

# Competences for the Future (Future Work 4S) – Green Skills and Environmental Education

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This article describes an innovative Future Work 4S project and provides comprehensive feedback on a free Massive Open Online Course (MOOC) focused on environmental skills. Feedback was collected from two main target groups: educators (including university professors, teachers, and trainers) and student adult learners from Bulgaria, Greece, the Czech Republic, and Italy. The purpose of this survey is to provide an in-depth analysis of the feedback received on the Green Skills course and to highlight the main strengths identified by both educators and students. The findings reveal a high appreciation for the course's interactive and experiential learning approach by both the students and the educators. Specifically, 93% of participants agreed that the course was interesting, engaging, relevant, accessible, and developmental. The course's interactive exercises and gamification elements were particularly praised, enhancing learning and motivation. However, suggestions were made for including more practical examples and improving the uniformity of the text.

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## INTRODUCTION

In an era marked by the 4<sup>th</sup> rapid industrial revolution, climate change, and other transformative trends, equipping students with essential competences for the future workforce is critical. The proactive Future Work 4S project addresses this need by developing a multidisciplinary curriculum, encompassing digital skills, green skills, entrepreneurship, and social skills. This initiative, born out of the recognition of economic instability, demographic changes, and the impact of events such as Covid-19, not only aims to enhance individual career prospects but also contributes to societal resilience by preparing a workforce capable of addressing contemporary challenges.

The Future Work 4S project (<https://futurework4s.eu/mooc-platform/>) recognizes the imperative for academic students to possess a diverse set of competencies to navigate the complexities of the modern workforce effectively. Through combining digital skills, essential for thriving in the digital era, with green skills and environmental awareness, crucial for addressing sustainability challenges, the curriculum ensures holistic development. Moreover, emphasis on entrepreneurship and innovation fosters a spirit of creativity and adaptability, essential for thriving in dynamic economic landscapes. Complementing these technical proficiencies, the inclusion of social skills underscores the importance of interpersonal relationships and collaboration in achieving collective goals.

As the project progresses, its significance extends beyond academic institutions to encompass broader societal implications. Through equipping students with the skills demanded by the 4th industrial revolution, the initiative not only enhances individual career prospects but also contributes to societal resilience and progress. Ultimately, the Future Work 4S project stands as a testament to proactive adaptation to emerging trends, ensuring that the workforce of tomorrow is well-prepared to embrace the challenges and opportunities of an ever-evolving world.

Massive open online course students choose according to their interest and the future focus. The Future Work 4S project is focused on 4 key skills for the future employability of students, across all fields of study, and in this case summarizes feedback on a free Massive Open Online Course (MOOC) on environmental skills.

## ENVIRONMENTAL EDUCATION

The development of environmental education occurred in the 1970s in North America and Western Europe in connection with issues of social progress, climate change, and demographic change. The Scottish professor of biology, Patrick Geddes, is considered to be the founder of environmental education; he attached great importance to education in direct contact with the environment (Müllerova 2009).

The first use of the term environmental education dates to 1965 in the UK. Since then, the main debate has been about the meaning of environmental education and the content and objectives of environmental education (Short and Palmer 2003).

International conferences were the first major step in the development of environmental education. The first major conference was in 1975. At this conference, the United Nations Educational, Scientific and Cultural Organization (UNESCO) adopted the Belgrade Charter. It was the first international document that focused on environmental education (Müllerova 2009). A general definition of environmental education was adopted in 1977 at the Tbilisi Conference.

Furthermore, the following goals of environmental education were mentioned at the Tbilisi conference:

- To strengthen our economic awareness and understanding;
- Social and ecological interdependence in urban and rural areas;
- Provide anyone with the opportunity to attain the knowledge, attitudes, values, responsibilities, and skills to protect and improve the environment,
- Create a new pattern of environmentally friendly behaviour for individuals, groups, and society as a whole (Intergovernmental Conference on Environmental Education organized by UNESCO in 1977).

The proposals adopted were implemented in national environmental education and are still valid today. Part of the solution to the problem was the idea of embedding this topic in educational curricula (Činčera 2007). Recent studies emphasize the necessity of integrating sustainability into higher education curricula, reflecting the growing recognition of its importance across disciplines (Davim 2015; Davim and Filho 2016). This approach aligns with the need to prepare students to address complex environmental challenges through innovative and interdisciplinary solutions. Higher education institutions are increasingly recognized as key players in fostering sustainability, not only through curriculum development but also through campus operations and community engagement, creating a holistic approach to sustainability education (Machado and Davim

2022). Moreover, education for sustainability must propose sustainable alternatives to current practices, enabling students to understand the complexity of global environmental, social, and cultural settings and to develop a critical, responsible, and participatory attitude based on sustainability principles (Machado and Davim 2023).

### **Environmental Education, Behaviour, and Awareness**

Environmental education is a conservation strategy that creates synergistic spaces, facilitating opportunities for scientists, decision-makers, community members, and other stakeholders to converge. Environmental education foregrounds local knowledge, experience, values, and practices, often in place-based settings; in this way, it encourages numerous groups, including those that may be marginalized, to interface productively with research (Toomey *et al.* 2017).

Environmental education, behaviour, and awareness (EVVO) is a system that leads to the acquisition of knowledge, skills, and habits, the formation of a hierarchy of values and lifestyle necessary to protect the environment to ensure sustainable development in the local and global dimension. Education is understood primarily as influencing the rational side of the personality, and upbringing is understood primarily as influencing the emotions and the will.

Education refers to special ways of conveying information, especially to the adult population. In fact, you could say that EVVO is a preventive tool in the protection of the environment and nature (MŠMT 2008; Monroe and Krasny 2016; Nováková *et al.* 2018; UNESCO 1977). EVVO is concerned with activities and activities taking place in schools and educational institutions in the context of leisure activities and in the unorganised leisure time of individuals specialising in environmental issues (MŠMT 2008). Therefore, it is education in formal, non-formal, and informal settings.

### **Study Plan for Massive Open Online Course (MOOC) on Green Skills**

The study plan includes a theoretical and practical part. It is based on the fact that for a comprehensive comprehension of information it is necessary to connect theory with practice.

Theoretical plan for MOOC on Green Skills:

1. Basics of ecosystem and the impact of human activity on nature (2 h)
  1. Ecosystem, photosynthesis, biodiversity (1 h)  
Activity: Connection of information – Photosynthesis/food chain
  2. Soil and water environment (1 h)  
Activity: Examine Example – Soil texture triangle – how to approximately determine soil texture (video)
  
2. Human impact and meteorology (2 h)
  1. Human impact and important element cycles (1 h)  
Activity: Connection of information– the carbon cycle
  2. Weather, meteorology, and basic measurements (1 h)  
Activity: Calculation – calculation of water during precipitation
  
3. Renewability and non-waste management (2 h)
  1. Earth pollution (Blue economy) (1 h)  
Activity: Quiz about Earth pollution

2. Ways to maintain renewability (1 h)

Activity: Connection of information –game – about waste sorting

4. Global problems and main goals for future (2 h)

1. Global environmental problems (1 h)

Activity: Connection of information – how long it takes for different materials to decompose in nature.

2. Main goals for future (1 h)

Activity: Check mark – How the student would reduce impact on the environment

*Practical plan for MOOC on green skills*

The practical part of the course focuses on good practice. Students share examples of where elements of sustainability are found in their environments. They also create educational posters and storyboards.

## EXPERIMENTAL

### Objectives and Methods

This article conducted a research probe using a survey, summarizing feedback on a free massive open online course (MOOC) in environmental skills. Feedback was collected from two main target groups: educators (including university professors, teachers, and trainers) and adult student learners. The respondents were from Bulgaria, Greece, Czech Republic, and Italy. There were 81 participants, including 18 educators and 63 students. Of the 81 participants, 26 were men and 55 were women. The purpose of this survey was to provide an in-depth analysis of the feedback received regarding the Green Skills course and to highlight the main strengths identified by both educators and students. Feedback was obtained from 81 participants who successfully completed the course. Data analysis involved both quantitative and qualitative methods to provide a better understanding of participant feedback.

The following research questions were explored through the survey:

R1: What did you like most about the course? What are its main advantages?

R2: Please provide suggestions for what should be changed/added/improved.

R3: Do you have any recommendations how to promote the MOOC most effectively across students from all fields and female learners?

## RESULTS AND DISCUSSION

Feedback on the environmental skills course was obtained from 81 respondents from teachers and students from the Czech Republic, Italy, Greece, and Bulgaria. Of the 81 participants 18 were educators and 63 students. Of the 81 participants, 26 were men and 55 were women. This feedback indicated a strong positive response, with 93% of participants agreeing that the course was interesting, engaging, relevant, accessible, and developmental. This feedback indicated a strong positive response, with 93% of participants agreeing that the course was interesting, engaging, accessible, relevant, and developmental. However, respondents suggested including more practical examples and improving the quality and uniformity of the text. The individual advantages and

disadvantages of the course from the participants' perspective, including specific comments, are presented below in research questions R1, R2, R3.

Participants were asked the following research statements, and their specific statistics are shown in Table 1.

**Table 1.** Green Skills – Feedback Respondents

GREEN SKILLS - 81 Respondents	Completely Agree	Rather Agree	Rather Disagree	Total
The course addresses a current and relevant topic.	79	2		81
The content is interesting.	78	3		81
The course meets learners' needs for knowledge.	76	5		81
The learning tasks are engaging.	77	4		81
The interactive exercises help assess what participants learned.	77	4		81
The course is easy to access and navigate.	80	1		81
The integrated gamification and technologies make learning more attractive.	79	2		81
The course helps improve the skills in this area.	77	3	1	81
I would recommend it to students and learners.	78	2	1	81
The MOOC achieves its objectives and can help develop the competencies of learners.	78	3		81
The MOOC is relevant and adequately meet the needs of the target groups.	78	3		81
The MOOC uses high-quality content, innovative pedagogies, and engaging digital learning technologies.	75	5	1	81
The MOOC could be multiplied and integrated by education providers.	79	1	1	81

R1: What did you like most about the course? What are its main advantages?

- **Well-Structured Content:** Participants appreciated the clear and well-organized structure of the course, which covered important aspects in an understandable manner. Specific comments highlighted the value of the structured presentation of information.
- **Effective Use of Videos:** The videos used in the course were frequently mentioned as being particularly useful for explaining individual topics clearly and effectively. Participants found the videos to be clear and comprehensive.
- **Engaging Gamification Elements:** The gamification of the course was a standout feature for many, transforming learning into an engaging and enjoyable experience. Interactive challenges, themed quizzes, and missions were particularly effective in maintaining motivation and making learning fun.
- **Specific Modules and Exercises:** Certain modules, such as Module 3, and specific exercises, like sorting garbage into bins and determining decomposition times, were highlighted as particularly useful and interesting.

- **Quality of Instruction:** The knowledge and teaching abilities of the instructors were highly praised, with participants noting that complex concepts were made accessible and understandable.

Comments from the participants:

- “I really liked that the course is prepared in an interactive way, the videos, tasks, and questions are relevant to the topic. The guidelines for study are clear and the MOOC is didactically correct. I would like to emphasize that images for pair matching and drag and drop tasks makes the course more attractive. Especially topics 3 and 4 are really practical and students will benefit from this a lot. A big advantage is that in topic 1, the invasive species reflect situation on each project country (BG, CZ, IT, GR).”
- “Even though the course is online, there is not a lack of interactivity, the student is engaged during the whole study. I really like that some interactive tasks are using interesting videos and some other interesting tools of Moodle such as drag and drop of images, hanging man, pairs, *etc.* Definitely the best MOOC I have ever seen at our university!”
- “The gamification - it will keep interactivity with the students, also it is great tool for their motivation. I liked the drag and drops exercises the most!”
- “The course is interactive, well-focused, and well-conceived, the individual texts build on each other smoothly, relevant topics are addressed, and adequate and realistic examples are given. The visuals of the materials are high quality and catchy. Visuals make it easier to learn and remember.”
- “It is written in a clear and comprehensible way, also the topics of the course, such as green skills, are very important and interesting for our generation. In fact, I personally found out something new from the course. Also, the activities have been effectively chosen.”
- “The course is accessible; the exercise helps to memorize the concept and the gamified elements help with the motivation needed to follow through and complete the course.”
- “The most interesting part of the course was undoubtedly the gamification, which transformed learning into an engaging adventure. Through interactive challenges, themed quizzes, and missions to complete, the course made each lesson a unique and fun experience. This approach not only made it easier to digest complex concepts, but also kept my motivation high from start to finish. Gamification has proven how effective it can be in making learning not only educational, but also extremely enjoyable.”
- “I really appreciated the quality and organisation of the contents covered by the course. Moreover, I think that the use of gamification and explanatory videos makes it even more interesting and enjoyable.”

R2: Please provide suggestions for what should be changed/added/improved.

Areas for improvement:

- **Addressing Pre-existing Knowledge:** Some participants felt that much of the material was already familiar to them, indicating a need for more advanced content or options to customize learning based on prior knowledge.

- Hybrid Learning Model: There was a suggestion to combine online learning with in-class recapitulation at school to enhance understanding and retention.
- Minor Improvements in Specific Content: While not a major theme, the feedback suggests there could be minor adjustments to ensure all exercises and modules are equally engaging and challenging for all participants.

Comments from the participants:

- “The proposed course is very well thought out, conceived and appropriately focused on the target group of learners. In a few passages, in order to improve the quality of the texts provided, I recommend rephrasing some passages or using a uniform style of text.”
- “I think the language of the materials is simple and not suitable for all ages. Materials could be more comprehensive.”
- “Some questions/tasks (*e.g.*, calculating the volume of water falling on the roof) seemed quite random to me for the topic of materials.”
- “There are some activities using internet or technologies but there could be more of them.”
- “Topic 1 is more about theory than skills, but it is acceptable because it is important to outline the information background and afterwards focus on practical skills development. In topic 3 - I would suggest to prepare for task about recycling more broadly, there is not so much information on this issue before the interactive task.”
- “This course is aimed at students of a variety of study programmes. But for students of environmental study programmes it would be really easy to pass. So I recommend this course for all the BSc. and MSc. students of all the programmes apart those of environmental study background. Some didactic navigations and marginalia would help more to study the course.”

R3: Do you have any recommendations how to promote the MOOC most effectively across students from all fields and female learners?

Comments from the participants:

- “I would suggest to evaluate this course on the base of badges. I am excited to see other project 4S courses. Please add a short text at the end of the Moodle with authorization of the pictures in the study materials of drag and drops exercised - own photos or pixabay, freepik. Try to promote *via* counseling of universities.”
- “It is appropriate that real-world examples are highlighted. It may be helpful to link the text (context) appropriately with selected experts in the field (*e.g.*, short video interview, mission statement). The course can be promoted on social media (or multiple platforms can be used). Engaging visual materials has their benefits.”
- “I think it would be nice to put it as a textbook so it would be more accessible.”
- “Try to send it *via* counseling departments of universities, which are most of the time in touch with students (at least by email).”

The Green Skills MOOC received positive feedback for its interactive and engaging format, which includes relevant videos and tasks. Both educators and students praised the high-quality visuals and gamification elements that enhance the learning experience. The course provided clear guidelines and didactically correct content, featuring realistic

examples and practical applications that are highly beneficial. Comprehensive coverage of green skills topics with engaging exercises was another appreciated aspect.

However, respondents suggested including more practical examples and improving the quality and uniformity of the text. They felt that the materials could be more comprehensive and visually appealing and recommended adding more gamification components to further engage learners.

To effectively promote the Green Skills MOOC, it was suggested to utilize social media and multiple platforms. Highlighting real-world examples and expert opinions could attract more participants. Promotion through university career counselling departments and offering the course as an introduction in new courses with completion badges were also recommended.

## DISCUSSION

The results contribute significantly to the ongoing discourse on environmental education and sustainability. The overwhelmingly positive reception of interactive and experiential learning approaches (such as interactive game elements, course visualization, and gamification) highlights their effectiveness in engaging learners and enhancing comprehension. However, it is crucial to acknowledge the potential bias present in the feedback due to the participant selection process. The respondents who completed the course already possessed a level of interest and commitment to environmental issues, which may have predisposed them to view the course content favorably. This inherent bias suggests that while the course was successful in engaging its target audience, it may not necessarily reflect the broader spectrum of learners who might benefit from environmental education.

The MOOC's gamification elements are particularly noteworthy for their ability to transform learning into an engaging and enjoyable experience. Gamification, defined as the use of game elements in non-game contexts (Deterding *et al.* 2011), is a powerful tool in educational settings. To maximize its effectiveness, it is crucial to identify the most suitable game elements, considering gamification objectives, learner characteristics, and the technical constraints of the learning environment, such as the Moodle platform (Bedwell *et al.* 2012; Tondello *et al.* 2016; Marczewski 2018).

Here, however, the taxonomy of game elements for gamification in educational contexts (Toda *et al.* 2019a,b) will be adopted. This taxonomy, defined with the specific aim of standardizing the naming and the definition of game elements employed for gamification in educational contexts, includes 21 game elements divided into five dimensions:

- Performance – progression, level, point, stats, acknowledgement.
- Ecological – rarity, economy, imposed choices, chance, time pressure.
- Social – social pressure, competition, cooperation, reputation.
- Personal – novelty, renovation, puzzles, objectives, sensation.
- Fictional – storytelling, narrative.

Similarly, the elements in the environmental skills course were divided into several sections that included different tasks, offering guidance for creating immersive and interactive learning experience.

Nevertheless, the feedback underscores the need for incorporating more practical examples to bridge theoretical knowledge and real-world application, thereby fostering a



deeper understanding and retention of environmental concepts. Given the predisposition of the participants towards valuing environmental knowledge, future iterations of the course should aim to expand the curriculum to include diverse perspectives, including those of learners who may not initially prioritize environmental education. According to the literature (Jarnac de Freitas and Mira da Silva 2023), the following game elements are typically adopted in gamified MOOCs:



**Fig. 1.** Elements for gamification in educational contexts (source: Freepik.com)

Points and badges: Learners earn points and badges for completing course activities, quizzes, assignments, or reaching milestones, serving as visible markers of progress and achievements.

1. Leaderboards: Leaderboards display the rankings of participants based on points, badges, or other metrics. They promote healthy competition and a sense of achievement.

2. Levels and progression: MOOCs may have different levels or stages, unlocking new content or challenges as learners progress. This provides a sense of advancement and keeps learners motivated.

3. Quests and challenges: Interactive elements, such as quests or problem-solving challenges, add a narrative and make learning more immersive.

4. Social features: Discussion forums, chat functionalities, or collaborative projects encourage learners to interact and learn from each other.

5. Virtual rewards: Some gamified MOOCs offer virtual rewards, such as virtual currency, virtual goods, or access to exclusive content, as incentives for active participation.

While these elements create an enjoyable and engaging learning experience, motivate learners, and promote knowledge retention, effective gamification should align with course content and learning objectives rather than merely adding superficial game elements.

Furthermore, it is essential to consider the course's capacity to prepare learners for future employment in environmental fields. Given the self-selecting nature of the

participant group, who were already inclined to find value in the course, the MOOC should integrate feedback mechanisms to understand better the skills and knowledge that future employers might demand. This could involve consultations with industry professionals or incorporating real-world scenarios that challenge learners to apply environmental knowledge in practical settings. In conclusion, while the Future Work 4S project's environmental skills MOOC successfully engaged its target audience through innovative teaching methods and gamification, future iterations should strive to broaden its appeal and applicability. By addressing the inherent bias in participant feedback and expanding the curriculum to include more diverse learner perspectives and industry insights, the course can enhance its contribution to preparing a workforce capable of addressing complex environmental challenges.

## LIMITATIONS

The conducted survey provides valuable insights into the evaluation, though not without certain methodological and analytical constraints. Primarily, the subjective nature of the evaluation survey brings the risk of data distortion and influencing the results by the subjective opinions of the respondents. To enhance objectivity, it would be advisable to combine this methodology with complementary approaches such as observation or experimentation. Another limitation concerns the sample size and its lack of representativeness. The sample was selected based on availability and may not comprehensively mirror the entirety of the population. Therefore, the results should be regarded more as an investigative probe into the issue illustrating the chosen topic, which nevertheless provided valuable results and may also serve to help the creators of courses for students who can better meet their educational needs.

## CONCLUSIONS

1. The Future Work 4S project successfully demonstrates the value of a multidisciplinary approach to education, particularly in the context of environmental sustainability.
2. Its objective is to create a gamified open online course called "Future Work 4S," designed to equip academic students with four high-demand skills required in the labour market and society during the 4<sup>th</sup> industrial revolution.
3. The curriculum covers four main topics: (1) digital skills, (2) green skills and environmental awareness, (3) entrepreneurship and innovation, and (4) social skills.
4. The MOOC incorporates innovative digital teaching methods, including gamified learning, project-based learning, and interactive exercises, to provide an engaging and motivating learning experience.
5. A survey of teacher and student respondents from the Czech Republic, Italy, Greece, and Bulgaria showed that the Green Skills Massive Open Online Course received positive feedback for its interactive and engaging format, including relevant videos and tasks.
6. Both educators and students praised the high-quality visuals and gamification elements that enhance the learning experience.

7. The course provided clear guidelines and didactically correct content, featuring realistic examples and practical applications that are highly beneficial.
8. Respondents suggested that the environmental skills course could benefit from more practical examples and improved text quality and consistency, enhancing overall comprehension and engagement.
9. The course materials were recommended to be more comprehensive and visually appealing to better capture the interest of learners.
10. The positive reception of the course underscores the importance of integrating interactive and experiential learning approaches in environmental education.
11. To effectively promote the course through social media and university career guidance departments is crucial to reach a broader audience.
12. Offering the course as an introductory module with completion badges (micro-certificates) could further incentivize participation and recognize learner achievements.
13. The success of gamification elements highlights the potential of innovative teaching methods to foster learner motivation and engagement. Gamification elements were found to be engaging, making the course interesting, relevant, accessible, and developmental for participants. However, intrinsic motivation plays a significant role in the effectiveness of the course. According to self-determination theory, intrinsic motivation is more powerful and effective than extrinsic motivation, impacting personal satisfaction and perceived benefits of the course.
14. Further research should explore the long-term impact of such courses on learners' behaviour and attitudes towards sustainability, assessing their contributions to improving quality of life. This will ensure that educational initiatives like Future Work 4S continue to advance and meet the demands of a changing world, preparing students to address complex environmental challenges with confidence and competence.

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