UNIVERSITY CONTINUING EDUCATION FOR SUSTAINABLE DEVELOPMENT: THE EXAMPLE OF THE 'INFERNUM' DISTANCE STUDY PROGRAMME

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ABSTRACT

In the context of an escalating climate and environmental crisis, effective Education for Sustainable Development (ESD) across all age groups is essential. This article highlights the innovative design and practice of the Interdisciplinary Distance Study Programme in Environmental Sciences (infernum), a university continuing education programme (UCE) offered by the FernUniversität in Hagen and Fraunhofer UMSICHT in Oberhausen. It explores how the infernum programme integrates interdisciplinarity – a core principle of ESD – with flexibility and individualisation, which are fundamental to lifelong learning, to promote ESD for adult learners. The article concludes with some reflections on the benefits and limitations of the infernum model.

INTRODUCTION

Humankind has been exceeding the planetary boundaries for several decades and there is no indication of a reversal of this trend. Ecological degradation, climate change and biodiversity loss are already seriously threatening the planet's integrity and its capacity to meet human needs. At the same time, poverty remains widespread, particularly in large parts of Africa. To tackle these urgent ecological and social challenges, a great transformation is needed that will lead to a fundamental change in the way societies and ecosystems interact. The 17 Sustainable Development Goals (SDGs), which form the core of the 2030 Agenda for Sustainable Development, serve as a roadmap for this necessary global transformation (UNEP 2021).

From the outset, education has been recognised as a critical lever for achieving sustainability. This is reflected in SDG 4, which calls for inclusive and equitable quality education and lifelong learning opportunities for all. At the same time, the importance of Education for Sustainable Development (ESD) in achieving all other SDGs has been emphasised (Rieckmann, 2022, p. 192).

Higher education institutions (HEIs) have been identified as key actors in promoting ESD through their three key functions: a) educating future leaders (teaching function), b) conducting research on sustainable innovations (research function) and c) offering lifelong learning opportunities for individuals to update their knowledge and skills (continuing

education function). However, many scholars have noted that the integration of sustainability into HEIs as well as the pedagogical innovation needed for ESD has been slow to develop (Mokski et al., 2023; Howlett et al., 2015). In particular, the third function – continuing education – remains under-researched and underreported from an ESD perspective. We still know little about how UCE can be conceptualised to effectively contribute to achieving sustainable development.

This article therefore presents an innovative example of uUCE for sustainable development: The Interdisciplinary Distance Study Programme in Environmental Sciences (infernum), offered by the FernUniversität in Hagen, Germany, in cooperation with the Fraunhofer Institute for Environmental, Safety and Energy Technology (UMSICHT) in Oberhausen, Germany. This study programme, which has been repeatedly awarded as best-practice model for ESD, integrates interdisciplinarity, flexibility and individualisation to promote effective university continuing education for sustainable development (UCESD).

The article first outlines conceptual linkages between the concepts of ESD, interdisciplinarity, lifelong learning (LLL), flexibility and individualisation. It then illustrates how these principles are implemented in the organisational and didactic structure of the infernum study programme, and concludes with reflections on its benefits as well as limitations.

CONCEPTUAL LINKAGES BETWEEN INTERDISCIPLINARITY, LLL, FLEXIBILITY AND ESD

ESD and Interdisciplinarity

Given that sustainable development is inherently interdisciplinary – spanning ecological, economic and social dimensions and intersecting with nearly all academic disciplines – it is evident that the SDGs cannot be achieved through isolated disciplinary efforts. Numerous scholars have emphasised the need for an interdisciplinary approach in ESD (e.g., Annan-Diab et al., 2017; Mokski et al., 2023). Correspondingly, in the literature on ESD competencies, interdisciplinary knowledge, understanding complexity and systemic thinking are highlighted as key elements of so-called *Gestaltungskompetenz* (shaping competence) – a concept referring to the competencies and capacities of individuals needed to actively contribute to sustainable development (Rieckmann, 2022).

In the context of ESD at HEIs, the academic discourse likewise advocates for stronger interdisciplinary approaches: Azeiteiro et al. (2015) claim that “The emphasis of higher education institutions should be to promote interdisciplinary thinking and analysis” (p. 309). Similarly, Lozano et al. (2013) stress that “proper academic recognition of the importance of multi-disciplinary and transdisciplinary teaching, research and community outreach is essential for speeding up the societal transformations that are needed for sustainable social development” (p. 18). Generally speaking, supporting ESD at HEIs is associated with interdisciplinary curricula and innovative pedagogical approaches such as problem-based learning, serious games, service learning or living labs (for an overview, see Smith, 2019).

In sum, an interdisciplinary approach is essential to effective university education for sustainable development. In the specific field of university *continuing* education – where universities serve as *lifelong learning* hubs for learners at all ages – such an interdisciplinary approach must be paired with a high degree of flexibility and individualisation. This ensures accessibility for diverse learner groups in various life circumstances and enhances their learning motivation.

ESD, LLL, Flexibility and Individualisation

Sustainable Development Goal 4 “brings the concept of lifelong learning to the core of the debate on sustainable development” (Viera 2019, p. 536). While the term education is often misleadingly biased to young people in formal learning settings, the lifelong learning paradigm broadens the perspective to learners at all ages, all levels of education and a wide range of individual learning purposes. The 2030 Agenda for Sustainable Development connects the concepts of education, lifelong learning and sustainable development by placing “the education of youth and adults in a lifelong perspective at the heart of the realization of the majority of the SDGs” (ibid., p. 542).

To make lifelong learning for sustainable development a reality, didactic approaches are needed that are both compatible with diverse life circumstances and effective in motivating adult learners. In this context, the concepts of flexibilisation and individualisation are frequently highlighted in the literature (Martin et al., 2024). These are closely linked to the growing demand for *digital learning* formats. Zawacki-Richter and Stöter (2020) explicitly advocate for *blended* or *hybrid learning formats* as the way forward by combining the benefits of asynchronous self-directed learning (flexible scheduling; self-paced learning) with those of synchronous formats (collaborative learning; sense of community, immediate feedback; exchange of views).

In addition to spatio-temporal flexibility through hybrid learning formats, *individualisation* is essential for effective UCE for sustainable development. Individualisation in education refers to an approach that adapts learning experiences to the specific needs, interests and circumstances of each learner. Research in adult education has long highlighted that learners’ motivation is closely linked to how well the content aligns with their personal backgrounds, interests and individual learning goals (e.g., Woldeab et al., 2023).

In summary, *interdisciplinarity* – an essential component of ESD – and *flexibility/individualisation*, which are central to adult learning, must be combined to achieve effective continuing education for sustainable development.

THE INTERDISCIPLINARY DISTANCE STUDY PROGRAMME IN ENVIRONMENTAL SCIENCES (INFERNUM)

The Interdisciplinary Distance Study Programme in Environmental Sciences (infernum) is a long-standing university-based continuing education programme which uniquely combines a high degree of interdisciplinarity in its curriculum with a high degree of flexibility and individualisation in the learning process.

For 25 years already, infernum has been jointly offered and continuously developed by the FernUniversität and Fraunhofer UMSICHT. Based on this innovative cooperation model between a university and a research institute, infernum provides complementary and interdisciplinary continuing education in environmental and sustainability sciences. It addresses professionals from business, academia, civil society associations or public administration – regardless of their prior field of study. Learners who already hold a first academic degree can obtain the academic degree “Master of Science” in Environmental Sciences. Participants without previous academic qualifications can pursue their further education goals in environmental sciences on an individual basis via the certificate programme.

Each semester, around 550 students take part in the courses offered by infernum. To date, more than 1,200 master's degrees and certificates have been awarded. The programme is accredited and has been repeatedly awarded by the German UNESCO Commission and the

Federal Ministry of Education and Research for its strong commitment to Education for Sustainable Development (ESD).

Interdisciplinarity in the infernum study programme

Interdisciplinarity is one of the defining features of the infernum study programme and is reflected in multiple dimensions. First, the curriculum is structured in a way that ensures a high degree of interdisciplinarity. It is divided into three overarching branches: (1) law, economics and social sciences, (2) natural and engineering Sciences, and (3) interdisciplinary cross-cutting issues. The elective modules offered across these branches cover a broad range of topics, including environmental economics, environmental and climate law, environmental politics, environmental psychology and climate communication, as well as environmental chemistry, climate science, water governance, circular economy, waste management, renewable energy supply, energy efficiency and sustainable mobility. The third branch, in particular, is designed to foster integrative thinking by combining different disciplinary perspectives on environmental challenges. For example, the module *Sustainable Mobility* explores mobility through technological, political, sociological, psychological and urban planning lenses.

Although students enjoy a high degree of freedom in selecting their courses (see section below), one requirement is clearly defined in the examination regulations: students must compile their elective modules in an interdisciplinary manner, meaning they are required to study courses from all three curriculum branches.

The complementary on-site and live online seminars are also designed to be interdisciplinary: speakers from various academic backgrounds are invited to address environmental topics—such as sustainable diets, climate adaptation, biodiversity loss or sustainable finance—from multiple disciplinary perspectives. A key component of these live (online) seminars is the use of group work and simulation games, designed to promote collaborative learning and interdisciplinary exchange. The interdisciplinary character of the seminars is reflected in the vivid discussions among the students, who all contribute their diverse disciplinary and professional backgrounds.

In addition, the programme's interdisciplinarity is reflected in the coursework and examinations. For their *Hausarbeit* (seminar paper), students are required to adopt a disciplinary perspective different from their own academic background. Students with a first degree in a discipline from curriculum branch 1 (economics, law and social sciences) must analyse an environmental issue from the perspective of curriculum branch 2 (natural and engineering sciences), and vice versa. Concerning their master's thesis, students are expected to adopt an interdisciplinary approach by combining insights from at least two academic fields to address a specific environmental issue. By engaging in interdisciplinary studies and coursework, students develop the ability to address questions and problems in a holistic and sustainable manner. Learning to navigate different 'scientific languages' prepares them to collaborate effectively in interdisciplinary teams.

Last but not least, the programme's interdisciplinary nature is also reflected in the diverse academic backgrounds of the two scientific directors and the staff in the two administration offices – one based at Fraunhofer UMSICHT, the other at the FernUniversität. In the day-to-day management of the programme, different disciplinary approaches, terminologies and academic cultures are actively mediated to develop formulations and requirements that are comprehensible to all students, regardless of their academic background.

Flexibility and individualisation in the infernum study programme

The infernum study programme offers a high degree of flexibility and individualisation to make it accessible and attractive to learners of all ages and in diverse life circumstances.

Didactically, the study programme follows a blended learning approach, combining asynchronous self-directed learning phases—using course books, video lectures, quizzes and e-learning units as learning materials—with live (online) seminars. In the synchronous seminars, lectures by scientists and practitioners, discussions, student presentations, group work, simulation games and excursions play a central role.

Students can begin their studies and start (asynchronous) modules at any time throughout the year, without being constrained by traditional semester schedules. Generally speaking, studying does not take place in fixed groups but is highly personalised. Modules with synchronous components are optional, allowing students to easily switch to asynchronous alternatives. Participation in at least three live (online) seminars is mandatory for master's students, but they can select dates that best suit their schedules. The standard study period stipulated in the examination regulations – based on a workload of 15 credits per semester – serves only as a flexible guideline in practice. In fact, students decide their own workload per semester as well as the duration of their studies. They can even take a break from the programme for several semesters and resume their studies at a later time. This flexibility allows students to adjust their study load and pace according to their professional and personal commitments.

In line with adult education theory, infernum students take responsibility for their own learning process and tailor their study content to their individual needs. The examination regulations provide only broad guidelines for selecting modules, giving students significant freedom to choose content that best supports their personal development. Additionally, students are encouraged to select topics for their seminar paper, practice module and master's thesis based on their personal interests. If desired, they can collaborate with a practice partner – such as a municipality, company or research institute – to connect their research to real-world challenges and contexts.

Due to the high proportion of asynchronous learning – approximately 90% compared to 10% for synchronous sessions – the two administrative offices of the study programme play a crucial role as communication and counselling hubs, bridging the distance between the institutions offering the programme, the lecturers and the students. As some students seek more interaction with their peers, the administration encourages them to form study groups (either virtually or in person) to foster more synchronous engagement during their studies.

CONCLUSIONS: BENEFITS AND LIMITATIONS OF THE INFERNUM MODEL

By combining an interdisciplinary approach with a flexible and individualised study model, infernum provides effective university-level continuing education for sustainable development. The programme is designed to foster key ESD competencies such as critical and systemic thinking, as well as a holistic understanding of environmental issues across disciplines. It offers a learning experience that is both research- and practice-oriented, drawing on current research at the FernUniversität and Fraunhofer UMSICHT while maintaining a strong connection to real-world challenges. Thanks to its highly flexible and personalised format, the programme is accessible to people in a wide range of life circumstances and enables learners to tailor both the content and timing of their studies to fit their individual needs.

A constant challenge for the academic and administrative leaders of the programme is to strike the right balance between asynchronous and synchronous learning elements. There is, to some extent, a trade-off between the use of innovative ESD pedagogies and the flexibility

offered by a distance-learning format. Many of the pedagogical approaches that are essential for a transformative learning experience – such as collaborative learning and the exchange of perspectives – require real-time interaction to some extent. While asynchronous tools like online forums do support a degree of exchange, synchronous formats, and in particular on-site seminars, remain the most effective settings for this kind of engagement. At the same time, a high proportion of asynchronous learning is crucial to maintaining the programme's accessibility—especially for those who, due to professional or family commitments, are unable to attend many live (online) sessions.

Despite this tension, infernum appears to have found a workable balance. Now celebrating its 25th anniversary, the programme continues to receive excellent feedback: according to annual graduate surveys, the majority of former students rate their study experience as "very good" or "good" and report a strong positive impact on their personal and professional development. Many also highlight that their studies helped them enter or advance in the environmental sector. These results suggest that infernum has been successful in creating a continuing education format that not only meets learners' needs but also contributes meaningfully to sustainable development.

REFERENCES

Annan-Diab, F. and Molinari, C. (2017) 'Interdisciplinarity: Practical approach to advancing education for sustainability and for the Sustainable Development Goals', *The International Journal of Management Education,* 15 (2017), pp. 73-83.

Azeiteiro, U.L., Bacelar-Nicolau, P., Caetano, F.J.P. and Caeiro, S. (2015) 'Education for sustainable development through e-learning in higher education: experiences from Portugal', *Journal of Cleaner production,* 106(11), pp. 308-319. https://doi.org/10.1016/j.jclepro.2014.11.056.

Howlett, C., Ferreira, J.-A. and Blomfield, J. (2015) 'Teaching sustainable development in higher education. Building critical, reflective thinkers through an interdisciplinary approach', *International Journal of Sustainability in Higher Education,* 17(3), pp. 305-321. https://doi.org/10.1108/IJSHE-07-2014-0102.

Lozano, R., Lukman, R., Lozano, F.J., Huisingh, D. and Lambrechts, W. (2013) 'Declarations for sustainability in higher education: becoming better leaders, through addressing the university system', *Journal of Cleaner Production,* 48, pp. 10-19. https://doi.org/10.1016/J.JCLEPRO.2011.10.006.

Martin, A., Pengel, N., Haag, M. and Wollersheim, H.-W. (2024) 'Learning in the Context of (Digital) University Teaching: Flexibilisation and Individualisation', *Higher Education Research,* 9(2), pp. 31-37.

Mokski, E., Leal Filho, W., Senehm, S. and Osório de Andrade Guerra, J.B.S. (2023) 'Education for Sustainable development in higher education institutions: an approach for effective interdisciplinarity', *International Journal of Sustainability in Higher Education,* 24(1), pp. 96-107. https://doi.org/10.1108/IJSHE-07-2021-0306.

Rieckmann, M. (2022) 'Developing and Assessing Sustainability Competences in the Context of Education for Sustainable Development', in Karaarslan-Semiz, G. (ed.) *Education for Sustainable Development in Primary and Secondary Schools,* pp. 191-203.

Smith, A.M. (2019) 'Innovative Approaches to Teaching Sustainable Development', in Leal Filho, W. (ed.) *Encyclopedia of Sustainability in Higher Education*. Wiesbaden: Springer nature, pp. 954-963. https://doi.org/10.1007/978-3-319-63951-2_18-1.

United Nations Environment Programme (UNEP) (2021) *Making Peace with Nature: A Scientific Blueprint to Tackle the Climate, Biodiversity and Pollution Emergencies*. Available at: https://sdgs.un.org/publications/publication-making-peace-nature-scientific-blueprint-tackle-climate-biodiversity-and (Accessed 09 April 2025).

Viera, D. (2019) 'Lifelong Learning and its Importance in Achieving the Sustainable Development Goals', in Leal Filho, W., Azul, A., Brandli, L., Özuyar, P. and Wall, T. (eds) *Quality Education. Encyclopedia of the UN Sustainable Development Goals*. Cham: Springer, p. 1-9. https://doi.org/10.1007/978-3-319-69902-8_7-1.

Woldeab, D., Punti, G. and Bohannon, R. (2023) 'The lived experiences of adult learners in an individualized program: Empowerment, responsibility, tensions, and anxiety', *Journal of Adult and Continuing Education,* 29(2), pp. 524-543.

Zawacki-Richter, O. and Stöter, J. (2020) 'Angebotsformen des Fernstudiums mit digitalen Medien in der wissenschaftlichen Weiterbildung', in Jütte W. and Rohs, M. (eds) *Handbuch Wissenschaftliche Weiterbildung.* Wiesbaden: Springer VS, pp. 299-314.