

The use of games and simulations in higher education can improve students' cognitive and behavioural skills



*In recent years there has been a surge of interest in how games and simulations might be applied to higher education learning. **Dimitrios Vlachopoulos** and **Agoritsa Makri** have reviewed the literature on the subject and here outline the positive learning effects of games and simulations; from cognitive outcomes such as improved critical thinking and problem-solving skills, to behavioural outcomes such as improved social and communication skills.*

The interest in examining game and simulation applications in higher education has rapidly increased in recent years. However, there still seems to be a lack of clarity among scholars and educators as to the operational definitions of games and simulations, contributing to a “terminological ambiguity”.

Educational games generally refer to the use of the entertaining power of games to serve educational aims, striking the right balance between the learning and entertainment components for the acquisition of knowledge. Although academics and game developers may use various taxonomies to categorise games, the majority broadly agree on the different genres: next generation video games; action games; adventure games; role-playing games; strategy games; serious games; educational games; micro-learning games; and web-based games.

Simulations are dynamic technological tools created through delivery platforms to provide a scenario-based environment. Students work collaboratively to solve real-world situations and problems, thus ameliorating authentic and **collaborative learning**. Designers must pay attention to characteristics such as the technical challenges, modules, and techniques associated with the game design, the players involved, and the teaching modes (single, multiplayer, collaborative, synchronous, etc.). They are considered both enjoyable and valuable learning tools, especially in addressing clinical skill practice and laboratory activities.



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The positive effects of games and simulations in the learning process

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Games should be treated mainly as supplementary elements since full integration requires high-quality mechanisms, student engagement, and instructor support. In other cases, the incorporation of games in the curriculum could either function as a supplement to existing teaching techniques or as a partial substitute for traditional teaching methods. The integration of games depends on instructors' contributions and their design in the teaching process. According to [our recent literature review](#), the positive learning effects of games and simulations can be divided into three main categories.

Cognitive outcomes

The majority of studies discuss the beneficial impact of game-based learning (GBL) activities on knowledge acquisition and conceptual understanding, revealing [positive cognitive outcomes](#) in promoting knowledge concept learning and deeper content understanding. Tasks framed through the design of games and simulations develop a diverse range of cognitive skills, such as deep learning, critical thinking, and scientific reasoning, as well as action-directed learning, transformative learning, decision-making skills, developed spatial abilities, and problem-solving skills. Also, simulations directly linked to the course content give students the opportunity to apply and better understand theoretical concepts and ideas.

Additionally, simulations provide an environment in which students can experiment with different strategies, adopt different roles, and take charge of their own decisions by assuming responsibility. Games and simulations promote collaborative work as they allow students to reconstruct and co-construct knowledge, encouraging problem-solving through peer discussion and dialogue.

Research confirms the power of games in developing complex cognitive skills, such as self-assessment and higher-order thinking, as well as metacognitive skills for deep learning. Additionally, simulations help students connect theoretical issues with real-world situations and develop analytical skills through comparing different viewpoints, developing arguments, reflecting and evaluating situations.

Behavioural outcomes

Behavioural objectives refer to the improvement of relational abilities; the development of organisational skills, adaptability, and the ability to resolve conflicts. Simulations and games are often seen as powerful tools in [promoting teamwork and team dynamics](#), [social and emotional skills](#), including collaboration and interaction, as well as other soft skills (project management, self-reflection, etc.). Leadership skills can similarly be gained through reality-based scenarios and action-oriented activities. Development of such skills should fully equip students with the necessary competencies to succeed professionally.

Simulation scenarios promote improved social and communication skills, which lead to the enhancement of student knowledge through active collaboration and engagement. Furthermore, through game mechanisms, meaningful feedback is a key factor in students achieving learning goals and being encouraged to reflect on misunderstandings and transfer learning to new educational contexts. Real-time feedback in simulation settings enables students to clearly define expectations in the interactive environment, leading to a reduction in anxiety and uncertainty and thus encouraging better performance outcomes. Most importantly, online social and interactive games help students shape strong peer friendships and provide multiple forms of interaction.

Affective outcomes

Affective outcomes of using games and simulations in the learning process are extensively highlighted in the literature. Engagement, transfer of knowledge, and motivational dimensions, such as self-efficacy, attention, confidence, and satisfaction are considered as major affective factors in enhancing learning objectives. [Motivation](#) is derived from peer learning and user cooperation. Instructors, through their pedagogical support and the creation of games and simulations, are able to motivate students and enable their engagement in the learning experience.

Instructors acting as motivators are key to engaging students in the learning process, rewarding them for their effort and supporting them by providing continuous guidance and pathways for further consideration. Similarly, designers of digital GBL activities need to consider extrinsic rewards to achieve students' motivational development and satisfaction. Students with a higher level of inner motivation, and positive attitudes towards GBL are more likely to have higher learning expectations, and to greater satisfaction in their GBL participation.

What are the next steps in research field?

Considering the above discussion points we suggest some of the pathways for further investigation:

- Researchers should focus on applying the relevant theoretical frameworks from a sociocultural and constructivist perspective to the learning outcomes of games and simulations.
- More research should be conducted on gender issues, with respect to the effectiveness of games on the different aspects of learning outcomes.
- Comparative surveys should be included with a design focused not only on tertiary education students but on other target groups as well (adult learners, primary school students, etc.).

This blog post is based on the authors' article, "[The effect of games and simulations in higher education: a systematic literature review](#)", published in the International Journal of Educational Technology in Higher Education (DOI: 10.1186/s41239-017-0062-1)

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