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E-LEARNING COURSES ON SUSTAINABILITY: TOOLS, ASSESSMENT AND VERIFICATION

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Abstract

E-learning courses on sustainability are essential for education in this field, encompassing various aspects of life and learning. This paper explores the significance of these courses, conducted at two universities in different countries, focusing on their creation, usage, and quality verification. Due to the subject's multifaceted nature, creating e-learning sustainability courses demands a holistic approach. To form a comprehensive educational program, it should integrate ecology, economics, society, and technology knowledge with didactic and pedagogical methods. The courses must be up-to-date, grounded in the latest scientific research, and tailored to meet the needs of a diverse audience, including students from various majors. A crucial aspect is the accessibility and flexibility of e-learning courses, enabling learning at any time and place. E-learning platforms should be user-friendly, fostering interaction and engagement through various activities such as hands-on exercises, online discussions, and progress tracking. A key component of e-learning sustainability courses is verifying content quality and teaching methodology. The verification process should assess the relevance of educational materials, the reliability of information sources, and the effectiveness of teaching methods. Furthermore, it is important to consider course participants' feedback through regular evaluations and surveys. Courses should be revised and enhanced if issues are identified or updates are required.

Keywords: *e-Learning, sustainable development, course assessment.*

1. Introduction

Sustainability is an important global issue that requires the involvement of different sectors, including higher education institutions, through research, education, and action. Another educational goal is inclusive education, which is now one of the priorities and standards promoted by the European Commission. One way of providing such education is through distance learning. Unfortunately, this is a very popular form of education that is not yet well standardized. E-learning combines teaching and communication technologies; its objectives and outline may vary depending on the related context and specific application. One explanation for this phenomenon may be the different degrees of combining these technologies, from classroom support to blended learning, distributed learning, and distance education (Carliner & Shank, 2008). As engagement increases, so does the demand for systems to support virtual learning, such as Learning Management Systems - LMS. Electronic or technology-assisted forms of learning are being used in various educational settings (Lau et al., 2014). New popular trends, such as massive open online courses - MOOCs and digital learning, make it even more challenging to standardize these activities.

E-learning has many benefits, such as time flexibility to adapt the learning schedule to individual needs and responsibilities, accessibility, regardless of geographical location - anyone can acquire knowledge and develop skills online, and personalization, adapting the pace of learning to individual needs (Al-Fraihat et al., 2020; Al Rawashdeh et al., 2021). Unfortunately, e-learning also has disadvantages, such as a lack of interaction and difficulties with self-motivation (Gherheș et al., 2021). Some learners find it difficult to learn independently and prefer traditional learning methods that provide direct contact with other people. The lack of direct feedback means that students must rely on automatic grading systems or wait for answers to their questions. This can lead to delays in learning and an inability to solve problems immediately. E-learning also limits the possibility of socializing and building relationships with other learners. For some people, social interaction is an important part of the learning process, and being unable to meet face-to-face can be disruptive. This was shown, for example, in an earlier study of two universities

in Poland and Norway (Fojcik et al., 2023). Another disadvantage may be technological limitations - E-learning requires access to a computer, a stable internet connection (Schleicher, 2020), and technically good materials. Any problems with audio or video quality or even technical issues can lead to interruptions in learning.

Higher education institutions have a special responsibility to shape future professionals. (Ferrer-Estévez & Chalmeta, 2021; Klašnja-Milićević & Ivanović, 2021). In recent years, knowledge of implementing a sustainability curriculum in higher education, campus practices, and outreach activities has expanded (Menon & Suresh, 2020). Other work has described pedagogical approaches to teaching sustainability in higher education (Seatter & Ceulemans, 2017). Through the thoughtful use of technology, universities can create more engaging, accessible, and student-centered learning experiences. Educators should introduce technology with forethought and a clear purpose to maximize the benefits while minimizing the drawbacks. However, despite the growing awareness of the importance of sustainability, there are impediments, such as a lack of resources and funding. Another difficulty is the traditional approach to education, which can make it difficult to create the necessary interdisciplinary cooperation. For this reason, it is important to recognize that sustainability is a cross-cutting issue that requires cooperation and commitment between disciplines and sectors (Otto & Becker, 2019).

2. Project goals

Since the emergence of various forms of e-learning, these modes have been used to spread sustainability (Corbeil & Corbeil, 2015). In the prepared scientific and didactic project, the main aim was to enrich the remote education offer for University WSB Merito students by preparing, in cooperation with Western Norway University of Applied Sciences (HVL), 10 innovative e-courses in English on the latest economic and social trends in sustainable development. The interdisciplinary topics of the courses highlight the innovativeness of the project, building greater awareness of students in the field of sustainable development, referring to the latest economic and social trends, and the flexible modular formula of the curricula for use in remote education, which can be easily integrated into curricula in a different way than before (e.g., the environmental course in the Management course, or the 'Wellbeing' course in the Computer Science course). The target beneficiaries of the project results will mainly be UWSB Merito and HVL students and teaching staff.

An initial audit before the project started revealed deficiencies in the UWSB's offer regarding compliance with inclusive education. As a result, the project developed 10 e-courses on topical, socially relevant topics for remote study, which can be flexibly used in the curricula of both UWSB Merito and HVL in different majors and specializations in a way that is convenient for any user (including disadvantaged people, e.g., disabled people, other people with limited possibilities to reach the university and attend regular classes for various reasons), which is in line with the idea of inclusive education. E-courses are prepared in the formula of "self-study" and constitute free open educational resources (Open Educational Resources, 2024) in an attractive graphic and multimedia form using various modern teaching methods and tools (e.g., short films, tests, or quizzes with the possibility of self-checking). As a result of the project, new technological solutions and teaching methods will be integrated into the course of academic education. Following an analysis of the situation, the current educational offer of both universities was analyzed, and by consulting lecturers and students, the following main conclusions were made:

- the e-course base needs to be updated to reflect the latest socio-economic trends, and their interface and format should be modernized in line with the latest standards,
- the highest possible quality of e-learning and its inclusive nature should be ensured,
- inclusive education should be built upon and promoted in the development of new learning materials, as current curricula are not sufficiently interdisciplinary,
- there is a need for more English courses, especially in subjects related to the functioning of international companies (IT, sustainability, management, logistics, etc.

In response to these findings, the subject areas of 10 e-courses were defined in correspondence with the fields of study, i.e., logistics, IT, finance, and accounting or management. The themes are:

1. Edu-Tech,
2. Fossil Fuel Free,
3. Work and mental,
4. Wellbeing,
5. No Trace,
6. Immersive Experiences: Blue Farming,
7. Smarter Living & Working,
8. Blockchain Ecosystem,
9. Deep Impact,
10. Machine Learning.

3. Course characteristics, structure and format

The e-courses were prepared using the "self-learning" formula, attractive graphics, and multimedia, such as short films, tests, or quizzes, to self-evaluate the student's progress. The production of the course used the latest technological solutions used in modern remote and face-to-face didactics, e.g., artificial intelligence, to render the lecture commentary (technical solutions and tools presented later). Consequently, the visually appealing, varied, and interactive nature of e-courses makes them more attractive.

Course authors from HVL and UWSB Merito followed similar general guidelines for course construction. The idea was to create a unified course model that would meet the functionalities and standards of the RES platform e-course and fulfill the educational objectives. The structure and preparation of the course consisted of preparing the initial assumptions on the course format, the method and type of student verification, and the method of visualization description. The courses were planned and created as 3 separate parts: substantive (scientific and pedagogical content), visual (interactivity, animation, chosen language, text), and matching with the educational platform present at the university. Subject matter experts prepared the content, and the E-learning department's visual was based on subject matter experts' guidelines. Matching involved adopting a common presentation format - SCRUM. All courses were adapted to the Moodle and OZE platform environment of UWSB Merito and the Canvas platform at HVL.

3.1. Format

The content of the course should be provided in PowerPoint and consist of:

- Introduction: presenting goals, agenda, planned learning outcomes,
- 4 modules (40-50 slides each) - duration of approximately max. 2 h,
- The total duration of the whole course: max. 8 h.

Each module should include:

- Introduction to the topic of the given module,
- 40-50 slides in total,
- 6 test questions - self–assessment module, e.g., multiple choice or true/false. Other suggested forms are also acceptable,
- Duration time: max. 2 h

Other guidelines and covered:

- provide a recording with the commentary for each slide (or a written scenario for AI),
- each slide should be described in detail, and additional audiovisual materials (graphs or diagrams, films, etc.) should be placed in separate folders with detailed instructions,
- the entire course content should be delivered in English.

3.2. Thematic scope

The choice of topics for preparing the e-courses is relevant to the idea of the project, i.e., to provide education and promote the concept of sustainability. The thematic scope of the materials refers to the most important current trends related to sustainability - mainly how to create a work-life balance, take care of mental well-being, how and where to find alternative materials to plastics and switch to a closed-loop economy, how to use natural resources wisely, how to apply smart solutions in society or how to use technological innovations such as AI or VR in education.

The e-courses created aim to raise environmental awareness among students, change their perception of the world, rethink their individual approach to everyday choices and routines, and show how individual decisions affect the environment.

All e-courses can be used as distance learning or as a supplement to full-time education in various courses and specializations within the curricula - 30 hours and assigned ECTS credits - or as part of self-study. The target group of the e-courses is undergraduate and graduate students, including those with fewer opportunities, of both partner institutions, who have free unlimited access to the OER (Open Educational Resources) website.

3.3. Programs, software and tools

Designing visually appealing and engaging material is a long process that requires creativity and skill. Often, the biggest challenge is the right choice of graphics, animation, content visualization, and the whole concept for the presentation and digitization of the material. Ensuring that the course is visually appealing so that it does not look like mere slides is the most complex and time-consuming process. Animations and videos make the material much easier to understand, and the consistent design and intuitive user interface make the platform a pleasure to use. Features such as quizzes, drag-and-drop, open-ended

questions, and clicking on-screen items allow students to assimilate knowledge better. The subdivision into smaller sections makes it easier to absorb the material, and an additional narrator adds to the appeal of the course. The ability to use the table of contents and modules to control the pace of learning is important in a personalized approach to learning. E-course developers have also used other solutions to achieve interactivity and increase the attractiveness of the course:

- Elements that appear at different times, depending on what the narrator is saying
- Visually changing shapes
- Insertion of films and animations
- Inserting elements such as a slider, drag and drop, or icons for the user to click on
- Inserting text
- Inserting sound effects and a narrator
- Text appears from left to right (imitates writing)
- Grouping of subject threads
- Some elements that only appear when the user performs a specific action
- Navigation blocks or setting up navigation within slides and between slides
- Creation of tests and quizzes with visual and sound effects

Simply having the software does not mean being able to use it correctly and effectively. Thanks to a joint team of specialists who knew the strengths and weaknesses of the various tools, several different programs were used to achieve the most suitable effect for all the courses prepared. These included software tools such as PowerPoint, Apple Final Cut Pro, Apple Motion, Adobe Illustrator, Articulate Storyline, Animaker, Doodly, Revoicer, Canva, LeiaPix, DaVinci Resolve, Audacity, Paint.net, and Affinity Designer.

4. Testing and evaluation of selected e-courses by students

The final stage in developing all e-courses was the evaluation stage, i.e., testing two selected, earliest-developed e-courses by their target group of students. Participants in the evaluations of "Wellbeing" and "Immersive Experience. Blue Farming" had 101 students representing various fields of study: finance and management, engineering specializations, and English philology. The evaluation results will provide valuable material for improvements to the e-courses currently under development. They will also provide important guidance for universities in the long term in developing e-resources. Preliminary results obtained so far show student evaluations for the quality of the content, interactivity, and friendliness of the courses. It is planned to compare the different means (programs) used to prepare the courses.

Figure 1. Evaluation of the Wellbeing course.

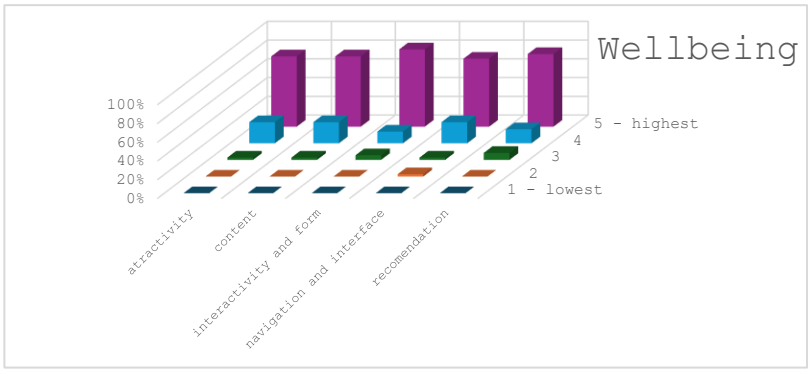
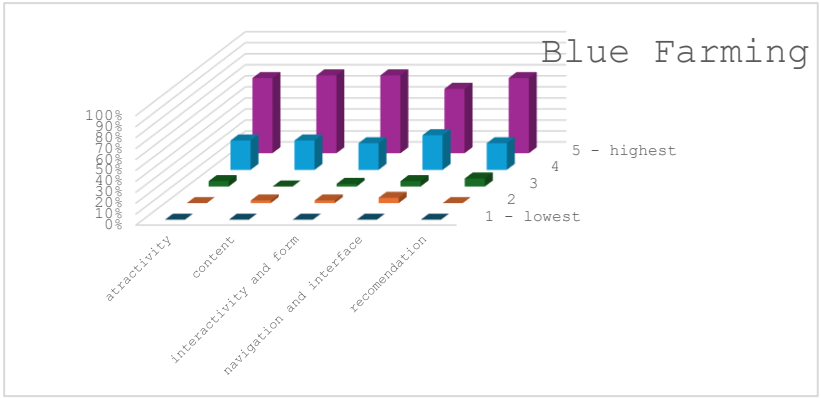


Figure 2. Evaluation of the Blue Farming course.



5. Discussion

Creating an engaging and effective e-course can be challenging, but with the right approach, it is possible to create an informative and enjoyable course for users. The following list of tips for e-course developers has been developed through experience:

- Define clear learning objectives: It is important to define clear learning objectives that are consistent with the course's goals and outcomes. This helps create relevant and meaningful content.
- Use of multimedia elements: Including multimedia elements, such as videos, images, and interactive activities, helps to keep students engaged and improve their learning experience.
- Accessible design: The e-course should be accessible to all students, including those with disabilities. This includes providing subtitles for videos and ensuring the course is compatible with assistive technologies.
- Peer collaboration: Encouraging collaboration between e-course authors can help them learn from each other and share knowledge and good practice, developing coherent courses.
- Regular feedback: Regular feedback to e-course authors and users is crucial. Authors' feedback is collected during the testing phase, allowing them to understand user expectations better and adapt courses to meet students' needs. Students' feedback can be provided through short tests, quizzes, and discussion forums to encourage interaction.

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