the waterfall and the best thing is.	
36.	P2	I like taking pictures.	Favourite environments and features – not
37.	P1.	That one because we get weird mouths.	applications (activity and spaces)
38.	P2.	Weird mouths and weird eyes.	
39.	P1.	Weird eyes weird clothes.	Perceived effect of previous use
40.	P2.	Weird ears.	
41.	K.	Oh Ok let me see if I can get a picture of that then. Do you want to go and have a quick stand up there for me hang on	
42.	P2.	Alfie	
43.	P1.	Big nostrils. I've got nose things in my teeth	
44.	K.	Ok that's great. Thanks boys. Is there anything else you'd like to say?	
45	P3.	Oh are we finished	Questions completed – discussion…
.46.	K.	Almost it's very quick and if you look back in there can you see yourselves	
47.	P2.	I can	
48.	P3.	I can	
49.	P1.	I can	
50.	K.	So anything else you'd like to say about this year at school?	

51.	P1.	Um yeah…	
52.	P3.	We play in the playground	
53.	P1.	We play (…)?	
54.	P2.	What is that for down there (*points to Tripod*)	
55.	K.	that's to make it higher and lower-	Discussion about tripod (curiosity)
56.	P2.	Make it higher.	
57.	K.	No don't want it higher actually we could do one	
58.	P2.	I can't see our our-	
59.	P1.	I can't see me	
60.	K.	It's not very good.	
61.	P2.	I can reach it .	
62.	K.	Yeah it's a bit stiff.	
63.	P3.	Pandas are doing do it.	
64.	P1.	Pandas are strong.	
65.	K.	Are they? Maybe I need to be a panda.	
66.	P2.	Because we're in the panda group and me and Stanley are in the panda group.	
67.	K.	Can you see yourselves?	
68.	P1.	And I'm. I am still.	
69.	K.	Okay	Dis. Being in camera view for interview
70.	P1.	I can only see me and	
71.	P2.	And me	
72.	P2.	I can see everybody	
73.	P1.	I can see P3 a bit	
74.	K.	Oh no too far too far	
75.	P1.	We can only see our heads. Where's my mouth?	
76.	K.	I can see you too but you're a bit out. So you can see yourselves now? Nice faces. Ok so have you had a good year at school then?	
77.	ALL	Yeah	
78.	.	You looking forward to next term?	
79.	K.	Yeah	
80.	ALL	Excellent	
81.	.	Can we go on?	Grouping: work as 3 through whole evaluation
82.	K.	Go on then you've got like five minutes then you have to go back to class	
83.	P1.	I want to go on a different one. Can I find a different one?	
84.	K.	Yeah sure	Flowers content playing from a previous session
85.	P1.	How do we do it?	
86.	K.	Can we do it the roller coaster?	
87.	P1	Yeah. If you want.	
88.	P3.	Oh where how do you get on it.	Can't switch between applications (open before arrive – play with what is open?) Reference content not application
89.	K.	Let's take pictures	
90.	P1.	[00:05] (*P3 dances in the video, P1 and P2 looking at the touch screen*)	
91.	P2.	Which one do you want?	
92.		The roller coaster.	
93.	K.	Wicked	
94.	P3.	I want a picture. Rollerecoaster. Ba:::M	
95.	P1.	[00:12] (*P1 and P2, with K, switching between applications – inaudible*)	
96.	P2.	Rollercoaster. We:::y. Its' not on there yet.	
97.		Did you (…) When you played in here did you talk to the children from the other school?	
98.	P1.	Yeah	
99.	K.	What was that like?	
100.	P1.	I didn't	
101.	K.	I played. I did	
102.	P2.	Okay. I did	
103.	P3.	I had to get two questions (…)	

104.	P1.	[	
105.	P2.	There's selotape on the wa:::ll. There's selotape on the wall	
106.		((*K leaves*))	
107.	P2.	Pictures, pictures.	Open Photobooth movie
108.		((*P1 and P3 navigate Photobooth - open video effects menu and select background from presets*))	
109.	P2.	Wicked. Look (.)	Once application open, children can use
110.		He::Y (*Excited*)	
111.	P2.	((*P1 and P3 still selecting from menu*))	
112.	P2.	Oh::: (b*ored*)	
113.		((*P1 and P3 select rollercoaster background*))	When live camera view appears – P2 starts pulling poses
114.	P2.	Rollercoaster	
115.		((*P1 and P3 turn round to face projection screen))*	
116.	P1.	Roller coaster. WE:::::: (*arms out stretched*)	
117.		We:::::: (*arms out stretched*)	
118.	P2.	[	Ps did not step out of frame – key effect not applied
119.	P3.	Wo::::	
120.	P2.	We:::::: (*P1 and P3 pushing each other in direction of the Rollercoaster ride*)	
121.		[	
122.	P1.	(Laugh)	
	P3.	(Tape End)	

Appendix 30. Long play discussion 2: Transcript

	Sp.	Transcript	Notes
1.	K.	So a big red?	
2.	P1.	Yeah.	
3.	K.	So I'm going to ask you some questions about playing. What sort of games do you play?	
4.	P2.	We like playing Mums and Dads and Police dogs.	List same socio-dramatic themes – Mum's
5.	K.	Ok. What's Mums and Dads?	and Dads
6.	P1	Where someone has to be the Mum and someone has to be the Dad and someone has to be the babies.	
7.	K.	Right and then what about… What's Police dogs?	Same narrative of events – dogs and
8.	P2.	Police dogs are when little dogs and their police people dogs.	babies (plus police) – distortion of domestic
9.		(00:01)	and media
10.	K.	And (.) what do you do in that game?	
11.	P2.	You have to you arrest people.	
12.	K.	Alright ok so why do you play?	Play because it's fun (motivation rather
13.	P2.	Because it's fun	than function)
14.	K.	Right. How often do you play?	
15.	P2.	Quite a lot.	
16.	K.	Quite a lot. And what about playing in here? (*indicating to play space*)	Shared exp
17.	P1.	On the computer we play on the roller coaster. That's really good.	Playspace described as fun
18.	P2.	Yeah it's fun. It's really fun.	
19.	K.	And so what's different about playing on the computer then to playing –	
20.	P2.	It changed the role play and you can imagine in your head like the at Somewhere:	
21.		[00:02]	
22.	K.	Somewhere else?	
23.	P1.	In the sea and I like the video because in the video there was that crab and it was going up and down doing it's exercises.	
24.	P2.	That was the best one.	Shared exp
25.	P1.	That was funny.	
26.	K.	That's good alright. Do you want two minutes to play? Ok go on then.	
27.	P1.	Thank you.	
28.	K.	No worries.	
29.		(*Ps move to playspace*]	
30.		(*P1 jumping in front of screen / cam, P2 and P3 at touch screen*)	
31.		[00:04]	Functional play – not constructive (dancing
32.		[*P1 joins P2 and P3 at touch screen*]	and watching self)
33.		[00:03]	
34.		[*Children check projection screen, see application working. P1 and P3 move to cam and start to jump up and down – watching*	
35.		*themselves*]	
36.		[00:04] (*P1 and P3 jumping*)	
37.		[00:06] (*P1 pulling faces in front of cam – P3 watching P1*)	
38.		[00:02] (*P1 and P3 pulling faces, P2 at touch screen*)	
39.	P1.	Hip Po:: Poo Oh Oh (*pulling facing in cam*)	
40.	P3.	Your lips have gone pink Georgina.	
41.	P1.	It's my lip stick, do you like it (*pulls faces and make noises*)	
42.		[	
43.	P3.	(*Laughs, pulls faces*)	
44.		[00:06 *P1 and P3 jumping and pulling faces*]	
45.	P3.	Have you got a nosebleed?	
46.		(*P1 puts her face close up in the camera*)	
47.		(*P1 and P3 laugh*)	
48.	K	Do you know how this one works?	

	P3.	We don't really ever have to work it.	
	K.	If you [K inaudible]	
	K.	Which one do you like? The crab one?	Remember content, but not application
		[	Children need help navigating the picture
	P3.	The crab one.	
	K.	That's it here.	
		(*P1, P2 and P3 turn space in front of cam*)	
	P3.	Come on. It's (…)	K leave
		[00:07] (*P1, P2 and P3 mimic crab motion*)	
	Ps.	(*Laugh*)	
		(*P1 and P3 turn to touch screen*)	
		(*P2 turn to touch screen*)	
	P3.	Um. Shall we (find) another one	
	P1.	There's another one.	Ps decide to change content
	P3.	I think Um. It think	
		[	
	P2.	That one. That one.	
	P3.	I just want to show that one. Then we'll go on.	
		[00:03} (*P3 clicking through menu*)	
	P3.	Right right. Ready to (…) these ones	
		(*P1 and P2 turn to look at projection screen*)	
	P2.	(…)	
	P3.	How do get onto the dolphins Katina?	
	K.	Well you click on the film (*indicate on touch screen*).	
	P3.	Oh	K return
		[	
	P3.	Oh. Sometimes that (…)	
		[	
		Yeah	
		(*P1, P2 and P3 turn space in front of cam, jumping*)	Content changes to Dolphins
	P3.	Oh DOLPHINS	
	P2.	Dolp-dolphins dolphins dolphins dolphins dolphins	
		[	
	P3.	Dolphins dolphins dolphins	
		(*P2 turn to touch screen*)	
	P2.	Er. Wrong	
	P3.	Oh::	P2 changes content, as P1 and P3 are playing
		[00:04] (*P2 and P3 turn back to screen and watch P2*)	
	P1.	Oh.	
	P3.	[	P2 changes content crabs running
		Oh I don't like this Katina.	
	K.	Do you know what type of crabs they are?	
	P2.	They're crabs. They're red crabs	
	K.	There's millions of them	
		(*P1 jumps and waves arms to bash the crabs*)	
	P3.	Don't kill them	
		(*P3 pretends to shoot crabs*)	Pretending to shoot / hit crabs
	K.	And they're all coming at you.	
	P3.	(Laugh). HA:::	
		[	
	P1.	(Laugh)	
	P3.	(…)	

	P2. P3. K.	Ha. They're in the water. I can see it from up here properly Ow::: Okay. I think I'm going to send you back to class. Can you send the other lot. Thanks so much for all your help.	Work as group (3) throughout

Appendix 31. Long play discussion 3: Transcript

	Sp	Transcript.	Notes.
1.	P1.	I can see myself.	
2.	P2.	Yeah. Yeah.	
3.	K.	Is that better?	
4.	P2	Yeah.	
5.	P3.	Now it's better	
6.	K.	Okay. So I'm going to ask you what kind of things you do when you play. What games do you play?	
7.	P2.	We I went on there [*indicating system*] and I saw (.) I clicked on this DV film and it was scary music and it was big waves-	Activities with system
8.	P3.	Yeah I remember that.	
9.	K.	Was that good?	
10.	P3.	And we were taking pictures on that.	
11.	K.	Oh okay (.) and what about you (*indicating to P3).*	
12.	P3.	Sara took a picture of her shoes.	
13.	P1.	And we also had a go on the computer quite a few times (.) and at the moment it's crabs scuttling away from something.	
14.	P2.	Did she ask you to come in? (*Talking about the crab*)	
15.	K.	Why do you play?	
16.	P1.	Because we have nothing else to do.	
17.	P3.	When we have time off.	Mention fun
18.	P2.	Well we have….role play…and we have the sand kitchen and we can go on the computer as well	
19.	P3.	And it's really fun	
20.	P1.	Yeah	
21.	K.	And how often do you play?	Frequency of play times
22.	P3.	Lots	
23.	P1.	Quite a lot	
24.	P2.	Lots	
25.	K.	Everyday?	
26.	P1.	Every Wednesday.	
27.	K.	Every Wednesday?	
28.	P2.	Yeah because that's when we change our library books.	
29.	K.	Ah. Okay.	
30.	P1.	But not always, not always.	
31.	P2.	No	
32.	K.	So what's different about playing on the computers? To like playing with the sand?	
33.	P2.	It's different	Consider the play technologies in real terms
34.	P1.	The computer is electric and sand is not.	
35.	P2.	Don't use spades.	
36.	K.	Yeah.	
37.	P2.	And you don't use plates.	
38.	P1.	And you don't smash the computer with a spade.	
39.	K.	No.	
40.	P2.	And sand doesn't have wires.	
41.	P1.	No.	
42.	P2.	And you don't use plates on that.	
43.	P1.	And you don't see yourself in the sand.	
44.	K.	That's great. Do you want a couple of minutes to play?	
45.	ALL.	Yeah.	
46.	P2.	Did the other people play?	
47.	K.	Yeah for a few minutes.	
48.	P1.	What shall we go on?	

49.	P3.	Sand.	
50.	P2.	I like sand as well.	
51.	P3.	Naughty people did this.	
52.	K.	Did they?	
53.	P2.	And this in toothpaste	
54.	P3.	Let me wash the toothpaste.	
55.	P1.	Kill the sand	
56.	P3.	I've got toothpaste in my teeth.	
57.			
58.		[Play with sand for the remainder of session]	

Appendix 32. Long play discussion 4: Transcript

	Sp	Transcript	Notes
1.	K.	On there.	
2.	ALL.	Yeah.	
3.	K.	Ok. I'm going to ask you some questions on play; and using the space out here. So what do you play? What sort of things do you play?	
4.	P1.	Colouring.	
5.	K.	Colouring. Ok. What's your favourite game to play?	
6.	P2.	Computers.	Playspace listed amongst play items / activities
7.	K.	Computers.	
8.	P3.	The blocks	
9.	K.	The blocks and what else? What have you played this week?	
10.	P2.	Computers, what do you play on the computers?	
11.	P2.	We've had colouring games	
12.	K.	Oh okay. They're fun. So why do you play?	Fun - reason for play
13.	P3.	Because it's fun	
14.	K.	Any other reasons? How often do you play? Everyday?	
15.	P1.	No. Fridays	Frequency of play
16.	K.	So Fridays at school. And how long? Two hours three hours?	
17.	P1.	A couple of minutes.	
18.	K.	A couple of minutes oh that so short isn't it?	
19.	P3.	Well it's about (.) like (.) half an hour we play.	
20.	K.	Oh okay that's not too bad and but not everyday?	
21.	P2.	No.	
22.	K.	What's the difference between play and work?	
23.	P3.	Work is like	
24.	K.	So what's work? Can you give me an example of something that's work?	
25.	P1.	We do lots of writing	
26.	K.	And that's boring yeah?	
27.	ALL.	Yeah.	
28.	K.	Ok. So you play out here you play with the (*gestures to the playspace behind the interviewees?)*	
29.	P1.	Sand.	
30.	P2.	Sand. Kitchen. Computer.	Listed again
31.	K.	So what's the difference with playing with the computer?	
32.	P1.	More fun	
33.	K.	And what sort of things do you play on the computer? Go on.	
34.	P1.	Pictures	What does system afford – see self
35.	P2.	And see yourself on it.	
36.	K.	See yourself in there? Okay. And is that fun?	
37.	P2.	Yeah.	
38.	K.	Alright do you want a couple of minutes to play?	
39.	P2.	Yeah.	
40.	K.	Okay.	
41.	K.	Do you want to play on the computer or in the sand?	Opt to play with computer (limited choice?)
42.	P1.	Computer.	
43.	P2.	Computer.	
44.	K.	Ok. Have you played with these ones?	
45.	P2.	I want to take picture.	Pref. capture images
46.	K.	Can you point to the one that takes pictures?	
47.	P2.	That one.	
48.			

49.		[*Ps move to playspace, P1 and P3 are in playspace looking at projection screen, P2 is at the touch screen*]	
50.	P1.	I want to go on this one	
51.	P2.	No in a minute I want to -	
52.	P1.	Oh:::	
53.	P2.	Okay, quickly now as I have to send you back to class soon	
54.	P1.	Oh:::: come on P1.	
55.		(*P2 selects video effect [mirror] to play*)	
56.	P1,	He he he he. Ho ho ho	Minor conflict – resolved when selection made
57.	P2.	See (*smiling*)	
58.		[00:10] (*P1 and P3 in front of cam sway and dance in front of cam*)	
59.	P1.	I'm going through a dimension (*walks across playspace so disappears on screen*)	
60.		(*P3 in front of cam sway and dance in front of cam*)	
61.	P1.	No look. I'm going through a dimension (*walks across playspace so disappears on screen*). Squeeze. No look.	
62.		(*P3 places head in cam so video effect gives her two heads*)	
63.	P1.	It's a two headed monster	
64.	P3.	I'm a. I'm two headed monster and my ear (.) my ear (*singing*)	
65.		(*P2 presses capture button*)	Cohesion in capture – no discussion but P2 can see P3 holding a good pose, so captures.
66.		(P1 steps into the back of the shot just before it captures.	
67.	P1.	He:: He.	
68.	K.	Okay I'm going to have to send you back to class now.	
69.	P1.	No. no one more picture.	
70.		[	
71.	K.	One more.	
72.		[00:08] (*P1 and P3 in front of cam dance pull faces / poses in front of cam*)	
73.	K.	One more picture.	
74.		(*P2 clicks on previously taken picture of another child using the rollercoaster backdrop.)*	
75.		(*P1 and P3 hold out arms*)	
76.		(*P2 return to mirror effect*)	Embodied response, even when now animated (respond to still image)
77.		(*P3 keeps arms out, P1 holds face so looks like he has one eye)*	
78.		(*P2 presses capture button*)	
79.	P1.	That's your arms moving	
80.	P3.	[	
81.		(*Laughs*)	
82.	P1.	Ir's moving.	
83.	P3.	(*Laughs*)	
84.	P1.	My eye. My eye. One more picture. One mo:re.	
85.	K.	One more. Okay.	
86.	P1	Okay one eye.	
87.		(*P3 keeps arms out to one, P1 holds face so looks like he has one eye)*	
88.		(*P2 presses capture button, P3 and P1 hold pose*)	Repetition in pose
90.	P3.	It's a mountain.	
91.		(Photo taken)	
92.	P3.	Now we have to go back.	Comment made referring to image made on the screen combined poses and effect – not intended by recognised.
93.	P1.	One more photo.	
94.		[	
	K.	No no no. You've done loads now.	
			[Children sent back to class]

Appendix 33. Long play discussion 5: Transcript

	Sp.	Transcript	Notes
1.	K.	Okay so I'm going to ask you some questions about play. Where are the others? One, two. Is there another one? Okay so do you want to	
2.		move your chair around a little bit? So I'm going to ask you some questions about play. And playing around here. You need to be able to	
3.		see yourselves in the little window. (*Indicating to screen on camera*) Can you all see yourselves?	
4.	ALL.	Yeah.	
5.	K.	Yeah. Okay. So a few questions and then you can play for a minute. Yeah?	
6.	P1.	(*Nod*)	
7.	P2.	(*Nod*)	
8.	K.	So what (.) what do you play?	Reference playspace, Lego, outdoor
9.	P2.	Er. We go on there (*points to the playspace*)	spaces for play. Lego considered a
10.		[	game (after prompt), as are star wars
11.	P3.	The Lego.	(?) and computer games. Also
12.	P2.	Um:: (looks around)	drawing
13.	K.	What other th-	
14.	P2.	The balls.	
15.	K.	What others things?	
16.	P2.	The balls. The balls out there (*points to outdoor playspace*).	
17.	K.	What sort of games do you play?	
18.	P2.	Um:	
19.		[	
20.	P3.	Um.	
21.	P2.	Lego and star wars.	
22.	K.	What's star wars?	
23.	P2.	(..) games	
24.	K.	Is that on the computer?	
25.	P2.	Computer. We play the computer games.	
26.	P3.	We play on. Lego and mobiles	
27.	P4.	And drawing.	
28.	K.	Drawing. Why do you play?	Play because it's fun, 'enough time'
29.	P3.	Cause they're fun. (*smiles*)	this is spare time.
30.	P2.	Cause its fun. And on we only play on a special day. Cause on a special day (.) we have enough time to have some free play –	
31.	P3.	Yeah. And it's our free play today.	
32.	K.	Right. So how much time will you have to play?	
33.	P2.	Er. 20 minutes.	
34.	K.	20 minutes.	
35.	P1.	Until (...)	
36.	P2.	Yeah (lloking at P1)	
37.	K.	Oh okay. And you do that everyday? Or just on Fridays?	
38.	P2.	Just on Fridays.	
39.		[	
40.	P3.	Just on Fridays.	
41.	K.	So what to you play out here then?	
42.	P2.	I like computer. (points to screen)	
43.	P3.	Mums and dads.	Favourite: Play with computer (not
44.	K.	Mum and dads.	part of socio dramatic)
45.	P2.	Sand-	
46.	P3.	Sand.	
47.	P2.	Beads	
48.	P3.	Playing on the computer.	
49.	K.	Tell me about mums and dads?	
50.	P2.	Um:: We make. Um.	

51.	P3.	We make lots of cakes with the sand.	
52.	K.	Right. Do you eat them?	
53.	P1.	No	
54.	K.	No	
55.	P3.	(Shakes head)	
56.	K.	So-	
57.	P2.	We just pretend to eat them.	
58.	K.	So what's different about playing on the computer?	Differences very literal – listed in terms of features
59.	P2.	Er. Cause you can take pictures of yourself.	
60.		[	
61.	P3.	pictures.	
62.	P2.	And you can put yourself anywhere. And and and.	
63.		[	
64.	K.	You can take. What was the last thing that you said?	
65.	P2.	And. I found something else on the computer. I found er. another thing that you can go on.	
66.	K.	What was that?	
67.	P2.	Er. Dinosuars.	Have explored the system (found video loaded by previous teacher based in past theme.
68.	K.	Dinosaurs. Wow.	
69.	P2.	On the video.	
70.	K.	Well. Would you like to have a play?	
		[Ps move to computer playspace] - Session cut short as Lunch time -	

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