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Undergraduate research goes global – what are the implications for student publishing?

The Plymouth Student Scientist Guest Editorial [10th Anniversary Issue]

Professor Helen Walkington, Oxford Brookes University

We often use the phrase ‘Think globally, act locally’ to get across the message that to benefit the world we need a localised approach, with individuals acting on a small scale and taking responsibility for small things within their control. It is this localised approach that is perceived to contribute to greater public, even global impact. Interestingly, this phrase was turned on its head for me when I started my journey as an undergraduate research mentor.

I was mentoring a student who was doing her dissertation research on the carbon-footprinting of onion production for a major supermarket chain. Her family farm was the starting point and she compared the carbon footprint of onion production there, in East Anglia, with partner farms in Spain and New Zealand, all supplying the same UK supermarket. Her research findings were surprising! Measured in grams of carbon dioxide per kilo of onions, her results revealed that the onions from New Zealand had the lowest carbon footprint despite being the furthest travelled (by ship). The fertile soils and good climatic conditions for drying the onions meant few additional inputs were needed. In contrast, the Spanish onions required water for irrigation and the cost of road transport to the UK was significant in carbon terms, giving them the highest carbon footprint. In the UK, in second position, the low travel costs were offset by our climate meaning lots of energy spent on drying the onions, as well as significant agricultural production costs such as fertiliser.

If we consider the research purely in carbon terms, the findings suggest that if we think globally about carbon dioxide, we also need to shop globally! The real danger is in not having access to all the information to make an informed choice. This student research acted as a transformatory experience for me. The research was clearly impactful, with potential for real-world application in supply chain analysis, carbon labelling and consumer information. However, the student left the university and didn't have time to publish her results (instead going on to develop a successful career in carbon offsetting!)

The experience of being a research mentor for this dissertation made me think about the volumes of great research carried out by students across universities in the UK and beyond that doesn't get published, but instead gathers dust on academics' desks after marking. This realisation was the impetus for a journal project to publish undergraduate research in my discipline of Geography and at the same time as I started a multi-institutional student journal called [GEOverse](#) (Walkington, 2008) I came across **The Plymouth Student Scientist** (TPSS).

Disseminating student research beyond the university was unusual ten years ago, and formal channels like student e-journals were few and far between. In 2008 there were only ten undergraduate research journals in the UK, GEOverse was one, but three were at Plymouth! Sadly, by 2014 four of the ten had been archived (Walkington, 2014) indicative of the challenge of sustaining journals which require time, resourcing, and significant ongoing commitment from a small team of people. What was unique about TPSS was that it made publishing top quality undergraduate research an achievable goal, as it publishes *in the format* of the student's assessment. This is unusual, and probably one of the reasons for the journal's huge success, impact (in terms of hits and downloads per submission), and survival to 10 years old! I believe the Plymouth Student Scientist's editorial team, authors and readers have created something that truly 'thinks globally' by 'acting locally,' inspiring other journals, and even international research collaborations (Walkington, et al., 2013).

In 2013 several strategies for widening student's engagement with undergraduate research journals were published (*ibid*). These included building a research culture where students want to participate, allowing co-production with staff and using articles in teaching sessions, amongst other 'local' (institutional) strategies. TPSS has led the way in adopting many of these as a means of ensuring the sustainable supply of high quality articles, as well as a large readership. With the rise of the open publishing movement, where researchers are increasingly committed to sharing their research freely beyond their university and beyond the academic community, online journals are a really effective means of doing this. But are the days of journals numbered in the light of overwhelming information availability, short attention spans, and competition with social-media outlets which allow for more dialogic forms of research dissemination? Perhaps student research conferences are a better alternative?

In 2013, Plymouth hosted the British Conference on Undergraduate Research (BCUR), where student researchers from across the country came together to talk about their research in a multidisciplinary conference. In Stuart Hampton-Reeves' TPSS editorial (volume 7 (2), 2014), he reflected on attending the US equivalent, the National Conference of Undergraduate Research (NCUR) with his students from the University of Central Lancashire, an inspirational conference that has been running for over 25 years. In 2016, the inaugural World Congress on Undergraduate Research (WCUR) was held in Qatar in the Middle East, bringing student researchers together globally to discuss world problems, combined with the benefits of experiencing a different culture. So, is it worth the time and expense to travel to share our research, when we could just read about it? What do student authors who write in our journals, and student presenters who attend conferences, get from their different experiences and is it worth the effort?

In becoming published authors in GEOverse, undergraduates reported that they gained not only academic recognition and curriculum vitae (CV) material but an ability to apply constructive criticism, a desire for more dialogue about their research and the motivation to publish further work in the future. Postgraduate reviewers also benefited, as they began to form a research community in their own right. Levels of

student attainment were also raised due to the possibility of publication (Walkington, 2008; Walkington, 2012). It hasn't all been positive though! Students said they had no chance to ask a reviewer what they meant or to have a conversation, since the reviewers were anonymous and from a different institution.

Similar to the journal, conference presenters (at national multidisciplinary conferences) also reported benefits like gaining CV material, recognition as a researcher and the benefits of feedback on their work from conference attendees. However, what differed was that they gained that feedback immediately, but it was a pressured situation, they also had to think on their feet and respond to questions from strangers in the moment (Hill and Walkington, 2016; Walkington, et al., 2016), quite distinctive skills compared to writing a journal article where there is time to respond to feedback! The weakness of the conference was the lack of legacy - no one could discover their work later, or from a distance.

I would suggest that the strengths of conferences and journals can be combined and weaknesses removed. A journal that creates and encourages dialogue, allows non-standard formats such as video, and harnesses technology to create research that is discoverable by a broad public audience could do this. An online journal article is democratising because, regardless of the context in which the research took place, the final publication can be accessed by readers now and into the future.

At the start of this editorial I described myself as a research mentor, not a supervisor. Ten key practices of undergraduate research mentors, from a literature review of 20 years of published work (Shanahan, et al., 2015), are members of staff who:

- *Plan in advance, so they could respond to different student needs and abilities throughout the research process;*
- *Set clear, scaffolded expectations;*
- *Teach the technical skills, methods, and techniques of conducting research in the discipline;*
- *Balance rigorous expectations with emotional support;*
- *Build a sense of community among members of the research team;*
- *Made time for one-to-one mentoring;*
- *Gradually increase a student's sense of ownership of the research;*
- *Support students' professional development through networking or explaining the norms of the discipline;*
- *Create scholarly opportunities for students and the chance to learn mentoring skills;*
- ***Encourage and guide students to share their findings through writing or presentations.***

The final practice above, of guiding students to share their findings, is key to mentoring novice researchers and Kneale *et al.* (2016) suggest there should be many more dedicated student journals to this effect. Mentoring is essential for developing research which has 'impact' (something that can affect or change our society or environment), indeed one objective of academic staff research is to demonstrate this impact. We work in our labs, in the field, in archives and libraries on local issues, in the hope they may contribute to wider global knowledge. This is a

form of globalisation of knowledge. In geography we use the term *glocalisation* which is the adaptation of *global* products (like research articles) around the particularities of a *local* culture (Plymouth university in this case). After 10 successful years, here's to The Plymouth Student Scientist continuing its localised approach of publishing student research to a global audience, with the potential for wider impact wherever it's read.

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