Developing environmental awareness and digital competency through English language education

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Abstract: *Innovative educational paradigms that promote sustainability awareness and digital competency are required due to the rising urgency of environmental issues and the ubiquitous effect of digital technology. This paper investigates how environmental and digital aspects can be included in English language education to produce students who are proficient in the language, ecologically aware, and digitally competent. Moreover, it incorporates illustrative scenarios from the classroom, including interdisciplinary student projects, online debates, and digital sustainability initiatives. The paper offers educators a pedagogical framework for coordinating language education with global sustainability goals, establishing English language education as a tool for developing responsible, digitally empowered citizens prepared to tackle the ecological and technical challenges of the twenty-first century. The research used a mixed-method design that included observation notes and students' projects (digital posters, presentations, and reflective essays), a brief pre/post survey on students' self-perceived environmental awareness and digital competency. The study also covers potential difficulties such as curriculum design, teacher readiness, and ambiguous environmental content for learners with different skill levels. Findings demonstrate that the inclusion of environmental topics in English language education fosters learners' critical thinking, active learning and collaborative problem-solving. Consequently, the integration of interdisciplinary projects in the language education supports sustainable, digitally empowered citizenship by providing learners with skills to deal with the urgent environmental and technical issues of thetwenty-first century.*

Keywords: Higher education, Digital pedagogy, Communicative language education, Content and Language Integrated Learning (CLIL), Education for sustainable development.

1. Introduction

The need for tackling environmental issues including pollution, biodiversity loss, and climate change has become more widely acknowledged in recent decades. The observable and palpable effects of these issues highlight the necessity for civilisation to produce environmentally educated individuals who can comprehend and resolve intricate ecological issues (UNESCO, 2020). This awareness is mostly fostered by education, which equips learners with the information, abilities, and mindsets needed to participate in sustainable activities and critically interact with environmental challenges (Tilbury, 2011).

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Environmental education has always been regarded as a separate academic discipline. Nonetheless, recent studies emphasise the benefits of cross-curricular integration, which involves integrating environmental themes into language instruction as well as other disciplines (Ceprian & Junyent, 2015). There are two advantages of including environmental topics into English language instruction: it promotes critical engagement with global sustainability concerns while also aiding in the development of linguistic competence. Modern educational frameworks that emphasise transversal abilities like critical thinking, problem-solving, digital literacy, and global citizenship are in line with this integration (European Commission, 2024; Council of Europe, 2020).

There are still few thorough models that show how environmental education and digital learning can be integrated together into English language pedagogy, despite the fact that many studies have looked at these topics separately. The creation of cohesive solutions that link linguistic, digital, and ecological competencies is hampered by this lack.

This article uses a conceptual framework enhanced by real-world examples; it uses pedagogical illustration and theoretical synthesis to show the feasibility of an integrated approach. Based on the examination of educational models, EU policy documents, and actual classroom assignments, the methodology is qualitative and descriptive.

Thus, the study rethinks language education as a transformative process that fosters social engagement, digital empowerment, and environmental responsibility rather than just language instruction. The investigation is carried out within the research project *Integrating and promoting green education in the initial training of English language teachers*, strategic priorities: societal challenges, strategic direction: Innovative Educational Technologies and Products, with the code 25.80012.0807.56SE, which studies integrated approaches to green education in English language learning contexts.

In Higher Education settings in Eastern Europe like the Republic of Moldova, the incorporation of digital and environmental education into English language instruction is yet largely unexplored. Few empirical studies show how these principles may be operationalized in foreign language classrooms, despite European initiatives like the European Green Deal (2024) and the Digital Education Action Plan (2021-2027) calling for cross-curricular sustainability and digital skills. In order to close that gap, this study combines classroom experiment carried out in a Moldovan university context with theoretical viewpoints from communicative language teaching (CTL), content and language integrated learning (CLIL), and project- and problem-based learning (PBL). The research provides contextual evidence demonstrating that acquiring a language can enhance both digital skills and environmental awareness simultaneously.

According to recent studies, language learning is connected to both digital transformation in education (Godwin-Jones, 2022; Redecker, 2023) and sustainable (Goulah, 2021). Nevertheless, the majority of research looks at these areas independently. In Higher Education, particularly in English foreign language

programs in Central or Eastern Europe, few discuss their intersection. In order to achieve a digital-green integration paradigm in English language instruction, this study expands upon CLIL and sustainability-pedagogy frameworks. This paper aims to design a pedagogical sample that integrates environmental and digital competences into English language education in higher education settings.

2. Research methodology

The study investigates how students' environmental consciousness and digital competency in Higher Education might be improved by including sustainability-related content and digital tools into English language training. A small-scale exploratory research was conducted in the spring of 2025 at „Ion Creanga" State Pedagogical University of Chisinau, Republic of Moldova, to demonstrate the applicability of this integrated strategy. Fourteen second-year students from the English and French Language and Literature program participated in the study. The research used a mixed-methods design that included observation notes and students' projects (digital posters, presentations, and reflective essays), a brief pre/post survey on students' self-perceived environmental awareness and digital competency. Through project-based learning activities, the four-week intervention incorporated environmental themes – *sustainable cities, digital activism, and eco-lifestyles* into English classrooms. Every week, students used English to conduct research, have discussions, and create digital products on sustainability themes in accordance with CLIL principles. Qualitative data were categorized thematically to find recurrent patterns in students' reflections and observed behaviours.

The study was guided by the research questions:

- How much do students' environmental awareness levels increase when sustainability-related issues are incorporated into English language classes?
- In what ways does the use of digital tools in project-based English education help students become more digitally competent?
- How do students feel about learning English with technologically assisted, ecologically related assignments?
- The research questions developed the following hypotheses:
- Students' knowledge of the environment will rise dramatically when sustainability-related subjects are incorporated into English language instruction.
- Students' digital competency will be greatly improved by using digital technologies in English language projects.

The elaboration of educational activities, the choice of survey tools, and the ensuing examination of both quantitative (means and differences) and qualitative data (thematic analyses) were all influenced by these theories. All female students, aged 19-20, participated anonymously and the data were collected with the students' consent.

3. Theoretical background

3.1 Connection between digital and green skills in English language education

The rise of digital technology has created new opportunities for combining digital skills, ecological consciousness, and language learning. Interactive platforms, online collaborative projects, virtual classrooms, and gamified learning environments are examples of digital tools that can promote collaborative problem-solving, authentic communication, and access to global environmental content (European Commission, 2024). Teachers may train children to explore, evaluate, and convey complex information in a digital world by including digital competencies into language curriculum alongside environmental issues. This will promote sustainable digital citizenship.

Additionally, including environmental issues into English language teaching directly advances the strategic goals of the European Union, especially the European Green Deal, which aims to make Europe the first continent to achieve carbon neutrality by 2050 (European Commission, 2024). Students gain the critical thinking and communication abilities required to participate actively in sustainability issues through digitally enhanced language instruction. By encouraging green skills, environmental responsibility, and active engagement in social change, this approach enables language education to go beyond conventional learning results (UNESCO, 2020).

This makes English language instruction a strategic tool for developing students' language skills as well as their environmental awareness and digital literacy, which will help create a sustainable, climate-neutral future. One example of how multidisciplinary methods might meet the urgent educational and societal concerns of the twenty-first century is the integration of digital skills and environmental awareness into language instruction.

Several important theoretical underpinnings are used when integrating real-world concerns, such as environmental difficulties, into language education. In his research on second language acquisition, Krashen highlights that contextualised, meaningful language learning results in more significant language growth, which may be promoted by interacting with current world concerns like environmental sustainability.

Furthermore, Swain highlights the importance of the assignments that demonstrate genuine communication, which is a fundamental tenet of the EU's educational strategy (Swain, 2005).

Moreover, the development of environmental literacy is consistent with the EU's Education and Training 2030 framework, which emphasises lifelong learning and active citizenship. As a transversal ability, *environmental competence* is one of the key competences for lifelong learning, equipping students to critically engage with global issues like climate change in addition to being prepared to participate in the labour market (European Commission, 2024).

Through interactive learning environments, online collaboration platforms, and virtual classrooms, students may access real-world environmental knowledge, meaningfully express their ideas, and work together to solve problems across geographic borders. These resources aid in the growth of digital competency by enabling students to successfully engage in online communities, traverse situations that are rich in information, and critically assess sources (OECD, 2019; European Commission, 2024).

3.2. Pedagogical frameworks of CLIL, task-based, and project-based approaches

Problem-based learning enables students to actively address difficult environmental issues, utilising multidisciplinay knowledge and digital resources to create workable, sustainable solutions, while task- and content-based methodologies provide the foundation for meaningful language acquisition. An educational strategy known *as problem-based learning* puts students at the centre of their education by engaging them in the hands-on exploration and resolution of actual problems. Grounded in experiential learning and constructivist theory (Vygotsky, 1978), problem-based learning promotes the development of students' critical thinking and problem-solving skills.

Approaches like language teaching, task-based language teaching, and content and language integrated learning really encourage bringing environmental topics into English language classes.

Task-based language learning focuses on both language form and function by emphasising the use of real-world activities that mirror everyday circumstances.

Project-based learning, which adheres to the ideas of task-, content-, and problem-based methods, is a logical step towards education that is more independent and inquiry-driven. By involving students in lengthy, interdisciplinary projects with measurable results, it enhances the learning process.

Students that take part in initiatives like *actual environmental problems, such as waste reduction, the promotion of renewable energy, or biodiversity conservation,* develop a greater awareness of sustainability issues within the framework of green education. This experiential method turns the classroom into a creative and inquiry-based laboratory by encouraging students to create knowledge through action rather than passive absorption.

4. Pedagogical implications

It is equally important to promote green skills, such as environmental responsibility, sustainability literacy, and well-informed decision-making. Learners with green skills are better equipped to assess environmental issues, create long-term solutions, and behave responsibly in social, professional, and academic settings. When combined with language instruction, these abilities enable students to speak out about environmental concerns, support sustainable practices, and take

part in national and international campaigns, all of which encourage civic engagement and active citizenship.

The effect of digital and green abilities is increased when they work together. By making it easier to obtain current environmental data, enabling virtual cooperation, and assisting in the development of multimedia projects that convey sustainability themes, digital technologies help improve green abilities.

This combination promotes sustainable digital citizenship, where students are able to solve local and global issues with knowledge and are not just technologically proficient but also ecologically conscious.

As it gives students the opportunity to participate in problem-solving exercises based on actual problems, *task-based learning* works especially well for incorporating environmental themes. *Creating a sustainable city* is one example of such a challenge. Students collaborate in small groups to design a city plan that takes into account important environmental issues including *waste management, green areas, transportation, and energy systems*. Using online tools such as interactive simulations, articles, and digital maps, students first investigate sustainable urban design techniques. Then, using digital tools like Canva, Google Slides, or Mind Map, each group creates a picture of their city with a short description of it.

Content and language integrated learning, which builds on the ideas of task-based teaching, offers an additional way to incorporate environmental subjects while encouraging language learning and subject knowledge. Students may learn language through relevant subject matter, including conservation tactics, climate policy, or renewable energy, thanks to content-based training. For instance, reading English-language scientific publications, summarising the main conclusions, and producing a digital presentation might all be part of a *sustainable energy module*.

A climate change campaign effort serves as another example. Using information from a variety of academic fields, including science, economics, and social studies, students choose an environmental topic, such as pollution, climate change, or biodiversity loss, and undertake research in English. Students create an eco-friendly project, such as a recycling program, a campaign to raise awareness of renewable energy, or a local environmental project, using the data they have collected. They provide promotional materials, such as *brochures, posters, or postings on social media*, and they make a digital presentation that promotes their project.

By emphasising genuine conversation and meaningful engagement, incorporating environmental education also makes learning better.. *Role-plays, problem-solving conversations, and environmental debates* are all ways that communicative language teaching may be used.

Green and digital abilities work very well together. By facilitating virtual cooperation, giving access to up-to-date environmental data, and assisting in the production of digital material that successfully conveys sustainability messages, digital tools improve green abilities. In a risk-free, interactive setting, for instance, students may construct environmentally friendly metropolitan areas and apply sustainable practices by using virtual simulation platforms like SimCity or

Minecraft Education. In English, students record their creative process and results, share them with their peers, and consider how their choices may affect the environment.

Teachers may develop students' language skills, environmental awareness, and digital competency all at once by incorporating these ideas into their English lesson plans. Students gain the skills necessary to critically assess how human activity affects the environment, interact online, and communicate effectively about sustainability.

The sustainable agricultural initiative for local communities serves as a real-world illustration of problem-based learning in English classes. *"How can local communities adopt sustainable farming practices to improve food security and reduce environmental impact?*" is the real-world problem that students are given this assignment. Students start by choosing a particular area, such as *organic farming, water management, or soil conservation*, and talking about the significance of sustainable agriculture.

Students collaborate in groups to provide a workable solution for the topic area they have selected. For instance, they can suggest measures for encouraging *organic practices, soil restoration, or water conservation*. Using programmes like Google Slides, Canva, each group creates a digital presentation outlining the advantages, possible drawbacks, and interdisciplinary considerations of their approach. Students defend their ideas, answer questions from their peers, and participate in critical discourse throughout the presentation phase. They conclude by writing a reflective summary in English that examines their understanding of sustainable agriculture, the effects their solutions have on society and the environment, and the interdisciplinary knowledge they used.

As students read, write, and communicate in English throughout the project, this problem-based learning exercise enhances language competence while also fostering critical thinking, teamwork, and problem-solving abilities. While green skills are built as students apply sustainability concepts and assess environmental effects, digital skills are improved through internet research, digital content production, and multimedia presentations.

Other potential problem-based learning exercises include climate action campaigns, in which students create projects to lower carbon emissions or increase awareness of regional environmental issues, or sustainable city planning, in which students create environmentally friendly urban areas incorporating renewable energy, green transportation, and waste management techniques.

In order to investigate how technological innovation and digital culture support environmental sustainability, students work together to create and publish a digital class newspaper called Eco-Digital Times: Technology for a Greener World. The concept reflects the multidisciplinary aspect of contemporary education by combining language learning, environmental education, and digital competency.

For information gathering, students turn to reliable internet sources including TED Talks, websites with EU environmental policies, and blogs about recent sustainability. Among the various kinds of material they create are:

Example 1. News feature; Interview; Opinion article; Infographic; Student column.

Digital publishing platforms like Canva, Padlet, or Google Sites are used by each team to create, edit, and design their sites. While overseeing the process, the instructor places a strong emphasis on linguistic correctness as well as digital ethics including copyright, citation, and online communication. The project culminates with a classroom display or online publication where students showcase their digital newspapers and talk about the intersection of sustainability and technology in modern society.

Example 2. Green Documentary Project. For this project, students collaborate in small groups to create a brief documentary video about a regional environmental problem, such as waste management, energy efficiency, or waste pollution. The writing, interviews, and narration of their discoveries are all done in English. While practicing digital storytelling and video editing, students also improve their speaking, listening, and writing abilities. Peer learning and community involvement can be promoted by screening the finished documentaries at a school-sponsored "Eco Film Festival".

Example 3. Designing a Green School Campaign. Students are expected to create a school-wide sustainability project, such as "green week", an energy-saving campaign, or a recycling program. The instructor leads the class through the phases of stakeholder communication, project planning, and English persuasive messaging. They craft slogans, make banners, and publish information on social media to promote their campaign.

All things considered, project-based learning fosters interdisciplinary learning and ecological citizenship by placing English language instruction in a practical, socially relevant framework. Students are becoming active change agents who use language, technology, and teamwork to imagine and create sustainable futures rather than being passive consumers of knowledge.

5. Findings and discussions

The research included fourteen second-year undergraduate students in the English and French Language and Literature program. We examined qualitative information by coding the themes in the students' reflective essays, digital projects, and observational notes. We assessed the projects using rubrics that focused on language use, content accuracy, digital design, and ecological importance. We analyzed the survey findings by comparing pre- and post-means since the small sample size did not allow for inferential statistical analysis.

The results of the experiment demonstrate an increase in students' self-assessment of digital competency and environmental awareness. Three recurrent reflections emerged as a result of analysing data:

- When language activities dealt with actual ecological problems, students expressed greater interest;

- Students liked learning communicative sustainability themes using digital tools.

The results are illustrated in Table 1. The findings are consistent with the difficulties that students reported, such as a lack of technological resources and uneven confidence with online technologies.

Table 1. Modifications in Students' Digital Competency and Environmental Awareness (Pre- and Post-Intervention)

Competence	Pre-mean	Post-mean	Difference
Digital competency	3.1	4.0	+0.9
Environmental awareness	3.2	4.3	+1.1

(Scale 1-5; 1=low, 5=high)

Digital competency improved by +0.9, rising from a pre-intervention mean of 3.1 to 4.0. This implies that students' trust in using digital technology for educational reasons was much increased when digital tools were incorporated into language learning activities. Environmental awareness increased by +1.1, from 3.2 to 4.3, suggesting an even greater influence. The improvement shows how well environmental themes, such as eco-friendly communication and sustainable life-styles, may be used as linguistic content in English language learning assignments. The good growth in both categories shows that dual competence development can be promoted by incorporating digital literacy and sustainability topics into language education. The observed tendency supports the idea that contextualised, project-based learning promotes deeper engagement and skill acquisition. The results are positive, yet, the study is limited by the small number of participants and the short period of the experiment. Future research should take these facts into consideration.

A limitation of this research is that the questionnaire assessed students' self-reported environmental awareness and digital proficiency, rather than evaluating their knowledge or abilities through objective testing. While self-assessment tools are valuable for gauging shifts in motivation and attitudes, they do not fully represent actual knowledge or practical skills. Consequently, the findings should be understood as indications of heightened awareness and self-assurance, rather than as definitive proof of skill acquisition.

There are many potential and real-world difficulties in integrating digital competency and environmental consciousness into English language instruction. To effectively integrate digital and environmental issues into their courses, teachers might require specialized professional development. Developing digital pedagogical abilities, such as managing digital projects, utilizing online platforms for collaborative learning, and successfully integrating multimodal materials, is just as important as gaining environmental literacy. Differentiated teaching, careful curriculum scaffolding, and the selection of age-appropriate, contextually relevant resources are also necessary to adapt complex environmental ideas to learners'

varied language competence levels. Maintaining a pedagogical balance between communicative fluency, linguistic correctness, and environmental or digital learning outcomes – so that none of them overshadows the others – is another problem.

Notwithstanding these obstacles, incorporating digital and green competencies into English language instruction is a progressive strategy that is in line with current European educational frameworks and policies, including the Digital Education Action Plan (2021-2027), the European Green Deal (2024), and Education for Environmental Sustainability (UNESCO, 2023).

Teacher professional development is essential for the successful application of digital-green pedagogy. Teachers require training in environmental literacy and digital pedagogy. This includes the use of collaborative platforms, multimedia tools, and project-based assessment techniques. A modular professional development approach is suggested. This approach should incorporate (1) ecological content training, (2) digital tool proficiency, and (3) pedagogical integration workshops. These workshops would allow teachers to develop and test interdisciplinary tasks. This model promotes sustainable implementation and facilitates the scalability of the framework.

6. Conclusions

Teachers may create engaging learning experiences that link language practice to actual environmental and digital difficulties by utilizing the concepts of communicative language teaching, content and language integrated learning, and problem- and project-based approaches.

Besides, using digital tools can improve student engagement and promote multimodal literacy. Examples of these include data visualization software, digital storytelling programs, and online platforms for collaborative writing. Digital tools enable students to become content producers rather than just consumers by facilitating access to real environmental data and worldwide viewpoints. Students utilize English to debate, evaluate, and promote sustainable practices in digital arenas, transforming language courses into labs for active citizenship.

In the end, including digital and environmental topics into language instruction empowers students to be critical thinkers, effective communicators, and proactive changemakers both locally and internationally. By using such integrated techniques, education goes beyond its conventional bounds and equips students to interact with the complex ecological and technological realities of the twenty-first century in an ethical and knowledgeable manner in addition to learning a second language. This study has a great impact on some other researche from different fields proving how integrated language learning contributes to the increase of students' digital competence and environmental awareness.

It is suggested that self-perception evidence should be integrated with evidence of practice, specifically by use of standardized performance-based measures (atelier-specific, policy-oriented and appraisal-type) of digital competence, ecological literacy quizzes, and project work evaluated using rubrics.

The availability of such measures would permit stronger inferences about gains and facilitate between-context comparisons.

Although the results of this study explicitly show some increase in awareness and engagement, future research is warranted to determine whether awareness and engagement actually sustain behaviour change. An item here which could be added to a future research agenda is for longitudinal studies that monitor students' ecologies and digital practices beyond their participation on the course or project, including involvement with sustainability initiatives, digital activism and community 'action'. This type of research would offer further understanding on the lasting influence of language education as a catalyst for active citizenship.

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