Interdisciplinary learning for ESD: teaching resources

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Introduction

Considerations for the design and implementation of interdisciplinary learning into your teaching to support student sustainability competency development.

For the purposes of this guide the phrase Interdisciplinary learning is used to include learning that involves the integration of two or more disciplines (interdisciplinary) and learning that involves academia and wider society (transdisciplinary).

If you have any resources that you use in your teaching that you think will be support this topic and will be accessible to other subject areas, please contact cie@liverpool.ac.uk

Decide on your aims & objectives for using interdisciplinary learning

Depending on the teaching approaches and learning activities that you use, typically interdisciplinary learning can support the development of:

- **Employability** – simulates collaborative interdisciplinary team working that students will encounter in many work and other settings.
- **Critical thinking** - ability to question norms, practices and opinions, reflect on different perspectives, analyse information, assess the credibility of information sources.
- **Integrated problem-solving** - ability to work within a discipline and across disciplines, link theory to practice, apply different problem-solving frameworks to complex sustainable development problems.
- **Collaboration –** ability to learn from and with others, respect different needs and perspectives, tackle conflicts, undertake collaborative problem solving.

- **Communication –** ability to communicate disciplinary understanding to non-specialists, to process information from other disciplines, and between students and teachers from different disciplines.

In addition, transdisciplinary learning can foster:

- **Real-world problem-solving skills –** that can be applied to real-world challenges.
- **Enhance creativity and innovation** - by exposing students to a wide diversity of perspectives and approaches outside of the institution.

Develop learning outcomes that can support interdisciplinary learning

Appendix A - lists some example interdisciplinary learning outcomes.

Select learning and teaching approaches that can support your interdisciplinary learning aims and learning outcomes

The learning and teaching approaches that you design into your programme will vary with subject area, practical considerations, and your aims for interdisciplinary learning. There are three broad types of teaching approaches commonly used to support interdisciplinary learning:

Co-teaching/ team teaching

Co or team teaching, and sharing the planning of learning:

- Advanced planning and negotiation with co-teacher.
- Co-advising with industry representatives.
- Taking turns in teaching.
- Creating learning community.
- Co-creation of syllabus and case studies.

Benefits:

- Can be relatively easy to coordinate with academic colleagues and external contacts.
- Supports the development of student's critical thinking competency through introducing diverse interdisciplinary perspectives for real-world sustainability issues.
- Can provide students with insights as to how experts in different disciplines and work settings develop solutions to complex problems.

Challenges:

- If not employing active for forms of student learning (problem-centred learning for example) co-teaching can tend to be knowledge focused and will not develop

students integrated problem-solving, communication, and collaboration competencies.

Active learning partnerships

Active learning approaches coordinated across two or more cohorts of students. For example, students from two different subject areas work on a sustainability problem in interdisciplinary groups providing different disciplinary perspectives but are assessed separately within their original module. Active learning approaches that can be used include:

- Research and inquiry projects.
- Problem-centred learning.
- Case study methods.
- Role-playing.
- Simulations.
- Virtual methods.

Teaching approaches that take advantage of the group setting of teaching interdisciplinary courses:

- Peer-assessment and review
- Peer-assisted Learning (PAL)
- Small-group teaching.

Benefits:

- Supports the development of students integrated problem-solving, communication, and collaboration competencies.
- Module leaders can develop collaborations and partnerships with colleagues without engaging with course change processes and school/ faculty requirements.

Challenges:

- Requires coordination and planning between staff to identify viable collaborations that are practical within timetabling restrictions etc. Strong trust and working relationship between staff from different disciplines is required.
- Staff time and input required to support students new to working in an interdisciplinary context, introducing active learning approaches that will be used, and coordinating student engagement through group work facilitation etc.
- As typically students are assessed within their original modules this approach will not simulate a fully collaborative group process requiring students to negotiate solutions, manage conflicts, and different perspectives.

Interdisciplinary courses

Full interdisciplinary or transdisciplinary courses that are extra-curricular or embedded into programmes.

Benefits:

- Extra-curricula interdisciplinary courses can provide students the experience of interdisciplinary learning that might otherwise might not be possible or available in their subject area.
- Signals to students that interdisciplinary learning is important.
- If embedded and progressively developed across a programme, interdisciplinary (transdisciplinary) learning modules can provide students with an opportunity to extensively develop their critical thinking, integrated problem-solving, collaboration and communication competencies aligned to solving real-world complex problems.

Challenges:

- Programme level interdisciplinary learning courses require resources to plan, coordinate and support across faculty processes and requirements.
- Capacity building for staff's abilities to work in interdisciplinary learning contexts is required.

Summary of the three different learning and teaching approaches to interdisciplinary learning:

Approach	Benefits	Challenges	Competencies
Co-teaching:	Easy to set up & integrate into current teaching.	Tends not to support active forms of student learning.	Critical thinking
Active learning partnership	Can engage students in active real-world learning that does not encounter the institutional organisational challenges associated with an interdisciplinary course.	Tends to employ separate assessments for each student cohort and does not fully simulate real-world interdisciplinary working. Relies on strong working relationships between academic staff.	Critical thinking Communication Integrated problem-solving
interdisciplinary courses	If students are engaged in real-	Can be problematic to coordinate	Critical thinking

	world problem-solving activities, interdisciplinary modules can effectively simulate real-world contexts.	across school and faculty structures, particularly for assessments. Requires resourcing and staff capacity building.	Communication Integrated problem-solving Collaboration

Course design considerations

Considerations for using interdisciplinary learning to support education for sustainable development (ESD):

Aim to integrate the interdisciplinarity in ways that reinforce students' disciplinary learning

- Designing interdisciplinary group work to build on disciplinary learning helps to reach all students rather than only the willing.
- It helps to persuade students of the relevance of sustainability where this is not obvious. Most straightforwardly, this could take the form of giving students sustainability problems or cases through which they practice applying new disciplinary skills or concepts.

Guide students to integrate knowledge in interdisciplinary settings

- Students generally need support to integrate different disciplinary knowledge, beyond simply accumulating it. A common topic or theme brings valuable focus here.
- Where courses are team-taught by disciplinary specialists across faculties, coming together for early introductory framing and concluding synthesis sessions can model for students how different disciplines can respond to each other as they address a given problem.

Designing interdisciplinary group work to build on disciplinary learning helps to reach all students rather than only the willing:

- It helps to persuade students of the relevance of sustainability where this is not obvious. Most straightforwardly, this could take the form of giving students sustainability problems or cases through which they practice applying new disciplinary skills or concepts. At its most advanced it could take the form of incorporating inter- or transdisciplinary sustainability learning into a disciplinary degree programme.

Supporting effective teaching partnerships

Effective partnerships in interdisciplinary teaching are typically based on three components: experience; personality and working style; and beliefs about learning. Spend sufficient time with colleagues in planning the course ensuring you agree:

- A shared pedagogical philosophy.
- Perception of roles and expectations.
- Negotiating teaching approaches,
- Assessment criteria.
- Responsibility for grading (if co-assessed).

Further support

Contact CIE about opportunities to connect with other subject areas or outside organisations cie@liverpool.ac.uk

References

Interdisciplinary provision in higher education. Current and future challenges (HEA report, 2015)

Education for Sustainable Development: a review of the literature 2015-2022 (QAA report, 2023)

Additional resources

Multi-cultural group work

Problem-centred learning for ESD teaching resources in this ESD toolkit.

Appendix A: example interdisciplinary learning outcomes and learning activities.

(Generated by ChatGPT)

1. **Critical Analysis Across Disciplines:**

Critically analyse problems by applying concepts and methodologies from at least two different disciplines.

Example Activity: Conduct a research project where students must utilise both sociological theories and statistical methods to examine a social issue.

2. **Interdisciplinary Collaboration and Communication:**

Demonstrate the ability to effectively collaborate and communicate across disciplinary boundaries.

Example Activity: Form cross-disciplinary teams to develop a proposal for a sustainable community development project, requiring input from environmental science, economics, and urban planning.

3. **Innovative Problem-Solving:**

Apply interdisciplinary approaches to propose innovative solutions to complex real-world problems.

Example Activity: Host a hackathon where students from computer science, business, and design work together to create a new tech-driven service or product.

4. **Ethical Consideration in Diverse Fields:**

Evaluate the ethical implications of decisions and actions in their own and other disciplines.

Example Activity: Analyse a case study involving a moral dilemma in healthcare, requiring understanding of both medical practices and ethical theories.

5. **Integrating Theory and Practice from Multiple Disciplines:**

Integrate theoretical knowledge with practical applications from more than one academic discipline.

Design and implement a community service project that requires applying psychological theories of human behaviour and education techniques.

6. **Global and Cultural Perspectives:**

Analyse global challenges by incorporating perspectives from different cultural and disciplinary backgrounds.

Example Activity: Participate in a global virtual exchange program where students collaborate with peers from different countries and academic majors to address global issues like climate change.

7. Reflective and Adaptive Learning:

Reflect on their interdisciplinary learning experiences and adapt their approaches based on this reflection.

Example Activity: Maintain a reflective journal throughout an interdisciplinary course, documenting the learning process and how different disciplinary perspectives have influenced their understanding.

8. Research Skills Across Disciplines:

Demonstrate the ability to conduct research using methodologies from multiple disciplines.

Example Activity: Undertake a thesis project that requires integrating research methods from both the humanities and the sciences.

9. Interdisciplinary Project Management:

Manage a project effectively, incorporating knowledge and skills from various disciplines.

Example Activity: Plan and execute a community event that involves aspects of event management, marketing, and cultural studies.

10. Digital Literacy and Technology Integration:

Utilise digital tools and technology effectively in an interdisciplinary context.

Example Activity: Create a multimedia presentation or digital art project that combines coding skills, artistic design, and narrative storytelling.

(From Co-pilot)

11. Analyse the impact of climate change on human health and well-being from the perspectives of environmental science, public health, and sociology.

12. Design and implement innovative solutions for sustainable development challenges using engineering, business, and policy tools.

13. Compare and contrast the artistic expressions and cultural influences of different civilizations in history using visual arts, literature, and music.