Pilar Acosta

Chapter 10. Solving Sustainability-Related Problems Using Self-Directed Learning

10.1. COURSE SUMMARY

Table 10–1

| Audience and level of studies | Students (Bachelor) | |
|--|--|-------------|
| Group size | 26–50 | |
| Course duration | 16 weeks | |
| Credits | 3 ECTS | |
| Workload | Presence: 48h Self-study: 72h | Total: 120h |
| Contents/primary top- ics | Sustainable development Organisational strategies for sustainability | |
| Main course objec- tives | Explain the concept of sustainable development and sustainable development goals (SDGs) Analyse organisational strategies for achieving SDGs Create a proposal for overcoming sustainability problems facing a specific organisation | |
| Main teaching ap- proaches | Experiential learning Self-directed learning Active learning | |
| Main teaching meth- ods | Sustainability-related consulting projectLectureField trip | |
| Learning environment | Classroom (face-to-face learning) Beyond classroom (organisational visits) | |
| Link to Sustainable Development Goals | SDG 9 Industry, Innovation and Infrastructure Build infrastructure, promote inclusive and sustainable industrialization and foster innovation SDG 12 Responsible Consumption and Production Ensure sustainable consumption and production patterns | |

Table 10–2

| Impact assessment: | (None) Low/Medium/High | Explanation |
|--|---------------------------|---|
| 1. Degree of student par- ticipation / activeness | High | Students are working on their own sustainability- related consulting project. They are responsible for directing their individual knowledge acquisi- tion process. The teacher offers guidance by providing the necessary resources, but students should demonstrate initiative and curiosity when developing the projects. |
| 2. Degree of student col- laboration / group work | High | Students work in groups throughout the entire course. |
| 3. Degree of student emo- tional involvement | Medium | Students reflect on their learning process in a self-assessment assignment. However, emo- tions are not explicitly explored. |
| 4. Degree of inter-/trans- disciplinarity | High | Students work in groups organised by the teacher to combine different disciplines to encourage critical thinking. |
| 5. Degree of student (self-) reflection | Medium | Students reflect on their individual learning pro- cesses through a self-assessment exercise. |
| 6. Degree of experience of real-life situations | High | Students provide solutions to real-life problems faced by a specific organisation. They also con- duct a field trip to the organisation. |
| 7. Degree of nature-related experiences | (None) | |
| 8. Degree of stakeholder integration | Low | Students learn through lectures and readings about how to map stakeholders and understand materiality as defined and used in the Global Reporting Initiative (GRI). |
| 9. Degree of integration between theory and prac- tice | High | Students work in groups using problem-based learning (PBL). This self-directed learning ap- proach involves an integration of theory and practice. |

10.2. COURSE INTRODUCTION

This course offers students the opportunity to create organisational strategies for achieving SDGs by using active learning pedagogies. The SDGs have been conceived recognizing the importance that multiple actors, including for-profit organisations, have in achieving them. In this course we seek to contribute to the participation of organisations of different nature to reach the goals of this global agenda.

Throughout the semester, students work on a project using problem-based learning (PBL). In this experiential learning approach (Kolb, 1984), students tackle real-world problems in small interdisciplinary groups. PBL is based on the principle that students are responsible for their own learning process, and it can be considered a self-directed learning approach (de Graaf & Kolmos, 2003).

Using PBL, students develop a proposal for solving a sustainability-related problem faced by a given organisation. Students must first define the problems at hand and then devise corresponding solutions. The teacher identifies organisations facing environmental and social issues in the context of local debates about sustainability (e.g. water access, biodiversity loss, poverty, lack of environmental education). For instance, in one semester, students dealt with problems faced by a social business in the industry of sustainable tourism; in another semester, students dealt with a distribution company's problem of how to reduce the impact of transportation. The course also includes a field trip that allows students to assess the sustainability situation of the target organisation.

At the end of the course, students present their proposed course of action to the organisation. They conduct a self-reflection exercise to assess their learning processes and the work they performed in groups.

10.3. LEARNING OBJECTIVES

The learning outcomes and competencies of this course are aligned with the competencies described in the educational institutional plan of Universidad Icesi (Universidad Icesi, n.d.). As required by the university, each course must contribute to the core abilities and competencies of the university. The course also contributes to the specific competencies of the business school which offers this course. It is also worth mentioning that this course seeks to develop higher-order competencies, i.e. analysis, synthesis, and evaluation (Bloom, 1956; St. Edward's University, n.d.).

Table 10–3

| Learning objec- tive dimension (UNESCO, 2017) | Learning objective | Competency referred to framework of Uni- versidad Icesi (n.d.) |
|--|--|--|
| Cognitive | Ability to explain the concept of sustainable development and the SDGs | Multiperspectivism |
| | Understand the historical evolution of sustainable development and related concepts | Local–global thinking |
| | Understand the principles of systems thinking | Multiperspectivism |
| | Ability to analyse organisational strategies for achieving SDGs | Strategic thinking |
| | Ability to understand different tools for the design, implementation and monitoring of strategies in terms of sustainable development | Innovation |
| Socio-emotional | Ability to critically reflect on the impacts of the sustainability practices of different organisations, particularly companies | Critical thinking |
| | Ability to critically reflect on the citizens' role in achieving the SDGs | Critical thinking |
| | Ability to associate everyday actions with the SDGs | Critical thinking |
| Behavioural | Ability to apply the socio-ecological system's framework | Multiperspectivism |
| | Ability to create a proposal to solve the sustainability problems identified in an organisation | Strategic thinking |
| | Ability to communicate the developed proposal to various audiences | Expression |
| | Ability to link organisational practices to the SDGs | Strategic thinking |

10.4. COURSE OUTLINE

Table 10–4

| | Structure | Session focus | Homework |
|--------|--|---|--|
| Week 1 | Introduction (3 hours) | Climate Fresk | Read an excerpt from "The Limits to Growth" (Meadows et al., 1972) Watch videos developed by the professor on the concept of sustainable development, as well as the course description and methodology of the course (PBL) |
| Week 2 | The concept of sustain- able development (3 hours) | Lecture on the concept of sus- tainable development Group exercise on sustainability in the food industry (see sub- chapter "Exercises") | Read an excerpt from "Collapse" (Diamond, 2005) Form groups for the semester |

| Structure | | Session focus | Homework | |
|-----------|--|---|--|--|
| Week 3 | The concept of sustain- able development (3 hours) | Video and discussion on "Collapse" (TED, 2003) Guest: biodiversity and conservation | Read website about SDGs (UN, n.d.) | |
| Week 4 | SDGs (3 hours) | Group exercise for SDGs: Prepare a newspaper article (see subchapter "Exercises") Lecture on SDGs | Read articles on socio-ecological systems (McGinnis & Ostrom, 2014; Ostrom, 2009) | |
| Week 5 | Systems thinking (3 hours) | Group exercise: Understand so- cio-ecological systems Guest: Systems thinking | Gather secondary information about the organisation and sus- tainability-related problems in the relevant industry | |
| Week 6 | Field trip (3 hours) | Field trip: Visit the organisation of the consulting project | Evaluation 1 (first six weeks) | |
| Week 7 | PBL (3 hours) | Discussion about the evaluation of the first six weeks Understanding the problem PBL: Design thinking | Understand the problem using complementary resources (sec- ondary data) | |
| Week 8 | PBL (3 hours) | Discussion and mentoring with the professor for each group | Prepare the first deliverable | |
| Week 9 | PBL (3 hours) | Presentation of each group: Iden- tified problems Feedback for each group | Read about examples of sustain- ability-related practices | |
| Week 10 | Sustainability-related practices (3 hours) | PBL: Analysing sustainability-re- lated practices for different orga- nisations | Watch videos developed by the professor on circular economy as well as the group self-assess- ment and peer assessment pro- cedures | |
| Week 11 | Circular economy (3 hours) | Lecture: Circular economyGuest: Lifecycle analysis | • PBL | |
| Week 12 | Developing ideas (3 hours) | Lecture: Developing ideasPBL: Developing ideas | PBL: Developing ideas | |
| Week 13 | Indicators for sustain- ability (3 hours) | Lecture: Indicators for sustain- ability Discussion and mentoring with the professor for each group | PBL: Defining indicators Prepare for the exam | |
| Week 14 | Exam (3 hours) | Individual exam | • PBL | |
| Week 15 | Mentoring (3 hours) | Discussion and mentoring with the professor for each group | • PBL | |
| Week 16 | Final presentation (3 hours) | Final presentation with the orga- nisation | | |

10.5. TEACHING APPROACHES AND METHODS

Active learning is emphasised in this course. Active pedagogies are rooted in constructivism, an approach that yields deeper understandings, particularly when teaching about sustainability (Armstrong, 2011). The teaching process for this course focuses on PBL, a self-directed learning approach that is guided by a tutor, which, in this case, is the teacher (de Graaf & Kolmos, 2003). PBL implicitly includes experiential learning, which is considered a pedagogical approach whereby learning occurs through experience (Lewis & Williams, 1994). PBL is suitable for teaching about sustainability issues because PBL is connected to problematisation, problem solving and critical reflection (MacVaugh & Norton, 2012).

In this course, students address real problems in small groups under the supervision of the teacher, who facilitates the learning process. The teacher serves as a guide and accompanies the students, who are each responsible for their individual learning process. Working in small groups is central to this type of methodology because small groups enable students to actively contribute not only to the learning process but also to the development of group activities by utilising their attitudes and soft skills.

Students work in multidisciplinary groups (the teacher defines the groups to ensure multidisciplinarity) to propose solutions and create a proposal for solving one sustainability-related problem faced by a specific organisation (McPherson et al., 2016). Working in groups composed of students from various disciplines (in this case, biology, engineering, design, economy and business students) fosters critical and reflective thinking (Howlett et al., 2016). In the face of the so-called grand challenges such as climate change, inequality and biodiversity loss, there has been an increased interest in interdisciplinarity. This is particularly true in the context of natural resource management, which requires collaboration across multiple disciplines and different stakeholders (Roy et al., 2020).

The objective of the course is not to focus on actions already developed by the organisation, but to propose methods for solving sustainability issues. The teacher's guidance helps students understand the context, define the problem and develop solutions. Students must present their proposals to the organisation at the end of the semester.

The course lessons combine lectures with guest visits. Guests are invited to speak further about certain topics (e.g. biodiversity) that might be useful for the development of the projects. During the development of the projects, the teacher provides tools to help students assess, understand and solve the problem. Examples of tools are iceberg analysis (Ellis & Black, 2018) and materiality analysis (GRI, n.d.), 1978.3748933090-185, am 27.07.2024, 01:50:37

Before each class, students read assigned texts or watch assigned videos. During class time, students must actively participate in discussions and exercises to understand the methodological tools proposed while reflecting on sustainability issues. Some lectures given by the professor or guests will help strengthen students' understanding of key concepts. These lectures are useful because students come from different backgrounds and have not necessarily taken sustainability-related courses previously. During the class, the teacher mentors students on their project development. After class, students mainly work on their projects and complete the necessary work to advance the development of their sustainability proposal.

10.6. EXERCISES

Exercise 1: Sustainability in the food industry

Students are given a question that they must research using different sources. They must identify problems that make the agri-food industry unsustainable. They must present their results using a conceptual map. The map clarifies the relationships between different variables by identifying causes and effects. For instance, a conceptual map can link the use of fossil fuels with the rise of food prices or dependency between countries. Students must also identify the different effects of the intensive use of natural resources or explain how the marketing of certain products and the idealisation of certain lifestyles impacts health and obesity rates. With this activity, students get an introduction to the PBL methodology.

Exercise 2: Newspaper article

In this activity, students must choose a SDG and write a short newspaper article. This exercise is carried out in partnership with a local newspaper. Students can choose to write an opinion column for the newspaper or research a topic related to a SDG. Articles are short (around 800 words). The teacher and the newspaper editor provide feedback before accepting the final versions.

Exercise 3: PBL

The main exercise of the course is the consultancy project using PBL (see subchapter "Teaching Approaches and Methods"). Once a tool, such as iceberg analysis, is explained, students are given time during the lesson to use the tool in their analysis of the organisation.

10.7. ASSESSMENT

Table 10–5

| Evaluation type | Percentage (%) |
|--|----------------|
| Newspaper article (see subchapter "Exercises") | 10 |
| Evaluation 1 | 10 |
| Individual exam | 30 |
| PBL project (group evaluation and individual evaluation) | 50 |
| Total | 100 |

Evaluation 1 covers the first six weeks of the course. It evaluates the first objective of the course (i.e. explaining the concept of sustainable development and SDGs). This evaluation is conceptual and includes multiple choice questions.

The *individual exam* covers the entire course. Students should be able to analyse a problem using the reflections and tools of the course. The exam presents a situation that involves different organisations and relates to different SDGs. Students are asked to understand the main problems and reflect on the causes.

The *PBL* assessment includes two deliverables. The first deliverable is a written report describing the situation and the identified problems. This report is not graded, but it is used to provide feedback to students. The second deliverable is an oral presentation where students briefly summarise the problems identified and present their solutions for solving these problems. It is evaluated in terms of the quality of the analysis, the creativity of the solutions proposed and the form of the presentation. Instead of a presentation, students can also produce a video. An assessment rubric is created and distributed to students. Students evaluate their peers in terms of both the quality of the analysis and their contribution to the group. The peer evaluation is done in weeks 10 and 16. Students also complete a self-assessment on their contribution to the project.

10.8. PREREQUISITES

- Required prior knowledge from students: basics of organisational management
- Required core competencies for teachers:
 - Sustainability and design thinking
 - Understanding the principles of PBL

- Required tools:
 - Online collaboration platforms (e.g. Zoom, Miro, Mural and Padlet)
 - Video and presentation development tools (e.g. Canva, Filmora, Adobe Pro and PowerPoint)

10.9. RECOMMENDED RESOURCES

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10.10. GENERAL TIPS FOR TEACHERS

Using PBL with undergraduate students who are accustomed to being passive recipients of a teacher's knowledge is challenging. Therefore, it is important to explain to students the differences between PBL and traditional, lecture-based classes. Students often forget the principles of PBL; therefore, it is recommended to remind them of these principles throughout the course.

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