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Embedding environmentally sustainable practices in learning and teaching: A student perspective

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Abstract

Embedding environmental sustainability practices as part of higher education programmes is an increasing priority. This paper examines factors influencing student perceptions of environmental sustainability values, attitudes, and behaviours through the introduction of activities situated outside of the formal curriculum in textile conservation, a post-graduate academic and professional skills programme. The study involved students across two year groups, teachers, and a graduate of the programme. Evaluation of student perspectives indicated that the conscious introduction of a learning and teaching model with extra-curricular activities led to changes in the ways they engaged with issues of environmental sustainability. Sharing, collaboration and a supportive environment was central to successfully developing and maintaining environmentally sustainable approaches forming part of their routine decision making. Informal extra-curricular activities transcended formal curriculum boundaries creating a holistic approach to conservation practices with an environmentally sustainable mindset. However, balancing such activities alongside the formal curriculum needs to be carefully managed to ensure students can meaningfully engage without added workload pressures.

Keywords

conservation, values, collaboration, environmental sustainability, learning

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Introduction

Addressing issues around sustainability are challenging not only because of their scale but also because they are wide ranging in their scope and goals which encompass society, environment and economy, making it a complex landscape to navigate for students and teachers. The word transformative (empowering learners to change their perspectives) resonates in UNESCO (2020) education for sustainable development (ESD) documents, which make it clear that action is essential to enable change. UNESCO (2020, p. 8) promote the need for changes to the learning environment to "enable learners to live what they learn and learn what they live". This is informing teaching approaches although Vogel et al. (2023, p. 3) note in their literature review that the focus is often on the complex problems rather than solutions creating "a wide gap between sustainability concern and sustainability action." They describe the importance of changing knowledge, awareness, and intent (readiness to act) into action.

Of interest for the framing of this paper is a learning model from Gajparia et al. (2022) for reimagining the learning environment in this context as encompassing learning about sustainability through classroom practices, learning for sustainability through pedagogical approaches and learning as sustainability "link[ing] intention and values to practice and behavio[u]ral change" (p. 5). Sipos et al. (2008), similarly described by Sterling (see Holdsworth & Hegarty, 2016), frame transformative learning practices through the three learning domains encompassing interaction of the cognitive domain (head) as means of engagement, affective domain (heart) underpinning enablement, and psychomotor domain (hands) as a means of enactment. Shephard (2008) and Bryne (2016) highlight how affective values and attitudes connect knowledge and behaviours in the context of sustainability education. However, affective values tend to be less often evaluated in comparison to skills such as knowledge, understanding, and competencies although they are a core aspect of learning as part of ESD (Shephard, 2008) and studying this through student perspectives is a valuable means to explore this further.

This paper will examine factors influencing student perceptions of environmental sustainability values, attitudes, and behaviours through the introduction of activities situated outside of the formal curriculum on a master's programme in a cultural heritage setting. These activities focused on enhancing environmentally conscious resource use in textile conservation (primarily relating materials/resources we buy, use and dispose of) as well as systematic and integrated sustainable approaches related to managing heritage conservation spaces (for example protocols for best practice and pest monitoring). The activities built on one lecture on environmental sustainability already embedded into the curriculum as the starting point and used extra-curricular activities as a means to engage in environmentally sustainable values and approaches beyond the lecture. Many studies on pedagogy present reported data or theoretical discourses rather than inclusion of the student's own voice in post-graduate education, highlighting an important gap (Rodríguez Aboytes & Barth, 2020). The authors wanted to explore the student values, attitudes, and behaviours through their perspectives to better understand factors influencing their ability to engage (enablement) and their actions (enactment) in terms of environmentally sustainable practices. The authors recognise that learning about one dimension of sustainability in isolation is not sufficient to be necessarily transformative in itself (UNESCO, 2020) but focusing on environmentally sustainable practices in this study provided a lens through which to begin to reimagine the learning environment to engage with issues of climate change.

In this paper, we will describe the design and development of the learning and teaching model with extra-curricular activities before discussing the student perspectives and present an evaluation of our findings. An aspect of this study has previously been reported in a publication for ICOM-CC (professional practice conference) which discusses ways in which heritage conservation can engage with the environmentally sustainable agenda as part of our ethical and critical thinking promoting changes in our conservation practices (Herriges & Thompson, 2023). This paper provides a complementary view of the study through a discussion of student perspectives.

Context

The MPhil Textile Conservation at the University of Glasgow (UofG) is both an academic and professional skills programme that prepares students to work as conservators in the cultural heritage sector. It is a two-year taught programme with a small student cohort (eight students per year) and it focuses on the theory and practice of textile conservation which includes a significant hands-on component (practical conservation treatment activities). Within the conservation profession, there is an ethical responsibility for conservators to commit to environmentally sustainable practices (de Silva & Henderson, 2011; Institute of Conservation, 2020). Herriges' research (2020) looked at environmentally sustainable practices in the textile conservation profession and found that they were limited and variable in their implementation. Prior to developing this research, teaching on the programme consisted of a single lecture that introduced concepts of environmental sustainability. Students come to the programme with a wide variety of backgrounds from both the arts and sciences and they tend to have little or no background of sustainability concepts or practices in their first degrees. Teachers on the programme were aware that this was limited in scope and did not consider wider ESD approaches beyond this session. As commented in a literature review (Vogel et al., 2023, p. 6), "a single one-shot sustainability course is unlikely to bring the transformed mindset and competencies needed to contribute to systemic change". They conclude that for meaningful progress in sustainable practices, a more holistic approach to promote understanding of sustainable development is needed, and to create settings where transformative learning can take place. As part of the development of teaching practices, there is increasing prominence within the ESD literature on pedagogy focusing on promoting opportunities for transformational learning contexts and we are seeing an essential shift to engaging with the 'how' of teaching (learning for sustainability) rather than only the 'what' (learning about sustainability) with expert-led content focused courses to develop sustainability teaching practices (Sandri, 2022). Knowing where to start, as well as a perceived lack of knowledge in this arena (also noted by QAA & AdvanceHE, 2021; Sandri & Holdsworth, 2022; Wuebold et al., 2022) provided the motivation for this study.

The authors, a teacher and a former graduate of the programme (who was working and researching on sustainability in the context of cultural heritage), ran a pilot project in the year 2020–21 involving first-year students. It involved a series of workshop style discussions as part of the practice-based courses focusing on conservation treatments. This prompted both students and teachers to begin to think about sustainable conservation practices in a practical (actionable) way. For example, when students were learning about wet cleaning of historic textiles, the implications of the use of resources during these treatments were debated. In addition, students began to suggest other ways

that we could think about environmentally sustainable practices more broadly and were keen to collaborate in order to build on the pilot project. It was clear that there was an appetite from the students to consider ways to enhance their sustainable practices across the programme and we saw the potential benefits of working with students as collaborators (Herriges & Thompson, 2023).

In professional skills settings there is the natural opportunity to embed sustainable approaches through practice both in and out with the formal curriculum. The pilot project had indicated that while discussion about environmental sustainability within courses was important, it also needed to transcend these courses to foster environmental sustainability as a core aspect of practice and the authors were keen to explore the benefit of developing activities that ran outside of the formal curriculum.

Positioning sustainability with the curriculum

Stand-alone courses outside the curriculum have been used where sustainability may not be accessible to students as part of their degree, so they are often offered as part of elective courses or to provide informal ways to engage in sustainability practices. In a survey of conservation and cultural heritage programmes, Wuebold et al. (2022) found that sustainability practices were incorporate in programmes through both formal and informal aspects of the curriculum. Vogel et al. (2023) caution that extra-curricular activities risk disassociating sustainability from the disciplinary learning and that they have the potential to be considered of less value by students, so not prioritised, and are likely to be less enduring. However, they found that they can deepen learning and they were more likely "to be transformative if they are interdisciplinary, transdisciplinary and designed to reinforce each student's degree specialism" (Vogel et al., 2023, p. 10). This can be seen in service learning opportunities such as that described by Dhivvya et al. (2019) who report on the value of community sustainability outreach activities within a university setting committed to a value-based education context encompassing ESD. In their study, activities were linked to the academic curriculum and they were also part of wider university activities which was aiming to develop life-long learning skills and civic responsibility. It involved students committing an hour a week to the activities which they found led to the development of a range of skills and aptitudes (both academic and personal). Armstrong et al.'s (2016) research, and also noted by Holdsworth and Hegarty (2016), show the value of a holistic (whole person and whole institution) approach to sustainability.

Textile conservation is an interdisciplinary profession that combines the arts and sciences bringing together different disciplinary perspectives within the learning context, so it naturally engages with different stakeholders and views. Situating learning in real-world, meaningful, and creative contexts, learner-centred pedagogies are particularly valuable in developing sustainability focused practices (for example, the skills of problem solving, reflecting on practice, and learning from each other) which are central to addressing the complexities of sustainable development (Byrne, 2016). This has obvious resonance in professional and practice based programmes as these settings can readily provide the real-world context for learning to live and work sustainably as study and professional practice are closely aligned.

Methodology

Study design

Building on the work of the pilot project, the authors were awarded funding through the University of Glasgow's Learning and Teaching Development Fund (LTDF) to evaluate the effectiveness of introducing environmentally sustainable practice opportunities through extra-curricular activities on the MPhil Textile Conservation Programme. Some of the details of the study have been described previously in Herriges and Thompson (2023) but they have also been included here to provide necessary context. Central to the development of the study was a recent graduate of the programme (one of the authors of this paper), who is engaged in promoting sustainable practices in conservation in their professional role with an international context through their work as a regional manager at the International Institute for Conservation (IIC) and an associate editor for reframing conservation through sustainability for News in Conservation (NIC). Working with partners is recognised as an effective way to promote transformative learning, translating knowledge, awareness, and intent into action (Vogel et al., 2023). Partnerships can take many forms such as working with internal and external communities, professionals and other expert groups (QAA & AdvanceHE, 2021, p. 28). Collaboration and co-creation with non-university partners has been found to be valuable as part of co-design and co-dissemination, particularly in an interdisciplinary and transdisciplinary context (Horn at al., 2023; Mauser et al., 2013). In this context, co-author Herriges was invited to act as a facilitator to promote best practice, and to act as a role model providing a bridge between study and work.

The learning and teaching model presented here drew on the design of the pilot project (for example, using workshops as opportunities to link environmental sustainability concepts to conservation practice) but additionally included the introduction of extra-curricular activities and involved first- and second-year students collaborating. Exchange between year groups as well as within each year group was also embedded in the learning and teaching model design. This was influenced by the ideas of co-creation in learning and teaching practice approaches which have gained much traction over recent years in learning and teaching more broadly (e.g., Bovill et al., 2011; Bovill et al., 2016, Bovill & Woolmer, 2019) as well as specifically in the ESD arena (Vogel et al., 2023). Opportunities to articulate multiple and diverse views is also recognised as important when addressing 'wicked problems', so-called because of their interconnected, disorderly, and socially complex nature, meaning that they have no single or definitive solution (e.g., Brown et al., 2010; Lönngren & van Poeck, 2021).

The study ran from October 2021 to May 2022 and involved 13 students, four staff members who taught on the programme, and a graduate of the programme. A broad framework for the learning and teaching model developed had four key elements –

1. Contextualisation and knowledge sharing
2. Activity design and implementation
3. Sharing and wider engagement, and
4. Reflection on conservation practice

The learning and teaching model can be seen in Figure 1 (cited in Herriges & Thompson, 2023). Underpinning it was the idea of a cycle and renewal providing opportunities to build on the knowledge, skills, and practices of the more experienced group. This

recognises that an environmental sustainability agenda is likely to be an ever-changing context without a single or definitive solution acknowledging its 'wicked' element.

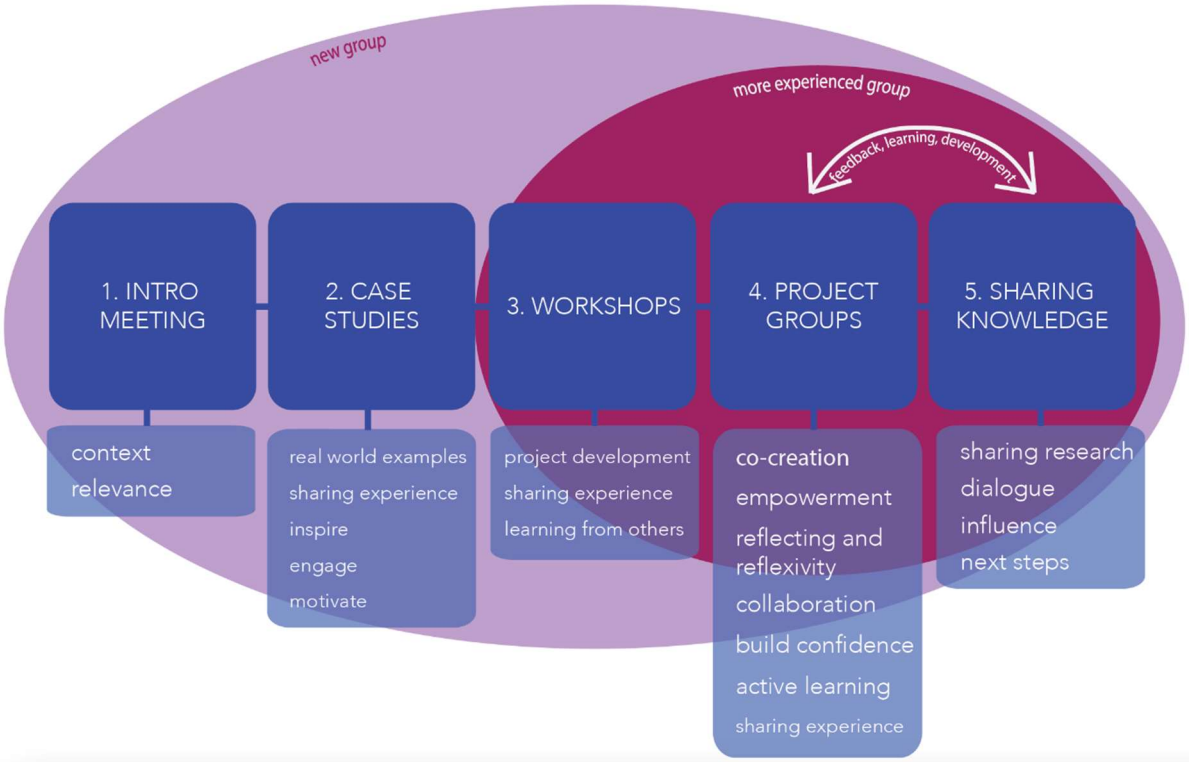

Figure 1. Learning and Teaching Model used for the project. Originally cited in Herriges and Thompson (2023).

The initial stages involved the first-year students as a means of providing context and an opportunity for knowledge sharing as a starting point. It involved workshops introducing general concepts relating to environmental sustainability, its place within the wider ESD context, and its relevance for their professional conservation practice. This was followed by case studies using real-world examples to illustrate environmental sustainability in conservation practice and more broadly providing an opportunity for students to share their own experiences and gain awareness of different perspectives within the group. Second-year students had engaged in similar introductory workshops in the pilot project the previous year (as first-year students).

The second stage involved first- and second-year students working together. Through workshops, students from both year groups, teachers, and co-author Herriges worked collaboratively to design four extra-curricular activities to engage with environmentally sustainable conservation practices that could be worked on over the academic year. The learning and teaching model design provided regular opportunities during the year for the groups to meet to share experiences as they developed their individual activities.

Some of the activities identified through the workshop discussions involved new initiatives and others built on existing conservation practices in the programme to include an environmental sustainability focus. They related to textile conservation and laboratory practices more broadly to enhance sustainable processes and resource use and environmental monitoring procedures. The design of the extra-curricular activities

was left open to individual groups to shape. Each group involved two to four students with a teacher working as partners on each activity. The teachers acted as team members helping to implement activity goals as well as facilitators. Co-author Herriges joined activity updates and supported resource development during the year.

The four areas of activity identified through workshop discussion, outlined below, varied in content and focus.

- Resource bank to provide information about environment sustainability processes within the department. With the programme being based in a multi-user space (Kelvin Hall, https://www.glasgowlife.org.uk/museums/venues/kelvin-hall), the group were keen to develop practices complemented existing protocols. Meetings with key stakeholders outside of the programme (e.g., building managers) formed part of the work. A wiki was created as a central resource for staff and students to provide links to protocols and publications relating to environmentally sustainable practices.
- Laboratory Efficiency Assessment Framework (LEAF) (University of London, 2024). This is an established framework to evaluate and improve lab environmental practices. This enabled the group to work with a wider practice setting as a means to enhance the management, resources use, and the safe disposal of chemicals.
- Identifying sustainable use of materials for conservation treatments. This activity was developed to evaluate the nature and extent of waste created during conservation treatments as a starting point in determining where conservation practices could be meaningfully improved.
- Pest and Environmental monitoring procedures, which built on existing conservation practice which had become rather decontextualised. The group wanted to focus on developing a better understanding of environmental factors within the teaching space, identifying issues and areas for development.

Other outreach and sharing activities were also developed during the course of the study, outlined in Herriges and Thompson (2023), that provided opportunities to engage with other students and the profession beyond the programme.

Data gathering

In order to evaluate the student experience from their perspective, data were collected using focus groups at the start and end of the study (October 2021 and May 2022). The data were evaluated using qualitative methods, and examined values, attitudes, and behaviours of the textile conservation students engaged in these extra-curricular activities.

The research received approval from the University of Glasgow College of Art Research Ethics Committee in August 2021 (Ethics Approval no: 100200004). The students were all enrolled full-time on the MPhil Textile Conservation programme and comprised UK and international students. Twelve of the 13 eligible students participated in the feedback. The focus groups were carried out remotely using the institution's approved video conferencing platform Zoom and recorded to create a transcription of the discussion. Separate focus groups were held with first- and second-year students because the authors were keen to understand how the different year groups engaged with the activities, particularly as the second-year students had been involved in the pilot project so they had prior experience. Although the discussions were initiated through planned

questions, the social interaction within each group further directed their focus, interpretation of the experience, as well as providing an opportunity to respond to each other's comments making different connections. This interaction enabled the participants to bring out what was significant and important for them and share different viewpoints influencing meaning creation. This was an important part of the process of generating the data and provided a supportive space for discussion within the group (Bryman, 2016).

The authors of this paper acted as facilitators for the focus groups. In this role, we recognised that we had the potential to influence the participants through our interactions within the focus group discussions. This was particularly relevant as we had helped shape the student journey and we were part of their lived experience during the study and one of the facilitators was also their teacher. Our understanding of the context was important but there was a risk that some participants may feel inhibited to speak openly. In order to address these potential issues, we provided clear instructions at the start of the discussions and maintained an objective presence. We explained our role as chairs to ensure that the discussions did not digress too much from their main focus (Fallon & Brown, 2002).

The focus group questions had a slightly different emphasis at the beginning and end of the study to help to understand changing perspectives. At the beginning of the study the first-year students were asked about their awareness and experience of environmental sustainability, its relevance for conservation and suggestions for how we could include this in textile conservation. Second-year students were asked about learning gained from the pilot project, ways they intended to apply environmental sustainability in their conservation practice at university, and any challenges they could identify. At the end of the study both groups were asked about the effectiveness of workshop and extra-curricular activity design, their application of environmental sustainability approaches to conservation practice on the programme and beyond, challenges to implementation, as well as working with and influencing others.

Participants

Students were invited to participate using a channel created for study in the Microsoft Teams platform, where the participants had access to the information sheet and consent form. Although participants comments have been anonymised, the small cohort means that anonymity cannot be guaranteed. Student involvement in the study was voluntary. One student participated in the activities but chose not to take part in the focus group.

Data analysis

The researchers adopted a constructivist epistemology drawing on meaning attributed by the participants as central to the interpretation of the data. Data analysis was an inductive process that reflected the content of the data, relying on a descriptive analysis of the data using semantic codes as part of theme interpretation (Bryne, 2022).

Analysis of the data was carried out following Braun and Clarke's (2019, 2023) reflexive thematic analysis process. The analytic process began with researchers listening to the recorded focus groups repeatedly, as well as reviewing the transcripts and notes, to immerse ourselves in the responses from the groups. Inductively, themes were shaped from interpretation of data alongside our experiences of working with the students. The categories and themes were discussed, regrouped, and reviewed again by the researchers. Through this recursive process alongside further reflection, the scope and

focus of the themes were developed. The thematic data analysis enabled the researchers to interpret three themes that were influential in interpreting student perceptions of environmental sustainability values, attitudes, and behaviours through the introduction of activities situated outside of the formal curriculum.

Results

The three themes interpreted from this data are: 'sustainability narratives', 'sustaining collaboration', and 'sustainable people-centred context', and are represented in the thematic map (figure 2) showing how patterns of meaning were created.

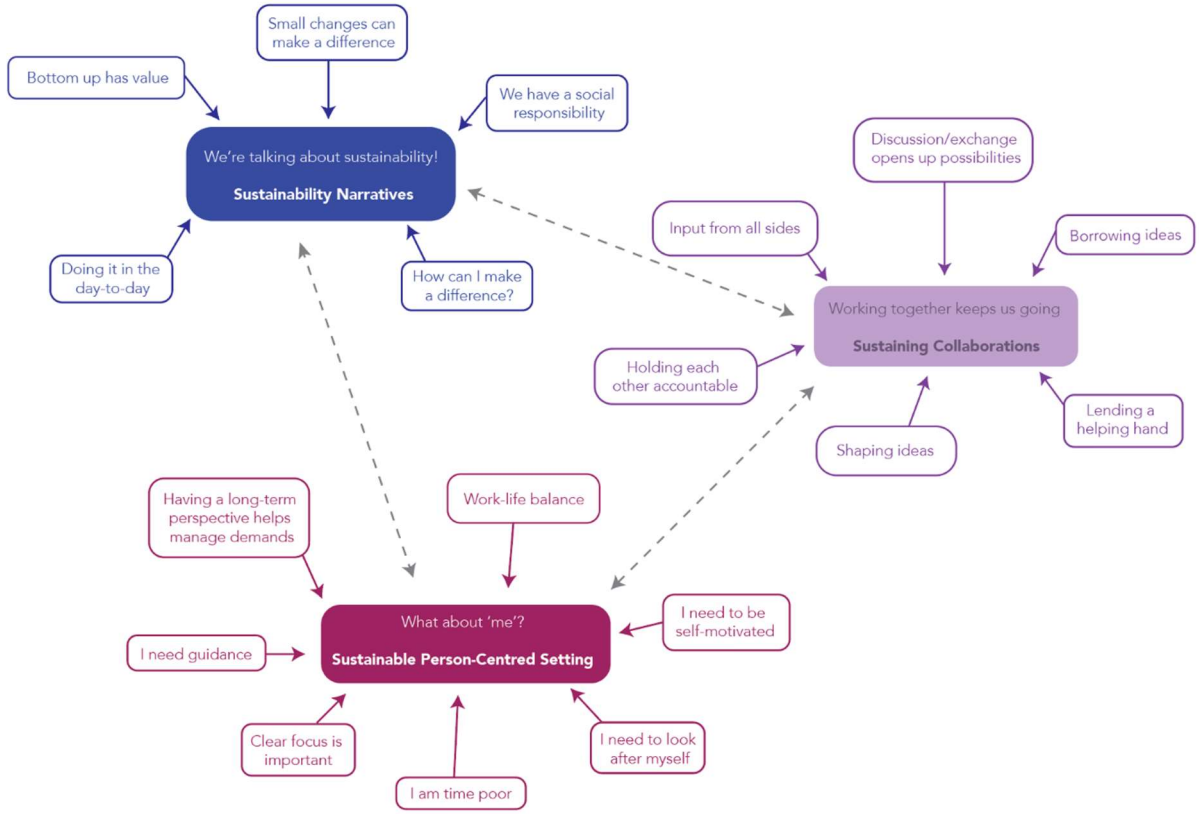

Figure 2. Thematic analysis map representing the themes interpreted from the data.

The following discussion of the interpretation of the results are presented with extracts from the focus groups. (Note: Key for student quotations - Focus group month (Oct or May)/Student Year (1 or 2)/Student identifier (a-l).)

Sustainability narratives

The theme 'Sustainability narratives' provided insight into the values and attitudes of the students and factors which influenced their engagement with aspects of environmental sustainability. It was characterised by the stories students told in terms of their past and present experiences as well as showing motivations, potential barriers, and changing views.

Student perspectives

These narratives provided a valuable starting point for the discussions as well as informing the design of the extra-curricular activities. Students were open to sharing

ideas and impressions during the introductory workshop discussions. They were invested in issues of environmental sustainability but at the start of the study some first-year students perceived their ability to have an impact on change as limited, or even futile, seeing any differences they could make as insubstantial or ineffectual. This feeling of disempowerment meant some students were reluctant to get involved which was initially a barrier as demonstrated by one student comment:

> I'm not saying that tiny changes don't make a big difference, [...] through tiny changes, we can achieve a lot, but I think [...] the majority of the impact that we're having on the planet comes from major [organisations], like big entities big business manufacturer[s], [...] I don't want to sound [...] like depressing [...] but like I think it's [...] something worth considering. (Oct/1g)

However, some students believed that they could begin to make a difference:

> It would be amazing if those [...] bigger issues [...] were dealt with directly, but I feel [...] we're at a point now where we can see that that's not happening and so maybe it's okay to work from the bottom up. (Oct/1b)

The student comments show the need to be aware of the experiences they bring especially when dealing with such emotionally charged subjects (Singer-Brodowski, 2023) which is particularly pertinent in this context as the students had a vested interest in sustainability beyond the education context. However, some students recognised the value in difference: "All being on an equal playing field and all coming at it from different angles, so [we're] all kind of having micro influences" (May/2a).

Barth (2013) writes about this in relation to engagement and highlights how dissatisfaction is often a motivator for change. Acknowledging both positive and negative values and attitudes helped to gain a better understanding of students' different perspectives especially as a starting point.

There was a difference in the narratives between the first- and second-year students and these changed during the course of the study. At the beginning of the study, first-year students recognised the sustainable choices they made in their day-today activities (such as consumer choices and recycling) but they were less confident about putting these into practice in their conservation roles, especially in the early stages of their training, as would be expected. They recognised that this would change as part of developing their conservation practice: "I feel like it might be easier to think that way as a conservator once [...] I understand the kind of treatments and materials that we use a lot more" (Oct/1f).

Second-year students, having a year's experience on the programme and involvement in the pilot project, were keen to suggest ways to shape the activities and put sustainability into conservation practice, focusing ways they could employ a sustainability mindset in their practice more confidently as well as suggesting adaptions to existing assessments. For example, students identified ways to embed environmental sustainability into their conservation practice through their choice of materials and by reflecting on practice as part of their assessed professional reports:

> The biggest difference [to our conservation practice] was to think more about reusing materials, not that I didn't do it before [the pilot project], but it was more present in our discussions, definitely for materials I think [it] was more natural after the discussions. (Oct/2b)

> Reducing use of solvents, could we maybe try to do a checklist when we're planning our treatments being like 'have you considered using other materials?' Or 'have you considered looking [in] the scrap box?' Maybe a little reminder while we're planning a treatment. (Oct/2d)

> "Include] as a prompt [...] to things like after treatments in our reports. We would include like a short reflection [...] It doesn't have to be [...] 'your treatment [was] perfectly sustainable,' but maybe it's [...] 'what are your thoughts on sustainability', 'what occurred to you during your treatment' that kind of thing. (Oct/2a)

Some students were asking questions about the wider perspective too: "It's the capacity for reuse and maybe that's an important starting point: I need to buy materials that are going to fulfil this purpose, but actually [consider] what is their capacity beyond that purpose?" (Oct/2a).

Learning and teaching contexts

Many students noted that the use of case studies and workshops discussions were valuable for generating ideas especially at the early stages of engaging with questions around sustainability. Classroom discussions helped provide the opportunity to explore the question of sustainability in more detail: "I think [real-world examples] makes [it] more tangible [...] I started to consider other possibilities" (May/2b). They were able to see these in relation to wider professional values: "It's all part of our ethical responsibility as a conservator" (May/1c).

Even at the start of the study, students recognised the need for self-directed and self-regulated practices as part of their learning too:

> I think it requires a lot of self-motivation, also to build a gap in the knowledge of understanding exactly what the environmental impact of water usage is, and how [...] that compare[s] with other things [...] I think it's about motivating yourself to fill in that gap in your knowledge [about] [...] the impact. (Oct/1c)

They commented on the importance of opportunities to building on their own interests as part of the activities:

> Having an interest already that we could then research further and within the context of the project [activities] has been really interesting and is definitely a good way to look at sustainability [...] having the option to look deeper into an area of sustainability was a good way of researching with an end goal. (May/1b)

Self-direction and the application of environmentally sustainable practices in other contexts provided a valuable opportunity to develop meaningful real-world activities which were motivational. Vogel et al. (2023) identified this in other studies.

By the end of the academic year, students from both year groups were more able to suggest ways to apply sustainable values beyond their own personal consumption and behaviours to think about applying more systemic changes to their conservation practice (Holdsworth & Hegarty, 2016). They were questioning established practices in their studies and integrating more sustainability-focused decision-making and problem solving, reflecting a change in confidence. For example, once they had learnt about the process of dyeing fabrics, which was part of the formal curriculum, they began to consider how (and if) they could make this process more sustainable by using less water in the preparation of dye stock solutions. Barth (2013) similarly found that where such informal activities had become a routine part of practice, they could be readily applied to new routines, providing a space for innovation and address new contexts "pro-actively" (p. 168). This has parallels with other studies where sustainability is embedded in the curriculum with students leading the way through their practice and research, e.g., Wuebold et al. (2022).

Recognising change

Some students were able to explain how their attitudes and behaviours were changing, which shows a cognitive awareness which is important as a means of engagement. Once again, the students were identifying ways to bring this thinking into the formal learning contexts within the curriculum in their conservation practice courses:

> When you first do it, you're just doing but with more practice one starts to understand that more, and know what can be changed in order to make the whole thing most sustainable. (May/1b)

> I think now I'm more prone to consider simpler solutions instead of going [...] all these instruments to use or chemicals. I think [...] for my current [conservation] treatment, it always ended up that the simplest solution and method was the right idea and actually more sustainable as well, so I think that's the realisation I had. (May/2e)

With increasing knowledge and understanding of their conservation practice, students were able to apply environmental sustainability values to their work more confidently and critically inform their decision making. This have similarly been found in other contexts (Armstrong et al., 2016). These formal and informal learning spaces provided opportunities for a "reflexive process of learning" (Barth, 2013, p. 167), which is key to developing behaviours to enable change. The importance of the development of students' critical thinking and reflective practice as part of the learning and teaching context is also noted by Sandri and Holdsworth (2022). Other studies have found that critical reflection about decision making and behaviours through place-based contexts is more likely to affect student beliefs than focusing on content/knowledge alone (Felgendreher & Löfgren, 2018). Here, students took the opportunity to apply sustainability thinking in their conservation practice beyond the extra-curricular activities, demonstrating the transferability of values and attitudes to wider practices and greater confidence in their ability to make changes. As Vare and Scott (2007) suggest, sustainability is difficult to measure as it will be impacted by the unpredicted decisions of others, but we observed changes in motivation, critical thinking, and recognising the need to take responsibility for decisions and actions.

By providing opportunities for developing environmentally sustainable practices through the extra-curricular activities, students were aligning values and attitudes in other aspects of their work. They provided a natural space to engage practically across the curriculum. Learning developed in an informal setting naturally found its way into the formal curriculum. This softening of boundaries between the formal and informal learning environments provided a holistic approach to developing conservation practice that transcended individual courses. Recognising that students bring different perspectives and values to the activities is important to understand informing how individuals may engage and possible barriers so these can be sensitively managed.

Sustaining collaborations

Working together in collaboration, talking to each other, and learning from and influencing others were seen as central for generating ideas and helping students incorporate environmentally sustainable values in their conservation practice both as a source of inspiration and as motivation. This context helped to support the potential for transformative processes that could lead to long-term change. 'Sustaining collaborations' acknowledges the value of working together, dialogue and social learning as both nurturing, nourishing and strengthening.

Social learning

Developing activities together was mentioned by participants as an effective and supportive way of working towards embedding sustainable values into daily routines, especially when students are new to conservation practice. Collaboration was highlighted as a way to carry out even simple tasks with a sustainable mindset. Action was clearly evident here and students felt able to influence others showing a sense of trust and the value of common goals:

> [During] the gel session [...] [a workshop as part of an advanced skills practical course], we [...] [were] really good with cleaning up. We were all doing it together, so we weren't really wasting water, because we did it all in one go rather than everyone talking in separate rooms. (Oct/2d)

> I think actually what's more effective at getting us to turn off the lights is holding each other accountable. (Oct/ 2a)

Dissemination and knowledge exchange took place through informal conversations during day-to-day interactions as well as informal meetings. Sharing progress on different activities, as well as highlighting other work taking place, opened up new opportunities to engage with each other: "I would say that [another student's dissertation] research was really great because [it] personally made me realise I shouldn't take for granted our recycling facilities for chemicals or materials" (Oct/2e).

One of the outreach activities (see Herriges & Thompson, 2023) provided the opportunity for the students to meet up with students from another conservation programme to share their approaches to sustainability: "I thought the signs [information posters] that the Cardiff department were showing [were] sort of being eye catching and engaging, I thought that was really cool" (May/1e).

The students also expressed enthusiasm for interacting in the future with other courses and networks to develop their thinking and share practices through transdisciplinary

opportunities within UofG: “We could get the word out [about] what we’re doing by interacting with other science-based courses, maybe to see what they’re doing” (May/2d).

It was evident that opportunities for discussion and exchange were essential for the students’ motivations and engagement. There was a sense of collective ownership, comradeship, and the notion of ‘a big society’ that emerged across within and across the year groups, and the students were keen to support the sense of community they had begun to form across the programme. As the first-year students gained confidence, they were keen to offer support to other students moving forwards and build connections:

> We’ve done a bit of groundwork, and I think definitely next year [...] we could definitely help the new first years [...] based on what we found out this year. (May/1b)

> Maybe [new students] will have new perspectives, so I guess getting to know them first and maybe having a discussion with them. (May/1c)

The extra-curricular activities created spaces for students from different year groups to work together. Social learning was central to the overall teaching design, and this was realised with students collaborating across and within year groups. The value of working in collaboration within disciplines (Wuebold et al., 2022) and across different disciplines (e.g., Sandri & Holdworth 2022; Yarime et al., 2012) is highlighted in a number of case studies as an important driver in developing successful practice in the ESD context. The development of a community of practice (Wenger, 2010) was evident within which individual perspectives were combined to create a collective approach with the hope of developing long-lasting measures through group discussion, sharing of resources, and encouragement. Key elements of partnership as defined by Cook-Sather et al. (2014) were evident, such as trust and respect and shared power, risks, and learning (p. 6).

Co-creation

These extra-curricular activities were not examples of co-creation in the curricula as defined by Bovill and Woolmer (2019) where students co-create learning outcomes and assessments as a formal part of learning. However, this student-teacher-graduate partnership was central to the activities design and continuity and there was a clear sense of student voice through an exchange of ideas, and they were instrumental in shaping the activities:

> The ideas for each individual groups’ [activities] came from your [teachers’ and graduate’s] end but what [the activities] were actually going to be [was] more influenced by the students. It was kind of a co-creation, because you had input from all sides [...] maybe it’s kind of interpreting the theme that comes up from this end [the students] and it kind of does the back and forth cyclical thing. (May/2a)

The language around co-creation in the curriculum has useful resonance in this context. Students took on different roles as the activities evolved, such as that of co-researcher, reflecting aspects of co-creation (although this was not directly articulated by them). As was evident in ‘Sustainability narratives’, harnessing the knowledge of students and their interests creates room for developing decision-making through opportunities for shared leadership.

Collaboration, and the supportive environment this created, enabled the students to begin to take ownership of the choices made and feel more confident to act. A community of practice that began to emerge helped the students to feel more open to engaging with others even beyond the programme. It was interesting to note that when the students talked about collaboration during the course of the activities, they only referred to the student body. Negotiating clear expectations of roles and responsibilities at the beginning of the activities may have helped to clarify the centrality of student roles and the opportunity for ongoing collaboration with teachers and other professionals through the course of the activities and not just in their initial development.

Sustainable people-centred setting

Student wellbeing and support underpinned the theme of 'Sustainable people-centred setting'. This recognises that for steps towards implementing environmental sustainability approaches in conservation practice to take place required a people-centred approach.

Setting expectations

The establishment of clear expectations was commented on by several students as described here:

> A better understanding of what's expected of us in the project [activities] [...] I'd be able to maybe manage it better [...] I didn't really understand [...] the outcomes, or how can we be more sustainable, [...] having [...] maybe more [...] immediate tangible outcomes would have been helpful [...] I felt a bit lost. (May/1f)

The organic and open approach taken in the development of the extra-curricular activities used in this study was found to be too unstructured. Some students felt overwhelmed at times and they flagged up the need for clearer expectations (goals) and more explicit guidance at the beginning of the activity development. This desire for teacher guidance is similarly noted in other contexts where students are working more independently and at the early stages of the development of activities, especially in more self-directed learning contexts and to support the development of self-regulated practices (Thompson & Dale, 2022). The need for teachers to act as facilitators was found to be necessary. The realistic scale and scope of the activities was important to ensure achievable outcomes in this context. Similarly, Sandi and Holdsworth (2022) comment on the need for higher levels of teacher engagement and creating trust to support students in developing their own views where problems are open-ended and complex.

Workload implications

The extra-curricular activities created additional workload for students and this was a concern that several of them raised both informally and through the focus groups. It was keenly felt by the postgraduate taught (PGT) students and has implications for future teaching design:

> It's difficult with the intensity of the programme as we seek these opportunities and actually [...] sustain them, like keep going. (May/2e)

> I think, having a specific project [activity] related to our interest[s] helped to focus on one aspect of sustainability, otherwise we'll be all talking [...] [about] a bit of everything, but not being able to organise actions, so I think it's good in that sense [...] But I would say that the

> [activity] we kind of created with the suppliers' list [sourcing materials which included information about their sustainability credentials] was too big for the amount of time that we have outside of the lab and especially after the last semester [referring to courses and assessment workload] when we were most tired. (May/2b)

Although there was a recognition that committing to sustainable practices takes time and effort, there was still a desire to make a difference: "I think there's opportunity out there. I think we just have to seek it and put effort into it" (May/2d).

The extra-curricular activities provided valuable context, but there needs to be realistic and achievable outcomes within the given timeframe. As well as being able to ensure continuity, an important part of 'Sustainable people-centred setting' requires the establishment of realistic expectations and awareness of the demands on students' time for the students' well-being. This is particularly relevant in this context with good health and wellbeing being one of the United Nations (n.d.) Sustainable Development Goals. Academic and professional skills programmes often involve extensive workloads, especially at PGT level. Several students highlighted the need to balance the expectations for contributing to these extra-curricular activities with their formal programme of study. Their perspective here is essential as they feel the impact of workload in this context keenly. Concerns have been voiced about workload on other programmes and suggest that embedding the development of sustainable practice within courses (and possibly also assessments) where appropriate, would help students to manage their workload (Wuebold et al., 2022). However, some students did suggest some practical solutions:

> I think [there were] [...] three or four weeks [...] [where] we regularly meet up on Wednesdays, and we had [...] an hour to start an action or to think what to do and to discuss and had ideas [...] I think that worked well. (May/ 2b)

> I think it's definitely [...] more of a weekly or biweekly [every two weeks] commitment to keep all those connections [...] so you can properly plan events and stuff. (May/2d)

Building in small but regular commitment has been found effective in other studies (e.g., Dhivvya et al., 2019). There is a need to be aware of the impact of extra-curricular activities, specifically the management of workload, as well and managing the teacher role within this in terms of helping to establish manageable goals.

This theme highlights the importance of the role of guidance both in establishing clear goals but also the need for support from the teacher in this challenging context. In addition, the need to create a manageable workload was imperative to avoid over-burdening students to enable the sustainable practices to be enduring. Again, the importance of negotiation setting clear roles and boundaries is important with the students taking an equal role in establishing workable practices.

Implications of this study

This learning and teaching model, with the inclusion of extra-curricular activities and its recursive design, provided opportunities for students to revisit the question of environmental sustainability as their learning develops which can enable them to build on skills over time, deepening the nature of their engagement, as represented in the well-

known concept of the spiral curriculum (Bruner, 1977). The extra-curricular activities provided a valuable context to enable students to develop environmentally sustainable values, attitudes, and behaviours. This is important in professional practice learning contexts where students are required to develop specific context-situated skills that need to be mastered over time, and this is equally important when developing skills and confidences when addressing these open-ended and complex problems relating to climate change. This model highlights the importance of focusing on the 'how' of teaching rather than the 'what', which is important in this context, bringing pedagogy to the fore (Sandri, 2022). However as recognised by others (e.g., Barth, 2013), it is clear that teachers have an important role in helping to sustain activities started by the different groups, and how this is done needs to be built into the learning and teaching development.

Collaboration was central to the effectiveness of this intervention. Establishing roles of the collaborators, whether this is amongst the student group or more broadly with teachers and other partners within the learning context, is important to ensure shared ownership of the design and running of the activities as well as providing a means to identify where guidance is needed. This has the potential to contribute to thinking about co-creation in wider contexts but also support the development of leadership skills. Hull et al. (2018) describe a leadership model in the context of environmental sustainability as utilising distributive, collaborative and adaptive approaches. Making such leadership roles more visible to the students could have been valuable in acknowledging their contribution and further empowering them which is an important aspect of driving change. This is important generally but specifically so in the changing context of ESD (Hull et al., 2018).

Integration of activities between years is an important aspect of the organising concept of this model, enabling the more experienced collaborators to support the less experienced and providing the structure to continue to build and develop practices over time; this is important in this context to address these types of 'wicked problems' which do not have a single answer. Such a model provides a good starting point for developing future projects. Although this context was small in scale, it aligns with new curriculum developments such as vertical integration projects (VIPs) which have been used in ESD contexts (e.g., Strachan et al., 2019). Continuing to explore learning opportunities in this context in new and creative ways are important in this developing ESD landscape.

Nevertheless, this research has highlighted that the workload implications for students needs to be considered in future opportunities. Extra-curricular activities need to be well circumscribed and voluntary so students can manage these alongside other commitments to enable them to maintain a good work-life balance. Embedding environmental sustainability in the curriculum would allow for more opportunities for integration into existing courses and help to manage workload. However as suggested by Singer-Brodowski (2023), the value of these informal learning spaces, situated as they are outside the more structured learning curriculum and without the need to align with assessment, is in providing a valuable space for the development of environmental sustainability activities that are low-risk, offer the opportunity to explore, experiment, and transcend course boundaries.

Limitations

The decision to hold separate focus groups for first- and second-year students did not allow for exchange between year groups as part of the data collection which limited the

opportunity for interpretation of the shared meaning across both year groups. The student cohort was relatively small, and they are on a specialised programme which could be seen to be a limiting factor. The voices of teachers and other collaborators has not been captured here as only the student perspective has been presented in the data.

Conclusions

This paper has described opportunities by presenting a learning and teaching model which included extra-curricular activities as part of its design with students working in collaboration across year groups with teachers and a graduate. By engaging with student voices, this study has shown that it has been possible to gain nuanced insight into student perspectives in values, attitudes, and behaviours which are typically difficult to access. Awareness of these factors has the potential to empower students and teachers in transforming learning opportunities. The student perspective was interpreted through the themes of 'Sustainability narratives', 'Sustaining collaboration' and 'Sustainable person-centred setting' which provided insight into how they engaged with environmentally sustainable approaches indicating motivations, enablers, and barriers to changing practices. It has shown that the teaching intervention led to changes in thinking, decision making, and actions, and through collaboration we can start to address these open and complex challenges presented in the ESD arena. In places of learning, we have an important role to play in providing learning and teaching opportunities for students to engage with many different aspects of sustainability. We present this study as a contribution to this developing agenda.

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