

Mainstreaming Education for Sustainable Development: Vertically Integrated Projects for Sustainable Development

– A Case Study from the University of Strathclyde



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Introduction

UNESCO (United Nations Educational, Scientific and Cultural Organisation) define Education for Sustainable Development (ESD) as “the process of equipping students with the knowledge and understanding, competencies, skills and attributes needed to work and live in a way that safeguards environmental, social and economic wellbeing, both in the present and for future generations.” Significantly, ESD is widely recognised as being more than simply educating students *about* Sustainable Development; critically it focuses on educating students *for* Sustainable Development – as Sir Jonathan Porritt, Vice Chancellor of Keele University, puts it, actively “preparing our students for the work of the world and not just the world of work” (Porritt, 2012). ESD is about preparing our students to face future shocks and shape a just, sustainable, healthy and peaceful future for us all.

(Kolmos et al. 2016) and (Kreber, 2009) also speak of education about sustainable development as an assimilation strategy where ‘Sustainable Development’, is treated as a subject that “we look at”, and that can

be learned “principally through extensive reading, listening and memorising,” e.g. by developing a new module on sustainable development informing students of the background to, motivation for, and progress made on the Sustainable Development Goals. By contrast, Education *for* Sustainable Development, asks students to treat Sustainable Development not exclusively as a subject only to be ‘looked at’ and learned *about*, but as an activity and agenda they can actively participate in, and influence – or more overtly, as a challenge to be met. In doing so, it seeks to connect students to the subject matter and ‘challenge’, not just cognitively, but emotionally and practically too – the so-called ‘head, heart and hands’ (Sipos, et al. 2008) competency framework - inspiring students to a deeper level of learning, and applying their learning to deliver positive impacts on target communities. This also speaks to Kreber’s description of “what actually happens in situations when teachers succeed in fully connecting their students with their subject”.

Like many other HE institutions, Strathclyde has already embarked on this journey to embed ESD

with examples of ‘add-on’ modules that have been purposely designed around sustainable development, and others that have re-oriented towards, or realigned subject content and context, with sustainable development. One of the most innovative programmes that has been introduced at Strathclyde is our award winning Vertically Integrated Projects for Sustainable Development Programme (VIP4SD) - winner of 2019 International Green Gown Award and the 2020 Association for Advancement of Sustainability in Higher Education Award. VIP4SD is also included as a case study in the 2021 [QAA and Advance HE Education for Sustainable Development Guidance](#) and on the [Sustainable Solutions Development Network \(global network of universities focusing on sustainability challenges\) website](#), and as an exemplar of best practice in the Scottish Government report “[Scotland and the sustainable development goals: a national review to drive action](#)”.

The Vertically Integrated Projects (VIP) model for embedding undergraduate research into curricula, was brought to Strathclyde from Georgia Institute of Technology in 2012, to create undergraduate research projects that were led by academics and researchers, and engaged undergraduate students from all year groups. From the students’ perspective, this means they can work collaboratively with academics and their peers, consistently, on the same real-world research area through all years of their programme studies at Strathclyde (i.e. vertical integration). From a research project and academic’s perspective, this means projects can be longer lasting, more ambitious in their scope and, over-time, self-sustaining, as more senior student team members assume mentorship roles to more junior members. This also allows academics and students to build stronger, longer lasting, collaborative research and educational partnerships. More broadly, the VIP model focuses on the nexus between education and research.

In 2016, the University of Strathclyde integrated and aligned its existing VIP programme with the 17 UN Sustainable Development Goals, creating the Vertically Integrated Projects for Sustainable Development (VIP4SD) programme. This allowed research projects to focus on SDGs, and make explicit how they planned to advance agendas towards specific SDG targets. This allowed the University to both embed Research-Based Education (RBE) and Education for Sustainable Development (ESD) into undergraduate curricula – now focusing on the nexus between education *for sustainable development* and research, and hence we refer to the VIP4SD programme as a model of Research-Based

Education for Sustainable Development (RBESD) ([Strachan et al. 2018](#)) (VIP4SD, n.d.).

Operationalising VIP4SD and ESD

The main challenges that institutions are likely to experience in implementing a programme of this nature, centre around institutional buy-in and its promotion, regulatory and quality assurance processes, rigidity of the curriculum (historically due to accreditation requirements), staff and student engagement, timetabling, assessment and supervision resource. The extent of each of these challenges is also likely to differ, and is in most cases based on operational and academic nuances that exist between the faculties, departments or programmes, where a VIP4SD pathway (i.e. ‘vertical’ route through each study year of a programme’s curricula) must be ‘carved out’.

Achieving institutional buy-in and finding a VIP4SD pathway through a programme of study, are probably the most significant of these challenges. This section focuses on these and proposes strategies for overcoming these, but also points to recent developments across the UK HE sector that are anticipated, over time, create the enabling environment required to embed programmes like VIP4SD in HE degree programmes, and facilitate the more general mainstreaming of ESD in HE.

Buy-in at executive level at Strathclyde was achieved early on by pointing to the success of Georgia Institute of Technology’s VIP programme and then proposing and implementing a plan for a proof-of-concept pilot, initially involving a limited set of engaged academics, and subsequently delivering on this. Furthermore, if it can be demonstrated that this programme complements and resonates with other aspects of your institution’s strategic plan (e.g. student experience, employability, sustainability, equality, diversity and inclusion, enterprise and entrepreneurship, internationalisation of the curriculum, etc.) this can also strengthen the case for implementation and mainstreaming.

There are two main approaches to defining a vertically integrated pathway through a programme’s curricula. One approach is to take advantage of a curriculum review, and work with Vice Dean Academics and Programme Directors to establish robust and fully-integrated pathways through the programme. This is analogous to considering a degree programme as a moving train, where its necessary to wait until the train (or programme) has stopped at the station before then switching out carriages (or modules) and replacing

with new ones. This is undoubtedly the most orderly, most sustainable and hence most desirable approach to embedding VIP in a programme. The other approach is to find a more pragmatic approach to embed (or retrofit) the pathway into an current and established programme curriculum, without waiting for a curriculum review, and with as minimal disruption to the programme and department as possible (e.g. when the opportunity for curriculum review is not available). Achieving this, also requires close collaboration between VIP programme coordinators, department heads and course directors to work around curricular constraints such as elective credits being limited to particular years of study, or navigating a way through, what may considered, from a course accreditation perspective, as a curriculum filled with ‘indispensable’ modules. One such alternative approach may be to identify a “surrogate” or “container” module, in the shape of an existing module, that equates to the same level of student effort (and credit) as required by a VIP project over an academic year, and which has comparable learning outcomes (perhaps more competency-based, such as those aligned with a professional skills development or research/project-based/case-study/capstone modules). This module could continue to run its existing syllabus with one section of the cohort, while offering others the opportunity to participate in a VIP4SD project, under the auspices of the same module and class code. This is analogous to re-arranging the furniture in specified carriages of the train as it continues travels between stations, without stopping. While a workable solution, this is also more of a ‘work-around’ solution, which may not be applicable or suitable for all degree programmes, and which may be more challenging to sustain. It is for this reason that more formal, sector-wide guidance from QAA and professional bodies and academies is required. Without this, programmes like VIP4SD, and ESD more widely, would likely remain an adjunct, add-on extra included in some, but by no means all, degree programmes. Therefore, it has been a welcome development to see ESD and other non-technical or subject-specific elements being actively promoted from such quarters; providing the influence and leverage required to motivate and legitimise the kind of structural change needed to mainstream ESD in HE.

Levers for Mainstreaming ESD

There is a perception that programme accreditation bodies may have the potential to act as a barrier to, or powerful enabler of, education innovation. In terms of ESD, and engineering education, as mentioned, there has been some welcome advances in this regard.

Many Professional Engineering Institutions (PEIs) and bodies are now acting as agents of change, actively advocating for ESD within HE, responding not only to the moral imperative, brought about by a climate emergency, to mainstream ESD in HE, but also to the market demand of employers and students. There is a growing recognition of their role as a key lever for the kind of curricular and educational reform needed to ‘refresh’ HE, and equip graduates with the knowledge, skills, attributes and competencies needed to meet the types of global challenges they will encounter in their personal lives and that will undoubtedly shape their careers.

The Engineering Council’s most recently published Accreditation of Higher Education Programmes - AHEP 4, asks for programme learning outcomes to have “a sharper focus on inclusive design and innovation, and the coverage of areas such as sustainability and ethics”, and emphasises that “HEIs are encouraged to make use of the United Nations Sustainable Development Goals, and Engineering Council Guidance on Sustainability in programme design and delivery.” Further to this, is the Engineering Professors’ Council (EPC) and Royal Academy of Engineering’s (RAE) Engineering Ethics Toolkit, which has been designed as a resource to “help engineering educators integrate ethics content into their teaching...including how engineering students need to see ethics in action.” Even more recently, the RAE, the EPC and Siemens have collaborated to create a Sustainability Toolkit Steering Group, which while acknowledging “many excellent resources explain the sustainability knowledge, skills, and mindsets essential for 21st-century engineers”, also recognised that “very few resources exist that support engineering educators to integrate these into their teaching in a comprehensive and effective way.” Therefore, this group will “develop and curate a toolkit of resources that help academics explicitly embed sustainability in their day-to-day practice of engineering teaching, and help make sustainability integral to, rather than tangential to, engineering learning” (EPC, n.d.). In a broader sense, what has contributed to this drive for the mainstreaming of ESD from PEIs and other quarters, not only in engineering education, but across all degree disciplines and programmes UK HE, is the [QAA Subject Benchmark Statements](#) (SBSs). These “have been drafted and published by UK QAA for over two decades, and describe the nature of study and the academic standards expected of graduates in specific subject areas. They show what graduates might reasonably be expected to know, do and understand at the end of their studies.” The current review cycle of SBSs, requires “incorporation of consideration of how practice within disciplines addresses

wider social goals, comprising equality, diversity and inclusivity; the requirements of disabled students; enterprise and entrepreneurship; and **education for sustainable development.**”

Conclusion

This paper has presented the University of Strathclyde’s approach to embedding Research-Based Education for Sustainable Development into its curricula, using the Vertically Integrated Projects model for undergraduate research developed initially at Georgia Institute of Technology. It has provided some historical context around how the programme has evolved from VIP to VIP4SD, as Strathclyde’s vision to embed ESD in its curricula started to emerge soon after the UN’s Agenda 2030 and the Sustainable Development Goals came into being. It demonstrates how the SDGs offer a powerful and inspirational framework on which the VIP4SD programme has built its portfolio of undergraduate research projects around. In addition, while these projects are wide and varied in their scope, disciplinary focus and nature, they all share a common, unifying sense of purpose amongst all staff and students participating in the VIP4SD programme.

The paper also highlights some of the academic and logistical challenges that may be anticipated when

attempting to create and operationalise a programme of this nature, but also points to welcome developments across the HE sector that will mean what may have been perceived as barriers to educational innovation of this kind previously, are now increasingly seen as key enablers of it.

Key Messages

Engineering education, like all others, needs to adapt and refresh to become fit for purpose in the face of the challenges its graduates will be instrumental in meeting collaboratively, through technological innovation and business leadership.

Many HE institutions across the UK and globally, have been focusing on education enhancement around ESD, with many successes such as the VIP4SD programme at the University of Strathclyde to point to. However, mainstreaming ESD across institutions and the HE sector as a whole, requires legitimising it through more formal, sector-wide guidance from QAA and professional bodies to help achieve institutional buy-in for ESD, while at the same time providing the necessary staff training and support that is combined to create the necessary ‘enabling environment’ for institutions and staff to engage with ESD through a whole institution approach. ■

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