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INSTRUCTORS' EXPECTATIONS AND OBJECTIVES FOR INTEGRATING SUSTAINABLE DEVELOPMENT AND ETHICAL ISSUES INTO THE CURRICULUM

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ABSTRACT

The integration of sustainable development and ethical issues into the curriculum is increasingly important in higher education. The study surveyed 17 instructors in ICT

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engineering education at Lapland University of Applied Sciences who were involved in curriculum development to explore their expectations and objectives in integrating sustainable development and ethical issues into their courses. Although most instructors had a good understanding of sustainable development and ethical issues, not all saw them as relevant to their courses. Those who did incorporate these themes focused on topics such as energy conservation, social sustainability, and sustainability and ethics in solutions. However, almost half of the instructors did not plan to incorporate ethical issues into their courses, and those who did focus on copyright, artificial intelligence, and source criticism. Instructors expressed the need for themed discussion sessions and expert lectures to enhance their knowledge and skills. The study's results suggest the need for more effective strategies to incorporate sustainable development and ethical issues into ICT education. The findings of this study could support academics in their ongoing efforts to incorporate ethical and sustainable development concerns into their curricula

1 INTRODUCTION

The integration of sustainable development and ethical issues into higher education has been recognized as essential for a long time (Menon & Suresh 2020). However, incorporating these themes into specific academic disciplines, such as ICT-engineering education, can be challenging. The research aims to explore the expectations and objectives of ICT-engineering instructors in integrating sustainable development and ethical issues into the curriculum.

The rectors' conference of Finnish Universities of applied sciences (ARENE 2022) has published recommendations for shared competences, including competencies for ethics and sustainable development. According to ARENE, graduating students should adhere to the ethical principles and values of their profession, taking into account the principles of equality and non-discrimination. They should also be familiar with the principles of sustainable development, promote their implementation, and act responsibly as professionals and members of society.

Integrating concepts of sustainability and ethics into the curriculum requires a predetermined plan. Lundqvist (2016) emphasizes the importance of integrating ethics in courses on engineering topics, using cases to teach ethics effectively. Park et al. (2022) argue that instructors must be open to new methods and master sustainable development approaches to provide guidance and solution-based processes. Segalàs et al. (2010) suggest that cognitive learning of sustainable development increases through experiential active learning, which can be implemented using a constructive and community-oriented pedagogical approach.

There are several approaches to incorporating sustainable development and ethics into engineering education programs, such as micro-curriculum (Ashraf 2020), project-based learning, multicultural and multidisciplinary teamwork (Duarte et al., 2020), and separate modules for first-year students (Amashi et al., 2021). Further, ethics has been taught through asynchronous videos as part of a PBL implementation (Koppikar et al. (2022) and with challenge-based learning involving

students in case manipulation (Bombaerts et al. 2021). Overall, Børsen et al. (2021) suggests involving students in the teaching of sustainable development and ethics, doing so by utilizing the methods of active pedagogy and by linking the content close to real life.

In conclusion, integrating sustainable development and ethical issues into higher education is essential. However, incorporating these themes into specific academic disciplines, such as ICT-engineering education, can be challenging. It requires a predetermined plan, and instructors must be open to new methods and master sustainable development approaches. There are several approaches to incorporating sustainable development and ethics into engineering education programs, and graduating students should adhere to the ethical principles and values of their profession, take into account the principles of equality and non-discrimination, and be familiar with the principles of sustainable development. Instructors' knowledge of these topics may require further development, and emphasizing their importance may encourage changes in attitudes towards these subject areas.

Previous research (Angelva et al. 2023) prior to the research described in this paper has mapped students' perceptions of ethics and sustainable development, but it is equally important to study the perspectives and prejudices of the professors and lecturers responsible for planning curriculum and teaching. Instructors' knowledge of these topics may require further development, and emphasizing their importance may encourage changes in attitudes towards these subject areas. The attitudes of instructors and supervisors can significantly influence students' motivation to think about these themes in all areas of their education and understand them as fundamental elements of their professional competence.

In the next chapter, we will first provide a summary of the initial study that collected students' perceptions and expectations towards ethics and sustainable development. Subsequently, we will present the methodology of the current study and the results obtained. We will then discuss the implications of these findings and provide suggestions for incorporating sustainable development and ethical issues into the curriculum.

2 METHODOLOGY

All 21 ICT instructors who were involved in the curriculum development process for the ICT engineering education in Lapland University of Applied Sciences in Finland were invited to the present study. In this process, one of the most important development targets was to try to include the perspectives of sustainable development and ethics in learning. The development was preceded by a survey collecting students' thoughts and expectations (Angelva et al. 2023), the results of which were tried to be included in the implementation plans of the curriculum. An earlier study concluded that students have a basic understanding of both themes, but also suggested practical examples, cross-cutting themes, and learning tasks to effectively integrate ethics and sustainable development into the curriculum.

In this study, a survey methodology was utilized to gather data from participants regarding their experiences with the topic of interest. To facilitate the comparison of teachers' thoughts concerning students' responses, it was decided to examine both themes through a similar set of questions. In addition, the teachers were asked about their intentions and plans for the contents of the study courses, as well as their wishes for the development of competence regarding these themes.

The survey was conducted using the Webropol 3.0 survey and reporting tool. The survey comprised a total of 10 questions. The first two questions aimed to assess the participants' understanding of key concepts such as sustainability and ethics. Respondents were asked to provide their answers using a sliding scale ranging from 1 to 10. Subsequently, participants evaluated the degree of integration of education for sustainable development by selecting the most appropriate option from the provided choices, as illustrated in Figure 1.

Open-ended questions were employed to explore respondents' perspectives on sustainable development learning tasks/curriculum for students and the type of training instructors themselves would prefer to receive. The participants' understanding of concepts such as responsibility and respect was assessed again using a sliding scale of 1 to 10. Similarly, open-ended questions were utilized to gather information on instructors' plans for organizing learning tasks/curriculum for students and their preferences for internal training on these topics.

Thematic analysis was employed to analyze the collected responses (Vaismoradi, Turunen, and Bondas, 2013). The data underwent multiple iterations of analysis, with the extraction of general concepts and meanings through an inductive reasoning process. The responses were subjected to content analysis using open coding, where analysis units were extracted from the text. These units were then classified and grouped into thematic areas. The analysis aimed to identify and categorize common themes across the responses. Frequencies were calculated for each theme to determine their occurrence. Due to the small number of responses, further grouping of the categories was deemed unnecessary to maintain the integrity of the content.

The survey link was distributed via email to the participants, and a one-week period was provided for response submission. The response rate for the survey was 81% (17 participants)

3 RESULTS

3.1 Sustainable development

In their own opinion, the respondents knew the terms sustainable development well on a sliding scale of 1-10, with the median being 8.0. Out of the participants, 7 (41.2 %) indicated a comprehension level of 9-10, while 6 (35.3 %) responded at levels 7-8. The minimum score of 3 was recorded by 1 participant (5.9%).

Regarding the question about how well the degree programme curriculum integrates sustainable development, as evaluated by the CDIO optional standard 3.0, Figure 1 shows that most of the instructors' responses fell into the 1-2 rating categories.

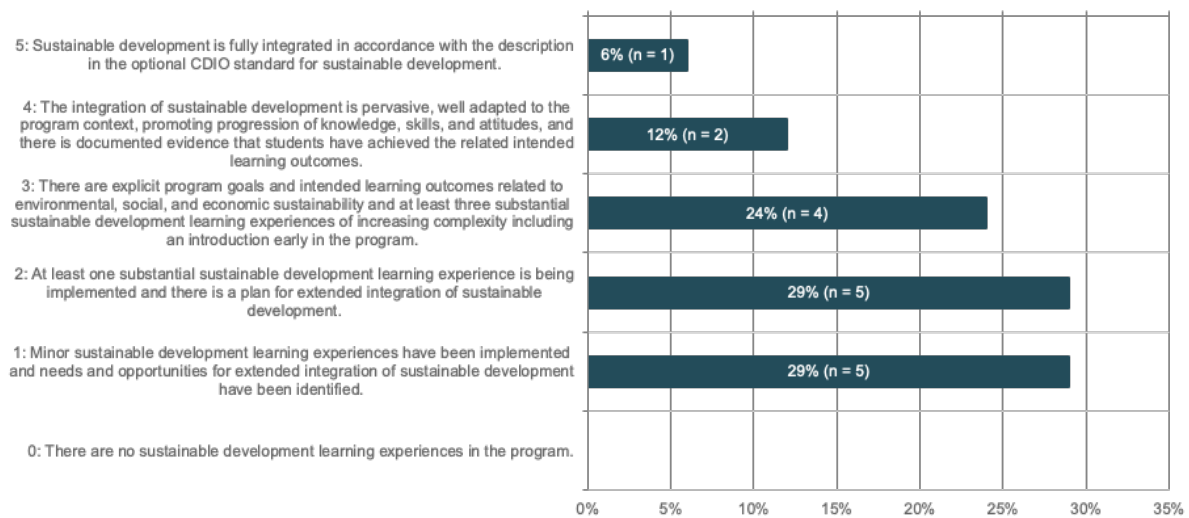


Fig.1. Instructors' assessment of the level of inclusion of sustainable development on the CDIO the optional standards scale.

The option that suggested no sustainable development learning experiences, was not chosen by any of the respondents and the level 5 option with fully integrated was answered by 1 (6%) of the respondents. Since the sustainable development was contextualized with a description according to the CDIO standard in the initial question, which also mentioned the term CDIO, the instructors were probed regarding their familiarity with this term. The responses were elicited using a sliding scale ranging from 1 to 10, and the instructors' ratings were predominantly within the 5-10 range, with levels 10 and 9 receiving the highest number of responses (both 23.5%). Four responses (23.5%) were missing from the dataset.

In an open question, instructors were asked what kind of sustainable development learning experiences they have offered or plan to offer. The instructors listed the following perspectives: learning assignments and projects related to the consideration and ideation of sustainable development perspectives in system development solutions, recommended programming practices, energy saving, and social sustainability themes, such as respect, consideration, and inclusion of others.

When the instructors were asked about their preferences regarding assignments on the theme of sustainable development, they expressed a desire to hear expert lectures and learn about the impact of the IT sector on sustainable development. Additionally, they emphasized the importance of topics such as achieving energy self-sufficiency and ensuring the security of supply. The instructors also expressed a need for themed internal discussion sessions on the topic. However, not all teachers and supervisors considered it necessary to include these concepts in the courses they taught or supervised. One comment suggested that sustainable development should not be conflated with regular course content and that a separate study course should be offered to students.

3.2 Ethical perspectives

Regarding ethical perspectives, 9 (52.9%) of the respondents felt that they understood the meaning of the term responsibility on a scale of 1-10 at levels 9-10. The minimum value was 3, which was answered by 1 (5.9 %) respondent. The corresponding number of answers regarding the term respect was 12 (70.6 %) respondents at level 9-10, the minimum value was 6, which was answered by 1 (5.9 %) respondent.

Ethics-related learning tasks were offered or planned to be offered as follows: Copyright in materials (3 mentions) and program codes, using artificial intelligence and challenges (2 mentions), source criticism (2 mentions), license terms, discussions, product compliance, and open materials and interfaces. However, 8 respondents (47.1 %) answered that they do not plan to organize any learning experience related to the theme and there were 3 (17.6 %) missing answers.

Regarding ethics and ethical perspectives, the instructors wanted themed discussions and themed days (2 mentions), expert lectures, independent study material and programming ethics. A total of 3 (17.6 %) instructors saw that there is no need to handle the theme as personnel training and 1 (5.9 %) could not say and 3 (17.6 %) missing answers.

Finally, the set of questions included an open question that was answered by 3 (17.6%) respondents. The themes were perceived as significant, and it was anticipated to receive further training. The importance of sustainable development in the future of the degree programme should be considered and the themes should also be made part of everyday life.

4 SUMMARY AND ACKNOWLEDGMENTS

Integrating Sustainable Development Goals (SDGs) and ethics into engineering curricula is an effective way to develop socially responsible and ethically aware engineers who are equipped to design and implement sustainable solutions to global challenges. By integrating SDGs and ethics, engineering curricula can provide a more holistic education that emphasizes the importance of considering social and environmental impacts in engineering practice.

This study examined the instructors' attitudes and plans for integrating sustainable development and ethical issues into their courses. The study's results reveal that while the instructors recognize the importance of sustainable development and ethical issues, they do not always see the relevance of these themes to their courses. This attitude may create resistance to incorporating these themes into the curriculum. The concepts of sustainable development and ethics are mainly well-known by instructors.

The instructors had used or planned sustainable development learning assignments, e.g., consideration of perspectives in system solutions, energy saving, and social sustainability themes. One way to integrate SDGs and ethics into engineering

curricula is to incorporate them into existing technical courses. For example, in general, in the context of engineering education, a course on environmental engineering could include discussions on how engineering solutions can contribute to achieving SDG targets such as clean water and sanitation or sustainable cities and communities. Similarly, a course on engineering design could incorporate ethical considerations into design decisions, such as considering the potential social and environmental impacts of a design. Another approach is to create dedicated courses or modules that focus specifically on SDGs and ethics. These courses could cover topics such as the ethical implications of engineering practice, the role of engineering in achieving sustainable development goals, and how to design solutions that prioritize social and environmental sustainability. The competence of sustainable development may be promoted by using real-life events as context (Leal Filho et al. 2022). It is also important to integrate SDGs and ethics throughout the curriculum by emphasizing their importance in engineering practice and by modeling ethical behavior in the classroom. This can include promoting a culture of ethical inquiry and reflection, encouraging open dialogue on ethical issues, and providing opportunities for students to engage in ethical decision-making exercises. Further, ethics scenarios can be implemented with the assistance of external stakeholders and guest speakers (Martin et al. 2021).

However, integrating SDGs and ethics into engineering curricula is not without its challenges. As mentioned earlier, a lack of expertise among engineering faculty in SDGs and ethics can be a major challenge. However, instructors play a key role in the successful integration of sustainable development approaches into the curriculum and course content (Park et al. 2022). Therefore, professional development opportunities and faculty support are essential for successful integration. Additionally, there may be a need for additional resources to develop new curricular materials or to redesign existing courses. According to the findings of the current study, not all instructors saw the themes of sustainable development and ethics as relevant to themselves or the course they taught. Furthermore, almost half of the instructors answered that they do not intend to organize learning assignments related to ethics. If assignments were organized, they were focused e.g., on copyrights, the use of artificial intelligence, or source criticism.

Although, based on this study, the concepts are known and seen as important, it is still more challenging to include the perspectives in one's subject area. In dealing with these issues, one could see similarities with the study by Lundqvist (2016) discusses the challenges faced during the integration process and provides recommendations for supporting program directors and teachers to accomplish such a change. The study also highlights the challenges in integrating ethics, including a lack of understanding from program directors and teachers, and the need for support and competence development for teachers (Lundqvist 2016). A successful change process can be established by using Kotter's (2007) eight steps, along with individual program directors' and teachers' engagement and involvement. A commitment from management can facilitate the change process, and instructors may need support to

become comfortable with integrating ethics into their courses (Lundqvist 2016). Kotter (2007) lists eight steps starting with steps 1) Create a sense of urgency and 2) Create a Guiding Coalition and ending with steps 7) Build on the change and 8) Anchor the changes in corporate culture. The research presented in this paper can be considered to represent Kotter's (2007) phase 1, where belief in the importance of change for the organization is built. Further, the instructors suggested themed discussion sessions to develop skills along with expert lectures, which can be compared to Kotter's phase 2. In it, the change process is promoted by assembling a team with the right knowledge, skills, and possibilities to support and accelerate. A commitment from management can facilitate the change process, and teachers may need support to become comfortable with integrating ethics into their courses (Lundqvist 2016).

In conclusion, integrating SDGs and ethics into engineering curricula is essential for preparing future engineers to be socially responsible and ethically aware professionals who can contribute to achieving sustainable development goals. This can be achieved through incorporation into technical courses, the creation of dedicated courses or modules, and program-wide emphasis on SDGs and ethics. Practitioners can use the findings of the current study to develop more effective strategies for integrating sustainable development and ethical issues into ICT education. The study's implications may have an impact on society, education, and global initiatives to promote sustainable development and ethical behaviour.

This paper has some limitations. The sample size of the study is small, although the participation rate is high 17/21 (81%). The research was done by translating the English questions into Finnish. The answers in Finnish have been translated into English for this publication, and it is possible that in some cases there may have been inaccuracies in the translations. The authors of the survey are also the authors of the publication and are also among the respondents. The influence of the survey authors on the results cannot, therefore, be excluded. The analysis of the answers and their classification was done by the authors and is possibly subjective. The published conclusions and the choice of operational development measures are also influenced by the fact that the authors have development tasks related to the organization's teaching and therefore also partially responsible for the implementation of the measures. This may have had an impact on the analysis.

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