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Empowering lecturers and students with constructivist, community-engaged pedagogies to support sustainable development goals

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Empowering lecturers and students with constructivist, community-engaged pedagogies to support Sustainable Development Goals

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Cover Page Footnote

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Empowering lecturers and students with constructivist, community-engaged pedagogies to support the United Nations Sustainable Development Goals



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Abstract

This reflective paper is a summary of a dialogue between colleagues in TU Dublin and Queen's University Belfast on addressing the United Nations (UN) Sustainable Development Goals (SDGs) through Community Engaged Research and Learning (CERL). Two of the authors were involved in facilitating an innovative online postgraduate Continuing Professional Development (CPD) module for lecturers who wished to start building CERL into their modules or to develop it further. The third author was a student on this CERL CPD module.

The paper was written during a series of meetings between the authors, in which they reflected on their experience of learning and teaching in relation to CERL. Through this dialogue they clarified the importance of rethinking curriculum to include Education for Sustainable Development (ESD), and the unique contribution that CERL as a constructivist pedagogy offers. CERL offers lecturers a way to streamline curriculum by making course content more relevant to students' lives and to society. Students reflect on and use what they are learning, in collaboration with community partners and lecturers, to deepen their understanding, to develop new competencies, and become more engaged citizens.

Furthermore, the authors argue that redesigning the curriculum and embedding the UN SDGs through CERL involves important themes, which may not feature in many university modules. These include building relationships; empathy; process; reflection on practice; time for communication and dialogue; fostering and actively supporting diversity, the understanding of context; and a willingness to demonstrate vulnerability. These are key competencies for

achieving the UN SDGs, and CERL supports lecturers, students, and community partners to build them together. The teaching that this approach enables is also enormously rewarding.

Keywords: community engaged research and learning; continuing professional development; constructivism; education for sustainable development; maths; partnership.

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Introduction

The UN Sustainable Development Goals (SDGs) are becoming a core feature of university strategy documents. Transforming higher education is clearly important given that the SDGs are a call to join what the UN Secretary-General calls the ‘battle for our lives’ (UNESCO, 2020 p.iii). However, the enormity of the ambitions in many of these documents, which talk of empowering learners with lifelong-learning, knowledge, skills, values and attitudes to take informed decisions and responsible actions for environmental integrity, economic viability and a just society, sound almost impossible to achieve to a busy lecturer teaching a module on introductory statistics. Consequently, when curriculum change is proposed, many academics will complain that there is no time to cover additional material given the already bulging curriculum. These academics may interpret Education for Sustainable Development (ESD) as having a narrow focus on topical issues, when it calls for a holistic approach that addresses learning content, pedagogy, and learning outcomes so as to bring about a fundamental behavioural shift towards sustainable development (UNESCO, 2020). We argue that Community Engaged Research and Learning (CERL), the subject of this paper, offers a holistic, constructivist approach to education and a focus on topical issues in sustainability. CERL combines community engagement, learning, teaching, and research. It addresses real-world questions and ideas provided by community partners who are working towards sustainable development goals. CERL, we argue, is, therefore, an essential element of ESD.

CERL involves students working with community partners on collaboratively-designed, real-life projects, within the curriculum, for mutual benefit. Such projects are designed to respond to community partners’ ideas, usually addressing one or more of the SDGs. Projects are supervised by lecturers, with input from community partners, to ensure that students develop both discipline-specific skills and transferrable professional skills, through authentic learning and assessment (Bates et al., n.d.). Reflection is a key enabler of learning on CERL projects, allowing students to make sense of their experience and draw conclusions to support future action, and to build competencies which will be essential for sustainable development. CERL enables students to learn both content and competencies simultaneously, by working on topical issues with community partners. On an individual level, the key Inner Development Goals (IDGs), which support the SDGs, encompass a way of being, thinking, relating, collaborating and acting (Jordan, n.d.).

Support structures for CERL (often known as science shops) were first established in northern European universities in the 1960s, with related developments on other continents, such as North America, around the same time. There is, thus, a substantial body of knowledge on how CERL projects can be embedded in a variety of degree pathways, complemented by a substantial body of literature which argues that universities need to rethink their mission and increase their community engagement (e.g. Boyer, 1996; Farnell, 2020; Goddard et al., 2016; Preece, 2017). To implement CERL more widely, however, frontline education staff need dedicated time and support to consider how this well-established approach can be implemented in their discipline, to develop necessary competencies, and to make connections and plans with a community partner. The innovative online CPD postgraduate module for lecturers on CERL that we reflect on in this paper aimed to provide these supports.

Two of the authors and a third colleague facilitated the CERL CPD module, (which was developed by two of the three, with input from a range of international colleagues on the Erasmus+ funded CIRCLE project, and other CERL stakeholders. The third author, a lecturer who successfully completed that postgraduate module, went on to adapt his own mathematics modules to incorporate CERL, and the SDGs. In this paper we reflect on two levels of curriculum innovation for the SDGs: the CPD CERL module for lecturers; and the maths modules that were adapted to include CERL.

Having provided the background context and the purpose of this reflection, the remainder of this paper is laid out as follows. In the first section the maths lecturer describes his motivation for taking the CERL CPD module. Next the facilitators describe the aims of the CERL CPD module. Critical reflections on experiences then follow, from the participant and facilitators. The mathematics lecturer then analyses how he implemented what he learned in his own teaching of mathematics. In the final section all three authors together reflect on the experience of teaching, learning and implementing these approaches, as part of ESD.

Why the maths lecturer chose to take the CERL CPD module.

I had taught a small third-year courses, for a number of years, and had even won a teaching award for this before signing up to the CERL CPD module. I had, however, recently started teaching a larger first-year module and felt I was being forced into teaching it in a traditional way. I also felt there was a lack of deliberate purpose in much of the planning around education.

I hoped that by signing up for this module, I could spend time with people who believed that changing the way we teach might improve the educational experience of the students.

My views on education align with the work of Tassone & Eppink (2016, p.19) who summarise two main directions of pedagogical philosophy: instrumental (instructivist), and emancipatory, (broadly constructivist). The instrumental perspective is in line with transmissive and mechanistic modes of education. Most educational activities in a typical STEM degree align with this instructivist mode of learning. There is a focus on transmitting expert knowledge, prescribing given standards and offering pre-determined solutions to well established problems. Much thought is put into how to cover these theoretical concepts in innovative ways that will capture the attention of students, but STEM students are generally seen as passive receivers whose role is to retain the knowledge provided. The principal aim of these courses is to ensure that students are familiar with the theoretical ideas that underpin the discipline. I take issue with this rather narrow aim, however, because being an effective STEM practitioner involves more than simply knowing the underlying theory. Furthermore, when viewed through the lens of educational taxonomies (e.g. Bloom, 1969) one recognises that cognition is not greatly enhanced by assessing whether students can remember or understand theoretical ideas, particularly when easily searchable information is freely available online.

One might argue that the emancipatory perspective outlined by Tassone & Eppink (2016) is used when students tackle supervised projects in the final year of their STEM degree. This emancipatory perspective, according to Tassone & Eppink (2016), aligns with social cognitive theory and socio-constructivist modes of education. In this perspective, education is approached mainly as a process. The student develops new knowledge and capacities by having some outcome to achieve. Students are supposed to actively "engage in questioning and in developing design, practices and solutions". They also reflect on different viewpoints, on affective elements and in their own experience. Teachers, meanwhile, "act more as facilitators, or they are even co-learning with the students and possibly with other societal actors." (Tassone & Eppink, 2016, p.19). My concern with embedding supervised projects in the final year of a STEM degree has always been that students rarely receive suitable preparation before tackling their final project. They have three years of education that is primarily instructivist, then in their final year they are suddenly expected to operate in an emancipatory mode applying the high-level theory that they have spent the previous three years learning.

Having said that, it is essential to get university students to engage with research, because there are so many free or cheap resources on mathematics topics available online. Getting students to do research at university offers a clearer justification for the staff-student ratios of 1-12 in my institution. However, not every student is interested in doing cutting edge mathematics research. In CERL, community partners give students a motivation for tackling research because the partner benefits from the student doing the work well. Furthermore, the benefit is not the usual vague promise of “improved career prospects” that will result from mastery of a particular body of theory. Instead the student has done work that might have a real and tangible impact for a community organisation, as well as supporting the partner to address the relevant SDGs through their work. Students can also definitely discuss this type of project when applying for jobs. In short, offering CERL projects provides students and society with a clear motivation for further study in higher education.

How and why the CERL CPD module was designed and facilitated.

Note: this section draws heavily on the Facilitator Guide for the CIRCLET module (Bates et al., n.d.), in which we outline our goals for the CPD module. We secured funding for, and developed, this CERL CPD module as part of the Erasmus+ CIRCLET project. We knew lecturers wanted to develop their understanding and skills in relation to CERL. We felt that an accredited programme could provide a structure to engage with relevant literature or case studies on CERL, and the SDGs, and bring participants through a process for starting, or developing, their CERL practice. The CERL CPD module was designed to build lecturers' capacity and confidence so they could rethink a module they taught, to embed and/or enhance CERL. We hoped to support them to acquire relevant knowledge, skills, attitudes, values and competencies. For their final assignment, participants had to submit a detailed co-designed plan to run a CERL project with their students, including a timeline, signed by their community partner and their local CERL coordinator. This meant that they could not pass the module without collaborating with a community partner to co-design a project that their students would work on to address the SDGs.

We encouraged lecturers to develop their reflective abilities, as a fundamental competency and support for their CERL practice and development. The CPD module was designed to align with CERL as a constructivist pedagogy, with a focus on 'authentic, experiential learning, driven by collaboration and engaged participation, and underpinned by reflection'. (Bates et al., n.d., p.8). Ideally, CERL involves a cycle of action and reflection (praxis) with the cooperation

of students/participants, facilitators, and community partners, using democratic methods and participatory approaches. This concept of praxis is integral to the collaborative, constructivist model of learning-

Key competencies for ESD educators (UNECE, 2012) include learning to know, to be, to do and to live together (or collaborate). We felt the best way to support lecturers to develop these was to give them the experience of learning as students on this module. One of the authors completed the CPD module on *Technology Enhanced Learning, Teaching and Assessment* (TELTA), run by TU Dublin colleagues in Learning, Teaching and Assessment, to build our capacity to develop our own online CPD module. The overall structure of the CERL CPD module was inspired by this award-winning TELTA module. We started with predominantly instructivist tasks, webinars and individual assignments, allowing participants to absorb existing knowledge. We gradually supported participants to become active co-creators of knowledge, in constructivist mode. Many key educational theorists recommend a mix of constructivist and instructivist learning (Moule, 2007; Salmon, 2003). The role of facilitators and guest speakers changed during the module, from transmitting knowledge to giving feedback to participants on their developing work. This approach was designed to align with the UNESCO roadmap for sustainability educators: "Educators should be facilitators who guide learners through the transformation as well as expert builders and transmitters of knowledge for a sustainable future." (UNESCO, 2020, p. 30). In one of the later sessions, we supported participants to collaboratively design the marking rubric for the module's final assignment. We wanted their learning to be empowering, as well as useful (Jones, as cited in Kelly, 2012), moving towards emancipatory education. We wanted to model how lecturers should give responsibility to their students on CERL projects, whilst supporting them to build their competencies for addressing the SDGs. In this way, our CPD module participants and their students could learn *to do and to be* as well as to know.

We decided to use flipped learning, in line with our constructivist approach: 'students are introduced to the learning material before class with classroom time then being used to deepen understanding through discussion with peers and problem-solving activities facilitated by teachers. [...] After the class students reflect upon [...] the feedback they have received in class and use this to further their [...] "deep learning".' (Higher Education Academy, 2015). Participants were asked to engage with pre-session resources every week and submit an assignment 2 days before each webinar, so we could give general feedback and/or pick out points for discussion

in the webinar. We also provided students with drop-in 'office hours' online each week, as a space to ask questions or test ideas - a practice we adopted from the TELTA module.

Building relationships is a fundamental skill required by all participants in CERL. It aligns with the ESD competencies of collaboration and living together. Cordingley & Bell's (n.d.) report on international studies on CPD for educators and managers emphasised that relationships were key in the 4 most effective CPD approaches. UNESCO (2020, p.30) also recommends peer learning in relation to ESD: 'Trainers of educators should systematically provide opportunities for peer-to-peer learning where pioneering educators can share their successes and challenges and thus demonstrate that, while ambitious as an aim, ESD can be integrated step-by-step into daily teaching practice.'

We aimed to build a supportive learning network for participants, to sustain them after the module (Haythornthwaite, 2006; Bidell, 2016). Participants learned with and from community partners, lecturers and students, who provided guest inputs or co-facilitation. We used a mix of whole-group and breakout group discussions in the webinars, because smaller groups work better for people who take quieter, more reflective roles in groups (Kantor, as cited in Isaacs, n.d.). Formative assignments required participants to complete group work, and to review and give feedback on work of their peers, learning with and from them. Whilst participants might complain about the challenges of group work, peer learning is an effective way to support their development of competencies for collaboration, and ESD.

The maths lecturer's reflections on taking the CERL CPD module.

In hindsight, I don't think I understood how much work the CERL CPD module would involve. I certainly don't think I knew how much reading there would be to do each week or how many assignments there were. Most significantly, though, I was not prepared for the possibility that the folks taking the module could fail! In my imagination, this course would be like other training courses I had done: some alternative pedagogies would be introduced, very little would be asked of participants, we would get a certificate at the end, and we would then be expected, but not required, to apply what we had learned with students.

I got a rude awakening when I realised that this course would require me to use what I was being taught to redevelop a module. This was not like those other CPD training courses - I couldn't simply blag my way through. I had to satisfy someone else's expectations of me, and I had forgotten what that felt like. I had gotten so used to being the lecturer who commands the

class that I had forgotten what it feels like to be a student who doesn't fully understand their assignment. Being in that situation again after having done some teaching is fascinating as you find yourself blaming the teachers for organising the resources on the VLE poorly, not writing clear assignment specifications, not understanding that you have other responsibilities outside the course. In other words, I found myself doing many things students in my classes do that I always thought they were doing to drive me crazy!

This experience of being a student again, more than the content, was the most valuable component of this course as it helped me to develop a greater empathy for the students - a key ESD competency. The irritating behaviours I described in the previous paragraph occur because of students' sometimes buried beliefs about education. For example, I no longer think students don't attend office hours for malicious reasons. When I was stuck on one of the CPD module assignments, it never even occurred to me to attend the office hours. I couldn't explain why, but I can understand why a student would behave the same way. Having completed the CERL CPD module, I can understand why students might feel constrained by assignments. I struggled with (and initially failed) an assignment. I told myself that I could not do the assignment, as I had never taught a module that involved CERL. With the benefit of hindsight, I can see that having taught a module using CERL was not a prerequisite. Again, this experience illustrated the importance of socio-emotional dimensions of teaching and how we need to spend time helping students to reflect on their own inner processes and resistances. The cycle of action and reflection is essential to achieving progress when addressing the SDGs.

My biggest take away from the CERL CPD module was that the final assignment was not simply a document that demonstrated that a certain threshold had been achieved. It felt like the whole course had been designed around completing an activity, with expert supervision, that I could use to do my job better. This clarity of purpose is often absent from STEM modules, which are usually assessed through exams. The assessment usually serves no purpose beyond determining the student's mark. However, once you recognise that learning outcomes and assessments can be designed to address higher aims, it becomes difficult to justify setting assignments solely to determine marks. Modules that are designed with a final summative assignment that involves students working on a real, research-level problem that, where possible, addresses the SDGs, should be the rule, rather than an exception.

Since completing the CERL CPD module, I have told students at the start of all my CERL modules that they can write on their CV afterwards "during the module SOR3012, I completed

a project in partnership with a rural transport charity called Fermanagh Community Transport". We tell students that a university degree will guarantee them a better job. It is strange to think that I felt no need to explicitly address how the module would contribute to this, prior to completing the CERL CPD module.

The facilitators' reflections on learning from the CERL CPD module.

We delivered what we hoped was a cohesive, rounded learning experience (SDG4 - quality education). From the facilitators' regular reflections, ongoing evaluations of the module with participants, and the dialogue involved in writing this paper, it is clear that the main successes of the module were:

- a) modelling constructivist approaches to learning and working with participants as collaborators.
- b) supporting participants to develop their own reflective practice, and thereby helping them to understand the importance of developing their students' capacity for reflection (a central component of both CERL and ESD).
- c) building the confidence, and competencies, of the lecturers to build CERL into their teaching (building capacity being a key pillar of ESD).

We could see that the participants, although keen, struggled at times with the changes that CERL and ESD would require from them. These were in some cases diametrically opposed to mainstream university teaching practices, so some had to unlearn instructivist ways of doing things to use constructivist pedagogies, specifically CERL. Learning was underpinned by regular reflection, by participants and facilitators, to help us all to develop as reflective practitioners, and give the participants ideas for how to support their own students to reflect. A number of participants, in an anonymous evaluation five months after the module ended, identified reflection as a key area of learning. For example, one participant noted:

"The reflection part was a kind of discovery for me. I have to say that is the most important skill of the module because it helped me think about the learning process and not only about the outcomes [...] reflection about the process helps adjust my goals and feelings."

Lecturers can find CERL projects challenging. It can be intimidating to work with a community partner for the first time, especially if one has never worked in the community sector. As facilitators of a pilot module we could empathise with this sense of discomfort. The community partners played an important role in alleviating the participants' fears, as guest speakers and co-facilitators. They discussed their experiences of working on CERL projects, from the practicalities of engaging with students to their motivations for being involved. Participants valued their opinions, openness and experience. Listening to the participants' discussions with community partners we were reminded that shared values, ethics, empathy and attitudes reinforce a sense of belonging, which can make a difference on a societal level and help progress ESD. Our module participants came from a wide range of disciplines, and from different contexts: from Western, Central and Southern European countries, and from different types of universities. This enriched theirs and our learning. We observed differences in practice that seemed to align with discipline boundaries. We received feedback that the case studies we provided did not sufficiently feature STEM. Diversity is a pillar of ESD, and we were reminded that it's not enough to assemble a diverse group of participants, we also needed to make sure they could see themselves in examples we provided, and that they were supported to collaborate in ways that enabled them to negotiate discipline-based and context-based differences.

Our constructivist approach required significant time and commitment from participants, who were already busy with lecturing roles, and hampered by ongoing COVID-19 restrictions. We supported 9 participants to successfully complete the first run of the module, and a tenth who made a decision to focus on their CERL practice rather than pursuing the module credits. In the second year of the module the drop-out rates rose: 13 started but only 7 finished, 4 receiving the 5 ECTS credits. We did our best to clarify from the start our expectations and the workload. We worked to scaffold participants' learning, with all formative assignments feeding into the final summative assignment, but we couldn't create more time, which was the biggest stumbling block to completion. We could have dropped some assessment criteria, such as the requirement to include a community partner's signature on their CERL project plan, but we felt this would have reduced the likelihood of the participants actually implementing a CERL project. As articulated by our co-author above, real-life, authentic, SDG-focused assessment requirements differentiated this module from other CPD modules. We felt it was better to support a core group to really achieve the module goals than to carry a larger number of people along at a lower level of learning. This balancing act can be a challenge in curriculum innovation for the SDGs.

We further developed our own understanding of constructivist methods through feedback from participants. Our co-author gave us insightful feedback during on our approach to flipped learning, saying that the webinars felt rather irrelevant because participants were required to submit the related assignment beforehand. In response to his feedback, in year 2 we offered participants the opportunity to resubmit any assignment up to 2 days after the webinar. One participant reflected that this approach transformed their own previously rigid thinking regarding giving students opportunities to resubmit work after further learning – demonstrating how they were cultivating the responsiveness required for ESD.

ESD thus involves supporting people to develop *competencies* as much as knowledge, which as mentioned above can be challenging for educators. Knowledge is arguably the currency of academia, and competencies are a relatively new way of thinking about academic development in the UK and Ireland. As mentioned above, few module participants made use of the weekly drop in 'office hour' sessions even if they were struggling or communicated their difficulties to us. They just disappeared, and/or did not submit their assignments. We followed up intensively with them and learned more about contexts and cultural differences as a result, discovering that in some cultural contexts, it could feel unacceptable to articulate that one might not meet a deadline. On reflection we wondered how we might better support the participants to let go of their need to be 'experts', a need which all learners arguably have, but which may be felt more acutely by lecturers, whose roles cast them as such. We wanted to support them to embrace a different role as learners, including experiencing the vulnerability and challenges inherent in not knowing, identifying and articulating these, and thereby developing competencies such as reflection and interpersonal communication. These also help to build trust in learning-focused relationships. We employed and further developed our own interpersonal skills - making people feel heard and supported, showing our own vulnerability, and our admiration for participants when they faced and overcame challenges.

Participants learned a lot about relationships, collaborative skills being a key pillar of ESD and CERL. Working as a team to deliver the module, we built on the trusting, positive working relationships we already had, and were hopefully able to model good working relationships to the participants. We wonder, however, if we had supported the participants more effectively to build peer relationships, might they have supported each other better through the challenges within the module? In the first year we moved participants around different small groups for every assignment, so that they could get to know more people in the class, but we learned from

the evaluations that most participants hadn't really formed relationships. In response, in the second year we kept the same small groups for weeks at a time, which seemed to work better. In the anonymous evaluation five months after this second run of the module, one student said: 'Resources helped me a lot, but I think that group work with others [sic] students in the module helped me much more.' We did our best to support group learning during the module, but it was beyond our capacity to ensure that students formed longer-term peer support relationships. We did wonder how we as educators could develop a deeper understanding of individual participants' commitment, motivations, contexts, time constraints etc; and build relationships, respect and reciprocity (key features of ESD) with them. The value of doing so is clear from how much we have learned through co-writing this paper with a module participant.

The maths lecturer's reflections on embedding CERL in a maths module.

I redesigned a third-year maths module by making the final assessment a student-designed CERL project. Representatives from a rural transport charity give the students an initial briefing about problems that they face and then participate in a discussion with the students. The students then use their mathematics to model transport. For example, students might model how many cars travel on a road or how many passengers get on a bus. Furthermore, as the charity focuses on transport in a rural setting where population density is low, students are working with, and for communities that are poorly represented in the arenas where transport policy is decided. Having a final assessment where the students are writing for a community partner forced me to think about the professional competencies that students are developing whilst learning mathematical theory. I have tried to move away from traditional maths exam questions, which assess if students can perform a hypothesis test. I feel that mathematical theory should instead be reframed in terms of SDG17 (partnership) and used to develop standards for discussing ideas. In my module this means explaining that the community partner needs to complete explanations of the students' models, and results that are described in a way that ensures that others can reproduce them. In the early parts of the module, the focus is on completing mini-projects where students engage with the unwritten consensus that maths practitioners have arrived upon for writing up their work. I provide a lot of scaffolding and guidance for these projects. Automated assessment is used to mark the technical aspects. I want the students to produce work that others can reproduce, so I provide model versions of these mini-projects and allow the students to produce write-ups of these projects that are similar to my examples. Gratifyingly, I have been told by colleagues that they can see students applying ideas learned from my module in project work in other modules.

Students meet the community partner after these mini-projects, during the seventh week of the 12-week module. After this meeting they can choose to work on one of the CERL project ideas that I developed with the partner or they can design their own project based on their discussions with the partner. If they design their own project, then I award them a higher mark, as I would like the students to demonstrate that they can engage creatively with mathematical theory from earlier parts of the module. Throughout the module, I provide suggested deadlines and encourage students to work at their own pace and in their own way, which I found liberating because this, combined with regular contact with students, allows me to support anyone who is struggling. Interestingly, the first time I taught the module many students spontaneously chose to work in pairs. The second time, every student chose to write an individual project. On both occasions the community partner noted that students produced work that showed real understanding of the transport challenges that rural communities faced. He also noted that there was a rigour to the students' work that illustrated a respect for the discipline.

In writing this reflection I realise that, although students in the module are doing ESD, they are not necessarily doing CERL in the fullest sense. To do CERL effectively, students need feedback from the community partner on their work. I have been reluctant to include further interaction with the community partner as (i) I don't feel I can ask the partner to provide feedback on twenty student reports and (ii) to produce work of value to the partner, students might have to work with complicated models. These concerns reflect the fact that I am still overemphasising mastery of mathematics. An easy fix would be to have an initial meeting with the community partner in the first week of the semester and a follow up meeting in week 6. The students don't need mastery of mathematics to suggest initial ideas to investigate. In fact, having the final goal in mind earlier may enhance their motivation for studying the maths.

Despite these limitations, students are still learning the skill of taking a very complicated real-world problem and reducing the number of variables and factors down to the point where a mathematical model can be solved. These aspects of mathematics are often glossed over in courses when students encounter abstract, idealised problems that, through instructivist teaching, have become divorced from the real world. I believe there is real value in changing the goals of modules and moving away from idealised settings towards more "messy" real-world problems. I have been consistently impressed by the ideas that students have come up with for their final reports. Furthermore, in helping them work on these projects I have been forced to learn more mathematics. My classroom for this module thus feels like the

emancipatory space envisaged by Tassone & Eppink (2016). I feel very much engaged in a process of co-learning with the students and other societal actors.

Conclusions

We wrote this paper over the course of fourteen two-hour-long meetings between the authors. Part of this time was spent individually, but simultaneously, writing the reflections that became the bulk of the paper. The rest of the time was spent having lively discussions about education, partnership, reflection and community that we could not find space to include. We mention this because this paper's genesis highlights the some of the key elements that we feel are needed for effective ESD - agreement on a clear and achievable objective, and time to achieve that objective collaboratively. Time is essential for developing effective relationships between lecturers and community partners, or between students and peers. A key ESD competency is learning to live together - including to think, reflect, plan, work and write together. We found the 'task, process, relationship' model developed by Partners Training for Transformation (Sheehy, 2001, p.48-9) particularly useful. In this model, in order to achieve a goal, one has to focus equally on the *process* of working, on supporting the *relationships* involved in the work, and on completing the *task* that has been agreed. Our process focused on regular meetings for collaborative engagement, rather than on pre-agreed milestones and deadlines. This attention to process and relationships ensured that tasks were completed in an organic way, that progress and milestones could be collaboratively reviewed, and that goals and timelines could be adjusted if needed. ESD takes time, because it involves developing competencies for collaboration as well as knowledge and skills.

The CERL CPD module had the clear objective that participants would redesign a module they taught to include CERL, and through the process of doing so, develop the required knowledge, skills, confidence and competencies. For the maths module, the objective was for students to complete a CERL project with Fermanagh Community Transport and in doing so, learn how to argue for policy change using the results from simulations. While every student who passed these two modules achieved the objectives set for them, few students took the linear path envisaged when the modules were designed. The convoluted routes taken by students exposed assumptions we made in the planning stage, and the challenges of developing competencies as well as knowledge, rather than any student's lack of ability. During the CERL CPD module, for instance, we found that lecturers were working in very different contexts and that lecturers at some universities did not have control over what they taught, or scope to make changes to

modules. Discussions with students on the maths module revealed how many assignments they have from other courses and how hard they have to work - issues mirrored in the experiences of the CERL CPD module participants. Our constructivist approach gave us scope to develop a better understanding of students' contexts, and the challenges of developing new ESD competencies, by spending more class time discussing work in progress than providing instruction, or giving directions for tasks. As discussed above, however, we felt there was more we could have done in this regard. It takes time to properly develop common objectives, and the competencies required to achieve them, with learners and community partners, within the different contexts, in which they operate. However, when this time is taken, the role of the educator in ESD is redefined. Lecturers further develop their expertise, together with that of their community partners, to give structure and purpose to student projects, with responsive guidance to keep students on track and support their holistic development. Teaching in this constructivist way is hugely rewarding as students can become more highly motivated and will often far surpass the goals set for them. Reflection is a critical competency for ESD, in both students and educators. Some participants on the CERL CPD module found the opportunity for reflection on their own teaching to be revelatory. Reflection is essential when students are adopting new approaches, as it provides a space for them to think about how theory can be applied in specific contexts. Too often, the theory is taught but students are not given an opportunity to reflect on how it operates in any context, meaning that their understanding of both theory and context can only be superficial.

ESD offers an opportunity for students to develop competencies that enable them to collaborate in order to apply theoretical ideas in context, with responsive supervision, in this case through CERL. As we have argued, these projects are exciting and inspiring for both students and teachers. When done well they offer students superb preparation for life outside of university. ESD then is not simply another thing that must be added to a bulging curriculum, but an opportunity to slim down the curriculum and focus on how students can use what they are learning to deepen their understanding, to develop new and essential competencies, and become more engaged citizens. ESD calls us to focus on supporting students not to be overwhelmed by the sheer quantity of information and data that is available online, but to develop competencies in doing, being, knowing, and working effectively with others. CPD for educators is a fundamental part of this process. In short, ESD offers a blueprint for a new type of competency-based, constructivist education that is far better suited to the global challenges faced by society in this information age.

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