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**Enquiry-based skills education for sustainable development
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Enquiry-based skills education for sustainable development in a UK Geography module as a catalyst for organisational change

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Abstract

Purpose – Higher Education Institutions have a significant role in preparing future generations for the world of work and sustainable development. The paper presents a curriculum model of an Enquiry-Based Learning pedagogy and a sustainable development conceptual context, as a mechanism for teaching skills in a Geography module. Potential influences of this model on organisational change towards integrating sustainable development are explored.

Design/methodology/approach – Following the design and implementation of the curriculum model, semi-structured interviews of the module teaching team were conducted. Thematic analysis was undertaken against *a priori* objectives determined from existing theoretical frameworks.

Findings – Thematic analysis suggests powerful synergies exist between Enquiry-Based Learning, Education for Sustainable Development, and skills teaching. Potential impacts are: (1) conceptual perspectives enhance cognitive potential around systems thinking, (2) learning methods promote behavioural potential around professional capability and agency, and (3) cultural encounters raise affective potential around inclusive curricula.

Practical implications – Findings indicate potential for bottom-up curriculum intervention to:

- enhance individual learner capability and outcomes,
- promote the role of Geography in responsible futures,
- build teaching team capacity for active learning pedagogies,
- influence individual and institutional behaviour change towards sustainability practices, diversity and inclusion,
- catalyse organisational change around sector priorities including integrating Education for Sustainable Development, active learning, inclusive education, and enhanced graduate outcomes.

Originality/value – This paper identifies multiple benefits from a curriculum model combining skills teaching in a synergistic pedagogical and conceptual framework, and its bottom-up potential to catalyse organisational change in Higher Education.

Keywords: Enquiry Based Learning, Education for Sustainable Development, Skills, Organisational Change, Geography

Introduction

Several factors have been attributed to the slow implementation of Education for Sustainable Development (ESD) in Higher Education Institutions (HEIs). These include conceptual, experiential, logistical and financial barriers (Leal Filho, 2011). There are many examples of sustainability

1
2 integration in curricula via top-down strategies, indeed some advocate institution-wide
3 approaches as an essential ingredient for success (UNESCO, 2020). However, in the absence of a
4 holistic approach, curriculum modifications can be superficial, 'bolted-on' to existing structures
5 and perceived as 'extra'. This is compounded if top-down implementation results in a lack of 'buy-
6 in' from academics responsible for delivering curricula.
7
8

9 This paper presents an enquiry based learning (EBL) pedagogical approach that utilises the
10 conceptual context of Sustainable Development (SD) as a vehicle for delivering undergraduate
11 skills teaching in a first year Geography programme. The rationale for this approach is two-fold:
12 First, from a learning perspective, framing skills development within the concept of SD provides an
13 engaging and authentic context for what might otherwise amount to dry and ineffective
14 standalone skills teaching (Allan and Clarke, 2007). The active EBL pedagogy also aims to empower
15 students to take ownership of their learning, and to develop incidental skills in metacognition and
16 self-regulation. Students can also be exposed to potential professional applications for their newly
17 developed skills through authentic sustainability scenarios. Second, the argument for widespread
18 integration of ESD in HE curricula has not yet been fully won and resistance from some individuals
19 and discipline areas remains for a variety of reasons (Cebrián *et al.*, 2015). Furthermore, allegiance
20 to the 'lecture' and resistance to non-traditional, active learning methods also persists in academia
21 (Apkarian *et al.*, 2021). From an organisational perspective, the integration of ESD into a core
22 module delivered by a substantial team provides an unusual opportunity to explore the potential
23 and benefits of this approach as a model for wider integration of ESD. To address the challenges of
24 ESD-integration, this study of a large, first year Geography module at a UK university, explores the
25 potential of this curriculum model both for effective learning, and as a bottom-up catalyst for
26 organisational change in HEIs.
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32

33 **Literature review**

34
35 The literature review provides a contextual synopsis of concepts underpinning the key themes of
36 the research. First, there is an exploration of organisational change towards integrating ESD in UK
37 HEIs. Second, there is a review of literature on links between skills education, graduate attributes,
38 and enquiry-based pedagogy. Following a brief synthesis, the paper articulates the research
39 questions and objectives.
40
41
42

43 ***Organisational change and ESD***

44 Organisational change, at its simplest, is a process resulting in a move from the status quo to a
45 desired or improved future situation (Nelson, 2003). This implies a simple, linear process, but large
46 organisations such as HEIs require dynamic models of change, reflecting the complexity of
47 interactions within the organisational system. Aspects to consider when studying change in an
48 organisation include the distribution of power, skills, information, and lines of communication
49 (Greenan, 2003). Change can be continuous or stepped, planned or emergent, top-down or
50 bottom-up (Brinkhurst *et al.*, 2011), and variable in size and impact (Rosenbaum *et al.*, 2018).
51
52
53

54 Organisational change in HEIs towards SD requires multistakeholder and multilevel stakeholder
55 involvement (Blanco-Portela, 2017). When looking at curriculum aspects, this means that staff
56 working at different levels of the institution ought to be involved (Novawan and Aisiyiah, 2020).
57 Additionally, transformational leadership supports organisational learning, which leads to
58 organisational change in this context (Novawan and Aisiyiah, 2020). Therefore, organisational
59 learning amongst staff focusing on delivery of curricula can support the transition to SD.
60

ESD is a key driver for change that began more than thirty years ago with the Brundtland Commission report (WCED, 1987). Since then, hundreds of new sustainability courses have been developed around the globe, and sustainability has been embedded in many existing courses. ESD encompasses all aspects of curricula including learning outcomes, pedagogy and learning environment (QAA/AdvanceHE 2021), and can be considered both holistic and transformational. Several curriculum frameworks have attempted to identify and shape ESD learning outcomes and competencies (e.g. Brundiers *et al.*, 2021; QAA/AdvanceHE 2021). ESD is regarded as integral to a quality education, and a widely adopted ESD objective is that it “*empowers learners... to take informed decisions and make responsible actions for environmental integrity, economic viability and a just society... for present and future generations, while respecting cultural diversity.*” (UNESCO, 2020).

With increasing urgency, ESD is identified as an important strategic mechanism for achieving the Sustainable Development Goals (SDGs). These are the focus for the UNESCO ESD for 2030 Roadmap which has as its strategic objective “*to promote ESD as a key element of quality education and a key enabler of all 17 SDGs*” (UNESCO, 2020:54). This places more onus on HEIs to integrate effective ESD. In fact, the 2030 Roadmap calls for a whole-institution approach to transforming learning environments, building capacity in educators for the transition to sustainability, and empowering and mobilising young people as key actors and agents for decision-making and change. This aligns with student views that SD should be incorporated into their institutional practices and curricula (SOS-UK, 2021). Nevertheless, there are significant challenges in achieving the scale of organisational change needed for whole-institution approaches to ESD (Farinha *et al.*, 2020).

Building capacity amongst educators has been highlighted as one the key priority areas for ESD by UNESCO (2020) because a major barrier to embedding ESD in curricula is lack of academic buy-in, knowledge and skills (McConnon, 2020). It often comes down to staff championing ESD and rarely from holistic approaches (Menon and Suresh, 2020). Additionally, successful integration of ESD in HE needs to go beyond a focus on the curriculum (Setó-Pamies and Papaoikonomou, 2016). Pedagogical tools and a culture supportive of the integration process need to be considered as well, which requires collaborative approaches between staff for organisational change (Setó-Pamies and Papaoikonomou, 2016). For a more holistic integration, universities need to move from a built-*on* to a built-*in* approach which requires redesigning their systems and operations (Menon and Suresh, 2020).

Organisational changes in the context of SD have been influenced in the UK by specific top-down tools such as policy frameworks, leadership, and internal processes, and external actors such as funding bodies, and the government (Radinger-Peer and Pflitsch, 2017). Given the range of potential challenges arising from top-down organisational change (Brinkhurst *et al.*, 2011), studying bottom-up mechanisms could help gain valuable insights for integration of ESD in the context of HE. Influences on, and drivers of, organisational change in the HE sector are pertinent to this research and are explored further below.

Enhancing graduate attributes through learner-centred pedagogy

One driver for organisational change in HE, closely linked to massification and marketisation of the sector, is the ‘employability’ agenda. This calls for HEIs to produce high quality graduates capable of making meaningful contributions to future economies. Graduates have always contributed to the labour market but previously, the role of HEIs has been somewhat passive. The ‘Dearing Report’ (National Committee of Inquiry into HE, 1997) was a significant catalyst for change in the

1
2 UK, establishing a clear expectation of universities' responsibility for developing graduates' skills
3 and attributes, and enhancing graduate outcomes. Graduate outcomes metrics are now used to
4 signify effectiveness in UK HEIs, and are an important quality enhancement driver.
5

6
7 'Graduateness' is defined by attributes which are captured at institutional level and used to shape
8 curricula and assessment criteria. Curricula have been transformed to embed a wide range of
9 generic skills teaching and Professional Development Planning (PDP). Increasingly, HEIs offer work
10 placements as core course elements, and promote extra-curricular activities and awards
11 (Bridgstock and Jackson 2019). Consequently, the fundamental purpose of HE, motivations for
12 study, and interactions between learners, academic staff, and institutions, have radically changed.
13 Some graduate attributes reflect generic learning objectives (e.g. critical thinking). Other
14 attributes closely align with agreed ESD competencies, complementing a labour market in which
15 portfolio careers are becoming increasingly common (QAA/AdvanceHE, 2021). ESD competencies
16 include systems and futures thinking, multi-disciplinary working, self-regulation, strategic and
17 collaborative problem-solving.
18
19

20
21 The ESD for 2030 Roadmap (UNESCO, 2020:8) requires an "*interactive, project-based, learner-*
22 *centred pedagogy*" empowering learners to take responsibility for present and future generations,
23 modify their values and behaviour, and actively contribute to societal transformation. Graduates
24 possessing these enhanced attributes can be considered global citizens. Fostering such learners
25 requires an approach to teaching and assessment that is flexible, future-facing, globally relevant,
26 active and experiential, collaborative, affective, and enquiry-based (Nicholson and Vargas, 2021).
27 EBL has an active, learner-centred focus that fulfils many of these characteristics and provides an
28 ideal pedagogical framework for effective ESD.
29
30

31
32 EBL embraces a collaborative investigative process around an authentic or real-world, open-ended
33 question or scenario (Randles *et al.*, 2022). The open-endedness promotes unhindered debate on
34 complex, global issues requiring systems thinking. EBL is most effective in a multi- and/or
35 interdisciplinary context as this promotes deep, critical learning and exposure to complexities in
36 SD issues (Warburton 2003). Learning in EBL is facilitated rather than tutor-led, with learners
37 largely determining direction and method of enquiry (Aditomo *et al.*, 2013). EBL tasks stimulate
38 engagement and problem-orientation, drawing on existing and shared knowledge from peers. EBL
39 can promote learner autonomy and self-regulation (Kahn and O'Rourke, 2004), both integral to
40 industry-relevant graduate and sustainability attributes. Therefore, an EBL pedagogy aligns with
41 the fundamental aims of ESD and underpins skills development (Cörvers *et al.*, 2016). EBL is most
42 commonly implemented locally, but there are successful examples of institution-wide
43 implementation (e.g. Scale-Up at Nottingham Trent, UK and Problem-Based Learning at Aalborg
44 University, Denmark).
45
46
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48
49

50 **Synthesis**

51 Review of previous research establishes the need for HEIs to both equip graduates with skills for
52 the future and to build capacity for ESD. However, there remain questions about the practical and
53 pedagogical mechanisms by which these can be achieved. This paper presents and assesses a
54 curriculum model that draws on synergies between enquiry-based skills education within a SD
55 conceptual context in a core, first year Geography module. Key research questions address: (1) the
56 effectiveness of this curriculum model for skills development and ESD, (2) lessons learned for
57 capacity building in teaching teams, and (3) strategic benefits and challenges of this model as a
58 bottom-up approach for organisational change in HEIs.
59
60

Methodology and research design

This study is conducted at a large, modern, post-1992 UK university, focussing on a compulsory first year core module weighted at 15 credits (7.5 ECTS). *Professional Geographer*, detailed by Nicholson and Vargas (2021), is taken by around c.110 students from BSc (Hons) degree programmes in Geography, Physical Geography, and Human Geography, and aims to support the development of academic, personal and professional skills (e.g. academic reading and integrity, communication skills, project design, organisation and time management, digital and information literacy, teamworking, Geography career pathways and PDP).

The learning outcomes align with an assessment strategy comprising a team presentation, an individual academic report, and a professional development portfolio. Students work in small multidisciplinary teams, supported by small group tutorials, to conduct an open-ended enquiry into a global geographical sustainability challenge of their choice. Enquiry-based teamwork in workshops is supported with just-in-time, interactive skills development and teaching around sustainability concepts. The curriculum model uniquely blends enquiry-based ESD to deliver the intended skills development outcomes. The teaching team comprises one Module Leader, Personal Tutors who lead small group tutorials, Workshop Tutors who facilitate the active learning workshops, and Specialist Tutors who provide discipline-specific input into a limited number of workshops. Some Personal Tutors have a dual role and are also Workshop or Specialist Tutors (Table 1).

Table 1: Characteristics and roles of interview participants

Descriptor	No.
Gender	
Male	6
Female	4
Role (<i>first value in parenthesis indicates number with this role uniquely, second value indicates total number for module</i>)	
Module Leader (1,1)	1
Personal Tutor (2,15)	7
Workshop Tutor-Facilitator (2,6)	5
Specialist Tutor-Facilitator (0,3)	3
Personal Tutor AND Workshop Tutor-Facilitator	3
Personal Tutor AND Specialist Tutor-Facilitator	3
Level of Experience	
New to teaching in HE (<2 years)	2
Experienced teacher in HE (2-7 years)	3
Highly experienced teacher in HE (>7 years)	5
Discipline	
Geography (Human)	3
Geography (Physical)	3
Geography (including GIS)	2
Environment (Management, Sustainable Development)	2

The study adopts a qualitative, inductive, grounded research methodology to explore phenomena associated with this curriculum model and to understand its effectiveness and value from the perspective of the teaching team. This focus on the teaching team experience places limitations on

findings because other stakeholder perspectives (e.g. students) are not explored. Nevertheless, it provides valuable insights to help identify capacity-building opportunities within teaching teams, and to assess the value and implications of the curriculum model for wider implementation, strategic benefits and implications for organisational change.

The method chosen was completed within available departmental resources and therefore within the institution's sustainability context. Module teaching staff were considered to be reliable primary sources, and were also viewed as crucial stakeholders in the delivery and development of the module and any wider future implementation. Semi-structured exploratory interviews comprising open-ended questions provide the principal source of data. This method allows the interviewer to follow-up on interesting responses and encourages a flow of open dialogue between colleagues (Saunders *et al.*, 2009). Use of interviews as the sole data generation method is considered appropriate for research intent on representing participants' experiences and perspectives (Roulston and Myungweon, 2018). The rich descriptions provided from an in-depth, qualitative case study can also provide the basis for drawing generalised conclusions that are transferable to a wider set of instances (Schreier, 2018).

Ten 40-60 minute interviews were conducted in-person with a convenience sample of contributors to module teaching delivery covering a range of specific roles and disciplines (Table I). Interviews were recorded, with permission, for later transcription, and at the start of each interview, interviewees were reminded of the module aims and outline. The interviewer was a junior member of the teaching team which meant there was no hierarchical influence on interviewees' responses to potentially sensitive reflective questions (Wang and Yan, 2012). The interviewer was familiar with the module and able to adjust questioning in response to nuances and layered meanings from interviewees (Johnson and Rowlands, 2012).

A small number of short interview questions were developed from the research aims, with pre-empted follow-up prompts identified from the research team's 'inside knowledge' (Roulston and Myungweon, 2018) to probe more deeply, and for clarity. Example interview questions included:

- How do you think student learning has benefitted from working in multidisciplinary teams?
- How might development of students' systems thinking skills influence their future work?
- How has your thinking about students as future Geography professionals changed?
- How has your understanding of SD changed?
- How might you apply your learning about SD beyond this module?
- How can you be better supported to teach using this curriculum model?
- How might this approach be adopted more widely across the programme?

Interview data were analysed in a coding system developed in NVivo (v.11) through systematic and iterative analysis of transcripts. No *a priori* codes were used. Instead, codes were first identified through elemental methods such as initial coding (Saldaña 2016) and included a variety of labels and phrases. Further iterations led to grouping of codes into interpretive *concepts*, then more abstract *categories*, and finally into top-level *themes* (Figure 1), following the Qureshi and Ünlü (2020) instrument for grounded theory.

Results

Selected properties of the three top-level themes identified through iterative coding are explored below and illustrated with examples of verbatim speech from interviewees. Potential for change is

included as a fourth thematic area. Throughout, *'tutors'* is used as a generic term referring to *any* member of the teaching team who participated in interviews.

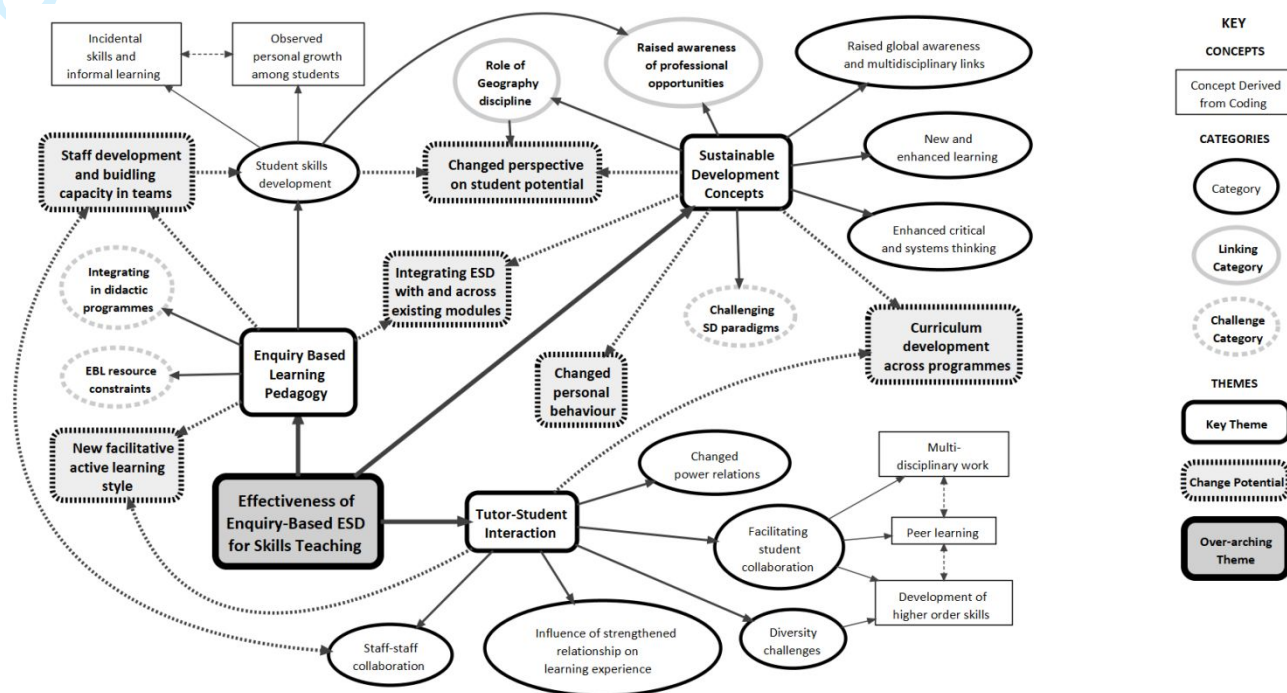


Figure 1: Summary of concepts, categories and themes derived from iterative coding

Sustainable development concepts

Most academic staff contributors tutored and facilitated on topics, chosen by students, that lay outside their areas of expertise. While challenging and discomfiting, this also led to significant new learning. Tutors with little prior knowledge of sustainability gained new understanding, especially in relation to the SDGs:

“I had a really skeletal understanding of the SDGs to begin with... I’ve definitely learned... and we were *all* learning!”

Those familiar with general concepts needed to re-apply their understanding to complex inter-connected systems and more critical perspectives:

“I wouldn’t say my awareness has changed much but the way I have considered [the SDGs] has changed because this module provided a slightly more critical stance of their role...before, I very much taught it as a positive thing without considering the difficulties and challenges.”

Conversely, concern was raised that exploration of the conceptual basis for SD and alternative paradigms lacked depth and that the SDGs were presented in an uncritical framework. This view towards the sustainability ideology, occasionally created internal conflict around communication with students:

“Someone who’s old and cynical like me will say *‘but look at all the examples of people not doing it [SDGs] and the lack of enforcement’*. It’s good that students are aware of that, but I tried not to be too negative.... to get them enthused as much as I could... despite the fact that I had misgivings about the concept. ...I didn’t want to bias them.”

1
2 One tutor was disappointed that students had engaged with non-Geography literature, unaware
3 that integral to a multi-disciplinary, systems approach, this had been positively encouraged. An
4 emphasis on systems thinking enhanced students' grasp of connections between the discipline of
5 Geography, and the economy, environment, and society, three pillars of SD. Tutors felt students'
6 became more aware of the potential for geographical concepts to solve global sustainability
7 problems.
8
9

10 There was a consensus that the module conceptual content deepened students' value of critical
11 thinking skills and awareness of global sustainability issues. Some suggested more students would
12 be inspired to undertake final year capstone projects with a sustainability focus. Tutors agreed
13 that the broad, global perspective provided an exciting introduction to students' university
14 experience, while case studies on important local issues lent an added authenticity:
15
16

17 *"...having this at the start, showing that it's actually really exciting and packs everything that's*
18 *going on in the world and gets that really global view is a really good way to start their*
19 *degree."*
20
21

22 **Enhancing academic, personal and professional skills**

23 An EBL pedagogy was considered the primary conduit for skills development, increased
24 employability awareness, and professionalism. Tutors saw evidence of incidental skills
25 development (i.e. not formally taught) including learner autonomy, leadership, decision-making,
26 reflection, and self-confidence:
27
28

29 *"I've been surprised at how well the students - after the initial shock of 'Oh my God, I've*
30 *actually got to drive this' - have got on with the job and done the research into topics that*
31 *they've been interested in and they've learnt something, and to me that's what it's all about".*
32
33

34 Students developed skills and values closely aligned with ESD and considered valuable for
35 professional development and their future contribution to society. For example, tutors judged that
36 many students effectively applied systems thinking in their teamwork:
37
38

39 *"I think it [systems thinking] will make a difference.... it should and it will influence their future*
40 *work".*
41
42

43 Tutors perceived that during the module, students' grew in their professional aspirations, self-
44 confidence, awareness of self-potential, and career pathways open to them.
45

46 *"I could see there was a general ability to see themselves as somebody who's on a pathway*
47 *towards becoming a professional, so having to go through this process made some sense".*
48
49

50 *"It [multidisciplinary working] makes a massive difference... it puts them in a position of looking for*
51 *their own agency and [asking] 'What is my identity?'"*
52
53

54 There was a consensus that it was good to consider employability at an early stage:
55

56 *"...definitely in the first year, they are ready to have their next three years put into context and*
57 *where they see themselves fitting in geography as a profession and have their eyes opened to*
58 *all the different things going on in the world".*
59
60

Tutors made a step-change in their appreciation of the professional potential of geographical thinking, and implications for students' future career pathways:

"I have been thinking a lot more about different career paths for geography students and how they can be very diverse.... It is important for students to develop transferable skills because geographers might not have a career that is linear and straightforward."

Tutor-student interaction

A strong narrative underlying the interviews concerned the benefits and challenges of tutors and students interacting in new ways, and several themes emerged:

a) Learning to work together

Tutors considered that the EBL active learning approach encouraged closer interaction with learners, transcending traditional formal learning, and contributing positively to the student experience:

"It forces you to know the students more and it forces the students to know the tutors more. ...It makes a massive difference for students to feel that they are getting... more of an individual experience."

Collaborative enquiry was also perceived to promote student engagement, with examples of infectious enthusiasm being transferred across teams. Effective peer pressure was observed among team members, with some individuals developing influential leadership skills. There were some dysfunctional teams, occasionally attributed to a skewed team membership (gender or discipline). Helping to address these problems presented a key relational challenge for tutors.

b) Learners as teachers

Tutors observed learners acting as teachers, both in student-to-student peer learning, and also in the changed power balance between students and tutors:

"They were teaching *me* about their topics. There was still a sort of '*I'm the expert and you're the student*' kind of thing when it came to the more skills-based queries, but for their projects it was very much me asking them questions."

Tutors gained new, broader perspectives from students' personal experiences:

"You get students from different backgrounds, different nationalities, conversation is spurred and all of a sudden... '*Alright! I had not considered that! I hadn't really thought of it that way*'."

c) Diversity challenges

Closer interaction as a facilitator in a diverse student cohort raised new challenges around appropriate use of language and assumptions made, particularly where team project topics uncovered potential sensitivities around gender, race inequality and oppression. One tutor, referring to themselves as a "*white, male, western, privileged teacher*", described some internal thought processes around this:

"you're not sure what you should be saying around some sensitive issues.... An example was gender equality and how Muslim females dress... if there had been any female Muslims in the room, I don't know what the correct or sensitive thing would be to say."

d) Changing power relations

Facilitating learner-centred team projects was challenging for some, who felt the urge to revert to a more directive teaching style:

“...they often just wanted a straight answer, and to be told what to do. Is that our job? I'd say in first year, it might be... to give them a bit more direction.”

Others struggled to maintain balance between encouraging independent learning and providing helpful support, or even felt *fraudulent*:

“Students knew much more about it [topic], and were much more interested in it than I ever was, so I took a bit of a step back... I didn't want to say, ‘Well, I would do it like that’. I left them to themselves because they were able to discuss it in ways that I couldn't quite engage with, because they had such a diverse range of interests.”

“There is that sense of feeling like a fraud”

“We have to be the experts”

Potential for change

Change was a recurring theme in interviews. Raised awareness of global sustainability issues inspired some tutors to integrate ESD in teaching, or to modify personal consumption behaviours:

“It inspired me to do carbon literacy training, which I've now done; I've just got my certificate”.

Some learned a new teaching style:

“Being able to facilitate... probably the biggest skill is being able to shut up and stand back and not just do what we traditionally do which is to profess and lecture.... that takes a change of mindset”.

Pre-conceived assumptions about student capability were challenged:

“It [EBL] has actually influenced what I thought about students' development... worked really well in getting students to think.... differently and outside of the box.”

The EBL pedagogy has influenced curriculum planning in other modules:

“I've got a new third year module... and am thinking of completely redesigning it so it's essentially EBL or PBL ...It'll make it much more relevant because they'll [students] be doing something they're really interested in and might be doing for future careers.”

Tutors anticipated challenges for wider implementation of EBL relating to infrastructure constraints, workload, resistance from colleagues:

“I think some staff may find it difficult because that's not how they approach things. Maybe as a module it is a bit too different from.... other modules that we teach”.

And integration in a largely didactic programme:

1
2 “The classrooms are not suited for EBL, students are not in that frame of mind, sometimes
3 they feel this module is quite different and [the course] doesn’t feel coherent”
4

5 Potentially, an institutional approach might bring greater success:
6

7 “I think doing more of it and making it... more ‘normal’. If we find ways to institutionalise it a
8 bit more.”
9

10
11 Positive impacts were identified for module tutors including enhanced digital literacy, professional
12 development of early career lecturers, and exposure to new perspectives:
13

14 “It is raising awareness among that team of the various issues to do with sustainable
15 development... global citizenship and... professional development in geography”.
16
17

18 Tutors valued the rare chance to work closely with colleagues from other disciplines:
19

20 “I’ve worked with people I’ve never worked with before.... there’s actually significant overlap
21 in our interests and research, so that might generate collaboration possibilities in the future”.
22
23

24 Discussion of emerging themes 25

26
27 A synthesis of the findings (Figure 1) as emerging themes provides a foundation to reach a
28 grounded assessment that this curriculum model has potential to catalyse organisational change
29 (Figure 2). The discussion represents high level abstraction of three inter-related variables; skills
30 teaching, ESD, and EBL, and is presented here as propositions re-organised within three learning
31 domains; cognitive, psychomotor, and affective (Sipos *et al.*, 2008). These domains align with
32 UNESCO’s specific learning objectives for ESD (UNESCO, 2020) and help reinforce the holistic
33 nature of the curriculum intervention.
34
35

36 **Cognitive domain** 37

38 In the cognitive domain (knowledge and thinking), the collaborative and multidisciplinary nature
39 of the pedagogical method (i.e. EBL) exposes participants to new conceptual perspectives
40 (Aditomo *et al.* 2013). This contextualises and raises awareness of the boundaries of relevant
41 academic disciplines and their potential role in addressing global challenges. In the specific context
42 of Geography, this can help bridge the conceptual divide between human and natural systems. At
43 the same time, academic enquiry into global sustainability challenges reinforces critical thinking
44 (Brundiars *et al.* 2021) around the complex nature of societal, environmental and economic
45 interactions. The combined effect of this is to promote *critical systems* thinking, a highly valued
46 personal and professional skill benefitting individuals (Brundiars *et al.* 2021).
47
48

49
50 If capability for critical systems thinking is well developed within the academic workforce and
51 student body, this creates potential for capacity-building that can help HEIs achieve sector
52 priorities around integrating authentic sustainability education into curricula (Paillé *et al.* 2020).
53 Critical systems thinking *beyond* curricula can also benefit HEIs through positive influence on
54 sustainable organisational practices (Leal Filho *et al.* 2018). Effective sustainability practices
55 identify HEIs as responsible contributors to local, regional and global economies (McCowan *et al.*
56 2021), and as such, there are potential economic benefits through cost-savings, enhanced market
57 visibility and funding, which can create new opportunities for engaging external stakeholders.
58
59 Despite the imperative for global climate action, there remains some scepticism in the academy
60

around the SD paradigm (Price *et al.*, 2021) and strategies for its integration into curricula (Blanco-Portela *et al.*, 2017). This may pose some resistance to bottom-up organisational change.

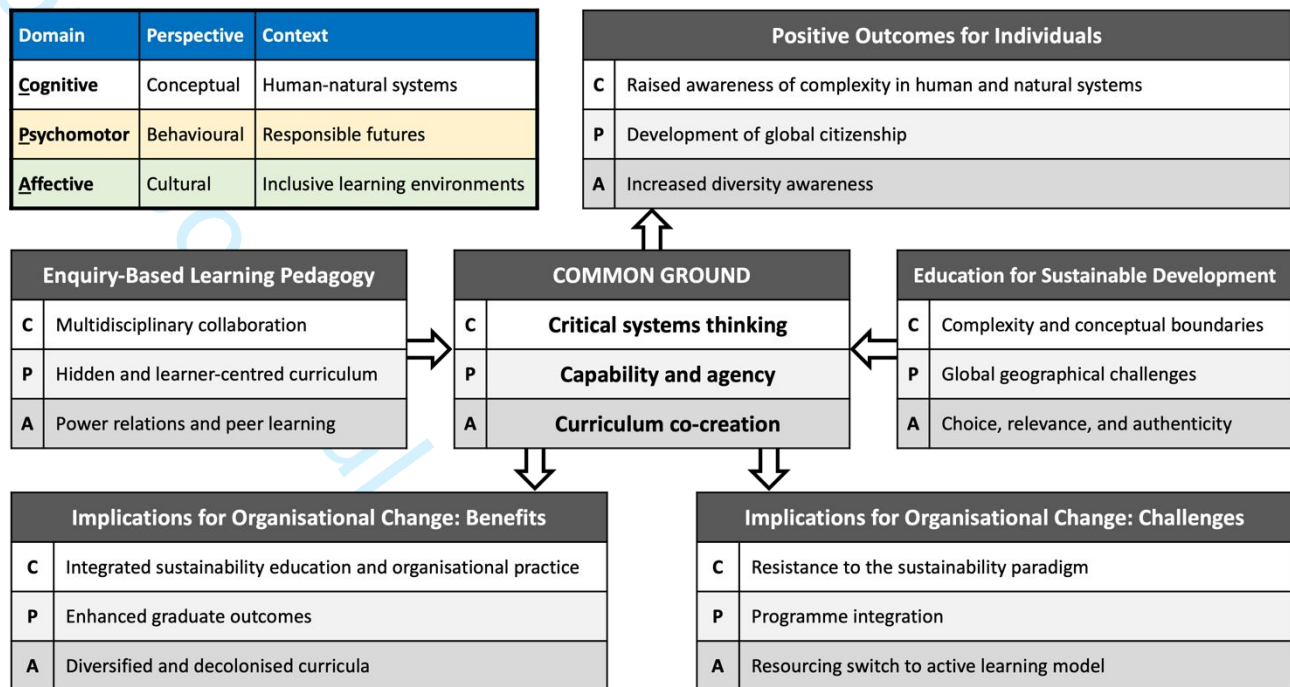


Figure 2: Emerging theory around efficacy of the curriculum intervention for organisational change, framed within cognitive, psychomotor, and affective learning domains.

Psychomotor domain

In the psychomotor domain (action-oriented and practical), EBL exposes students to more authentic personal experiences from tutors and peers (Schraw *et al.*, 2006). This can heighten students' awareness of their own positionality in global sustainability challenges, and enhance metacognition, a key component of self-regulation (Pintrich 1999). This informal learning has potential to build incidental skills including learner autonomy, leadership, decision-making, problem-solving, and self-efficacy. These higher order skills can translate mere conceptual cognition into personal and professional application (Gramatakos and Levau, 2019), raising students' aspirations and self-perception of academic potential, future capability and agency (Bandura 1997). When enhanced capability and agency are coupled with greater acceptance of responsibility for solving sustainability problems, powerful individual outcomes can include a re-evaluation of potential career pathways, or increased commitment to activism for social and environmental justice.

At large, modern HEIs with a high proportion of learners from socio-economically, culturally and ethnically disadvantaged backgrounds, lack of self-confidence and self-belief can impede individual success (Bridgstock and Jackson, 2019). Enhancing learners' engagement, capability, agency, and development as global citizens, has potential to positively influence individual outcomes, and sector priorities for enhancing graduate outcomes. Furthermore, changes in individuals' production and consumption behaviours can positively impact on HEIs' internal sustainability targets. These benefits can be maximised by integrating the curriculum model across the education portfolio, but this presents challenges in mixed ability settings, across disciplines, and variations in delivery style. Bottom-up approaches may struggle unless there is agreement within teaching teams, or top-down strategic planning for wider integration (Schraw *et al.* 2006).

Affective domain

In the affective domain (socio-emotional, attitudes and values), Enquiry-Based Education in the context of global sustainability challenges can transform teacher-learner and learner-learner interactions, and the relationship between learners and diverse societal and global communities. New possibilities then emerge for curriculum co-creation and staff-student partnerships, when tutors are not by default perceived as the 'expert' in a power relationship. Learner-centred curricula may then be freed from boundaries heavily influenced by disciplinary traditions, institutional practice, and Eurocentric cultural canons that typify many western curricula. This creates opportunities for exploring sustainability concepts that offer greater personal interest and relevance, and which align more closely with learner cohorts from diverse backgrounds (Holfelder, 2020). Curricula that reflect learners' interests and motivations tend to feel more authentic, and promote commitment and self-efficacy (Pintrich, 1999), suggesting that some degree of curriculum self-determination is a pre-requisite for success. A further positive by-product of collaborative enquiry into global sustainability challenges is exposure to new cultural perspectives, broadening the scope of curricula, and co-creation of curriculum content. This mirrors the pedagogical benefits of inclusive partnerships (Moore-Cherry *et al.*, 2015), and can help raise diversity and sustainability awareness (Van Opstal and Hugé 2013), and improve connectivity with people and cultures at a range of spatial scales.

Tutor-student co-creation of sustainability curricula can help drive institutional priorities for developing and delivering transformative inclusive education. This is particularly true for curricula that bear the legacy of injustice, inequality and disadvantage from global historic colonisation, mostly by European nations (Liyanage, 2020). As a consequence, many western curricula are characterised by 'whiteness'; colonial world views dominate, traditional power relations are reinforced, and there is conflict with the pedagogy of learner autonomy. Conversely, to decolonise curricula is something of a 'wicked' problem, requiring a pedagogy that is multi-disciplinary, systems-based, future-looking, authentic, co-created, globally and culturally representative, and espousing values of fairness, equity and justice (Shay, 2016). Curricula that are decolonised may promote critical and open dialogue, empowering, reflecting and representing learners in curriculum content, and preparing them for work in a diverse and globalised marketplace. Such a pedagogy reflects the curriculum intervention presented here, and aligns very closely with ESD (QAA/AdvanceHE, 2021). The enquiry-based ESD model for skills teaching therefore has potential to contribute to wider institutional priorities around closing award gaps (e.g. between white and non-white students):

"There is an opportunity for ESD to reinforce other institutional objectives such as internationalisation and developing global perspectives; decolonising learning..... and championing equality, diversity and inclusion" (Universities UK and NUS, 2019, p12)

Organisational transformation from a passive to active model of teaching requires culture change and there are potential barriers. Tutors comfortable with a more didactic than facilitative delivery style may feel challenged by modified teacher-learner power relations, especially relating to perceived loss of control over the pace and mode of learning, and curriculum content. This may require educator development training for effective application of EBL-ESD (Windschitl 2002). Ownership and 'shared authority' improve motivation and learning (Schraw *et al.*, 2006), but also place significant expectations on learners to take ownership, to shape, control and regulate their own learning. Development of learner autonomy requires careful and progressive scaffolding and expectation management. There may also be constraints relating to the nature and use of physical learning spaces.

Limitations

There are potential limitations to the study from the relatively small number of interviews conducted, the focus on staff rather than student perspectives, and analysis based on one UK undergraduate Geography module. To counter this, participants represented a range of disciplinary, experiential and demographic characteristics and were able to shed light, indirectly, on aspects of the student experience. Propositions discussed above are also partially derived from learning design principles that are independent of discipline and geographical boundaries (Price *et al.*, 2021). The conclusions include some speculation, but this is well-founded on the basis of rigorous data analysis and established understanding of organisational change and pedagogy.

Conclusion

Synthesis

With the imperative on HEIs to prepare future generations for the world of work and responsible futures (UNESCO, 2020), this case study of a Geography module in a UK university set out to assess a curriculum model that teaches academic, personal and professional skills using an EBL pedagogy and a SD conceptual context. Key aims were to establish effectiveness of the model for learning and for capacity building, and to explore the benefits and challenges of this bottom-up approach for organisational change in HEIs. Thematic analysis of in-depth interviews with the teaching team reveals that powerful synergies exist between skills education, enquiry-based learning, and SD concepts. Synthesis of emerging themes framed around the interconnecting 'head, hands, and heart' learning domains (Sipos *et al.*, 2008) proposes that:

- multidisciplinary learning around conceptual complexities can enhance cognitive potential around critical systems thinking,
- learner-centred exploration of global challenges promotes personal and professional behavioural potential around capability and agency, and
- socio-cultural encounters raise affective potential around inclusive curricula.

Findings presented here suggest an effective curriculum model that has positive individual outcomes. For both academics and learners, these include enhanced critical systems thinking around complex sustainability problems, changed consumptive behaviour, increased commitment to social and environmental justice and activism, exposure to new and diverse cultural perspectives, transformed power relations, new opportunities for learning, and raised awareness of the pivotal role of Geography in global sustainability solutions. For learners, further positive outcomes derive from enhanced capability and agency, and raised awareness of potential professional contribution to responsible futures. These individual, bottom-up outcomes have potential to drive organisational change in relation to four sector priority areas:

- *Sustainability education*: Institution-wide integration of sustainability education in curricula; improved organisational sustainability practices and metrics; and enhanced reputation and market position.
- *Active learning*: Building teaching team capacity to transition from didactic to active learning pedagogies; facilitating institution-wide implementation of active learning pedagogies.
- *Inclusive education*: Contribution to cultural transformation to support development of inclusive, diversified and decolonised curricula; related measures to close award gaps.
- *Graduate outcomes*: Improved metrics for academic and graduate outcomes; building global citizenship.

Challenges

To conclude, thematic analysis of interview data from academics suggests there is considerable potential in this bottom-up curriculum model to catalyse organisational change in HEIs towards future-thinking pedagogies that fully integrate ESD, active and inclusive learning, and enhanced graduate outcomes. However, multiple challenges can obstruct progress, including human factors (Blanco-Portela *et al.* 2017) such as scepticism and resistance (McConnon, 2020). More effective systematic change may be realized through a middle-out strategic approach (Brinkhurst *et al.*, 2011), though this may introduce new structural barriers. For example, integration of a new curriculum model across a diverse education portfolio with mixed abilities, disciplines, and pedagogies requires a flexible and adaptable top-down strategy. A bottom and/or middle-out approach can helpfully exploit these differences, fostering good practice by embracing collaborative cross-disciplinary teaching and providing exemplars (Leal Filho, 2011; Farinha *et al.*, 2020).

Further challenge will come from the need for institutions to resource pedagogical transformation, including provision of educator support and training for skills education, active learning pedagogies, and ESD (Leal Filho, 2011). Physical learning spaces may also need to be reconfigured. Tutors will need to modify practice by scaffolding the development of learner autonomy and managing learner expectations in relation to peer learning and co-creation. But perhaps the biggest barrier to institutional change is a sector-wide antipathy for risk-taking (Price *et al.*, 2021), and there is a need for organisational leadership and influential stakeholders to be bold, flexible, and innovative. These are key enablers for HEIs that wish to develop global citizens capable of critical systems thinking who can contribute to a responsible, sustainable future world.

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40 **About the authors**

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Table I: Characteristics and roles of interview participants

Descriptor	No.
Gender	
Male	6
Female	4
Role (first value in parenthesis indicates number with this role uniquely, second value indicates total number for module)	
Module Leader (1,1)	1
Personal Tutor (2,15)	7
Workshop Tutor-Facilitator (2,6)	5
Specialist Tutor-Facilitator (0,3)	3
Personal Tutor AND Workshop Tutor-Facilitator	3
Personal Tutor AND Specialist Tutor-Facilitator	3
Level of Experience	
New to teaching in HE (<2 years)	2
Experienced teacher in HE (2-7 years)	3
Highly experienced teacher in HE (>7 years)	5
Discipline	
Geography (Human)	3
Geography (Physical)	3
Geography (including GIS)	2
Environment (Management, Sustainable Development)	2

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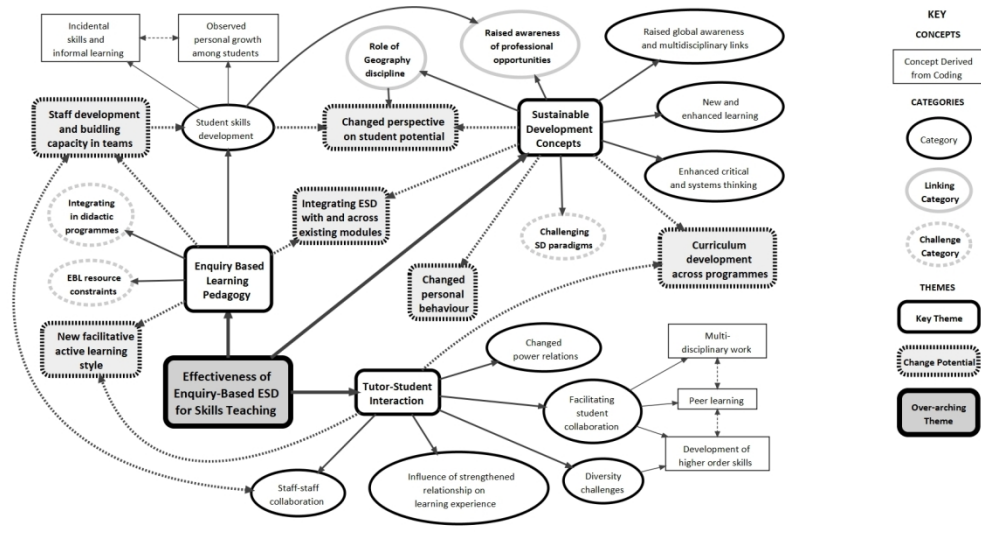


Figure 1: Summary of concepts, categories and themes derived from iterative coding

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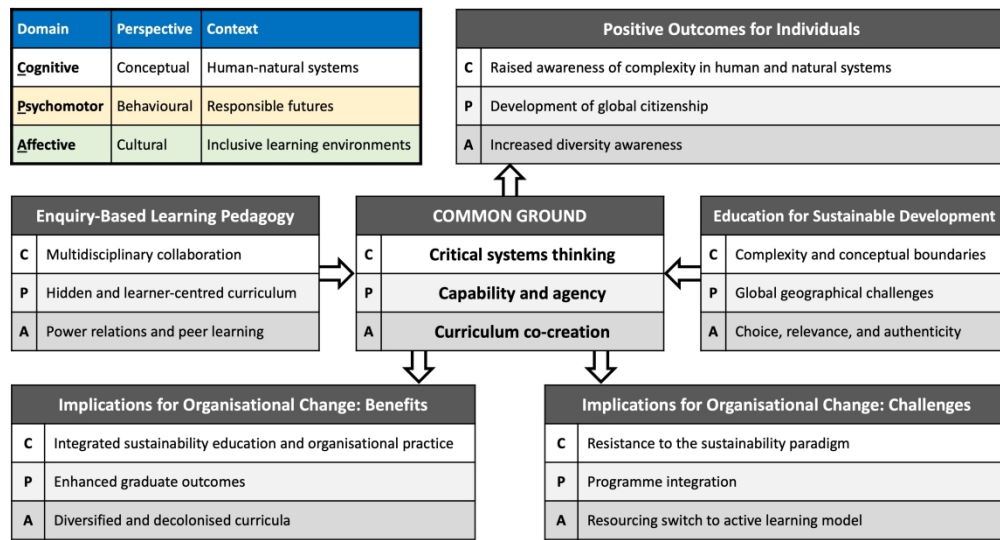


Figure 2: Emerging theory around efficacy of the curriculum intervention for organisational change, framed within cognitive, psychomotor, and affective learning domains.

266x142mm (330 x 330 DPI)