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Eco-Oriented Pedagogical Practices in Higher Education

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Abstract: The growing emphasis on sustainable development has reinforced the need for higher education institutions to rethink and innovate their pedagogical practices. This article presents a classroom-based case study examining the integration of sustainability-oriented teaching practices with 15 fourth-year undergraduate students in a higher education context. Sustainability principles were embedded into regular instruction through learner-centered and participatory strategies, including guided discussions, case-based activities, project work, and reflective writing. Data were collected through classroom observations, student-produced artifacts, and an end-of-course questionnaire exploring student engagement and perceptions. The findings reveal high levels of student participation, enhanced awareness of sustainability issues, and positive attitudes toward sustainability-oriented learning. These results highlight the potential of innovative, sustainability-focused pedagogical models to support the development of responsible and engaged future professionals. The study demonstrates that sustainability-oriented teaching practices can be effectively integrated into higher education, contributing to the transformation of contemporary university education in line with global challenges. The research was conducted within the national project *Integrating and Promoting Green Education in the Initial Training of English Language Teachers* (code 25.80012.0807.56SE), aligned with Moldova's strategic direction of Innovative Educational Technologies and Products.

Keywords: sustainability education; higher education; sustainability-oriented teaching; active learning

JEL Classification: Q56

1. Introduction

The urgency of environmental, social and economic problems has made sustainability a high priority in today's education. Higher education institutions are increasingly expected to provide learners with sustainability-related competencies (such as critical thinking, sense of social responsibility and decision-making) rather than only subject-specific knowledge. This is why it is imperative that universities give their students the opportunity to be equipped to handle the sustainability-related issues encountered in their future work life and as citizens of the world.

As a response to the rising demands, teaching and learning for sustainability has been more and more emphasized in higher education settings. In this approach, learning for sustainability takes place throughout the education (both inside and outside the curriculum, at any learning instance) by incorporating sustainability into learning contexts in active, participatory, experience- and reflection-

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based modes of learning. Sustainability-related teaching is not taught as a specific subject, but it includes interdisciplinary work and the construction of concrete, ethic-based consciousness concerning the needs of the sustainable future. Studies in Education for Sustainable Development highlighted the potential of participant and student centered pedagogies for creating a capacity for sustainable thinking and action (UNESCO, 2017).

While the institution and political actors are increasingly supporting the subject, many teachers at the universities lack opportunities for teaching on the topic, which include flexible syllabi, appropriate pedagogical methods and assessment of knowledge of the subject matter. Practical reports on teaching the subject at the universities would be welcome. The paper contributes to the discussion of the topic by giving an example of classroom-based case study about eco-oriented pedagogy used at the university. The study deals with application of the sustainability principles in the university teaching via learning through active and reflective methods, as well as students' attitudes and learning with the topic.

The following questions constitute a frame for the study:

- a) How to implement teaching on sustainability principles at the universities?
- b) What is students' reception of learning with sustainability-oriented activities?
- c) What advantages and drawbacks emerge from sustainability-oriented teaching at universities?

The paper is organized as follows. At first, the main theoretical aspects concerning the pedagogy of sustainability at the universities are described. The second part deals with methodological and learning approaches in this particular study. The next two parts contain analyses of the findings and the final ones provide recommendations for sustainable teaching at the universities.

2. Theoretical Background

The teaching perspective aimed at sustainability in higher education stems from the broader discourse on Education for Sustainable Development (ESD). Education for sustainable development aims to provide learners with knowledge, skills, attitudes and values that would enable them to be engaged in a sustainable development, and to find solutions for current world issues (UNESCO 2017).

Within higher education, this has been viewed as necessitating a shift from traditional, teacher-centered, information transfer-based education towards more active, reflexive and learner-centered approaches to teaching. A key goal of sustainability-oriented education is to enable the development of the crucial sustainability competences such as systems thinking, critical thinking, collaboration, problem-solving, and ethical responsibility (Mochizuki & Fadeeva, 2010, pp. 394-395). Some researchers argue that these competences would be fostered more appropriately through active and experiential learning strategies than only through lectures (Wiek, Withycombe & Redman, 2011, pp. 204-207). Sustainability-oriented pedagogy encourages students to take part in investigative, reflective and collaborative learning processes, so that they engage more intensely with the issues of sustainable development.

Project-based learning, problem-based learning, cooperative tasks and discussions-for-reflection are among the most extensively employed teaching and learning strategies in sustainability education. All of these strategies permit students to establish a bridge between theoretical knowledge and issues of sustainability faced in the real world, thus increasing learning involvement and practical application (Sterling, 2010, pp. 20-22). When knowledge is anchored in authentic social and real-world situations

sustainability education supports the students' cognitive growth and also their affective and attitudinal development in regard to sustainability related behaviors.

Under such learning context, teachers shift from being knowledge transmitters to being learning facilitators; guide inquiry, provoke critical reflection, encourage dialogues, participation and instead of delivering correct answers encourage students to consider alternative interpretations and to reach well informed and responsible positions regarding sustainability related issues. These ideas are aligned with the ideas of transformative learning where higher education serves as a space for learners to cultivate a critical view of their assumptions and to response positively to ambiguity and uncertainty.

3. Methodology

3.1. Research Context and Participants

This qualitative classroom-based case study was designed to investigate the implementation of sustainability-oriented instructional practices in higher education and to investigate students' interaction with the implemented practices. A qualitative research approach was selected because the inquiry was concerned with teaching practices, classroom interaction, and students' reflection in their authentic educational environment and not with an assessment of academic achievement. The case study was situated in the context of regular university courses and 15 fourth-year undergraduates participating in their last year of studies were chosen to be participants.

The course context facilitated discussion-oriented, reflective, and project-oriented learning and was considered to be suitable for the application of sustainability-oriented instructional practices. As senior students, the participants possessed adequate academic sophistication and critical thinking skills required to address intricate environmental and social problems. Sustainability-oriented instruction was integrated in the course through themes linked to students' actual lives and professional futures. Topics discussed were students' daily lives and careers, responsible consumption, waste and recycling, climate change, sustainable diet, a green university, sustainable employment etc. Topics were chosen to help students connect abstract concepts on sustainability with their real-world situations and everyday experiences.

3.2. Sustainability-Oriented Instructional Practices

Instruction was framed by active, collaborative, and reflective pedagogical strategies of Education for Sustainable Development. Activities used here aim to construct student-centered learning where student explore sustainability-related issues critically through collaborative and reflective dialogues, inquiry, and critical reflection. Instead of focusing on abstract knowledge of sustainability, practices here encourage students to link concepts of sustainability to life and to future role of student as professional.

Guided classroom discussion about real sustainability-related issues is the one of the primary pedagogical practices employed. Question such as "*How sustainable are our daily practices?*," "*Should universities have more responsibility for the environment?*," or "*Can individual actions contribute to solve environment problems?*" are explored by students. This kind of activities encouraged students to share opinions, support reasons, compare perspectives, and critically reflect on their personal and collective responsibility.

Case-based learning practice was implemented to introduce realistic case regarding sustainability issues that needs students' problem-solving skills. Students analyze the case study regarding the massive use

of plastic on the university cafeteria and then discuss possible solutions institutions can make in order to reduce plastic waste. Similarly, a case about international green campuses, where student discuss which practices of green campuses can be implemented into the students' university is explored. Students were encouraged to understand complexity of the sustainable issues, and the relationship between individual and institutions.

Project-based learning practice was also used throughout the course to facilitate students with real sustainability-oriented mini-project work toward university life or student society. One group of student creates a campaign to inform students to decrease use of plastic on campus while another group of students suggest new recycling methods. Students need to explore the specific sustainability issues and find potential solution with collaboration with their groupmates, organize the information and presentation of the proposal to their peers. This type of learning activities enhances collaboration, communication, creativity, and problem solving skill and sustainability practice.

Reflective learning activities are introduced throughout the course in order to foster personal engagement in sustainability issues. Students make reflection writing for the question such as "Which personal unsustainability practices can I contribute to?," "How can students make students' behavior towards sustainability be achieved?," and "What is reasonable personal changes I can make in my daily life?." These questions are to encourage students to transcend a theoretical perception of sustainability into the students' individual consciousness, behavior and responsibility.

Collaborative learning is an approach widely incorporated in all instructional practices. Students usually work in pairs or groups to discuss sustainability issues, exchange ideas and solve problems together. For example, during a lesson on sustainable consumption students work together in pairs to analyses their weekly consumption behaviors, and to work together on composing a poster to persuade peers into consuming responsibly. *The collaborative tasks* help student build rapport, share responsibilities, actively participate and contribute their idea, and therefore enable student to learn from their peers.

In conclusion, it is claimed that pedagogical practices adopted in this instructional model are not just leading the students' knowledge into the understanding of sustainability issue, but also into students' critical thinking, participation and active and conscious action, as well as the institution's responsibility.

3.3. Data Collection and Analysis

To gain insight into student participation in and perceptions of sustainability-oriented pedagogy, the data were collected through multiple qualitative means. Three forms of data collection were employed: observations, analysis of student work and a final questionnaire.

The observations took place during the instructional period and were designed to elicit information on student engagement and participation, patterns of interaction between students, and student responsiveness to sustainability-related information during activities. Special attention was paid to indications of students' willingness to engage in discussions, work with peers, present their own opinions and thoughts, and think critically about sustainability issues. Observations were logged by hand throughout each teaching segment, both during and shortly after the lesson.

Student work was the second source of qualitative data, including such items as student reflections, project proposals, posters on various awareness campaigns, messages for such campaigns, and short oral and written presentations that students produced throughout the course of the lesson. By analyzing student work, I was able to see whether or not students grasped concepts related to sustainability, their

connections between the abstract and the real-world, and the depth of their personal connection to sustainability issues.

At the end of the lesson, the students completed a brief questionnaire which tapped into their perceptions of sustainability-oriented pedagogical practices. The questionnaire had two parts. The first part asked students to rank their level of agreement with several statements on a *Likert-scale* from 1 (*strongly disagree*) to 5 (*strongly agree*) about such items as the importance of sustainability topics, classroom participation, the helpfulness of lesson activities and their views about sustainability-oriented instruction. Part 2 included open-ended questions asking the students to reflect on the most valuable learning activity, the difficulties that they encountered during the lesson and how the instruction affected their understanding of sustainability.

The qualitative data collected through observation notes, student artifacts, and student questionnaire responses were then analyzed thematically through inductive analysis, as described by Braun and Clarke (2006, pp. 81-84). Themes were developed by repeated reading of notes, artifact contents and responses on the questionnaire to find repeated patterns in student engagement, sustainability awareness, reflective learning and perceived pedagogical value. The responses on the Likert-scale survey were also analyzed using descriptive statistics in order to ascertain any general trends in student perception of sustainability-oriented teaching practices.

4. Findings

The results are organized thematically according to data collected from observations, students' writings and artifacts, reflections and end of term questionnaires. During the analysis three main themes emerged across all the data collected; engagement and student participation, development of awareness regarding sustainability, students' attitudes about teaching related to sustainability.

4.1. Student Engagement and Participation

Observation in the classroom suggested that students were actively engaged during those learning activities centered on the concepts of sustainability, especially in activities such as teacher-led discussion, case study, pair work/group work, and project-based learning. Students took active participation especially during learning topics relevant to real life and social phenomena, such as sustainable consumption and life-style, waste reduction, eating habit and practices, environmental responsibility etc.

In teacher-led discussion, the majority of the students took initiative to give their own examples and were willing to express their own views, compare between different views and reflect critically upon behavior concerning sustainability. For example, in a teacher-led discussion on sustainable lifestyles, a number of students compared their personal lifestyles and argued about the possible influences of individual action on the general environment change. The discussions are often developed into the free interaction between students through the exchange of ideas, inquiry and supporting one another.

In the *collaborative project* activities, also a lot of students showed active participation and interaction. Students seemed motivated during tasks related to the practicality and re-levance to university life concerning sustainability. For instance, in a task of developing small awareness campaign towards reduction of disposable plastics within campus and in another task proposing suggestions of enhancing

university recycling performance, students are all active in the course of generating ideas, organizing information and negotiation of their own decisions in groups.

The data gathered through observations also suggested that active and cooperative learning setting benefits in interaction among students in the classroom. Compared to some traditional learning opportunities, students' behavior during participatory activities relating sustainability to their real life and personal experience are more confident and communicative.

4.2. Development of Sustainability Awareness

Examination of student written tasks and learning objects indicated the growth of sustainability awareness throughout the instruction. Initially, most of the students treated sustainability solely as an environmental concern, but at the end of the course their written tasks indicated a more global view of sustainability as an issue integrating individual responsibility for the environment, society and individual actions.

Through written assignments student writings show their growing perception that daily choices can influence sustainability outcome. Several students recognized the impact of daily behaviors, which are concerned with consumption, recycling, traveling, foods and etc. In the reflections, several students expressed that they had never before the learning activities given thought about the environmental *effects* that could result from daily activities related to personal consumption. In particular, some of them emphasized that the discussions during class were challenging their habit such as to much usage of plastic and food waste.

In addition to reflective writings, the growth of student sustainability awareness was also evidenced through learning objects created by students. Posters, campaigning materials, presentations and projects commonly address topics of responsibility for environment, personal consumption and the action of all citizens for sustainability issues. Many students recognized and demonstrated their ability to integrate the global ideas and theories about sustainability with their everyday campus life and the society.

The student *questionnaire* also indicated that most students gained more understandings on issues of sustainability and began to reflect on themselves. Many students stated that it is necessary to include topics of sustainability into various university courses.

4.3. Student Perceptions of Sustainability-Oriented Teaching Practices

It appears that the sustainability-oriented pedagogical practices employed during the course were viewed positively by students in the questionnaire. Overall, students felt that the teaching activities were interesting, relevant and not like other typical university-teaching methods. Specifically, students enjoyed the use of interactive and active teaching methods such as classroom discussions, case studies, group work and reflective activities.

Several students felt that the use of real-life examples and authentic sustainability related situations helped increase motivation and engagement with the learning process. Some participants felt that discussing actual sustainability-related issues concerning university life and everyday behaviour, makes the material learned more relevant and easier to identify with. In addition, some students said that group work encouraged them to express their thoughts and to take others' perspectives into account.

Reflective tasks were particularly highlighted for promoting individual engagement and critical reflection. Students thought that writing a reflection encouraged them to think about their own behaviors, responsibilities and attitudes towards sustainability, things they hadn't really thought about before. Some students perceived these kinds of tasks as 'eye-opening' as they went beyond mere academics.

It seems that several limitations and some difficulties were experienced by some students. The topic is a complicated one and cannot be discussed easily within limited classroom time, as some respondents thought. Others felt that more time for discussing specific issues, more practical examples and a more extensive project would have been useful. These comments demonstrate that sustainability-oriented teaching demands time and specific methodological planning. To provide a concise overview of the findings, *Table 1* summarizes the main themes emerging from classroom observations, student-produced artifacts, and questionnaire responses.

Table 1. Summary of Findings by Data Source

Theme	Data Source	Key Observations
<i>Student engagement</i>	Classroom observations	High participation during discussions, case analysis, and collaborative project work
<i>Sustainability awareness</i>	Reflective writing and student artifacts	Increased recognition of sustainability in everyday choices and future professional contexts
<i>Perceived relevance</i>	Questionnaire responses	Sustainability topics perceived as meaningful, practical, and socially relevant
<i>Learning experience</i>	Student reflections	Positive attitudes toward active, collaborative, and reflective learning practices
<i>Challenges</i>	Open-ended questionnaire items	Complexity of sustainability issues and need for more time for discussion and project work

The convergence of evidence from classroom observations, reflective tasks, student-produced materials, and questionnaire responses strengthens the consistency of the findings. Overall, the results suggest that sustainability-oriented pedagogical practices contributed positively to student engagement, reflective participation, and the development of sustainability awareness within the higher education context.

4.4. Perceived Pedagogical Value

In general, students felt that the sustainable teaching methods were appropriate and beneficial for university level learning. This combination of active learning, reflection, collaborative learning and relevance of content, seems to help students engage with the subject matter on a more significant level and see its link to their individual lives as well as society at large. Students identified the importance of addressing themes related to sustainability in university courses more consistently and showed willingness to participate in such activities in the future.

These results suggest that these sustainability-centered teaching methods could serve the goal of both content acquisition and developing a critical perspective and an informed and responsible attitude towards sustainability related aspects of individual and social life.

5. Discussion

The results of this study suggest that sustainability-oriented pedagogical practices can foster students' participation in learning, their critical reflection and their sustainability knowledge in the context of higher education. Active learning strategies in form of tasks requiring discussion, collaboration and real-

world problem solving contributed to increased student participation; meaning that student learning is more powerful when it involves them in active learning rather than only in learning centered on contents, as is typical in many higher education courses.

A key finding of this research study is on the role of relevance for sustainability education. Tasks that were perceived as having relevance to their real life-such as waste disposal, consumption and environmental responsibility-induced greater student participation in activities and the participants showed a more reflective behavior. This observation supports previous work, that sustainability competences can be acquired when the learning activity involves “*real-life contexts in contrast to an abstract theoretical content*” (UNESCO 2017, Wiek, Withycombe & Redman, 2011, pp. 207-209) and it shows that students are able to get motivated when teaching connects to their everyday life, for example through real-world activities and problems (cf. Ristovski, 2013).

Another positive effect of the application of *sustainability-oriented learning tasks* relates to the development of reflection and collaboration among students. In the research study reflective writing tasks supported students to look back at their own behavior and habits, and group work helped students to reflect on the subject and work towards consensus on certain issues. This led not only to cognitive outcomes but also to the internalisation of sustainability-related knowledge. In addition to these positive aspects, the results of this study are informative on some of the obstacles that sustainability-oriented teaching faces. Several students acknowledged that topics of sustainability seemed interdisciplinary and complex to them and require additional classroom time and deeper understanding; which might suggest the importance of clear task structure, of teacher facilitating roles and the need to make topics relevant and comprehensible in this specific context of higher education.

All in all, it was possible to successfully implement *sustainability oriented pedagogical tasks* in higher education if the learning was participatory, reflective, and learner-centered, as well as embedded in real-world applications and socially relevant settings.

5.1. Limitations of the Study

Some limitations should be noted. First, the participant sample included only 15 undergraduate students from one course setting; as a result, the applicability of the findings to a broader audience cannot be generalized. Second, qualitative data were primarily used for analysis, and include researcher observations, student reflections, and student survey data focusing largely on students’ attitudes and perspectives, rather than objective learning outcomes.

Lastly, the limited instructional term did not allow for long-term evaluation of changes in student perspectives and behaviors toward sustainability. Finally, some subjectivity may be present since the researcher also served as the instructor in the course.

Nevertheless, the study provides some practical implications and ideas for applying teaching practices oriented towards sustainability in higher education and emphasizes the effectiveness of the use of active and reflective learning in sustainability education.

6. Conclusions

This study investigates the application of sustainability-oriented pedagogical practices within the higher education setting and analyzes their effects on student participation and sustainability understanding.

This study concluded that activities, which foster active, collaborative, and reflective learning experiences could enhance significant participation in sustainability issues through real, relevant, social contexts.

The paper concludes that the student-centered approach, rather than passive learning, which promotes dialogue, enquiry, collaboration and reflection should be embraced. In this study, real sustainability problem activities resulted in higher levels of student motivation, interaction and personal investment in learning.

From pedagogical viewpoint, the results draw the importance of teacher as facilitators of reflection and enquiry, and creator of space for significant dialogue and critical thinking. This study found that sustainability contents could be integrated in regular university courses by concrete activities, with less necessity for the curriculum redesign.

Even though the current study was restricted to only one learning environment, it has contributed to the discussion of sustainability in higher education and demonstrated the sustainability-oriented pedagogical practice with practical activity in classroom for wider context of education disciplines and settings.

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