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Implementing inter-institutional lifelong sustainability education: The UNI-ECO e-learning case study



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Abstract

Inter-institutional collaboration is a key strategic action for higher education institutions (HEIs) engaging in sustainability education initiatives. Collaboration of this type can strengthen sustainability knowledge sharing and production, develop student and staff sustainability competencies, foster research partnerships, and address strategic sustainability goals. However, meaningful scaffolding in terms of instructional design and professional development support is crucial for their success.

This research describes an inter-institutional e-learning sustainability education initiative (UNI-ECO e-learning modules) for staff and students in five European HEIs. It presents a novel instructional design model for sustainability knowledge dissemination and behavioural change applied in five sustainability e-learning modules. This model integrated multiple sustainability focused learning activities fostering social presence, self-determination, and self-reflection in learners. Evaluation results (n=67) describe how modules, based on the model, encouraged learners to change or improve their sustainability practices, foster new sustainability skills, and share knowledge from the modules to others.

This research contributes a novel understanding of designing and implementing lifelong sustainability education within inter-institutional HEI collaborations, providing recommendations for practitioners. Generalisability and transferability limitations to the research that can be addressed by further implementation in different contexts.

Keywords: collaboration, e-learning, instructional design, inter-institutional, professional development, SDG 4, sustainability education

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Introduction

Collaboration with industry, civil society and other higher education institutions (HEIs) is a common strategic theme for many HEIs (Cooper & Mitsunaga, 2010; Fehrenbach & Huisman, 2022). Research partnerships, quality reviews, educational innovations, and professional development (Knight, 2015), amongst many other collaborative activities, can improve internationalisation, increase staff and student mobility, produce interdisciplinary research, enlarge common topics and interests, and enhance institutional networks (Karvounaraki et al., 2018). Within inter-institutional collaboration (i.e., universities collaborating with other universities or higher education institutions) HEIs often seek to develop their institutional capacities via joint educational programmes, collaborative institutional activities (e.g. networking and research), or sharing, generating or enhancing resources (Caniglia et al., 2017). In essence, inter-institutional collaborations can be an important influence on knowledge transfer, creation and innovation activities (Tetrevova & Vlckova, 2020).

Another common HEI strategic theme, sustainability, has strongly emerged in recent years due to recognition of the needs of future generations (Lozano et al., 2013), ethical obligations (Ralph & Stubbs, 2014), evolution of societal and stakeholder needs, commitment to global targets (e.g. Sustainable Development Goals (SDGs)) (Beynaghi et al., 2016), and response to funding systems (Larrán et al., 2016). Strategic activities related to sustainability include developing sustainability networks, interacting with industry and society (Ramísio et al., 2019), integrating sustainability into policy, operations and management, fostering sustainability enhanced research (Lukman & Glavič, 2007), and promoting sustainability in teaching practices (Alshuwaikhat & Abubakar, 2008).

Intersecting these two strategic themes, inter-institutional collaborations and sustainability, has brought about novel activities related to sustainability education. One such activity, the UNI-ECO inter-institutional e-learning programme, is the focus of this research. The following sections describe the current landscape of inter-institutional collaborations in sustainability education, key considerations required for their implementation, and introduces the UNI-ECO case-study. Discussion of results from the case-study analysis critically describe the process of developing inter-institutional sustainability modules, evaluate its implementation, and provide recommendations for practitioners.

Inter-institutional collaborations in sustainability education

Within sustainability education, inter-institutional networks have been highlighted to accelerate learning, deeply embed sustainability within HEIs, and intensify collaboration. Sharing courses, sharing faculty, developing joint courses, and improving staff and student mobility options offer opportunities for this acceleration (Withycombe Keeler et al., 2016). This can involve joint Bachelor, Master or PhD programmes, microcredentials, lifelong learning modules, and continuous professional development courses. Inter-institutional collaborations in sustainability education have grown due to greater access to funding, a perceived need for a whole-institution sustainability approach, growth in interdisciplinary teaching, increased need for visibility of sustainability integration, and promoting new student sustainability competencies and literacies (Leicht et al., 2018; Mossman, 2018). However, challenges with policy, resourcing, internal curriculum procedures, organisational structures, and technical infrastructure often need to be surmounted to achieve a successful educational collaboration (Caniglia et al., 2017). In addition, challenges related to maximising the impact of such collaborations need to be addressed. These include facilitating inter-institutional stakeholder and community engagement, offering shared inter-institutional online or blended learning environments, and addressing inter-institutional accreditation barriers.

Considerations for inter-institutional sustainability education

To develop an inter-institutional sustainability education initiative, multiple considerations are required including pedagogical, administrative, technological, instructional design, collaboration and values alignment, and professional development (Dale et al., 2015; Dickson et al., 2013; Jose, 2016; Sims & Falkenberg, 2013). To ensure alignment with programme learning objectives and funding requirements, HEIs must investigate what pedagogical approaches are optimum for achieving student success, achievable by staff and technological resources, aligned with sustainability competencies, and relevant to strategic pedagogical goals (e.g. student-centred learning, and universal design). Pedagogical approaches should also consider their alignment with best practices for delivering sustainability education, such as problem-based learning, active learning, collaborative learning, reflexive learning and research-based learning (Evans, 2019). HEIs must also consider how their current administrative and infrastructural resources can support and enhance an inter-institutional collaboration of this type. Clear and structured instructional design to ensure that all institutions are supported by a standardised approach can ensure quality, and alignment with

programme learning objectives. Institutions may or may not have expertise in pedagogical methodologies, module delivery methods, sustainability content delivery, and curriculum design approaches to be used as a foundation for an inter-institutional module. Ensuring that all institutions are trained on how the module will be taught, and that teaching staff have the knowledge of doing so is crucial for a successful module delivery. The outcomes of this type of collaborative professional development can support cross-cultural competencies, and knowledge generation from differing peer perspectives (Withycombe Keeler et al., 2016). Finally, the content of the sustainability educational initiative should be scaffolded by institutional research and teaching strengths and aligned with sustainability competencies. Depending on target learners, level, and learning objectives, teaching content should address competencies in sustainability education, such as self-awareness, critical thinking, problem solving, values thinking, and solution implementation (Bianchi, 2020).

The UNI-ECO project

The UNI-ECO project was a “Strategic Partnership”, co-funded by the Erasmus+ Programme of the European Commission. The three-year project, which began in 2019, was dedicated to increasing sustainability behaviours, practices, and projects at the participating universities (University of Montpellier, Utrecht University, Trinity College Dublin, University of Barcelona, and Eötvös Loránd Tudományegyetem). The project took inspiration from the United Nations Sustainable Development Goals and the European Green Deal as roadmaps for supporting change at all scales. The project mission was to create practical and collaborative tools for sustainability innovation in each University. One of the four main aims of the UNI-ECO project was to create five e-learning modules accessible by all HEI staff and students to establish the principles of sustainability within the campus community. This element of the project was co-ordinated by Trinity College Dublin, with each partner University leading on the preparation of study material for one of the five modules. The objectives for the e-learning modules element of the project were:

- a) to develop an innovative tailor-made training on sustainable development for all institutions; the themes to be informed by community priorities based on data /information gathered through Phase 1 of the project: data gathering and cross community survey at each university.

- b) to design five innovative, open access, interactive e-learning modules to help change behaviours across the community.
- c) to produce training modules, accessible widely by all European universities (and community partners) wishing to enter a sustainable development process.

The concept was to design modules that focus on practical case-studies, tips, and ways to change behaviour, and which are open to any student or staff interested in living more sustainably, increasing their knowledge and awareness of sustainability. This study aims to:

- a) critically describe the process of developing inter-institutional sustainability modules from a pedagogical and a practical perspective.
- b) evaluate of learner perceptions in a lifelong sustainability education module.
- c) provide recommendations for practitioners seeking to develop lifelong learning inter-institutional sustainability education modules.

Methods

A single case-study is used for this research which supports scientific development in this nascent field of study (Flyvbjerg, 2006). This case-study will be described via a narrative four-phased approach. First, a description of collaborative determination of module themes is presented; second the development and description of the pedagogical model, and third, its subsequent implementation in all institutions in five unique modules. These first three phases are described via a retrospective approach using documentary evidence, module content, personal experiences from teaching staff, and project management resources. Module evaluation by learners using an online survey is then presented as the fourth phase. The initial survey design was developed by one researcher with input from inter-institutional members. Qualitative and quantitative questions were posed in the survey. Qualitative (open-ended) questions were included. Quantitative questions included Likert style scales, rating scales, and multiple-choice options. The same questions were posed for all modules. A total of 10 questions was presented in the survey focusing on changes to sustainability practices following completion of the module, perception of learning new skills, satisfaction with the modules, and perception of module usability. The survey was available at the end of each module. Once a learner had completed a module they were presented with an online link to the survey. All data was downloaded via a CSV file. Quantitative data was analysed using Excel, and qualitative data was analysed using general open thematic analysis.

Results

The UNI-ECO e-learning modules were developed between November 2020 and January 2022 and were opened on a phased basis from April 2021. A total of 387 learners from five partner universities accessed at least one of the five modules. At the completion of each module (two-three hours of learning), learners received a certificate of completion. Learners were any student or staff from the five participating HEIs with no prerequisites to complete the module (i.e. the modules were geared towards a lifelong learning audience).

Collaborative determination of module themes

Module themes were determined via a collaborative discussion following completion of the first phase of the project. A cross-community survey was used to produce summary report on the state-of-the-art of sustainability in each HEI. The report integrated the institutional initiatives and limitations with respect to sustainability, as well as perceptions and priorities of the communities at each institution. Following reflection on the report and the priorities for focussed attention, collaborative discussion, identification of strengths, local expertise, and resourcing, five module themes were determined: Consumption and Waste, Carbon Footprint, Water, Biodiversity, and Circular Economy. Each institution took ownership of the material to be delivered in one module for each of these themes.

Description of pedagogical model

Development of the pedagogical model for the modules was scaffolded by multiple elements: the aims of the project (increase awareness of sustainability, promote action, and change behaviour), the target audience (lifelong learners), involvement of multiple institutions and differing teaching knowledge, sustainability competencies, and related instructional strategies (learner motivation, online learning engagement). A theoretically based pedagogical model in an online environment was then constructed. The model for each module included an introductory video, a self-assessment questionnaire, a prepare to learn section, a study section, an action section, and a final quiz. Each section was considered in terms of the aforementioned elements and then aligned with best pedagogical practices. These practices included, among others, social presence, self-determination, active and experiential learning, and cognitive load theory. An online environment was chosen for ease of access and inter-institutional dissemination. Theoretical alignment, description, and rationale for including these sections are described in Table 1.

Module development process

The module development process was divided into two phases; Phase 1 (November 2020 to March 2021) used the initial pedagogical model for two modules, Consumption and Waste (developed by Trinity College Dublin), and Carbon Footprint (developed by University of Montpellier). Phase 2 (October 2021 to February 2022) refined the pedagogical model for three modules based on experiences and feedback in Phase 1, Water (developed by Eotvos Lorand University), Biodiversity (developed by Utrecht University) and the Circular Economy (developed by University of Barcelona). For each phase, the same development approach was used. Introductory documentation was initially sent to all partners to inform them of the pedagogical model, location of files, timelines and requirements, and key personnel. Following this, an interactive online workshop was held for module teaching staff to introduce them to the structure and pedagogy of the modules. This was a key activity to guide, construct, and support module development.

Within the workshop, information on module structure, audience, learning objectives, formulating questions for the self-assessment questionnaire, and multimedia resources were provided in an activity-based format. At the end of the workshop, participants were encouraged to reflect on five elements related to the inter-institutional nature of the modules, namely, cross-cultural misunderstandings, European-level rather than institutional-level, behaviour and action, the other modules, and target audience. Each institution was then given three months to develop their module. When an initial module draft was completed, the other institutions reviewed the content for readability, alignment with key educational principles, and coherence with the other modules. Additional workshops and support meetings were held where necessary. Once module development was complete, resources were subsequently uploaded to an online platform (<https://uni-eco.umontpellier.fr/e-learning-platform/>), accessible to staff and students.

Learner survey results

On module completion, learners had the option to complete a feedback survey. A total of 67 responses was recorded. In terms of changing sustainability practice, a Likert statement was posed to the respondents “This module has encouraged me to change or improve my sustainability practices” with five options, Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree and Strongly Agree. Across all modules, 91% of respondents either agreed or strongly agreed with this statement, indicating a positive disposition towards the module.

Table 1: UNI-ECO pedagogical model

Section	Description	Rationale	Theoretical alignment
Introductory video	A short (one-two minute) talking head video by the module lecturer introducing themselves, the module topic, some key facts, and learning objectives.	Many of the learners are from different institutions, disciplines, and levels. Establishing a positive interpersonal and emotional connection with the lecturer was crucial at an early stage.	Social Presence (Cui et al., 2013)
Self-assessment questionnaire	Ten multiple choice questions encouraging learners to reflect on their perceptions and awareness of the topic. All answers were supported by additional information in different multimedia formats (e.g. video, blog post links, images), and learners were provided with encouraging text whether their response was correct or incorrect.	The questionnaire in this context is a learning tool to help learners understand concepts, reflect on their behaviour, and address misunderstandings. This element was used to promote feelings of competence and autonomy in learning and motivate students to continue the module.	Self Determination (Chiu, 2022)
Prepare to learn	One entry level resource (i.e. video, blog post, document, podcast) on the module topic with a reflection question.	This information stimulated student interest on the topic, actively engaged students with preparatory content by posing a reflection question, and presented any prerequisite knowledge needed. It was geared to the 'Factual Knowledge' level of Bloom's Taxonomy.	Revised Blooms Taxonomy (Krathwohl, 2002)
Study	The main educational content piece of the module, using interactive presentations and/or videos. Both audio and visual elements were included, and a text-based script was available. Learners clicked through the presentation to learn core concepts, statistics, and theories, and read practical case studies.	Given that the learners were from different backgrounds and most had little prior knowledge of the topic, presenting information in manageable interactive chunks supported meaningful learning and retention of knowledge.	Cognitive Load Theory (Van Merriënboer & Ayres, 2005)
Action	10 practical, action based 'dos' and 'don'ts' in a text checklist format were presented to learners based on the module topic.	Presentation of practical actions supported the module aim to encourage sustainability actions and changes in behavior.	Active and Experiential learning (Budhai, 2021)
Final quiz	Five multiple choice questions based on the previous learning materials. Learners were required to complete this to gain a certificate of completion.	To facilitate a certificate of completion, reinforce learning concepts and assessment of student learning. A small number of questions were presented to facilitate time poor learners, reduce cognitive load, encourage module completion and encourage future action.	Cognitive Load Theory (Van Merriënboer & Ayres, 2005)

The statement “I have learned new skills for being more sustainable” had strong agreement with 86% respondents in agreement. 92% of respondents would recommend the module to others, and the same percentage were satisfied with their learning experience. Respondents were provided a scale from zero to 10 to rank modules in terms of developing their skills and knowledge on sustainability. An average positive ranking of eight was provided by respondents. Qualitative responses were provided by learners for questions related to what they liked best and least in the modules. Within responses related to what learners like best, four themes were identified: structure, learning content, content variety, and interactivity.

Structure: Multiple learners positively commented on module structure. The shortness of the sections was commended as facilitating engagement and learning. The overarching structure was noted as “*user friendly*” and “*easily learnable*” suggesting that sections were comprehensible from a learner perspective. Specific sections were also addressed by learners. The quiz and self-assessment questionnaire were noted as a successful way of improving understanding, and the Do’s and Don’ts section was highlighted as useful for practical application.

Learning content: In terms of content, learners commented that the provision of practical information throughout the module was beneficial to them for applying personal sustainability action “*it helped me understand what I could do to help*”. The complexity of information was praised as being highly “*understandable*” by multiple learners and “*not too hard nor too simple*”. One learner noted that there “*was something here for everyone*” suggesting that the content was suited for a varied life-long learning cohort.

Content variety: Multiple participants positively commented on the variety of content (e.g. videos, images, articles, quizzes, links, and interactive maps) presented, and how it supported their learning by being relatable, understandable, and informative. This suggests that for a lifelong learning cohort, multiple means of presentation are beneficial.

Interactivity: Although the modules were asynchronous, multiple learners commented on the interactivity of the content provided as a positive. The use of the word “*interactive*” by the learners without prompting, suggests their awareness of content presented as non-linear, actively engaging, and allowing for personalisation.

Regarding comments related to what learners liked least the following two thematic areas were identified: check your knowledge section and content variety:

Check your knowledge section: Although the *Check your knowledge* section had a low entry point, some learners felt that understanding the content could still be difficult or discouraging for individuals with no prior knowledge. “*More playful*” means of checking learner knowledge were suggested, or alternatively providing some preliminary information.

Content variety: Although many learners commented positively on the broad variety of content provided, some felt that there could be more varied forms of delivery, or conversely, less information provided. This diversity of opinions could be linked to the diversity of learners. Providing content for all types of learners can be more challenging than for a particular cohort (e.g. undergraduate).

Discussion and Recommendations

This case-study has described the process of developing inter-institutional sustainability modules from a pedagogical and practical perspective and evaluated perceptions of learners participating in a lifelong sustainability education module. Overall, the module design was received positively by teaching staff and learners. In addition, the indication that learners changed or improved their sustainability practices supported the use of the approach taken. Although the pedagogical model could, in theory, be used for any discipline, the inclusion of a self-assessment questionnaire and practical activities for sustainability practice align with sustainability competencies, such as empathy, changing perspective, self-awareness and personal involvement. Delivering an online course of this type to lifelong learners presents pedagogical challenges. Sustainability education often uses problem-based learning and collaborative learning, neither of which were explicitly addressed in the modules. Given the learner profile, staff resourcing, modules aims and activities related to these types of pedagogical approaches were deemed out of scope for this iteration of the project. For example, an online community was considered for collaborative learning, but maintaining and moderating this activity would have been challenging. In addition, the short timeframe of each module (two-three hours to completion) to satisfy the needs of time-pressed learners would have been extended, potentially reducing the number of learners who would complete the course. Yet, future iterations of this type of inter-institutional sustainability initiative could

include a community of practice (CoP) if a different type of learner was targeted (e.g. teaching staff) or if more formal accreditation were sought (i.e. an ECTS-based micro-credential). Following the UNI-ECO module development and delivery, the following recommendations for developing inter-institutional lifelong sustainability education are proposed:

- Determining module learning objectives and overall thematic areas in sustainability should be a collaborative exercise grounded in data from each institution. This exercise would provide evidence-based purpose to each module and serves a would dual role by encouraging institutions to reflect on their own sustainability activities.
- A centralised staffing resource is necessary to act as an administrative and supporting function for all institutions. This allows for quality assurance, standardisation of materials, and successful management of the project.
- For inter-institutional sustainability education module development, clear guidelines and structure are key for successful, integrated, coherent delivery.
- Teaching staff across institutions should be aware of the content and perspectives presented by all partners. Sustainability definitions and theoretical perspectives can differ across disciplinary, institutional, and national spectra. Peer review and clear programme learning objectives can support this.
- Instructional design is crucial to ensure alignment with strategic, pedagogic, and funding requirements. Staff with knowledge of pedagogy and instructional design within the context of sustainability education, should be involved at all stages of development.
- The previous experience of teaching staff should be considered. Teaching for lifelong learning can differ from teaching for undergraduate or postgraduate learners. Providing examples of learner typologies, readability levels, and a range of learning resources can support teaching staff developing modules for a different audience.
- Peer feedback between teaching staff can be useful for enhancing modules, synthesising different perspectives on content, and sharing new resources and knowledge.
- Teaching staff may have expertise in a variety of different disciplines with varied pedagogical approaches. Module coordinators or project managers should be aware of these different approaches, and how teaching staff may never have taught online, or

designed an online course, for instance. Professional development opportunities should be shared between institutions to facilitate improved understanding of online teaching.

- Inter-institutional modules should consider cross-cultural misunderstandings of terminology and language, in particular, in the interdisciplinary sustainability field. Language should be simple and clear.
- Highlight to teaching staff that the module is being developed for multiple institutions. Thus, module content should be geared towards students of different ability levels, background, language proficiency, and geographical location.
- Challenges with policy, resourcing, internal curriculum procedures, organisational design and technical infrastructure will emerge. Using a collaborative, understanding, and diplomatic approach will often surmount these challenges. However, exploring and documenting potential challenges at the start of any initiative is crucial for its success.

Limitations

This research is a single case-study example of the pedagogical framework in action, and as such the results may lack generalisability and transferability to other contexts. Further research and application on its use in other contexts and learning environments is warranted.

Conclusions

This research contributes a novel understanding of designing and implementing lifelong sustainability education within inter-institutional HEI collaborations. Major findings from this case study suggest that structured guided collaborations, balanced by inter-institutional data and resources, are key to a successful inter-institutional sustainability education programme. Given the variety of experiences, perspectives, and content provided from inter-institutional partners, peer feedback, professional development, awareness of institutional strengths and limitations, and clear instructional design are crucial. When developing inter-institutional sustainability education to a lifelong audience, cross-cultural and broad ability considerations should be integrated into the module design to ensure all learners can meaningfully interact with the content in the same way. These findings, and subsequent recommendations, address important considerations facing inter-institutional collaborations, including pedagogical, technological, instructional design, collaboration and values alignment, and professional development. They also provide a means to address challenges facing inter-institutional collaborations seeking to provide sustainability education initiatives.

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