

LEVEL UP SUSTAINABILITY – GAME-BASED LEARNING IN MODERN HIGHER EDUCATION

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Purpose: To explore how *Game-based Learning* (GBL) can improve *Sustainable Development* (SD) competencies in higher education students. The paper aims to address the challenge of gradual transformation of educational processes in *Higher Education Institutions* (HEIs) to align *Sustainable Development Goals* (SDGs) with learning outcomes of curricula and learning preferences of new generations of students (Z and Alfa generations).

Design/methodology/approach: The paper focuses on *UNESCO Education for Sustainable Development*, using a case study approach to discuss the SEED simulation game from the EU-funded SEED project. It analyzes the game's design and effectiveness in developing students' SD competencies and attitudes.

Findings: The SEED simulation game presented in the paper may successfully enhance students' understanding and internalization of key SD concepts as well as their applications in real-world businesses, through collaboration and decision-making with regard to sustainability challenges.

Research limitations/implications: The analysis conducted is limited to controlled educational environment and design context of SEED simulation game. Further research is needed to explore long-term impact of an approach used, on students' professional behavior in real business environments.

Practical implications: The SEED simulation game demonstrates the potential of the GBL approach for integrating SD competencies into higher education curricula. This method aligns with new generations' learning preferences, improving teaching practices and better preparing graduates to enhance future enterprise sustainability.

Social implications: The paper emphasizes the role of HEIs in preparing sustainability oriented and focused professionals. It also suggests that using GBL approach to increase students' SD awareness may positively impact public attitudes toward corporate and social responsibility.

Originality/value: The paper provides valuable insights for educators on integrating SD learning outcomes into higher education curricula. It uniquely analyzes the role of the GBL approach in aligning learning outcomes with SDGs, serving as a key resource for stakeholders aiming to develop SD competencies in future generations.

Keywords: Education for Sustainable Development, Sustainable Development, Game-based Learning, SEED project, SEED simulation game.

Category of the paper: Conceptual paper.

1. Introduction

Achieving Sustainable Development requires a profound transformation of our thinking and actions on the economy, society and individual levels. To create a more sustainable world, individuals must become change-makers with the knowledge, skills, values, and attitudes driven by SDGs. Education plays a key role in achieving these goals, but not every form of education promotes sustainable development. Education that only promotes economic growth can lead to unsustainable consumption patterns.

UNESCO *Education for Sustainable Development* (ESD) model provides guidelines on how to enable students to make better informed decisions and act for the environment, economy, and society (UNESCO, 2024). UNESCO emphasizes that ESD aims to equip people with the skills and knowledge to solve economic, social, and environmental problems. It encourages reflection on consumption, poverty, solidarity, and cooperation (Rieckmann, 2017).

Digitization of higher education and educational processes helps to meet the labor market requirements and the learning preferences of the new generations – Z and Alpha. The Sustainable Development Goals (SDGs) describe the main challenges for humanity, aiming to ensure a sustainable, peaceful, and just life on Earth. Higher Education Institutions (HEIs), according to their mission, should contribute to the SDGs. As the United Nations Declaration states *Since HEIs educate and train decision makers, they play a key role in building more sustainable societies and creating new paradigms. As educational institutions, they have the mission to promote development through both research and teaching, disseminating new knowledge and insights to their students and building their capabilities. Given the objectives of Rio+20, HEIs have a special responsibility to provide leadership on education for sustainable development* (UN, 2011).

Therefore, important research question is *How to properly transform HEIs educational processes to fulfill these new responsibilities?* Without a doubt, in the first place, changing the learning preferences of new generations should be taken into account. These young learners, surrounded from birth, by social media, digital devices and interactive content, have developed new learning habits. They expect interactive, dynamic and engaging learning experiences. The new digital world has severely limited their attention spans and accustomed them to frequent dopamine ejections. All this means that traditional, passive learning methods are no longer effective and efficient. New methods are needed, that take into account the cognitive peculiarities and learning preferences of the new generations.

This paper describes *SEED simulation game*, one of the outcomes of *Sustainable Entrepreneurship in EDucation* project (SEED project), funded by the European Union (2022-1-PL01-KA220-HED-000088765). The project aimed to implement a set of innovative learning methods and tools that takes into account learning preferences of new generations and, at the same time, develops SD awareness, related skills as well as deepen the knowledge on SDGs. These have been done through Game-based Learning (GBL) approach, what enables young people to make decisions in digital interactive environment, receive constant and immediate feedback, engage in collaborative learning and act in a way that contributes positively to SDGs. This approach is innovative in combining interactive learning methods with the global agenda for sustainability, offering a practical framework for educators. The paper is focused on two main areas – SD skills, their importance in contemporary enterprises and GBL, as an innovative teaching method that can be used to meet learning requirements of new generations and shape SD competencies in more efficient and effective way. The paper offers valuable insights for higher education institutions (HEIs) on the integration of GBL into their curricula, with the objective of better preparing students for sustainability challenges. The practical implications for improving teaching practices and aligning them with SDGs are clearly articulated.

2. The Critical Role of SD Awareness of the Contemporary Workforce

Employees of sustainable companies should have specific competences that enable them to work effectively in the context of corporate social responsibility (CSR) and sustainability. Sustainability is a transdisciplinary field that deals with complex issues and challenges. Several frameworks emerged in the literature, that describe the key competencies that universities should equip their graduates with. Such future employees and entrepreneurs will contribute to the transformation towards sustainability. Currently, in many cases, students are taught traditionally with the assumption, that creating value for a company is about maximizing profits and sustainability can be a leverage to increase company profits (Foucrier, Wiek, 2019). The most widely accepted framework (Wiek, Withycombe, Redman, 2011), which has also been operationalized (Wiek et al., 2015) includes the following competencies:

- *Systems thinking competency* – the ability to understand and analyze complex systems and the interrelationships between their components.
- *Anticipatory competency* (aka Future Thinking competence) – the ability to anticipate future trends and scenarios and assess their impact on sustainability.
- *Values thinking competency* (aka Normative competence) – ability to recognize, reflect upon, and integrate different values and ethical considerations into decision-making processes related to sustainability.

- *Strategic competency* – the ability to develop and implement strategies and action plans for sustainable development.
- *Interpersonal competency* – the ability to effectively communicate, collaborate, and manage conflicts within diverse groups.
- *Integrated problem-solving competency* – the ability to utilize diverse problem-solving methodologies to address intricate sustainability challenges and formulate feasible solution strategies.

This framework was later subjected to an expert evaluation (Brundiens et al., 2021) and compared with the literature to find convergence (Redman, Wiek, 2021). During evaluation two additional key competences for sustainable development have been identified:

- *Implementation competency* – the ability to effectively execute and manage sustainability initiatives and,
- *Intra-personal competency* – the ability to understand and manage one's own emotions, motivations, and behaviors in the context of sustainability.

Of course, this is not exhaustive list of the competences a graduate should be equipped with. There are several additional competences that should be acquired during higher education such as 21st Century Skills (e.g. critical thinking, problem solving, creativity, communication, learning to learn etc.), topical knowledge (specific to the field of study) and other professional skills (e.g. project management). All the frameworks mentioned do not include a description of a detailed set of major-related competences (topical knowledge) (Bianchi, 2020).

An empirical study conducted in Belgium, with professionals working in sustainability-related management positions for at least 5 years, provided a slightly different breakdown of competences and identified competences not presented in the framework for higher education (Venn, Perez, Vandenbussche, 2022). Practitioners emphasized the role of competences called interventions. These competences enable to develop solutions to sustainability challenges in cooperation with stakeholders and help to support change towards sustainability. The following competencies have been added:

- *Capacity-building competence* – the ability to develop and strengthen stakeholder resources and capacities so that they can contribute to sustainable development.
- *Intrapreneurial competence* – the ability to taking initiative, passion for sustainability, courage to take risk, exploration of opportunities and creativity.
- *Political competence* – the ability to engage in political thought and action.

According to practitioners, *living experience*, defined as knowledge that evolves over time through daily practice, is also important in sustainable development.

3. Aligning teaching methods with new generations learning preferences

3.1. Digital natives and learning likes and dislikes

One of the main challenges nowadays, facing higher education, is to increase the learning engagement and motivation of young people born in the 21st century. Representatives of *Generation Z* (born in the years 1997-2010) and *Alpha* (born after year 2010) use technology for learning. Generation Z may prefer traditional teaching methods, while generation Alpha representatives learn mainly through interactive educational games and apps. Given the usually long lead times for changes at universities, in such areas as teaching methods, modifications to curricula or training of academic teachers, universities should start preparing now to welcome representatives of the Alpha generation into the university walls. As Digital Natives, the Alpha generation is the first generation that coexists with advanced technologies since birth (dos Reis, 2018). Representatives are very proficient in the use of ICT solutions, and heavily rely on mobile devices. For universities, an equally important characteristic is the propensity for entrepreneurship, creativity, and leadership, which will point to leadership and technology-related professions (Asni, Tsuraya, 2023). It is also expected that one in two representatives of Generation Alpha will want to pursue a university degree, which is a decline from Generation Z (Bennett, Maton, Kervin, 2008).

Research results show that new teaching strategies, that resonate with the technological prowess of Alpha generation will need to take into account:

- *Increasingly interactive teaching methods* using technology based on games, simulations, and experiential learning; and shorter class times due to difficulty in maintaining attention (McCrindle, Fell, 2020).
- *Individualizing teaching and adapting to the needs of individual students* considering preferred learning styles and expectations of the education system (Miller, 2023).
- *Alpha generation's propensity to innovate*, that may contribute to progress and the development of society (Ziatdinov, Cilliers, 2022).
- *The constant development of Artificial Intelligence tools* and the proficiency of the Alpha generation in using them (Ahmed, Ahmad, 2023).
- *Collaboration and social interaction* in the teaching methods used (Ziatdinov, Cilliers, 2022).

3.2. Game-based Learning and Gamification

Annual reports on the gaming market indicate continuous dynamic growth in the rate of 8-10%, driven by successive technological innovations, subscription models for game consumption or the growing popularity of mobile games. According to Newzoo's estimates, the value of the global games market in 2023 accounted for \$184 billion, 0.6% higher than in

2022. Last year has shown a growth in both the PC games segment (which increased its value by 5.3% y-o-y to \$38.4 billion), and the console segment (which grew by 1.7% y-o-y to \$53.1 billion). In contrast, the value of the mobile games segment declined in 2023 contracting by 1.4%, to \$ 90.5 billion (Newzoo, 2024). The long-term growth outlook for the global games market remains optimistic.

According to Newzoo, the global video game market will reach \$205.4 billion by 2026 (Newzoo, 2024). Power of Play report prepared by 12 national trade associations (NTAs), serving the video game industry around the world, issued a survey to look at the behaviors and interests of 13,000 players (ages 16 and older). One conclusion is that games are not just for entertainment. Engaging gaming experience provides valuable opportunities for enhancement of different skills and cognitive stimulation. Video games are seen as a tool for building problem-solving, teamwork, collaboration, communication, conflict resolution and leadership skills (Power of Play, 2024). According to the DFC Intelligence Global Game Consumer Market Overview report (Games Industry, 2024), there are currently 3.7 billion gamers in the world, meaning that almost half of the Earth's population engages in computer games in one form or another. These figures show what a huge and diverse social phenomenon computer games have become worldwide. Therefore, it is not surprising, that games, or elements of games, have been used extensively in education for many years. Learning patterns are evolving and students' intrinsic motivation is driven by several factors related to social and economic change, as well as new developments in ICT domain.

3.3. Benefits of games in education

The scientific literature provides numerous examples of the utilization of gamification in a variety of fields, including business, biology, marketing, management, and psychology (Boyle et al., 2014). In the field of higher education, GBL is a well-established teaching method that is employed across a range of disciplines. GBL is increasingly being used in contexts, where the subject-matter content is challenging and requires a sophisticated comprehension process, includes advanced 'what-if' analyses, is difficult to grade, or when strategic thinking and communication skills of learners are required (Al-Azawi, Al-Faliti, Al-Blushi, 2016). The literature on the benefits of GBL and gamification in education is extensive (Vlachopoulo, Agoritsa, 2017). Table 1 outlines the key publications on this topic.

Table 1.

Benefits of using games in the learning process

Publication	Benefits
(Beed, Hawkins, Roller, 1991)	Facilitates teaching based on the individual needs and aptitudes of each student.
(Perini et al., 2018)	Helps students acquire practical skills relevant to their future careers.
(Lapek, 2018)	Encourages students to think critically and solve complex problems in a simulated environment.

Cont. table 1.

(Johnson et al., 2014)	Provides opportunities for formative assessment. In-game feedback helps students to understand their performance and areas for improvement, identifying needs or difficulties among students.
(McGonigal, 2011)	Evokes reactions of an emotional nature, such as happiness, curiosity, self-improvement, as well as others, such as frustration and disappointment
(Boyle et al., 2014) (Muntean, 2011) (Buckley, Doyle, 2016) (Rabah, Cassidy, Beauchemin, 2018)	Increases students' motivation, attention, and involvement in the teaching and learning process what makes education more stimulating and fun.
(Camilleri, Busuttill, Montebello, 2011)	Elements such as rankings, encourage engagement through competition, badges provide a visual display of progress and provides feedback on learning progress.
(Gee, 2003)	Allows "immersion in experience", as a result of which learners are more effective in remembering information and strengthening their lasting understanding of concepts.
(Glover, 2013)	Is an attractive and motivating formula for new generations of learners, growing up in the age of video games and widespread Internet technology.
(Hanus, Fox, 2015)	Fosters a trial-and-error learning process that enables mistakes made to be corrected.
(Kalinauskas, 2014)	Fosters creativity, develops imagination.
(Kazmierczak, 2016)	Takes you out of the routine, breaks up routine duties, triggers curiosity, creates and maintains commitment, convinces students to act more effectively, increases efficiency, improves productivity.
(Lee, Hammer, 2011)	Gives students the freedom to experience failure in the learning process without fear of consequences.
(Oblinger, 2004)	Encourages an active role in the learning process by supporting experiential and problem-based learning.
(Yang, 2012) (Deci, Koestner, Ryan, 2001)	Supports the good atmosphere in classes.
(Zimmerman, 1990)	Allows self-monitoring and progress tracking through feedback to support self-regulation of the learning process.
(Liu, Shaikh, Gazizova, 2020)	Make the learning process more effective, which is reflected in better results.
(Hartt, Hosseini, 2019)	Enable the integration of both intrinsic and extrinsic motivational elements.

Source: (Świątoniowska, 2021).

Properly applied GBL, that considers the learning outcomes, characteristics of the target group, and the quality of game content can be an effective educational tool (Fernández-Raga et al., 2023). It can facilitate and enhance the learning process, by promoting interaction, collaboration, and communication, generate interest in the educational content, and increase students' learning motivation and engagement, by encouraging participants to actively participate in the activities (Anastasiadis, Lampropoulos, Siakas, 2018). Additionally, several studies summarized in a meta-analysis (Karakoç et al., 2022) show that GBL can have a positive impact on student achievements and learning outcomes.

4. SEED Project – shaping tomorrow's workforce SD skills with GBL

4.1. SD skills development with the SEED simulation game

Sustainable Entrepreneurship in EDucation project (SEED project) funded by the European Union (2022-1-PL01-KA220-HED-000088765), aimed to develop a set of innovative didactic tools, that enable young people to take decisions and act in a way that is likely to contribute positively to SD. One of the project's outputs is the SEED simulation game, where students act as executive teams, making realistic business decisions in the context of a whole enterprise – The Café. By making decisions in the game, students develop the skills necessary to manage their own business, with a focus on sustainability. They can make decisions on specific matters, such as determining a convenient location, related to the type of potential customers, planning the offer, equipping The Café with the all necessary equipment and finally hire employees. Students must also take care of advertising and promotion. They are supposed to interpret market feedback, analyze competitors' moves, and adjust properly their business strategy in a real time. The students' business operates in the market ecosystem, with other businesses established by other teams in a group.

Throughout the SEED simulation game, students can:

- *Develop and apply essential business skills*, such as decision making and strategic planning (goals setting, resource planning and allocation, market analysis etc.), financial management (forecasting expenses and revenues, monitoring operational costs, pricing strategies etc.), human resource management (hiring the right staff, providing necessary training etc.), marketing (creating a brand identity, implementing marketing campaigns to attract and retain customers, etc.).
- *Improve teamwork skills*, as in the game all decisions are made by them as a team, according to the division of responsibilities assigned to team members at the beginning of the game. Students must analyze data, discuss and finally implement the selected strategies. They develop communication, negotiation, working under pressure and critical thinking skills. Analyzing successes and failures after each round helps students learn from their mistakes and allows them to plan their next moves. The game teaches responsibility and helps to understand how individual decisions affect the success of the entire team.
- *Face various real-life sustainable dilemmas*. The game engages students in implementing a sustainable strategy for The Café. Students are forced to make decisions that are critical to maintaining the right balance between the profitability of their café and sustainability. They must consider the consequences of every decision they make as an entrepreneur.

According to United Nations, by 2030 all learners should acquire knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and nonviolence, global citizenship, appreciation of cultural diversity and of culture's contribution to sustainable development.

The authors believe that the best way to educate young people about sustainability is to help them discover how the decisions they make affect their lives, the environment and the economy. This will allow them to better understand the consequences of these decisions and promote responsible attitudes. The SEED simulation game helps to develop students' attitudes toward sustainability and to make young people aware how they can play a role in creating a more sustainable future. Game helps them to understand the impact that entrepreneurs are having on the environment and the steps they can take to reduce their environmental footprint. When making decisions in the game, students are encouraged to consider aspects related to corporate social responsibility (CSR) and SD. Making efforts in sustainable development is promoted in the game.

SEED simulation game develops cross-cutting key competencies that are relevant to all SDGs and are seen as crucial to advance sustainable development. All these key competencies are transversal, multifunctional and context-independent and, as UNESCO underlined, cannot be taught, but have to be developed by the learners themselves. They are acquired during action, on the basis of experience and reflection. Thus, the GBL can be an effective tool to develop these cross-cutting key competencies. The SEED simulation game develops not only business competences but also the following key competencies (UNESCO, 2018), which are seen as crucial to advance sustainable development:

- *Systems thinking competency* – students must recognize and understand the relationships between different elements such as finance, procurement, marketing and human resource management to make efficient decisions in the game. Teams analyze the consequences of their decisions and their impact on other areas of the business. Students' decisions are set in different contexts, including business or environmental, which allows them to develop systems thinking competency.
- *Anticipatory competency* – students must analyze and evaluate the consequences of the decisions made by the team and their impact on the development of the company. By implementing investments in human resources development, sustainability and CSR practices, they develop the ability to anticipate the consequences of their own decisions.
- *Normative competency* – students must take into account the norms and values of both themselves and society when making decisions. Such activities promote the development of the ability to critically evaluate norms and values.

- *Strategic competency* – the game requires taking into account innovative actions that promote sustainability, both at the level of the company itself and at the level of society. Collaborative strategy planning for the company helps transform complex challenges into concrete practical actions.
- *Collaboration competency* – as all decisions in a game are made in teams, it teaches cooperation, understanding and respecting the opinions of others and develops the ability to negotiate and reach consensus. The game also develops conflict resolution, leadership and decision-making skills.
- *Critical thinking competency* - the game encourages students to question norms, practices and opinions as well as to reflect on their own values, perceptions and actions.
- *Self-awareness competency* – applying in game the elements of sustainability and CSR strategy allows students to reflect on their own role in building a sustainable business and their role in the local community and society. The game develops the attitudes of a self-aware student.
- *Integrated problem-solving competency* – students need to apply different approaches related to dealing with market challenges. This requires implementing activities that integrate all the above competencies.

4.2. Game design and learning objectives for SDG

The SEED simulation game takes into consideration the following sustainable development aspects:

- *Location and its impact on sustainability* - including sustainability practices in the selection of location for the café and the consequences of choosing a particular location (e.g., venue in a shopping mall means that customers more likely use take-out products, which will require these elements to be included into a sustainable strategy and then into the price of the products; the venue in a historical center may limit the possibility of making sustainable investments in such buildings, etc.). This aspect is closely linked with Goal 11 (*Sustainable Cities and Communities*), which makes cities and human settlements inclusive, safe, resilient and sustainable.

Example learning objectives for SDG 11 implemented through the SEED simulation game include:

- The learner is able to plan, implement and evaluate community-based sustainability projects.
- The learner is able to participate in and influence decision processes about his/her community.
- The learner is able to co-create an inclusive, safe, resilient and sustainable community.

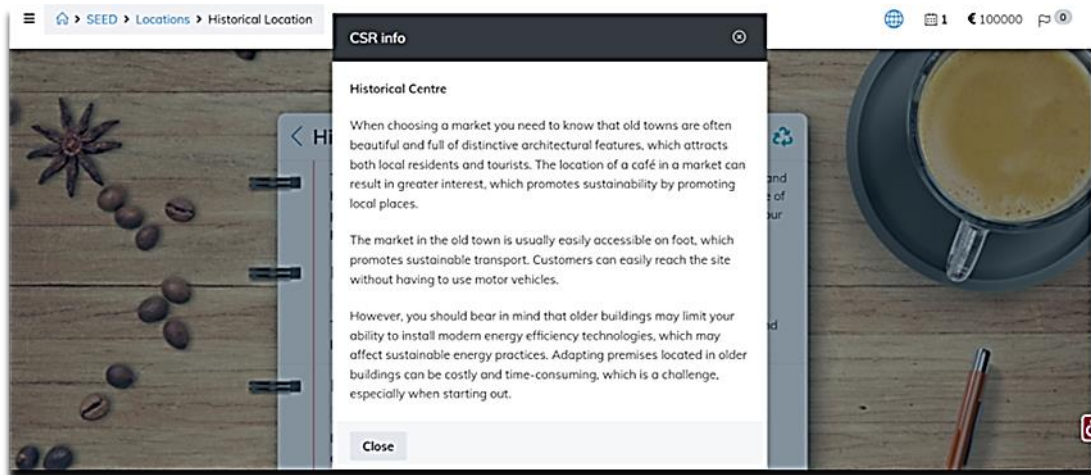


Figure 1. Decision-making interface for sustainable practices in *Location* area.

Source: SEED Simulation Game.

- *Accessible interior design* – as part of the process of opening a café, students must also choose the interior design style. They can select from two predefined styles. In the decision-making process, they can consider the aspect of adapting the interior to the needs of people with disabilities. Such a decision will have consequences in financial aspects as well as in the revenue. This aspect is closely linked with Goal 10 (*Reduced Inequalities*) which empowers and promotes social and economic inclusion.

Example learning objectives for SDG 10 implemented through the SEED simulation game include:

- The learner is able to plan, implement and evaluate strategies to reduce inequalities.
- The learner becomes aware of inequalities in their surroundings and is able to recognize the problematic consequences.

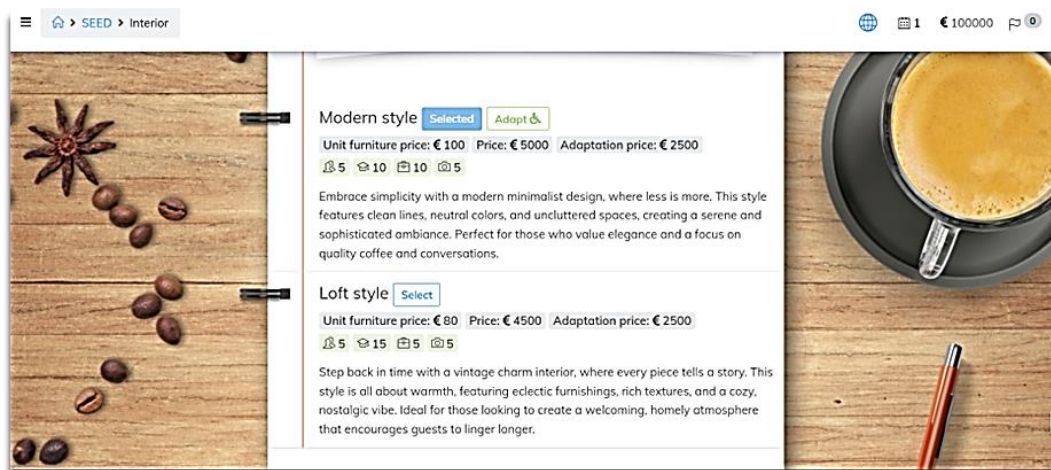


Figure 2. Decision-making interface for sustainable practices in *Interior* area.

Source: SEED Simulation Game.

- *Sustainable equipment* - once the students have decided on the type of products they offer and understood the expectations of their customers, they need to equip their café with the necessary facilities. They should consider various parameters such as energy consumption, reliability as well as eco-friendliness of the equipment. At any stage in the game, teams can revise their sustainability strategy by replacing their equipment with greener ones. This aspect is closely linked with Goal 9 (*Industry, innovation and infrastructure*) which is all about promoting innovative and sustainable technologies, sustainable industrial development and technological progress.

Example learning objectives for SDG 9 implemented through the SEED simulation game include:

- The learner is able to identify opportunities for greener and more resilient approaches to infrastructure, understanding their overall benefits for societies.
- The learner is able to innovate and develop sustainable enterprises.

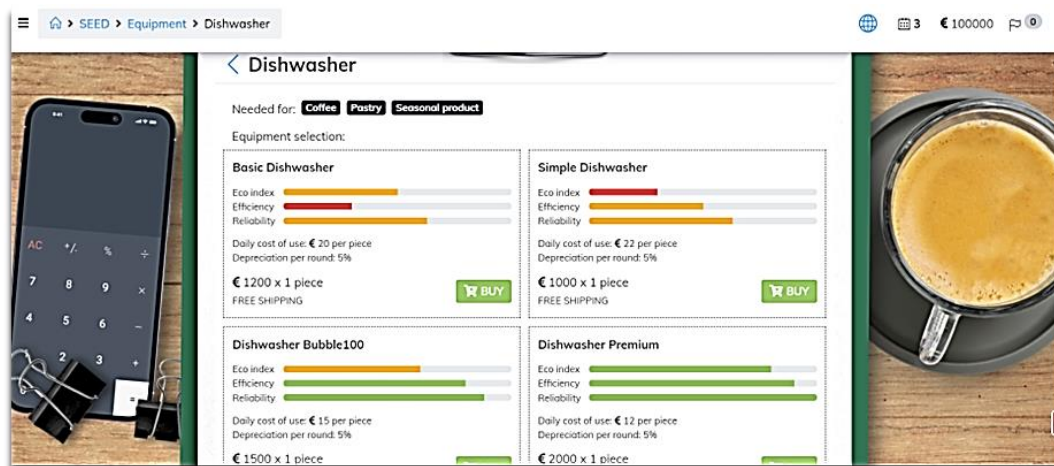


Figure 3. Decision-making interface for sustainable practices in *Equipment* area.

Source: SEED Simulation Game.

- *Sustainable deliveries* – the part of a company's sustainability strategy is to be sensitive to the selection of business partners. There is an “eco-index” in the game, to assess how sustainable and green the supplier's practices are. Students can make their deliveries more sustainable, which would be a step their businesses can take to be more eco-friendly. This aspect is also closely linked with Goal 9 (*Industry, innovation and infrastructure*) as it promotes sustainable industrial development.

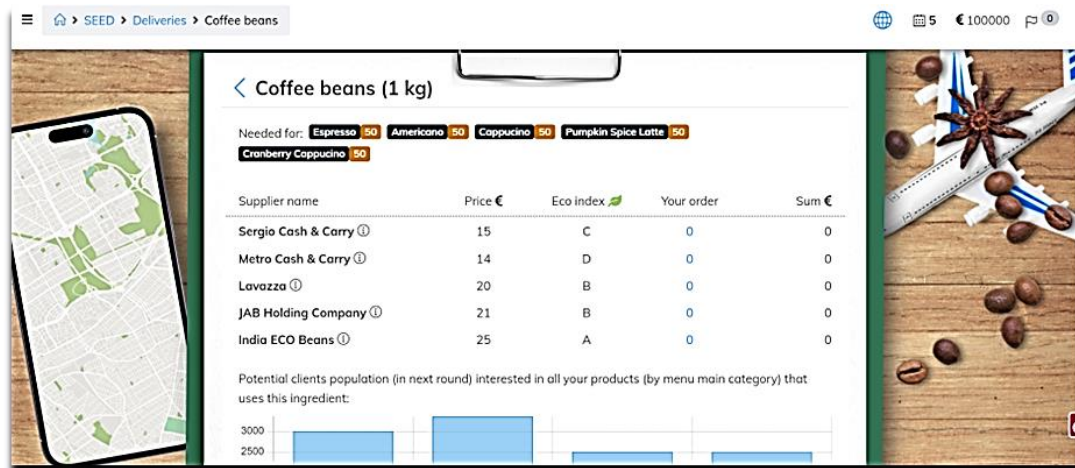


Figure 4. Decision-making interface for sustainable practices in *Deliveries* area.

Source: SEED Simulation Game.

- *Reduced inequalities* – an element related to building students' awareness of equal access for people with disabilities to jobs has also been included in the game. Students have to decide about hiring employees in their company, so they can operate effectively in the market. Among the candidates, from which the teams can choose, are also people with disabilities. However, students must remember that the space in their café must be adapted to the needs of people with disabilities. This therefore requires an appropriate strategy and connects game design with Goal 8 (*Decent work and economic growth*).

Example learning objective for SDG 8 implemented through the SEED simulation game include:

- The learner understands how innovation, entrepreneurship and new job creation can contribute to decent work and a sustainability-driven economy and to the decoupling of economic growth from the impacts of natural hazards and environmental degradation.

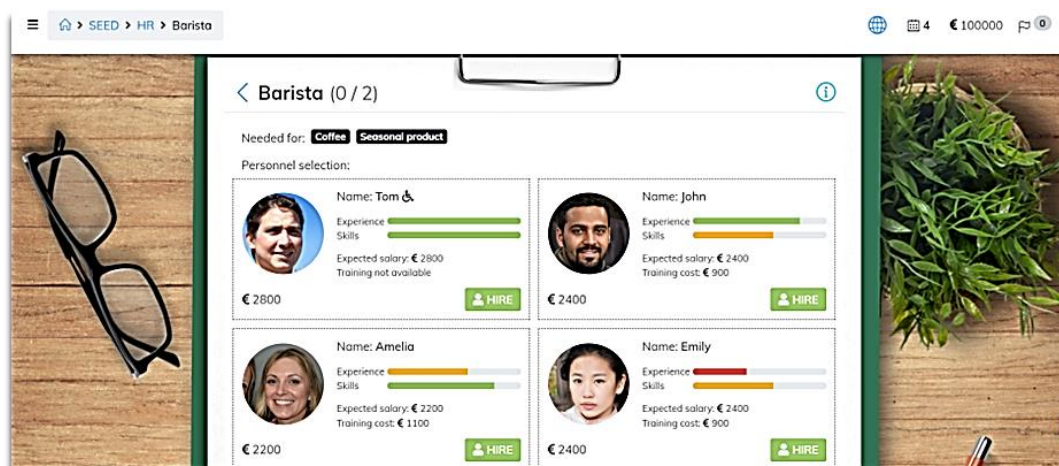


Figure 5. Decision-making interface for sustainable practices in *Human Resources* area.

Source: SEED Simulation Game.

- *ECO-ranking*. The following ranking systems were implemented to evaluate the effectiveness of the students' decisions:
 - *Overall ranking*, which is based on the revenue generated by companies. It reflects the effectiveness of teams in the area of company and finances management and its ability to compete with other companies operating in the market (other teams involved in the game).
 - *Ecological ranking*, which assesses the effectiveness of the implementation of sustainability practices in the game (e.g. the selection of suppliers with a high eco-index or the environmental performance of the equipment used). Ecological ranking is created based on four components: the average eco-index of the equipment, the average eco-index of suppliers, the average eco-index of all marketing actions carried out as well as the leftovers from orders that are disposed of after each round.
 - *CSR ranking*, which measures the teams' commitment to implementing responsible business practices, such as hiring people with disabilities or adapting café space to accommodate them. CSR ranking takes into account the following aspects: eco ranking, accessible interior design, employment of people with disabilities, and the average CSR index of all marketing actions carried out.

Ecological ranking		
PLACE	GROUP	RESULT
1	MC	🌿 5405
2	Bean Brew	🌿 5327
3	wirtualis	🌿 5128
4	Delish	🌿 5100
5	LuCafé	🌿 5012

CSR ranking		
PLACE	GROUP	RESULT
1	Delish	❤️ 5411
2	LuCafé	❤️ 5386
3	SEED CAfe	❤️ 5219
4	Bean Brew	❤️ 5193
5	MC	❤️ 5101

Figure 6. Overview of *Ranking Categories* in SEED simulation game.

Source: SEED Simulation Game.

The use of ecological ranking as well as CSR ranking helps to develop students' awareness, that running a business should not be based only on financial aspects, but each enterprise should take special case of environmental and social responsibility to society. Eco-ranking motivates students to take actions that minimize the negative impact on the environment, while CSR ranking teaches that it is important to implement inclusive practices and build relationships with

the external environment. The SEED simulation game includes the most important components that are pointed out by researchers as characteristic of GBL and that make learning effective and efficient.

Conclusions

As it's stated in *UNESCO Education for Sustainable Development. Learning Objectives* (UNESCO, 2023), HEIs should orient educational processes towards principles of sustainability. Such transformation involves not only rethinking the curriculum, but also methods of teaching and making them as efficient and effective as possible. Integration of GBL with learning objectives related to SD offers a transformative approach to cultivating sustainability competencies in students and engage them into the interactive and immersive experiences that resonate with the learning preferences of Generation Z and Alpha.

The paper presented the SEED simulation game, one of the outcomes of SEED Project. The insights collected during the implementation of the game demonstrate that students can acquire not only essential business management skills, but also develop critical competencies presented in such frameworks as UNESCO and other research initiatives.

During the learning process in the frame of GBL, done with SEED simulation game, which is based on realistic business simulations, students are supposed to make decisions and find a balance between profitability and sustainability. The game provides students with the context of modern business environments where sustainability should be a key factor in decision making processes. The design of SEED simulation game has been aligned with the goals included in the UNESCO framework, that emphasizes the importance of equipping learners with competencies, values and attitudes supporting SD across all aspects of life. In particular, Goal 4 (*Quality Education*), Goal 8 (*Decent Work and Economic Growth*), Goal 9 (*Industry, Innovation, and Infrastructure*), Goal 10 (*Reduced Inequalities*), and Goal 11 (*Sustainable Cities and Communities*) have been taken into consideration in the SEED simulation game design process.

Students are engaged with these goals in practical context and the decisions made require them to consider such aspects as social, economic and environmental. Moreover, controlled game environment enables students to experiment with and internalize SD principles much better than with traditional educational methods. This is because GBL approach fits learning preferences of new generations (Z and Alfa).

The present investigation is not without limitations and weaknesses. Firstly, the analysis is based on a single case study, which may not be representative of all higher education contexts. Secondly, the research primarily examines short-term outcomes, lacking longitudinal data to assess long-term impacts on students' SD competencies. The study paves the way for further

research into the long-term effects of GBL on SD competencies and its applicability across diverse educational settings.

The insights collected during implementation of SEED project have shown that GBL initiatives can be powerful tools for advancing education for SD in HEIs. Such tools can transform educational processes in HEIs and extend their capacity to prepare students to challenges of sustainable future. This wider social impact highlights the potential of GBL to influence not only educational outcomes but also societal values. The SEED simulation game serves as a practical example of how theoretical concepts can be translated into engaging learning experiences.

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