

CARCRAFT

Learning Methodology



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Introduction

Modern educational institutions are dealing with a generation of students that were born and raised in a digital world and demand a different approach to teaching. Moreover, the COVID-19 pandemic has a significant and devastating impact on the educational sector. Therefore, there is a demand to develop new education standards. Changes in modern society's technical and social conditions necessitate new professional capabilities, dubbed "21st-century skills". Because these skills are not only practical, but also psychological and behavioral, so they should be cultivated. Gamification and game-based learning can be useful methods for developing such skills.

It can be beneficial in Europe, which had to swiftly adjust to the new educational realities brought on by the COVID-19 pandemic. Using digital games in education could be a great example of turning face-to-face learning into virtual learning, and simulation software could be a useful tool for helping learners gain knowledge and experience on a certain subject.

Games have already been widely integrated into the conventional educational process, along with rapidly expanding technological applications. For instance, simulation games, a category of video games designed to closely simulate real-world activities, have already been utilized in the past, primarily in the field of information technology¹. Many video games for auto mechanics have been developed, but a majority of them are not instructional or based on a specific narrow topic. Car and racing video games may help in the development of some technical skills and competencies in an ad hoc manner, but they do not meet the educational demands of students pursuing automotive mechanical courses in vocational training centers. Therefore, there is a need to implement a new game-based approach.

¹ Coller, B., Shernoff, D. (2009). Video Game-Based Education in Mechanical Engineering: A Look at Student Engagement. *International Journal of Engineering Education*. 25(2). [Mode of access](#)



Chapter 1. Understanding Game-Based Learning

Because enjoyment increases engagement and retention, using games in learning processes is a great idea. But you have definitely come across these two terms: gamification and game-based learning, if you have been looking at adding game elements to your training. At first glance, it seems that these terms mean almost the same thing, but they are not. So, what is the difference between the two?

1.1. What are the differences between gamification and game-based learning?

First, let us outline the difference between the two methods mentioned above so that later we can move on to a more detailed definition of game-based learning (GBL).

GAMIFICATION	GAME-BASED LEARNING (GBL)
It is adding game-based elements and approaches to non-game activities to encourage student involvement and motivation.	It is a method that uses games to teach a specific skill or reach a particular learning outcome.
It is used: <ul style="list-style-type: none"> • to reward and recognize students and behavior; • to promote a specific desired behavior to drive learning outcomes; • to increase engagement and motivation. 	It is used: <ul style="list-style-type: none"> • to teach <u>through</u> games (not by or with) • to transfer knowledge and teach new skills; • to increase engagement and motivation.
Game-like aspects are adjusted to fit the lesson content.	Lesson content is adjusted to fit the game.
Assessment is not within the game.	Assessment is in-game.

Figure 1. Differences between Gamification and GBL

The primary difference between gamification and game-based learning is their application and integration. GBL fully integrates games into the educational content, so the entire course or class can be turned into a game, while gamification employs just features from games to promote the course among learners by increasing its attractiveness (by using reward systems, for example). A gamified environment has engagement, immediate rewards, and healthy competition. It keeps students motivated and maintains their will to learn more, even if the course's content does not seem very captivating. However, we can say the same about GBL. Indeed, but, in addition, in this approach, the game serves as the embodiment of theory into practice.

We can also define game-based learning as a way of teaching that employs the power of games to establish and support learning objectives. The core concept behind GBL is teaching through repetition, failure, and the accomplishment of goals².

1.2. What is the impact of game-based learning?

The brief answer is that it makes learning more efficient, engaging, and motivating. The game-based learning approach encourages students to take action and learn from real-life experience. The right game can improve attention, feedback, and skill levels. For instance, competitive games encourage participants to perform better. Furthermore, GBL improves interaction and autonomy in the learning process, which increases student engagement and makes learning more inventive. Thus, it facilitates teaching and learning and raises the awareness and interest of students.

There are a variety of reasons why using video games creates great learning environments. Some reasons are based on little or no empirical evidence, while others are well supported by theory and research. We present some of the most essential arguments here.

² Denton, M. (2020). The science behind game-based learning. Gamify.com. [Mode of access](#)

First of all, it is **motivation**. The most commonly mentioned feature of games is their ability to motivate players. The argument is that, through a succession of motivating game elements, games for entertainment have been proved to be able to drive learners to stay engaged for lengthy periods of time. Such aspects as rewards (points, leaderboards, badges, or trophies), a great storyline/narrative, as well as game dynamics and activities that learners like or find fascinating can be engagement tools.

Secondly, it is the **engagement of the player**. We take into account the INTERACT model³ of learner activity to understand the engagement issue. This model distinguishes between several types of engagement – cognitive (mental processing, metacognition), behavioral (movements, gestures), and affective (emotions). We can also add socio-cultural engagement.

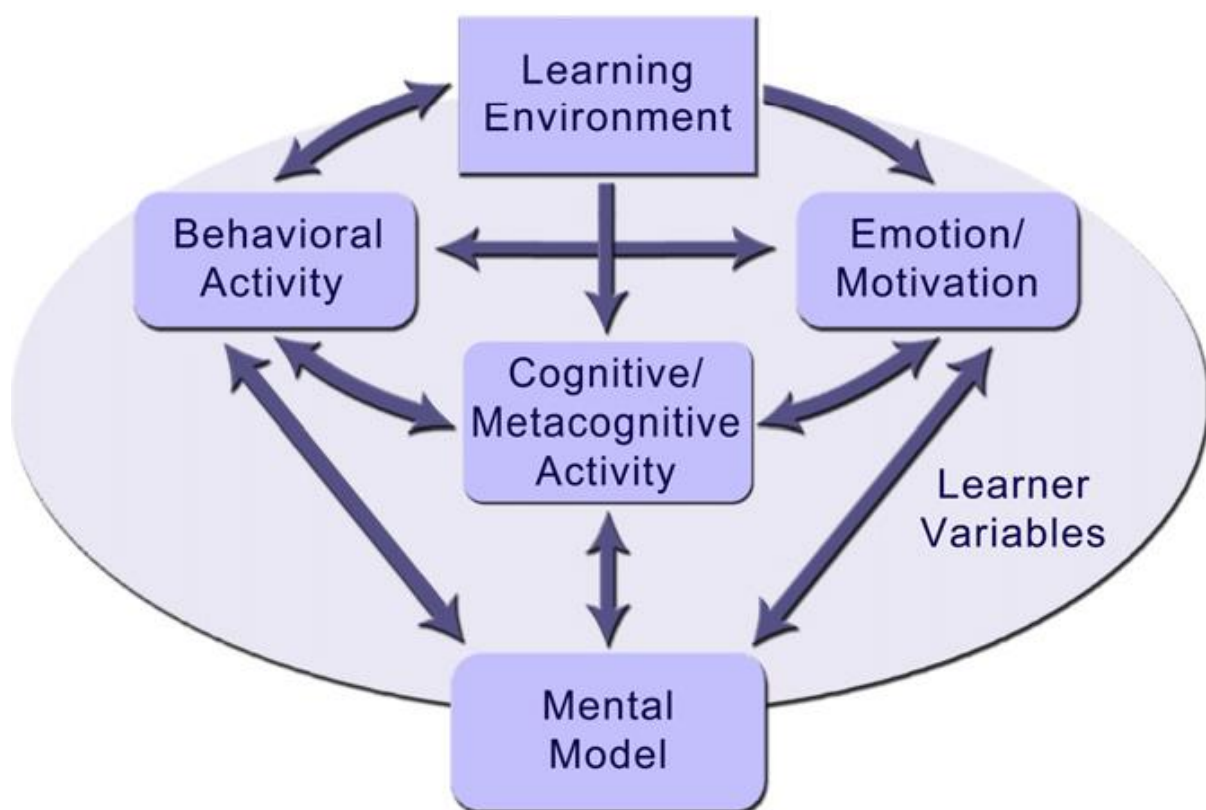


Figure 2. INTERACT model⁴

³ Domagk, S., Schwartz, R. N., & Plass, J. L. (2010). Interactivity in multimedia learning: An integrated model. *Computers in Human Behavior*, 26(5), 1024–1033. [Mode of access](#)

⁴ Ibid



However, different game elements activate different forms of engagement in different circumstances and for different learners, so the actual type of engagement will vary per game and within the game. Each form of engagement is applied in accordance with learning goals, learner characteristics, and learning context.

What is clear is that all sorts of playing activities can lead to all 4 types of engagement, but if the game does not create elements of cognitive engagement, it is unlikely to accelerate the achievement of learning goals.

A real-life example: learners became more motivated, engaged, and boosted their will to learn more when teachers added digital GBL components such as feedback, choice, and collaboration into their instructional design, according to a 2019 study article⁵.

Encouragement of critical thinking is another significant impact.

Game-based learning has been demonstrated to promote critical thinking abilities in learners, *“including the development of independent beliefs prior to engaging in collaborative discourse and providing opportunities for guided reflection⁶.”*

GBL helps to gain and develop **problem-solving skills**. Students may utilize game-based learning to solve issues by developing abilities such as comprehending causation, reasoning, and decision-making that they can apply outside of the classroom.

Despite the positive outcomes that integrating such a method as GBL into the educational process can bring, it is critical to understand that one of the most challenging aspects is correctly incorporating games into the overall learning plan. After all, game-based learning works only when we consciously employ its tools.

⁵ Serrano, K. (2019). The effect of digital game-based learning on student learning: A literature review. Graduate Research Papers. University of Northern Iowa. [Mode of access](#)

⁶ Cicchino, M. (2015). Using Game-Based Learning to Foster Critical Thinking in Student Discourse. Interdisciplinary Journal of Problem-Based Learning, 9(2). [Mode of access](#)





It is also important to emphasize that in order to develop effective game-based learning, a game that generates realistic circumstances in which students may practice their skills must be included.

Chapter 2. Video games in the educational process and the Minecraft case

Computer or video games are an important part of game-based learning processes. In addition to an entertainment component, video games offer useful educational potential that can serve as a tool for teaching certain topics or obtaining specific skills. Video games being used in the right context can be a facilitatory educational aid. They are an important part of improving education due to their ability to force players to realistically simulate real-life situations.

2.1. Video games in educational processes

Video games are transforming not only our leisure time but also ways of gaining education and conducting research. Nowadays, game developers are forging new ground throughout every area, aiming to maximize the potential of their creations beyond commercial entertainment.

How can we leverage game technologies to create a unique experience? How can we use games to persuade people to take action? How might games help us dig deeper into data, gain knowledge, and create scientific breakthroughs?

The solution is to explore games that are not only for fun – serious games. What are they? Serious games can be defined as games that have a serious outcome and aim to make a long-lasting impact on players. Serious games should be entertaining, but they should simultaneously deliver the intended knowledge and effects at the right moment, and on the right channels.





	SERIOUS GAMES	COMMERCIAL GAMES
FOCUS	<ul style="list-style-type: none"> • Tangible effect and knowledge • Education and training 	<ul style="list-style-type: none"> • Amusement and entertainment
OBJECTIVES	<ul style="list-style-type: none"> • To increase the player's experience in the specific field • To provide with new skills, competencies, and knowledge 	<ul style="list-style-type: none"> • To deliver enjoyment and satisfaction
TARGET AUDIENCE	For needs of special interest groups	For genre preferences and mass-market appeal
EXAMPLES	<ul style="list-style-type: none"> • Minecraft: Education Edition (by Microsoft) • Stop Disasters! (by UNDRR) • EndeavourRX (by Akili Interactive) • Rights Arcade (by Amnesty International) 	<ul style="list-style-type: none"> • Angry Birds • World of Warcraft • Assassin's Creed

Figure 2. Differences between serious and commercial games

Serious games can bridge the theoretical and practical gap. They provide learners with an opportunity to use what they have already learned in real-life situations and enhance their decision-making and problem-solving competencies. Serious games may therefore be used in a wide range of industries, including military, government, education, business, healthcare, and so on. These games can be very effective at teaching essential skills at an early



stage, so learners will be able to convert them into mastery in practical situations as quickly as possible.

Serious games provide a secure atmosphere in which players may explore and educate themselves at their own speed. Learners get a sense of autonomy since they have the ability to train, practice skills, and discover new things in a safe atmosphere. They can choose numerous pathways with varied outcomes without any real-world consequences, so players can take responsibility for their actions.

These games have the ability to immerse students in realistic, open-ended challenges akin to those confronted by real-world professionals. Since it is a low-risk virtual environment, certain components may be customized to allow students to transfer themselves into qualified specialists.

To summarize, we can say that serious games have a clear educational purpose and, when used appropriately, can support and promote learning. They feature explicit rules that are geared toward a certain task or objective.

Serious games that are well-designed and purposeful have the potential to alter not only educational processes but also the lives of players. These games appeal to our most fundamental human motivator needs by allowing us to have fun, develop ourselves, and even prompt us to make a positive impact on the world.

2.2. The Minecraft case

Why Minecraft? First of all, it is one of the most popular video games of all time around the world. The game has a huge fan base, which means that among students there are probably those who are familiar with the game – so you do not have to explain the rules once again.

Secondly, Minecraft shows a high-level deal of creativity and nearly no limitations. You may use it to construct buildings, harvest resources, create and





complete quests, participate in group activities, or just explore the area. The more freedom you have, the more creative you can be with it. There is no linear narrative in this game, but there are several creative tools available, thus the player's freedom is unrestricted. You can also create a variety of content, mechanics, and interactive features inside the game.

Simplicity and versatility allow Minecraft to be used in almost all academic disciplines: solve math exercises, illustrate chemical and physical experiments, model organic systems in biology classes, immerse yourself in historical worlds, and so on.

For teaching with Minecraft, Microsoft has created a special platform – *Minecraft: Education Edition*. It is nearly identical to the regular version, although there are a few unique capabilities designed exclusively for educators.

Minecraft has had an educational edition since the fall of 2016, and it is quickly gaining traction in classrooms. The game has been included in the curriculum of American and Swedish schools since 2013. It is also being utilized in other countries to teach sciences, urban planning, and even languages.

But, despite the benefits described above, there are several questions to be raised. What are the most important impacts of Minecraft's application on educational processes? Is it possible for students to learn effectively by playing it? Are there any obstacles to employing this sort of video game in a classroom setting?

Let us check real-life experiences of using Minecraft for educational purposes in order to answer these questions.

Many studies have already shown the positive impact of Minecraft on the educational process. According to Noelene Callaghan⁷ (Rooty Hill High School, Australia), the usage of Minecraft provides favorable learning environments, especially for engagement, cooperation, and creativity. The research of several

⁷ Callaghan, N. (2016). Investigating the role of Minecraft in educational learning environments. *Educational Media International*, 53(4), 244-260. [Mode of access](#)





scientists from various Spanish universities concludes that video games such as Minecraft “*are of high interest in education as they develop skills for problem-solving, collaborative work, research motivation and proactivity*”⁸. The study of Gregor Steinbeiß from the University of Innsbruck showed that gamified learning environments in Minecraft are beneficial to both formal and informal learning experiences⁹. Danish researchers Rikke Magnussen and Anna Lindenhoff Elming conducted research and a project on urban development by using Minecraft. They discovered that the game helped students of the 7th-9th grades to become aware of the authentic knowledge they possess about deprived neighborhoods in Copenhagen and that they can connect it to structural changes¹⁰. The case study of Mia Lynn Morgan from the New England College determined that after 6 months of playtime, participants' media literacy abilities improved and that playing Minecraft provided opportunities for players to practice 21st-century skills¹¹.

The study conducted in a French-language school in the Greater Montreal Area (Canada) among the 3rd-6th grade students highlighted several educational benefits of using the game, including digital, math-related, and soft skills. Minecraft had a significant impact on student motivation. Moreover, students gained a better understanding of scientific concepts and improved English language skills (students were mainly French-speaking)¹².

However, it is essential to mention that Minecraft must be utilized in a methodical, well-supported, and deliberate way. If true educational objectives

⁸ López Méndez, M.D.C., González Arrieta, A., Queiruga Dios, M., Hernández Encinas, A., Queiruga-Dios, A. (2017). Minecraft as a Tool in the Teaching-Learning Process of the Fundamental Elements of Circulation in Architecture. International Joint Conference SOCO'16-CISIS'16-ICEUTE'16. Advances in Intelligent Systems and Computing, vol 527, 728-735. [Mode of access](#)

⁹ Steinbeiß, G. (2017). Minecraft as a Learning and Teaching Tool - Designing integrated Game Experiences for formal and informal Learning Activities. University of Innsbruck. [Mode of access](#)

¹⁰ Magnussen, R. & Elming, A. L. (2017). Student Re-Design of Deprived Neighbourhoods in Minecraft: Community-Driven Urban Development. Making a Difference: Prioritizing Equity and Access in CSCL, 12th International Conference on Computer Supported Collaborative Learning (CSCL) 2017, vol 1, 271-278. [Mode of access](#)

¹¹ Morgan, M.L. (2015). Developing 21st century skills through gameplay: To what extent are young people who play the online computer game Minecraft acquiring and developing media literacy and the Four Cs skills? New England College. ProQuest Dissertations Publishing. [Mode of access](#)

¹² Karsenti, T., Bugmann, J, and Gros, P. P. (2017). Transforming Education with Minecraft? Results of an exploratory study conducted with 118 elementary-school students. Montreal: CRIFPE. [Mode of access](#)





are to be met, this sort of structure must be maintained. In the lack of structure, a computer game like Minecraft, which has considerable educational benefits, will be ineffective. Students may not want to quit playing if certain boundaries are not established, and they may miss out on many possible learning experiences. Thus, a presence of a certified, competent moderator is critical to the success of any educational activity involving the use of the game. Students should also be required to describe what they have learned so that they and trainers can track their progress.

Generally speaking, in addition to their entertainment appeal, video games offer a bunch of useful prospects. Especially when games are explicitly created to address a certain issue, teach a specific skill or educate on a certain topic.

Moreover, students' attitudes regarding a course can increase as a result of the game-based learning method. As a result, this strategy may be used to engage learners who are uninterested in the class.

Integrating Minecraft and other serious games into training processes may help to build a high-performing digital education ecosystem by developing digitally competent and confident educators, providing high-quality educational content and accessible and understandable training materials.





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