

EXPERT PERCEPTIONS ON DIGITAL EDUCATION TOOLS AND ASSESSMENT STRATEGIES UNDER THE EUROPEAN GREEN DEAL FRAMEWORK

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Abstract

This study investigates expert opinions from five universities across Romania, Spain, Portugal, and Ukraine regarding the use of digital learning, gamification, and artificial intelligence (AI) in enhancing education aligned with the European Green Deal (EGD). Based on structured survey responses from academic professionals, the findings reveal that 65% of participants view online learning as a potential contributor to social isolation, highlighting the value of blended learning approaches. Gamification received broad support, with over 70% of experts agreeing it improves student engagement and comprehension, although concerns about cost and implementation persist. AI was acknowledged as a valuable tool for academic integrity and assessment, though its effectiveness in providing real-time personalized feedback remains inconclusive. These results suggest that a balanced integration of digital tools can support improved educational outcomes and better understanding of sustainability-related content.

Key words: gamification, artificial intelligence, European Green Deal.

INTRODUCTION

The integration of digital education and assessment techniques within the framework of the European Green Deal (EGD) presents both challenges and opportunities in reshaping higher education. The EGD, a strategic initiative by the European Union (EU), aims to achieve climate neutrality by 2050, requiring the transformation of multiple sectors - including education. Digital tools such as Moodle, Coursera, and other e-learning platforms contribute to this shift by facilitating access to educational content and promoting sustainable practices like cloud-based infrastructure and reduced material consumption (Aparisi-Torrijo et al., 2024; Oliveira et al., 2022; Torrez-Ruiz & Moreno

Ibarra, 2019). These platforms are increasingly used to equip students with the knowledge and skills necessary to address climate change and sustainability challenges. Notable digital techniques include:

- 1) *Blended learning* – combining in-person teaching with digital platforms to enhance flexibility and inclusiveness.
- 2) *Gamification* – incorporating game-based elements into educational content to simulate real-world sustainability scenarios, making EGD-related topics more engaging.
- 3) *Collaborative learning* – leveraging online tools to support international teamwork on environmental and climate-related challenges (Elfert & Rubenson, 2022; Misra, 2012).

Assessment in digital education has also evolved to include:

- 1) *AI-Based Personalization* – tailoring learning and evaluation processes to individual student needs through adaptive technologies.
- 2) *Virtual simulations* – allowing students to interact with sustainability scenarios in realistic, consequence-driven environments.
- 3) *Digital assessment tools* – including online quizzes, virtual labs, and project-based evaluations (Frazão Santos et al., 2024; Reimers, 2021).

In this context, since 2023, five universities from four European countries and Ukraine have collaborated on a study examining expert perspectives on the most effective digital tools and teaching strategies for fostering a deeper understanding of EGD principles among Master's and Doctoral students. This paper presents the findings of that study, offering insights into current perceptions, regional differences, and key challenges in digital education for sustainability.

MATERIALS AND METHODS

Between 2023 and 2025, a consortium of five universities conducted a structured survey aimed at evaluating expert opinions on digital education methodologies suitable for enhancing students' understanding of the European Green Deal. The study aimed to evaluate preferred learning and assessment strategies aligned with sustainability goals in higher education.

The survey analysis consisted of 20-30 questions, grouped into thematic sections, regarding learning and assessment techniques most appropriate for a digital learning approach. Pilot testing was conducted with a small number of experts from each university or country involved in the study (a maximum of 10 experts per university). Representatives from each participating university selected individuals with specialised knowledge in areas such as environmental policy, digital education, sustainability in education, and European policy development. The selection criteria for experts involved in this study were as follows: a minimum of 15 years of experience; involvement in EU-funded education or green projects; academic publications in relevant areas; and participation in working groups or

policymaking bodies related to the European Green Deal or digital education. The experts selected were teachers, researchers, or policymakers in higher education. The participating institutions included: Universitat Autònoma de Barcelona (Spain), University of Porto (Portugal), University of Agronomic Sciences and Veterinary Medicine of Bucharest (Romania), National University of Sciences and Technologies Politehnica of Bucharest (Romania), Uzhhorod National University (Ukraine). The study targeted academic experts involved in Master's and Doctoral education, focusing on identifying the most effective digital learning and assessment strategies aligned with sustainability principles. The survey employed a structured questionnaire developed based on methodologies established in previous educational research by Radu et al. (2018; 2019; 2020). These earlier studies served as the foundation for question framing, relevance scoring, and data analysis. Respondents were drawn from the five partner universities, with the following country-level distribution recorded by early 2025:

- Romania (combined responses from two universities): 15%;
- Spain: 27%;
- Portugal: 15%;
- Ukraine: 42%.

Each question was rated by respondents on a five-point Likert-type scale, with scores interpreted as follows: Score 1 - Not important; Score 2 - Low; Score 3 - Medium; Score 4 - High; Score 5 - Very High.

RESULTS AND DISCUSSIONS

1. Online learning and social isolation

A key concern identified in the survey was the potential of online learning to contribute to social isolation among students. Experts were asked: "*Do you believe that online learning is frequently avoided due to its potential to promote social isolation?*"

The responses varied across countries. In Romania, 50% of experts rated this concern as *Very Important*. In Spain, 67% considered it *Important*, while in Portugal, the responses were more moderate, with most participants selecting *Medium* importance. In Ukraine, 42% of respondents rated it as *Very Important*, and an

additional 25% regarded it as *Important*. These results indicate that, apart from Portugal, most respondents viewed social isolation as a significant barrier to online education (Figure 1a). The overall distribution of responses confirms this pattern, with 42% of participants rating the issue as *Important* and 23% as *Very Important* (Figure 1b). This finding reinforces the value of blended learning models, which combine digital tools with face-to-face interaction to mitigate isolation while leveraging online flexibility.

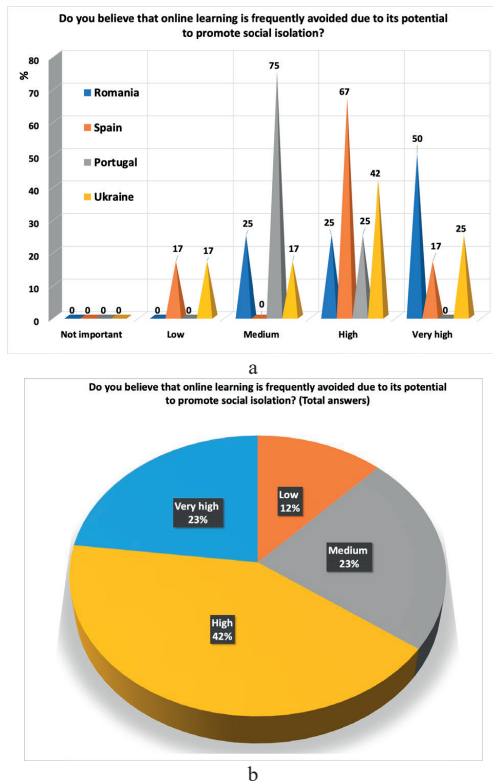


Figure 1. Expert perceptions of social isolation caused by online learning across four European countries:
 a) Country-level breakdown;
 b) Combined overall results

2. Gamification in digital education

The effectiveness of gamification in supporting the understanding of EGD principles was explored through three distinct survey questions.

a) Perceived benefit of gamification

Responses to the question, "Do you believe that incorporating gamification or educational

games into the curriculum is a beneficial approach?" indicated that experts from Ukraine and Romania rated this approach as *Very Important* in 58% and 50% of cases, respectively, while those from Portugal and Spain predominantly considered it *Important* (Figure 2a). The overall distribution showed 42% of respondents selected *Very Important*, and 31% selected *Important* (Figure 2b), indicating strong support for gamification as an engaging teaching method.

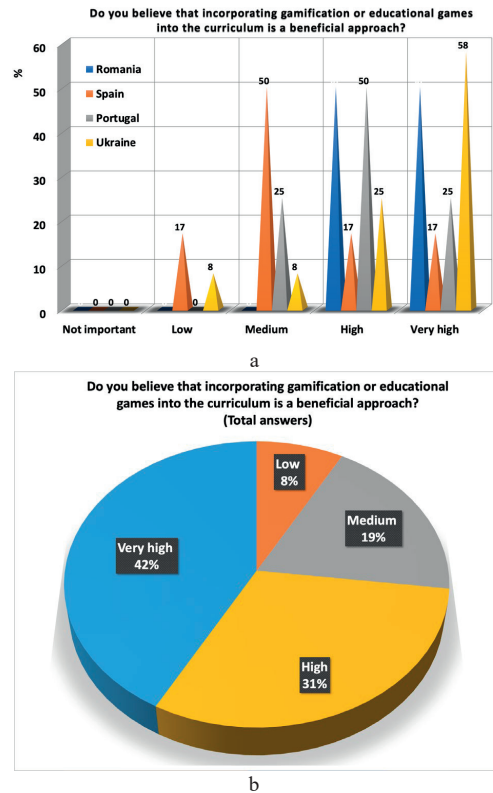


Figure 2. Expert perspectives on the educational value of gamification in the curriculum across four European countries: a) Responses by country; b) Overall response trends

b) Effectiveness in enhancing understanding

The answers to the question: "Have you observed a better understanding of course materials when implementing gamification in assessments?" are more nuanced, likely due to practical limitations such as development cost and the need for technical expertise. As a result, 42% of experts from Ukraine rated this aspect as

Very Important. Meanwhile, all respondents from Romania and Portugal considered it *Important*, as did 50% of respondents from Ukraine. In contrast, experts from Spain provided more varied responses, generally leaning toward *Medium Importance* (Figure 3a). Overall, 50% considered gamification *Important*, and 23% *Very Important* (Figure 3b). This indicates a generally positive view, tempered by concerns about implementation feasibility.

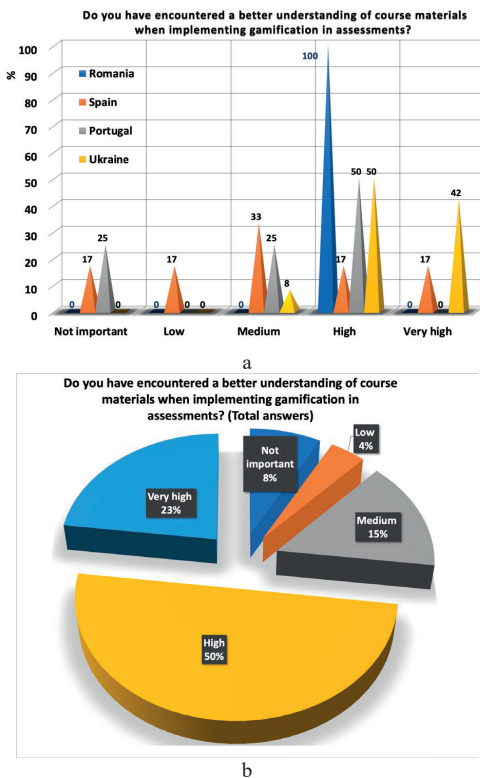


Figure 3. Expert opinions on whether gamification enhances student understanding of course materials:
 a) By country; b) Overall distribution

c) Impact on student participation

To gauge engagement, experts were asked: "In your opinion, does gamification contribute to increased student participation?" Experts from Romania, Spain, and Portugal rated this *Important* in 100% and 50% of responses, respectively. Ukraine: 42% rated it *Very Important* (Figure 4a). In total, 49% rated gamification as *Important* for increasing participation, and 31% as *Very Important*

(Figure 4b), confirming its motivational potential.

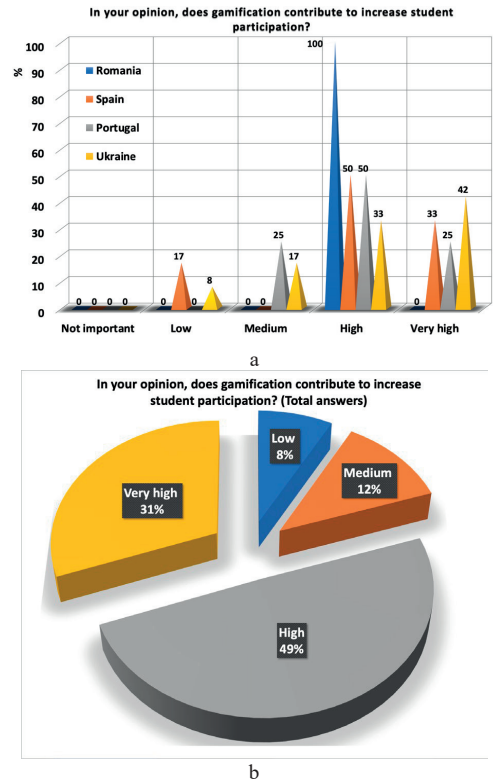


Figure 4. Expert views on whether gamification contributes to increased student participation, based on responses: a) Country-specific distribution; b) Overall response distribution

3. Artificial Intelligence (AI) in assessment and feedback

The survey also evaluated expert perspectives on the use of artificial intelligence in academic evaluation, particularly in two key areas: ensuring academic integrity and delivering real-time, personalized feedback.

a) AI for preventing academic dishonesty

In response to the question: "Do you consider that AI can be effective in identifying and preventing academic dishonesty during online exams?", expert opinions reflected moderate to strong support. In Ukraine, 42% of respondents rated this aspect as *Very Important*. In Portugal, 25% of experts considered it either *Important* or *Very Important*. Meanwhile, the majority of respondents in Romania and Spain rated it as

Important, accounting for 50% and 83% of responses, respectively (Figure 5a). Overall, 34% of respondents considered the use of AI for detecting academic dishonesty as *Important*, while 23% rated it as *Very Important* or of *Medium* relevance (Figure 5b). This indicates a generally positive outlook, though the level of support varied across countries.

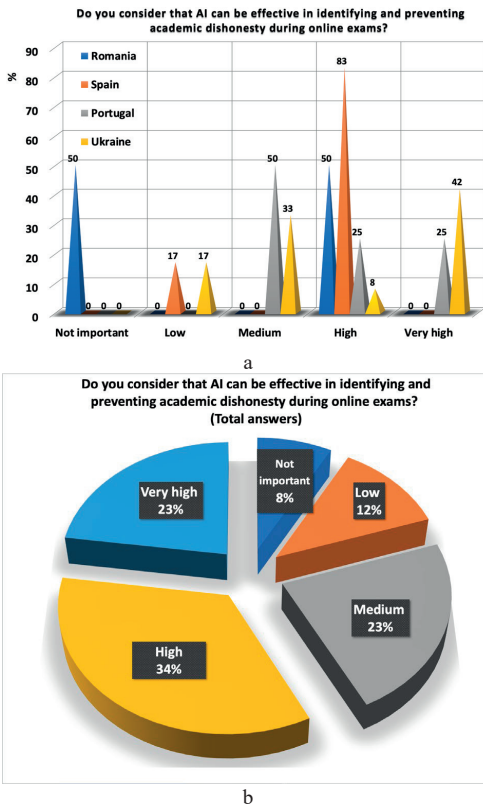


Figure 5. Distribution of expert responses to the question: "Do you consider that AI can be effective in identifying and preventing academic dishonesty during online exams?": a) Responses by country; b) Overall response distribution

b) AI for providing personalized feedback

When asked, "Do you consider that AI can be used to provide immediate, personalized feedback to students during online exams?", responses were generally more reserved. In Spain, 50% of respondents rated this aspect as *Important*, while in Ukraine, 33% expressed a similar view. In Portugal, most responses leaned toward *Medium* importance. In contrast, all

respondents from Romania considered this functionality *Not Important* (Figure 6a). Overall, only 27% of experts considered AI-based real-time feedback as *Important*, while 12% rated it as *Very Important*. A significant portion of the sample rated this function as *Moderately Important* or *Unimportant*, reflecting uncertainty about its practical value (Figure 6b).

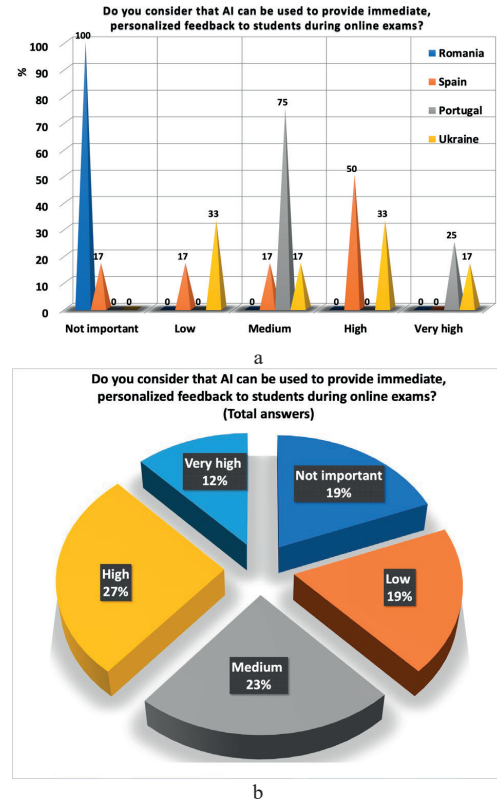


Figure 6. Expert perspectives on the effectiveness of AI in providing immediate, personalized feedback to students during online exams: a) Distribution of responses by country; b) Overall response distribution

The survey identified a significant concern associated with fully online learning: the risk of social isolation. This issue was acknowledged by 65% of respondents, who rated it as either *important* or *very important*. In contrast, responses related to game-based learning experiences were largely positive. A substantial proportion of experts viewed gamification as a beneficial approach, highlighting its potential to enhance student engagement and improve the

overall learning experience. More than 70% of respondents agreed that incorporating game-based experiences into the curriculum is a beneficial approach that can enhance the understanding of scientific information. While respondents were in favour of using AI for knowledge assessment in EGD, it remained unclear whether its implementation in online exams could lead to immediate, personalised feedback. The survey results are consistent with recent studies. For instance, Khoshnoodifar et al. (2023) found that gamified learning improved medical students' attitudes toward statistics, making learning more engaging and efficient. Li and al. (2023) highlighted significant effects of gamification, particularly in science disciplines. Lampropoulos & Sidiropoulos (2024) confirmed gamification's superiority over traditional methods in higher education, with improvements in success rates and retention. Ortiz-Rojas et al. (2025) showed that leaderboards boosted learning performance but did not significantly affect self-efficacy. Effective implementation of gamification in education requires a tailored approach that addresses the diverse learning needs of students, particularly within STEM disciplines - science, technology, engineering, and mathematics (Ortiz-Rojas et al., 2025; Qudsi, 2024). Another study concludes that gamification represents a fundamental shift in pedagogical practice, emphasizing its potential to foster deeper learning and highlighting the need for further research to refine and assess its long-term effects (Li et al., 2023; McHenry & Makarius, 2023). According to Wulan et al. (2024), gamification offers several key advantages in the learning process. First, it *enhances student engagement and motivation* by making learning experiences more interactive and enjoyable. Second, it *promotes active learning*, encouraging deeper understanding through direct participation. Third, gamification helps *develop problem-solving and critical thinking skills* by fostering strategic thinking and informed decision-making. Fourth, it *encourages collaboration*, often through multiplayer or team-based activities that promote communication and cooperation. Finally, gamification can *personalize the learning experience*, adapting content and pace to meet the unique needs of individual learners.

CONCLUSIONS

The survey highlighted concerns and views on digital learning, gamification, and AI across four European countries. About 65% agreed that online learning can cause social isolation, seen as important by most experts except in Portugal. Over 70% supported game-based learning for improving understanding and engagement. AI was viewed as useful for reducing cheating and assessing knowledge, though opinions differed between countries. The use of AI for instant, personalised feedback was not supported, with all Romanian respondents finding it irrelevant. Future studies should examine how gamification preferences differ across disciplines and student groups. Differences in views on digital education tools among universities in Spain, Portugal, Ukraine, and Romania may stem from cultural, institutional, and technological factors unique to each country.

Cultural context: in some countries, the adoption of digital education tools is shaped by the local cultural approach to learning and technology. Countries with a strong tradition of face-to-face learning may be slower to adopt fully digital platforms, while others may be more open to innovation and remote learning.

Institutional digital readiness: different countries have varying levels of digital infrastructure and readiness. Spain and Portugal, as EU member states with substantial investment in digital education, may have more advanced systems in place compared to Ukraine and Romania, which may face challenges related to digital infrastructure or government support. These disparities may lead to differing opinions on the effectiveness and feasibility of certain digital education tools.

The digital readiness levels in these countries significantly influence the opinions of stakeholders (teachers, researchers, and policymakers). Countries with higher levels of digital readiness (such as Spain or Portugal) may be more confident in adopting advanced tools like AI-driven platforms or immersive technologies, while countries with lower digital infrastructure (such as Ukraine or Romania) may be more cautious or focused on basic digital tools and platforms. Limitations of this study are due to two factors:

- The maximum number of respondents, limited to 10 experts per country or university, is relatively small. This limits the ability to generalise the findings to the broader population of educators, policymakers, or researchers.

- The study included a maximum of two universities per country, which further restricts the diversity of perspectives. Different institutions may have different levels of digital readiness, and focusing on just a few may not fully reflect the variations that exist within each country's educational landscape,

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