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PEDAGOGICAL MODEL FOR TEACHING SUSTAINABILITY IN HIGHER EDUCATION: ENGAGING HEAD, HANDS AND HEART

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Abstract

This study aims to build a pedagogical model that engages both head, hands, and heart in the transformative learning of sustainability. We built our pedagogical model for teaching sustainability by integrating the theories of transformative learning (Mezirow 2006; Hoggan 2016), transformative learning for sustainability (Sipos et al., 2008; Rodríguez Aboytes & Barth, 2020), sustainability competencies (Redman & Wiek, 2021) and education for sustainability leadership (Haney et al., 2020; Novy et al., 2021). Our study contributes by integrating the theory into a coherent pedagogical model with learning activities that are designed to engage both the learners' thoughts, identity, and agency. By using empirical data from the first implementation in the advanced master's level course in the fall 2023, we tested its transformative potential through pre- and post-surveys (n=25) and student feedback (n=19) and demonstrated the learning outcomes as well as the evaluation of the implementation practices.

Keywords: *Education for sustainable development, sustainability competencies, transformative learning, pedagogical model, higher education.*

1. Introduction

Exceeding the planetary boundaries that sustain life on earth indicates how we as a humankind need to radically change our course and break with unsustainable social and cultural structures, norms, and practices (Boström et al., 2018). Against this background, many scholars have recognized the necessity of transformative learning to solve our deep-rooted sustainability challenges (Sipos et al., 2008; Rodríguez Aboytes & Barth, 2020).

In this study, we aim to answer the research question: *How to build a pedagogical model that engages both head, hands, and heart in the transformative learning of sustainability?* Our focus is on learning activities. We aim to build a transformative pedagogical model for higher education that not only aims to develop sustainability competencies but also to advance the identity of a sustainability expert and leader. Through action-oriented case study, we explore how students develop sustainability competencies, sustainability leader identity and empowerment to act through engaging in active learning exercises. These learning activities are designed to engage both the learners' thoughts, identity, and agency.

2. Transformative learning for sustainability

The concept of transformative learning was introduced in 1978 in the field of adult learning by Jack Mezirow (Mezirow 2006), who developed it through various revisions into an established learning theory (Kitchenham 2008). Mezirow (2006, p. 92) defines transformative learning as "the process by which we transform problematic frames of reference (mindsets, habits of mind, meaning perspectives) – sets of assumptions and expectation – to make them more inclusive, discriminating, open, reflective and emotionally able to change." The key elements of transformative learning are the critical reflection on the assumptions and the participation in discourse (Kitchenham 2008). For creating fruitful conditions for transformative sustainability learning, Rodríguez Aboytes & Barth (2020) emphasize the importance of time and space for reflection and discourse as well as the social interaction among learners. Recent reviews have pointed out the superficial use of the term *transformative* learning and the danger of becoming empty of meaning when it is used to refer to almost anything (Hoggan 2016; Rodríguez Aboytes & Barth, 2020). Hoggan (2016, p. 77) argues for broadening the meaning of transformative learning from Mezirow's specific definition focusing on people's meaning making processes and

epistemic shift, into a metatheory or overarching paradigm, where transformative learning is understood as "processes that result in significant and irreversible changes in the way a person experiences, conceptualises and interacts with the world." Based on the synthesis of previous literature, Hoggan (2016) presents a typology of transformative learning outcomes, which illustrates that transformative learning does not only refer to cognitive changes but also engages emotions, identity, and agency. Similarly, the framework of transformative sustainability learning by Sipos et al. (2008) is organized on the principle of head (engagement, cognitive), hands (enactment, psychomotor) and heart (enablement, affective) to facilitate behavioural change.

Research on sustainability competencies and sustainability leadership have furthermore considered the preferred learning outcomes in sustainability education. There is a high level of agreement among scholars over the competencies needed for advancing transformations towards sustainability (Redman & Wiek, 2021). The framework of key sustainability competencies developed by Redman & Wiek (2021) is based on the systematic review of the previous literature and centers on eight key competencies in sustainability, five of which are established and gained widespread use in the literature (systems thinking, futures thinking, values thinking, strategic thinking, and interpersonal thinking competence), and three of which are emerging ones (intrapersonal, implementation, and integration competence). With emerging aspects, the framework better acknowledges the need to address emotional development along with the intellectual (intrapersonal) and put more focus on doing and acting on sustainability (implementation). Even though the term 'competence' is understood broadly to include knowledge, skills, understanding, values, attitudes, and desire (Redman & Wiek, 2021, p. 3), it seems to emphasize cognitive and practical abilities, instead of focusing on the agency and identity development of the learner. The research of sustainability leadership development complements this by highlighting the importance of personal development element in sustainability education and the need to address emotional and motivational aspects and not only the intellectual (Savage et al., 2015; Haney et al., 2020; Novy et al., 2021). For example, Haney et al. (2020) found out in their study how making sustainability personal for participants led to deep learning and feeling committed to and empowered to act for sustainability. In conclusion, the previous literature on sustainability education implies that we need to design the learning activities in a way that engages both thoughts, identity, and agency for sustainability.

3. Research context and method

This study was conducted in a Finnish university for a master's level course, for which a new pedagogical model was built and tested. The course is an advanced course included in the Degree Programs of Information and Knowledge Management and Environmental Engineering. We, the authors of this paper worked as the teachers and developers of this course while simultaneously studying this sustainability education and reflecting on it as researchers. The course had already been launched in 2020 and has been implemented twice in an academic year. We as the original designers and teachers of the course, wanted to renew the course and carefully consider what kind of learning activities would support the emergence of sustainability expertise and leadership. Building up the new pedagogical model started in the spring of 2023 by studying the literature on sustainability education, reflecting experiences on previous implementations, and drafting a pedagogical model to be tested in the fall 2023.

The designed pedagogical model was then implemented and tested by using feedback from the course participants in the form of pre- and post-reflection surveys (n=25) and official course feedback system (n=19). By using pre- and post-reflection surveys, we assessed the transformational learning in sustainability (based on changes in environmental perceptions, intentions, and behaviours) as well as the development of sustainability leadership and sustainability competencies. Both surveys included 38 statements to be answered in Likert-scale. We used validated statements from previous literature (mostly from Saari et al. 2021) to measure environmental knowledge, environmental concern, environmental risk perception, behavioural intention for environmental protection and sustainable consumption behaviour. Sustainability leadership was measured based on the sustainability leadership meter: "Rate on a scale of 0 (Not at all) to 10 (fully) the extent to which you see yourself as a sustainability leader". This idea of measuring leadership identity was derived from Clapp-Smith et al. (2019) but applied to the sustainability leadership context (Haney et al. 2020). Sustainability competencies were measured based on the statements in the survey by Savage et al. (2015) as well as on the definitions by Redman & Wiek (2021) and Annelin & Boström (2022). In addition to the statements, the post-survey included two open-ended questions: "How has the course affected the way or the extent you see yourself as a sustainability leader?" and "How has the course affected your sustainability competencies?"

Answering the surveys was anonymous to strengthen the validity of our research. Using identification number that the respondent self-created, we combined the respondent's pre- and post-answers. 32 students participated in the course, of which 25 answered both surveys. Because we

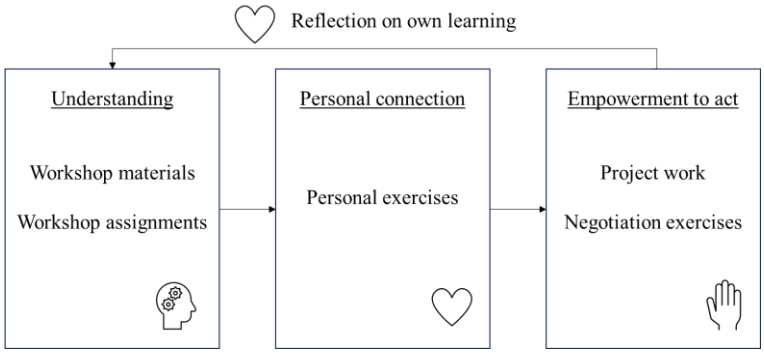
were interested in changes in students' perceptions due to learning in the course, for the analysis, we only included responses from respondents that answered both surveys (n=25). Although the sample is rather small, it well represents the participants in the course. In addition to the surveys, we analysed the students' numeric and verbal feedback received from the university's official feedback system (n=19). The course implementation in the fall 2023 was held in English and the participants represented several nationalities in addition to Finnish.

4. Results and discussion

4.1. Transformative pedagogical model for teaching sustainability

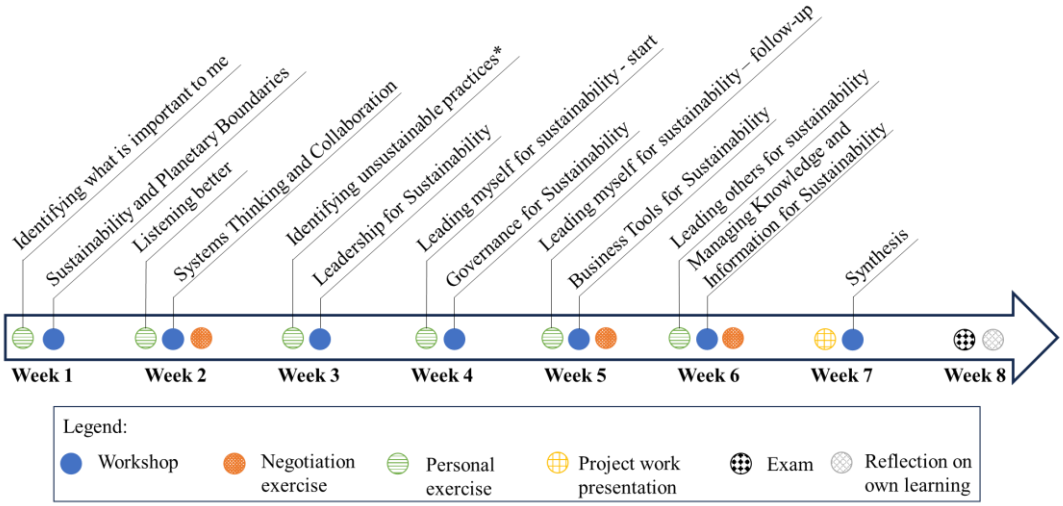
The overall framework of our pedagogical model builds on the idea that we need to develop not only thoughts but also identity and agency (Figure 1). It is in line with the organizing principle of head, hands, and heart for transformative sustainability education proposed by Sipos et al. (2008), and furthermore reflects the sustainability leadership education framework by Haney et al. (2020) consisting of three interlinked elements of understanding, personal connection, and empowerment to act.

Figure 1. Transformative pedagogical model for teaching sustainability (modified from Haney et al. 2020 with references to Sipos et al. 2008).



The course "Knowledge-based and Collaborative Decision Making for Sustainability" was taught over a period of eight weeks, out of which seven weeks consisted of preparative and in-class assignments (Figure 2). Students prepared for the classes by familiarizing with the workshop materials and by conducting personal exercises. The personal exercises aimed at engaging students' own motivation and to see their own role as a leader for sustainability. In the workshop, the personal exercises were discussed along with the workshop materials. In addition, project work assignments were carried out. Negotiation exercises were organized three times during the course. At the end of the course, students reflected their own learning based on the learning objectives of the course, which highlighted the change in students' sustainability skills brought on by the materials and assignments in the course.

*Figure 2. Timeline for the assignments during the course. The personal exercise marked with an * will be added on following implementations.*



The workshop materials consisted of short lecture videos on the key topics of the course and related scientific articles. The discussions in the workshops were to deepen the understanding about the topic and share knowledge and understanding between students. At the end of the course, the main learning points were discussed in a synthesis session. Workshop assignments were related to the project work on backcasting (based on Quist et al., 2006) that addressed transition towards defined sustainability vision using the backcasting steps. The project works were presented in a final poster session. The purpose of the negotiation exercises about complex sustainability issues (purchased from Program on Negotiation at Harvard Law School) was to introduce the collaborative approach to negotiations and to apply it in practice. Students had to prepare for the negotiation exercises by reading the general instructions of the negotiation context and their own role, and by familiarizing themselves with the chosen theoretical material (e.g., videos and texts by Program on Negotiation) that was discussed first in the session. One of the main learning goals of the negotiations was to change the mindsets from win-lose mentality into seeing a negotiation more as an opportunity to make up win-win solutions in contexts containing many contradictions and tensions related to the informational uncertainty, to the perceptions of risks, to the short-/long-term perspectives and to the ecological, social, and economic development.

4.2. Evaluation of implementation and learning outcomes

Students' answers were categorized in head, hands and heart, to reflect the sustainability knowledge and understanding, empowerment to act for sustainability and personal connection to sustainability, respectively. The course induced a positive change in all three categories.

Prior to the course, 48 % of the students claimed to know at least quite a lot of the causes of environmental problems. This value increased to 72 % after the course. Even larger difference was in the knowledge of the solutions of environmental problems: prior to the course 20 % claimed to now at least quite a lot, while after the course 60% knew at least quite a lot. After the course, the written answers revealed the increase in students' confidence in sustainability issues: "I am much more knowledgeable in sustainability context and now I have a better and wider perspective on how to assess the issues and solutions related to these." The results showed also that the futures thinking abilities clearly increased. Especially the ability to predict and consider the possible repercussions of our actions and decisions improved: prior to the implementation 28% agreed or strongly agreed of being capable of this in comparison to 80 % being of that opinion after the course. Analysing complex systems was rehearsed in workshops and in the backcasting project work. However, both prior to and after the course, students evaluated their ability to analyse complex systems to average (44% of the students agreed or strongly agreed). It is possible that when the understanding about the complexities of the sustainability problems and solutions increased, it decreased confidence in their own system analysis skills.

The ability of values thinking requires both knowledge and intrinsic motivation, and hence represents both head and heart. The course helped students to apply sustainability norms, principles and goals to solve sustainability problems (Strongly agree or agree changed from 48 to 84 %), to articulate a vision of a just and sustainable society (Strongly agree or agree changed from 56% to 80 %), to understand their own strengths and weaknesses as sustainability leader (Strongly agree or agree changed from 48% to 76 %) and to construct action plans that can help solve sustainability problems and create transformation for sustainability (Strongly agree or agree changed from 44 to 80 %). The increase in motivation to act for sustainability was also demonstrated after the course. The improvement in the intrapersonal skills was shown by the increased positive feeling about being able to induce change: "The course has given me confidence and provided me knowledge regarding sustainability tools and approaches and that now I feel positive about myself and prepared to work towards sustainability."

The behavioural intention to protect the environment by paying higher taxes or prices or accepting cuts in the standard of living stayed nearly unchanged (a change from 56 % to 61 % being at least somewhat willing), whereas the sustainability consumption behaviour increased somewhat (a change from 48% to 62% being at least often). The course increased the feel of being a sustainability leader by 26%. After the course, the average score was 6,7/10, while for some there was a clear difference: "It [the course] has increased my knowledge about sustainability and given me confidence to see myself as a sustainability leader." The course developed students' strategies thinking skills. The ability to develop practical tools for advancing a sustainability agenda increased (Strongly agree or agree changed from 36 to 64 %). The students rehearsed their interpersonal skills in workshops, project work and negotiation exercises. They evaluated that their ability to use collaborative approaches to problem solving increased clearly (Strongly agree or agree from 56 to 88 %) and to work together across e.g., different disciplines or perspectives increased (Strongly agree or agree changed from 72 to 84%). After the course, they also felt better at motivating positive change in others (Strongly agree or agree changed from 56 to 76 %) and at collaborating with diverse stakeholders (Strongly agree or agree changed from 52 to 80 %).

The mean of the overall assessments (n=19) given to the course was “very good” (4.00 on the scale 1–5). Versatile, participatory learning activities were appreciated. The model for negotiations: 1) pre-material, 2) in-class discussion based on the material, 3) negotiation, 4) debriefing and reflection on theories, worked well. Students were able to form syntheses on issues in the class discussions, and the final learning café-based synthesis tied issues together. However, some students hoped for more teacher-led overall syntheses on issues. Presumably, the whole potential of personal exercises was not achieved, because the exercises were launched for the first time and the actual implementation practices (e.g. instructions) were not well-established. Afterwards, with our intentional focus on solutions, we noted a need for the additional personal exercise of critical questioning where students would identify collective unsustainable practices and what kind of social norms, habits, structures, and power relations maintain those practices. Overall, based on the results, we could identify shifts in thinking, but we could not verify deeply rooted changes in students' worldviews, e.g. towards more ecologically grounded worldview.

5. Conclusions

Our study contributes by integrating the theory of transformative learning, sustainability competencies and education for sustainability leadership into a coherent pedagogical model with learning activities that are designed to engage both the learners’ thoughts, identity, and agency. Based on the results, the course increased environmental awareness and many sustainability competencies, such as futures thinking, strategic thinking and interpersonal skills, improved. The course increased students’ motivation to work towards positive change and to lead others. In the future, the pedagogical model needs to be further developed to encourage even more agency and empowerment to act for sustainability.

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