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Seeking Spaces for Learning in a European Global Learning and STEM Project

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Introduction

There is a growing interest in the monitoring and evaluation of Education for Sustainable Development and Global Citizenship (ESD/GC). Development education practitioners highlight tensions between the demands of monitoring and evaluation for reporting purposes and opportunities for learning about practice within funded global learning education projects (Bond, 2012; Fricke, Gathercole with Skinner, 2015). This chapter presents a post-project reflection on the monitoring, evaluation and learning (MEL) processes of a three-year European Commission (EC) funded project involving non-state actors in formal education systems on development education and global learning in Science, Technology, Engineering and Mathematics (STEM) curricula. The Make the Link project focussed on development of engaging materials and professional development for teachers. The authors provide an overview of what was involved in developing a monitoring and evaluation framework that aimed to capture progress against results as defined by the project's EC logical framework, as well as learning about experiences of global learning and STEM from partners across four country contexts. This reflection contributes to discussion on the theme: how can ESD/GC monitoring, evaluation and research engage meaningfully with practice and vice-versa?

The Project

The Technology Challenging Poverty: Make the Link project focussed on embedding global learning in European STEM curricula through the development of engaging STEM materials and professional development for teachers. Practical Action was the lead organisation for the project and worked alongside six project partners: Engineers Without Borders (UK); Tomorrow's Engineers (UK); Sheffield Hallam University's Centre for Science Education—CSE (UK); Centre for the Advancement of Research and Development in Educational Technology—CARDET (Cyprus); Oxfam

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Italia (Italy); and Fundacja Centrum Edukacji Obywatelskiej—Centre for Citizenship Education CEO (Poland).

The aims of the Technology Challenging Poverty: Make the Link Project were to:

- Raise awareness and understanding among young people of development issues, the interdependent world and their own roles, responsibilities and lifestyles in relation to a globalised society;
- Integrate development issues and global learning methodologies into the science and technology curricula in policy and practice in four European Union (EU) countries (UK, Poland, Italy and Cyprus).

The main activity to achieve these aims was to develop teaching resources linked to STEM curricula focussed on students aged nine to fourteen years. Teaching resources were provided as free online resources, hosted on individual partner websites in the four participating countries. A curriculum mapping processes ensured that educational materials were relevant and reflected the different curricula of each of the countries involved (Practical Action, 2013). Resources include the following:

- Beat the Flood is a STEM challenge where students use their science skills to design, build and test a model of a flood-proof house. Students examined global contexts where flooding had occurred in Bangladesh, Italy and England and considered consequences for families and their needs in developing future flood-proof homes. (http://practicalaction.org/beattheflood)
- Plastics Challenge is a new STEM challenge that focuses on the reuse and recycling of plastics. The resources were developed and field-tested by a secondary teacher and her group of Year 10 'Plastic Chemists' before being made available. (http://practicalaction.org/plastics-challenge)
- Make the Link resources are a comprehensive set of materials made up of four units of work, each with six lessons. Materials include PowerPoint slides, notes for teachers and student task worksheets. Topics covered include water, climate change, energy and food, reflecting key themes in STEM curricula. Developed with the Centre for Science Learning, videos were provided by Practical Action on authentic global contexts on topics discussed. (http://practicalaction.org/make-the-link)
- Power for the World is an activity where students learn about inequalities of energy access and then design, make and test a wind turbine. These resources were developed and used in UK classrooms by Engineers Without Borders (UK) and further developed in Oxfam Italia in continuing professional development workshops with primary teachers. (www.ewb-uk.org/our-initiatives/inspiring-

change-in-engineering-education/outreach-programme/power-for-everyone-everywhere)

Methodology

Before the Make the Link project began, the authors attended a BOND workshop to consider approaches to monitoring evaluation and learning (MEL) in practice, and in the context of the upcoming EC funded project. BOND is a UK-based Non-Governmental Organisation (NGO) that supports development organisations on a range of topics including MEL and programme design (see www.bond.org.uk). In particular, we discussed how to integrate a results-based logical framework with a range of mixed methods to track progress against results as well as to gather evidence of good practice. Methodological challenges arose in planning how best to monitor progress, how to evaluate impact and how to identify opportunities for project learning as part of the external evaluation of the project. We wanted to avoid dualist thinking around qualitative versus quantitative data and to move to a point of identifying what it was that we wanted to know to inform and develop practice and what we wanted to know to ensure accountability and reporting to funders.

Research from the NGO sector identifies several challenges in reporting requirements that are useful for ESD/GC practitioners to consider when designing monitoring and evaluation processes for projects. The EC reporting frameworks utilise four key themes to measure success and to define results: relevance, efficiency, effectiveness and sustainability. These themes suggest there is a connection between valuing results as outputs and results as an ongoing learning process during and beyond the project. The NGO research highlights how similar themes contain potential challenges for practice. The effectiveness agenda, by which NGOs are required to demonstrate their effectiveness, efficiency and impact, requires good monitoring and evaluation systems to capture change within the constraints of a time-bound project or programme (Bond, 2012). The Improve It Framework (Bond, 2008) supports NGOs by providing a resource that links domains of change measured over time with appropriate data collection tools to assess and communicate outcomes of project activities. The accessibility agenda, whereby NGOs need to be answerable for good use of public funds, suggests that monitoring and evaluation is part of accountability as well as of good project management (O'Donnell, 2016). Many monitoring and evaluation reports remain on the shelf, whereas results made public in accessible and useful ways facilitate greater accountability and promote wider learning about the work of development organisations in the public domain. This is linked to a further challenge of 'lost learning' though limited dissemination of evaluation findings (Cooke, 2015). ESD/GC practitioners in particular may be highly reflective and able to capture

useful knowledge in innovative MEL approaches. However, there may be insufficient funds for in-depth research and evaluation beyond results-based and financial reporting. For many development organisations, there are rarely time and financial resources for sharing learning beyond reporting to funders (Cooke, 2015). Therefore, seeking broader opportunities for dissemination and developing skills in public engagement with research may not be a priority. Finally, short project timeframes may militate against the capture of longer-term impact and change over time, with particular difficulties in attributing effects and impacts within the complexities of social development programmes (Fricke, Gathercole with Skinner, 2015).

Findings

A MEL framework for Make the Link was designed to mirror and build on the EC logical framework of the project which listed intended activities and anticipated results (Daly and Brown, 2013). The results outlined in the project's EC logical framework were ambitious, as noted below.

Result 1: A set of teaching resources complementing the Science and Technology curricula accessed by 13,000 teachers.
Result 2: 1,600 teachers inspired and empowered to integrate development education into their teaching through training.
Result 3: 200 key influencers in education actively engaged in encouraging teachers to integrate project materials into their teaching.

The MEL framework provided evidence that Make the Link Project exceeded its ambitious results and objectives. Methods used and a reflection on findings are outlined below.

Webstats

Use of webstats was incorporated into the project monitoring design. Google Analytics captured downloads of Make the Link educational resources across partner websites and differentiated between the countries where materials were accessed from. Information was input into a shared data set by each partner. The project had significant reach with 18,200 teachers downloading quality materials that combine global learning methodologies with development contexts for STEM learning. An unexpected finding was that a small number of teachers from other EU countries not involved in the project have accessed online materials, indicating their suitability for teachers more widely. In addition, 1,368 teachers engaged in professional development. Six months after this training, 93% of teachers said they were likely to incorporate global learning in their planning. Incorporating webstats as a monitoring tool

provides longer-term evidence that resources are relevant and dissemination is continuing post-project.

Case Studies of Impacts on Teachers and Students

Three-monthly partner reports provided detailed information on activities, numbers of teachers and students in schools reached, qualitative reflections on progress against objectives, short case studies of practice including photographs of educational activity, teacher and student reflections, and findings from teacher questionnaires following any training delivered. A mid-term review of the project used a case study approach to analyse outcomes and effects resulting from the project's implementation and strategies (EC, 2005). A final review brought partners together for a participatory evaluation workshop (Chambers, 2002). The project had positive impacts on teachers and their students. It is estimated 1,026,000 students aged seven to nineteen engaged in the project through teachers' access to materials. Feedback from students was not easy to obtain; however, valuable student feedback was received via engaged teachers, through small scale observations and focus groups. Rich qualitative evidence of students' understanding of the relevance of STEM in tackling global issues and their interest in global debates on development issues was found. Students expressed their feelings of empathy, attentiveness to inclusive design, and, an unexpected outcome, their interest in STEM careers, as noted by these students:

> I've learnt that bamboo isn't very absorbent—so we have used it to make our house. You never know when the weather will change. The climate is changing due to global warming. A flood proof house would help because if there was extreme weather, this would stand it. I have built my house so that all people can use it. It has a ramp so anyone in a wheelchair can get up to safety if the water comes over.
>
> (Primary students)

> Today has been amazing. I really want to do this when I am older.
>
> (Secondary student)

Teachers and students were involved from the outset in developing quality resources. A youth panel worked with teachers to design and test materials and to identify global STEM contexts that they thought would be engaging for students. Practical Action's authentic materials from real world development contexts were used to augment and connect global issues to STEM content as explained by one of the partners:

> It really works in our schools and it helps to have high quality videos, scenarios and resources from development. We have gone on

> to develop our own materials based on real stories from across the globe.
>
> (Partner)

Engagement in Dissemination Activities

A 'key influencer log' was compiled detailing engagement with global learning practitioners, teachers and STEM stakeholders. The project engaged with over 300 key influencers at local, national and European levels through innovative use of social media, writing material for over thirty-five education materials and dissemination at networks and conferences. The extent to which teachers were peer influencers was an unexpected finding. Teachers created a multiplier effect by sharing resources via locally organised 'Teach Meets', social media groups, and involvement in subject associations and networks. A teacher with a lead role in supporting newly qualified teachers commented on the importance of engaging with new materials and continuing to learn as a mentor:

> It's given me a context to talk about an experiment with different fuels. As a teacher who is trying to inspire others, it has certainly changed my approach.
>
> (Secondary teacher)

Reporting to and Hearing From the EC

The EC funding strand required annual and final narrative and financial reports. These contained selections of qualitative and quantitative data provided by partners and case studies of good practice, and recommendations and actions arising from the mid-term and final review. In addition, a Results Only Monitoring (ROM) visit was carried out on selected projects by the EC. The ROM Visit for Make the Link was held between 13 September and 5 October 2015, and EC auditors met with partners and stakeholders across the project. The ROM report was received by the lead partner on 3 January 2016 and comprised a five-page report using a traffic light system to evaluate the project. Make the Link achieved 'green' for good/very good in each of the themes of relevance, efficiency, effectiveness and sustainability. As the project ended on 31 January 2016, the report came too late to consider comments, and many of the recommendations had already been made in the mid-term review. The EC also held a post-project lead partners' meeting in March 2016 to reflect on experiences arising out of the funded projects under the EC action 'Non-State Actors and Local Authorities in Development: Global Learning in formal education system 2013–2015'.

Discussion

This reflection has enabled us to identify spaces for learning in the project's MEL processes that helps address the challenges for development education organisations in demonstrating effectiveness, accountability, accessibility and sustainability. We offer some suggestions for project evaluation in development education and ESD/GC based on our experiences.

Firstly, we suggest collaboration of partners in the development of MEL as an initial and ongoing part of the project. The overall management of the project was supported by a robust but flexible MEL framework and methods. Internal and external technical expertise were drawn upon, including technical support on social media, webstats and project management from Practical Action; external monitoring and evaluation workshops provided by BOND; and the expertise of a researcher with experience of qualitative, quantitative and participatory research methods. This enabled collection of data in a variety of ways and demonstrated efficiency and effectiveness in MEL processes (Bond, 2012; EC, 2005).

Opportunities for partners to reflect on MEL included face-to-face kick-off and mid-project meetings intended to support the production of monitoring tools, and dissemination plans to ensure deadlines and reporting expectations were realistic, achievable and meaningful. Recommendations from the mid-term review helped partners to feel more connected: themed Skype calls were introduced in the second year to share aspects of interesting learning such as teachers as influencers, e-learning modules and working with networks of teachers. Limited funds meant thinking creatively about the final review (Cooke, 2015). It comprised a participatory evaluation workshop and a seminar in Liverpool where ideas and achievements were shared locally with other global education stakeholders. Partners defined aspects of MEL to take forward to new areas of their individual and collective work. In two subsequent projects, a research strand is integral to the project plan, demonstrating how longer-term learning can be integrated into practice (Fricke, Gathercole with Skinner, 2015).

Secondly, we suggest developing a meaningful team approach to support collective project learning. Partners contributed to the achievements of the Make the Link project and benefited from the rich experiences from working in a 'European team'. The participatory methods in the mid-term and final reviews included workshops and Skype seminars, and co-development of case studies supported this sense of connectedness (Daly and Rogers, 2016). These spaces for joint project evaluation revealed areas of highly reflective learning among partners that enabled thoughtful yet critical perspectives on the role of development organisations, the contested nature of development contexts in STEM resources, and the diversity and relevance of global learning in training educators

across European countries. The relevance of making the link between STEM, global learning methodologies and a concern with ESD/GC was captured by one of the partners:

> That's part of the tension, to bring the rich context of global development and global issues, and at the same time cover the science required in a conceptually sensible way.
>
> (Partner)

Thirdly, we suggest being open to opportunities to build capacity in MEL and sharing findings as the project progresses. All partners grew in confidence in engaging with the wider ESD/GC practitioner and research community. The blend of traditional reporting and use of findings to communicate with a variety of interested groups enabled partners to demonstrate the value of global learning and development education to wider public audiences (O'Donnell, 2016). This included attending and winning an award at the European Scientix conference (Scientix, 2014), delivering an academic research chapter at the European Science Education Research Conference (Daly and Brown, 2015), publishing in the Association of Science Education publications, *Primary Science and Education in Science* (Seeley, 2014; Cox, 2014) and discussing our reflections on MEL processes with ESD/GC educators at the TEESNet conference (Daly and Brown, 2016).

Finally, we would be braver about asking for support and feedback from EC funders. This may promote adequately resourced MEL, research and dissemination work. Learning about the project and learning about MEL processes has not been lost (Cooke, 2015). Based on our experience, we value the link between research and monitoring and evaluation practice for deeper learning about global learning and STEM. We have sought to design into future programmes adequate resources for a more central role for project learning that includes mixed evaluation methods, research including more participatory action research, and public engagement with findings.

Conclusion

In conclusion, the project achieved its intended results regarding involving non-state development actors in providing resources for STEM curricula in the UK, Poland, Cyprus and Italy. We also learned a great deal by focussing on good monitoring and evaluation systems from the start and throughout the life of the project. We conclude that monitoring, evaluation *and* learning is important to all stakeholders, but each must consider what 'useful knowledge' is for their purposes. By combining the requirements of the EC logical framework with our own MEL framework of mixed methods, we were able to make a connection between results and

outcomes for teachers and students, and were able to capture rich data and unexpected outcomes. Spaces for learning were both planned for and serendipitous. As the project developed, we became sufficiently confident to take advantage of opportunities that were not in the overall project plan to engage in wider opportunities to sharing learning. This points to a more central role for participatory learning spaces as an integral element of future global learning projects. This methodological reflection has informed our future developments in approaches to researching what is valuable in global learning and STEM practice.

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