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 a need to incorporate environmental and sustainability issue in the higher education curricula, four European higher education institutions decided to join their competences to build a five ECTS international, collaborative, and multidisciplinary online-course modules focused 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 3 years to develop an online course. The 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 goal of the course is to improve the students' interest and develop the scientific, technological, and socio-political foundations in the field of environment, sustainability, health as well as communication, English and crisis management skills. The process involved the teachers and students in a co-construction way and, through a situated learning environment.
The aim of this paper is to present the methodology and the partial results after one year, based on quantitative and qualitative indicators.

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

1. Introduction

Assuming that educators need further targeted support, expertise, and training opportunities to incorporate the principles of the green transition and sustainable development in their teaching and training practices, the Council of the European Union recommend the support and enhance teaching and learning for the green transition and sustainable development by providing infrastructure, digital tools and resources and supporting educators' digital competences so, the EU recognizes the key role of universities and university colleges reaching a successful transition (Council of EU, 2022). In the context of our research, the primary objective was to equip students with relevant and scientifically grounded knowledge on critical environmental issues. These included topics such as achieving zero pollution in Europe, climate neutrality, the

transition to clean and reliable energy sources, the development of sustainable transport systems, and the preservation of Europe's natural capital.
The main objectives of the Learn4Green project are to meet stakeholders' expectations, enhance the quality of curricula, foster international collaboration, and actively engage stakeholders in all project phases. A key component of the project was the development of innovative pedagogical approaches, aiming to move beyond the traditional transmissive model of teaching. Additionally, the project emphasized the development of a transdisciplinary approach, the promotion of collaborative work and collective intelligence, and the improvement of soft skills, such as 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.

Acoording to that the main objectives were: (1) to develop an online course module focused 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 pressing societal needs related to climate change and environmental challenges.
A French study highlights the necessity of incorporating environmental and sustainability topics into both initial and higher education curricula as a response to these challenges (Bortzmeyer, 2021). Furthermore, a student survey 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. These institutions 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 to incorporate 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 undertaken: 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 the creation of a platform for communication and the provision of teaching materials, available through the website https://www.isibnet.be/.

The Learn4Green project incorporated an evaluation component designed to assess student knowledge on the begining of the lectures and 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 1). The survey was structured to provide insights into the effectiveness of the program 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 conection 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 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 conection 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, such as differences in academic calendars, which were 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 a part of the course each year. Over three years, the course will be designed, improved, and validated through joint efforts from teachers and students. Key activities occur 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 taking place each year in another country. On a pedagogic level, methodology is based on situated learning environments that place students in authentic learning situations. They are then actively immersed in activities while using problem-solving skills. 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 in better understanding 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 English language regarding specific environmental topics specific pedagogic activities would be organized for every 3 years of the project (different methods: desk research, oral and written presentations, collaborative work, games, debate, and etc.).
Despite a common objective, there are many differences between the 4 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.

An additional challenge lies in transforming traditional lectures and lessons into online courses that support independent learning for future participants. One of Europe's obligations is to ensure that the outcomes and content of these courses are made accessible to a broad audience. As such, the course format must be adapted to facilitate independent 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 (3 from each institution) attended the face-to-face mobility session at Tartu Health Care College in Estonia (Table 5, 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 centered 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 communication skills, as students actively engaged in cross-cultural dialogue and critical thinking.

The first year of the Learn4Green project was successful in several key areas. We could identify student's 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 and mostly the 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 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. The affective indicators after the first year of the programme were identified through quantitative indicators, students and teachers' satisfaction surveys, and a SWOT analysis.

The satisfaction's 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.
Also, it is identified the need to transform the pedagogic materials (pptx) to a format for e-learning. Therefore, the pedagogic team will start focusing during the next academic year to achieve this goal. To address the lack of student evaluation of course content, the pedagogic team will formalize and structure student's evaluations in a template for e-learning and individual learning.

5. Conclusion

In conclusion, the first year of the Learn4Green project successfully met 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 and has significantly raised 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 this complex issue. This project opens new doors to the possibility of inserting this course module into many other higher education curricula as a transversal program. Also, the growing interest of young people and teachers in environmental issues, teachers' and students' contribution to society and younger generations, towards the development of higher education

institutions, developing soft skills, English skills and collaborative work and long-term structural impact and networking.

Figure 1. Tartu, Estonia Learn4Green final meeting day

Literature:

1. Slock, C., Netanyahu, S. (2021). Leading transformation in environment and health. Bonn School on Environment and Health Report, Boon, Germany.
2. Bortzmeyer, M. (2021). Prendre en compte les enjeux environnementaux et de durabilité dans la formation initiale et continue. Un point de vue depuis le ministère de la transition écologique. *Dans Revue française d'administration publique* 2021/3(179), 639-656.
3. Zheng, R. (2010). Effects of situated learning on students' knowledge acquisition: An individual differences perspective. *Journal of Educational Computing Research*, 43(4), 467–487.
4. World Health Organization. (2022). Compendium of WHO and other UN guidance on health and environment, 2022 update (WHO/HEP/ECH/EHD/22.01). Geneva: World Health Organization. Retrieved from https://iris.who.int/bitstream/handle/10665/352844/WHO-HEP-ECH-EHD-22.01-eng.pdf?sequence=1
5. World Health Organization. (2021). Climate change and health research: current trends, gaps, and perspectives for the future. Retrieved from https://cdn.who.int/media/docs/default-source/climate-change/cop26/final_cop26-research-web.pdf?sfvrsn=e8fb5dcb_5&download=true
6. European Commission (2020). The European Green Deal, striving to be the first climate-neutral continent. Retrieved from https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en
7. UNEP and the sustainable goals (2015). Goal 13: climate action
8. United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development* (A/RES/70/1). United Nations. Retrieved from https://sdgs.un.org/publications/transforming-our-world-2030-agenda-sustainable-development-17981
9. European Commission (2020), Erasmus+ 2021-2027, key action 2: Cooperation partnerships. Retrieved from https://erasmus-plus.ec.europa.eu/programme-guide/part-b/key-action-2
10. Council of the European Union (2022) Proposal for a Council Recommendation on learning for environmental sustainability - Adoption. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022DC0011