Preliminary communication

CLIMATE CHANGE IN EUROPE: HOW TO ADAPT OUR HIGHER EDUCATION CURRICULA AND INVOLVE THE STUDENTS – LEARN4GREEN PROJECT

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Abstract: *In response to the need to incorporate environmental and sustainability issues into higher education curricula, four European higher education institutions decided to combine their competences to build five ECTS international, collaborative, and multidisciplinary online course modules focusing on environment, sustainability, and health (energy crisis, analysis methods in the field of environment, green smart factories).*
The four partner institutions received an Erasmus+ subvention for a three-year period to develop an online course. These higher education institutions are Brussels-Brabant University College (Belgium), University of Applied Sciences Velika Gorica, (Croatia), Polytechnico Institut – Coimbra (Portugal) and Tartu Health Care College – Tartu (Estonia).
The course's objective is to foster students' interest and develop the scientific, technological, and socio-political foundations in the fields of environment, sustainability, and health as well as communication, English language and crisis management skills. The project closely aligns with the European Strategy on Multilingualism and broader EU policies promoting foreign language learning and soft skills development. The teachers and students worked together in a co-construction way, using a situated learning environment. The process involved the teachers and students in a co-construction way, through a situated learning environment.
This paper aims to present the methodology and partial results after one year, based on both quantitative and qualitative indicators.

Keywords: environment, energy crisis, higher education, online courses, communication skills

1. Introduction

Assuming educators need further targeted support, expertise, and training opportunities to incorporate the principles of the green transition and sustainable development into their teaching and training practices, the Council of the European Union recommends supporting and enhancing teaching and learning for the green transition and sustainable development. This can be achieved by providing infrastructure, digital tools, and resources, as well as supporting educators' digital competences. The EU recognizes the key role of universities and university colleges in achieving a successful transition (Council of EU, 2022). Our research primarily

aimed to equip students with relevant, scientifically grounded knowledge on critical environmental issues, including achieving zero pollution in Europe, climate neutrality, the transition to clean and reliable energy sources, developing sustainable transport systems, and preserving Europe's natural capital.
The main objectives of the Learn4Green project are to meet stakeholders' expectations, improve curricula quality, foster international collaboration, and engage stakeholders actively in all project phases. A key component of the project was developing innovative pedagogical approaches, moving beyond the traditional transmissive teaching model. Additionally, the project emphasized developing a transdisciplinary approach, promoting collaborative work and collective intelligence, and improving soft skills like communication and English language proficiency. These elements serve as the driving forces behind the creation of a more flexible and engaging educational environment at the international level. Also, the project resonates with the goals of The EU strategy for multilingualism which emphasizes the importance of language proficiency as a tool for enhancing student and worker mobility, employability, and cultural and knowledge exchange among EU citizens (European Council, 2008).

According to that, the main objectives were: (1) to develop an online course module focusing on climate change, environment, sustainability, and health; (2) to stimulate innovative learning and teaching methods; (3) to enhance students' English and communication skills; and (4) to assess the collaboration methods between partner institutions and create a framework and guideline document. The choice of this subject is motivated by the pressing societal needs related to climate change and environmental challenges.
A French study highlighted the necessity of incorporating environmental and sustainability topics into both initial and higher education curricula in response to these challenges (Bortzmeyer, 2021). In addition, a student survey has revealed that 80% of students are concerned about climate change, and 87% believe that universities and university colleges should offer modules focused on climate change.
Therefore, four European higher education institutions decided to pool their expertise to create a five-ECTS international, collaborative, and multidisciplinary online course on environmental sustainability and health. They applied for and received Erasmus+ funding for a three-year project to develop this module.

The Learn4Green project addresses:

- The Erasmus+ priority on the environment and climate change, aiming to equip students with relevant knowledge to become responsible global citizens and stimulate innovative teaching and learning practices.
- The United Nations Sustainable Development Goals (United Nations, 2015), particularly Goal 13 on climate change: "13.2 Integrate climate change measures into national policies, strategies, and planning; 13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning."

- The Council of the European Union's recommendations, which emphasize the importance of supporting educators in incorporating environmental sustainability into their teaching practices (Council of EU, 2022).

2. Methodology

The Learn4Green project utilized a range of methodological approaches for its implementation. The first approach focused on the selection and cohesion of project partners. The primary criteria for partner selection included: prior collaborative experience with some partners in the engineering sector, expertise in Erasmus+ staff and student mobility programs (e.g., courses at Tartu Health Care College, Euroweek with Velika Gorica, and Polytechnic of Coimbra), as well as involvement in joint research projects. Equally important was the willingness to engage in a paradigm shift and the readiness to develop a common identity, which included fostering a sense of belonging and creating a unified visual identity.

A significant part of the methodology involved the analysis of existing curricula related to environmental and health issues, which were central to the project's goals. The curricula examined included:

1. Bachelier en prévention, sécurité industrielle et environnement (HE2B, Brussels) – Environmental and Health issues
2. Bachelor and Master Level in Environmental Health (Tartu Health Care College, Estonia)
3. Bachelor in Crisis and Disaster Management (University of Applied Sciences Velika Gorica, Croatia)
4. Bachelor and Master Programmes in Health Care (Polytechnic of Coimbra, Portugal)

In developing the methodology for course creation, the following steps were taken: setting clear project goals, defining the roles of each partner, outlining the study programs, establishing learning outcomes, developing a methodology for online teaching, planning the structure for mobility weeks, conducting student and teacher surveys to evaluate knowledge acquisition and satisfaction, and ensuring the dissemination of results. An integral part of the project was also creating a platform for communication and providing teaching materials, available through the website https://www.isibnet.be/.

The Learn4Green project incorporated an evaluation component designed to assess student knowledge at the beginning of the lectures, student satisfaction and the impact of the online and mobility week courses. The evaluation framework consisted of both closed and open-ended questions, aimed at measuring various dimensions of student development, including academic skills, language proficiency, social competencies, personal skills, and multicultural sensitivity (Table 2). The survey was structured to provide insights into the programme's effectiveness in fostering these competencies and understanding the broader implications of the learning experience on students' academic and personal growth.

Table 1. Short feedback about your experience in the Learn4Green project (online courses and stay in Tartu, Estonia)

Q1: I gained knowledge that I would not have otherwise acquired at my institution.	Yes	No
Q2: I gained skills that I would not have otherwise acquired at my institution.	Yes	No
Q3: I am more open to ecological concepts.	Yes	No
Q4: I am more open to the green transition.	Yes	No
Q5: I am more open to sustainability.	Yes	No
Q6: I have acquired new knowledge.	Yes	No
Q7: During this L4G experience, I improved my English.	Yes	No
Q8: I adapted better in new situations.	Yes	No
Q9: I acted better in new situations.	Yes	No
Q10: I am more capable of critical thinking.	Yes	No
Q11: I am more able to critically analyze information.	Yes	No
Q12: I can now more efficiently collaborate with my colleagues during any group work.	Yes	No
Q13: I now feel more self-confident.	Yes	No
Q14: My IT skills have improved.	Yes	No
Q15: I am now more creative.	Yes	No
Q16: I enjoyed visiting the host country.	Yes	No
Q17: I visited the host country (Estonia)for the first time.	Yes	No
Q18: I am more open to the concept of democracy.	Yes	No
Q19: I am more open to the concept of justice.	Yes	No
Q20: I am more open to the concept of equality.	Yes	No
Q21: I am more open to the concept of citizenship.	Yes	No
Q22: I am more open to the concept of civil rights.	Yes	No

Table 2. presents a connection with questions designed to evaluate various skills, including academic, language, social, personal, and multicultural competencies. These questions were specifically crafted to assess the broader impact of the Learn4Green project on student development in these areas.

Table 2. Different questions related to skills

	1. academic skills
	2. language skills
	3. social skills, personal skills
	4. multicultural sensibility

Table 3. Short teachers' feedback about the experience in the Learn4Green project Tartu, Estonia

Q1: By participating in the project, I gained additional disciplinary skills.	Yes	No
Q2: I modified some of my teaching methods after this experience.	Yes	No
Q3: I increased my knowledge about didactic practices abroad.	Yes	No
Q4: I improved my IT skills.	Yes	No
Q5: My creativity has increased.	Yes	No
Q6: I improved my English language skills during my stay.	Yes	No

Q7: I am satisfied with the whole mobility experience.	Yes	No
Q8: My job satisfaction has increased.	Yes	No
Q9: I improved my collaboration skills for group work.	Yes	No
Q10: My self-confidence improved.	Yes	No
Q11: I expanded my professional network.	Yes	No
Q12: I have new collaborative projects for the future.	Yes	No

Table 4. presents a connection with questions designed to evaluate various skills, including academic, language, social, personal, and multicultural competencies. These questions were specifically crafted to assess the broader impact of the Learn4Green project on teachers' development in these areas.

Table 4. Different questions related to skills

	5. disciplinary skills
	6. pedagogic skills
	7. language skills (English)
	8. motivation and satisfaction at work
	10. expansion of the professional network for the future

The pedagogic team, management team, and steering committee held regular videoconference meetings to address organizational challenges, including differences in academic calendars, which they resolved through collaboration.

3. Problem analysis

The development of the course module is a collaborative effort among the four partner institutions, with each institution contributing to the course every year. Over three years, the course will be designed, improved, and validated through the combined efforts of teachers and students. Key activities take place twice a year: online courses in November and mobility activities in February. Each year focuses on a different theme:

- Year 1: The Energy Crisis
- Year 2: Analytical Methods in Environmental Studies
- Year 3: Green Smart Factories.

To improve interculturality, activities are held annually in different countries. On a pedagogic level, the methodology is based on situated learning environments that place students in authentic learning situations. Students are thus actively immersed in activities, and apply problem-solving skills to engage with authentic tasks. This develops cooperation, sharing specific competences and collective intelligence (Zheng, 2010). In addition to defining the energy crisis as one of the key focuses of the first year of the project's implementation and education, the need to strengthen English language proficiency and communication skills was also recognized. This was particularly addressed by the Croatian partner institution. Throughout the online courses, introductory lectures on specific English vocabulary related to each topic were provided. These sessions significantly helped students better understand the subject matter and the thematic content. Similar support was also offered during the face-to-face sessions.

Enhancing soft skills is of great importance for the development of students' general competencies.
Therefore, a dedicated lecture on communication skills was organized for the students. This session focused on applying the knowledge gained in the context of presenting collaborative work. By fostering these competencies, the project aimed not only to deepen subject-specific knowledge but also to enhance the overall academic and professional abilities of the participants. To improve the students' knowledge of communication skills and the English language regarding specific environmental topics specific pedagogical activities would be organized for every three years of the project (different methods: desk research, oral and written presentations, collaborative work, games, debates, etc.).
Despite a common objective, there are many differences between the four partner institutions due to their different environmental, energy, and educational contexts. Yet, we are all subject to the requirements of the Green Deal.
This collaborative study aims to identify the most effective strategies for familiarizing both teams and students with the European Green Deal, and for integrating specific modules related to sustainability and climate action into existing curricula. The analysis is approached from several key perspectives:

- Addressing concerns related to climate change.
- Assessing students' knowledge of climate change, energy issues, and environmental challenges.
- Examining the differences between countries in terms of climate policies and crisis management approaches.
- Investigating intercultural challenges in collaborative learning environments.

Transforming traditional lectures and lessons into online courses that promote independent learning for future participants presents a significant challenge. Additionally, Europe's responsibility includes ensuring the outcomes and content of these courses are widely accessible. To meet these objectives, course formats must be adapted to support flexible and autonomous study, enabling students to engage with the material in a flexible and autonomous manner.

4. Results and discussion

In the first year, 46 students participated in the online courses, while 40 students and 12 teachers (three from each institution) attended the face-to-face mobility session at Tartu Health Care College in Estonia (Table 6, Figure 1.).

Table 5. List of participants by country

Countries	Belgium	Croatia	Estonia	Portugal
Students	6	12	12	10
Teachers	3	2	5	2

The first-year course focused on the energy crisis, with each participating country identifying specific issues. Topics included the environmental, economic, and strategic aspects of using oil

shale in Estonia; the health impacts of renewable energy sources in Portugal; and the positive and negative aspects of nuclear energy in Belgium. The first year of the project was dedicated to the preparation of interactive online lectures, which covered all the defined areas related to the energy crisis. Special emphasis was placed on the specific characteristics of each partner country. Within the context of developing English language skills, particular attention was given to the vocabulary relevant to each topic. The development of soft skills was focused on recognizing different communication methods, including both verbal and non-verbal communication, as well as theoretical preparation for debate. During the mobility week, students were divided into international groups and, through mentorship and a collaborative approach, participated in the creation of presentations on assigned topics. They also prepared for a debate that centred on the discussion and confrontation of opposing views regarding the energy crisis and potential solutions, such as green and nuclear energy. This pedagogical approach demonstrated a clear need for the development of English language and communication skills, as students actively engaged in cross-cultural dialogue and critical thinking. The chance to work on collaborative projects fosters intercultural dialogue and gives students a platform to practice their foreign language skills in a creative and innovative way.

The first year of the Learn4Green project was successful in several key areas. We could identify students' knowledge and gaps about the environment, climate change, and energy crisis. It has enabled us to meet the expectations of the Green Deal (European Commission, 2020) and the United Nations Sustainable Development Goals, mostly Goal 13 (United Nations, 2015).
Initial teaching materials on energy issues and the energy crisis were developed by teachers with expertise in these fields. These resources will form the foundation for the future modules. Additionally, the project has promoted inclusion and intercultural learning (European Commission, 2020). The emotional and interpersonal aspects of the project have been highly positive for all participants. The project aims towards inclusion and interculturality (European Commission, 2020). On an affective and emotional level, it was a very positive experience for the participants.

A survey regarding the energy crisis and climate change revealed that students:

- 95.1% expressed concern about climate change.
- 76.7% correctly defined the term "Anthropocene."
- 95% could describe the greenhouse effect.

While students answered technical questions on greenhouse gases, fuels, and energy production methods correctly, many struggled to identify the main goals of the European Green Deal. Differences in English proficiency among students have affected their ability to engage in scientific discussions. Therefore, scientific argumentation was sometimes poor for debate, and the students were not prepared enough. Developing students' foreign language skills and adopting interdisciplinary approaches are essential for enabling them to become competent communicators and promoting environmental issues and responsibility. Integrating environmental themes into foreign language curricula at all levels of education and incorporating authentic materials not only enhances language proficiency but also deepens

students' understanding of environmental issues fostering curiosity, active engagement, and a more meaningful learning experience. The effective indicators after the first year of the programme were identified through quantitative indicators, student and teacher satisfaction surveys, and a SWOT analysis.

The satisfaction results after the mobility week were:

For the students:

- Improvement in English, self-confidence, and critical thinking.
- Greater sense of collaboration and global citizenship.
- Adaptability to new environments and intercultural learning.
- Some students requested more visits and longer mobility sessions.

For the teachers:

- Acquisition of new knowledge on energy and environmental issues.
- Expansion of professional networks and new collaboration ideas.
- Increased job satisfaction.

In the next two years, the plan is to increase the focus on the socio-economic aspects of the Green Deal, including lectures on EU directives, Green Deal goals, and utilizing EU pedagogic platforms for resource sharing. We also identified the need to adapt the pedagogical materials (e.g., PowerPoint presentations) into a format suitable for e-learning, which will be a primary focus for the next academic year.
Therefore, The pedagogic team will prioritize this transformation in the next academic year. Additionally, the pedagogic team will address the lack of student evaluation of course content by formalizing and structuring student evaluations into a template for e-learning and individual learning.

5. Conclusion

In conclusion, the first year of the Learn4Green project successfully achieved most of its objectives. We identified key areas for improvement and established strategies for future work. The project has led to a new dynamic within each partner institution, significantly increasing awareness of the green transition and sustainable development among all stakeholders. The complementary skills of the partner institutions have contributed to a more holistic approach to addressing this complex issue. It is a concrete example of an initiative that promotes multilingualism and language learning, develops a range of soft skills, and tackles educational issues, all while contributing to international cooperation on environmental protection. This project opens new doors to the possibility of integrating this course module into many other higher education curricula as a transversal program. It also contributed to the growing interest of young people and teachers in environmental issues, as well as their contributions to society and future generations. This includes advancing the development of higher education institutions, improving soft skills and English language proficiency, encouraging collaborative work, and creating long-term structural impacts and networking opportunities.

Figure 1. Tartu, Estonia Learn4Green final meeting day

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