



Types of Game-Based Learning in Education: A brief state of the art and the implementation in Greece

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Abstract: The interest towards game-based learning (GBL) is continuously growing worldwide. However, several countries still face difficulties to efficiently implement GBL approaches in their Educational Institutions. This literature review is focused on the identification of the main types of GBL approaches that have been recently implemented in educational contexts, by providing one representative game-example for each case. The study also examines the implementation of GBL in educational contexts in Greece, identifying game-based learning popular tools and approaches. A qualitative content analysis is used to investigate the general characteristics of the identified GBL types and the representative example-games, as well as the main benefits and drawbacks that render GBL implementation impracticable in several countries. Overall, this study contributes in the research attempt towards the recognition of the main GBL types, focusing on their drawbacks or other features that seem to affect their broad implementation in several countries and educational contexts.

Keywords: *Educational games; Examples of Game-based learning; Drawbacks of Game-based learning; Game-based learning in Greece; Types of Game-based learning*

Introduction

Nowadays, more and more students grow up using devices like computers, mobile phones, and video consoles for almost any activity. On average, young people spend 7 hours a week on playing games (Forbes, 2019). Therefore, it is very crucial to motivate and engage young learners into learning activities by transforming the traditional teaching methods such as lectures and written materials in more digital form, like games that seem to attract their interest (Fu, et al., 2009; 2006). Computer and video games let students dive in practice lead them to expertise by gaining professional skills and acquire innovative thinking. Digital games are the perfect tool that supports learning to students without even realizing it. These

games use virtual words and symbols through which students can experience the concrete facilities that these words describe. In that way, youngsters can understand the complex concepts without losing the connection between abstract ideas and the authentic problems that can be used to solve (Huizenga, 2009). In order to delve deeply into the conversation, it is essential to clarify what Game-based learning (GBL) is. Overall, GBL is a type of education that provides learning through video games in order to teach a specific skill or achieve a specific learning outcome. Students take in information from many sources and make decisions quickly. It takes your core content and objectives and makes it fun. Video games use design patterns, principles and data in order to deploy new learning opportunities and environments. Video

games, computers and technologies in general, have created new social and cultural environments that help students learn by integrating thinking and social interaction using the collaborative aspects of video game play.

Game-based learning is an innovative approach that uses computer games which offers educational value using different kinds of software applications, to succeed teaching enhancement, assessment and evaluation of learners. This process includes elements of competition, engagement, and immediate reward. Learners can compete with each other and collaborate in order to be motivated to achieve a specific goal and succeed high scores. Then they receive immediately feedback and rewards. This kind of challenge motivates and engages students to learn by completing series of activities (Fu et al., 2006; 2009).

The aim of this report is to identify the main types, benefits and drawbacks of game-based learning approaches in education, and also explore its implementation in Greece. Contrary to previous review studies, this study does not aggregate all the existing works in the field, rather it uses an example-based research approach, to identify key trends through the analysis of a limited set of representative GBL cases. Specifically, the present study poses the following three research questions:

Q1: What are the main types of GBL approaches that have been implemented in the Primary and/or Higher education?

Q2: What is the situation of educational GBL integration in Greece?

Q3: What are the main advantages and disadvantages of implementing GBL in Education?

To provide answers to the above research questions this report collects the basic types of game-based learning approaches that have been implemented in educational contexts. Then, it records a set of representative ‘example games’ of each GBL type, discussing their drawbacks and/or benefits, as well as their (limited) implementation in Greek primary/secondary and/or higher education.

There are several literature review studies that have analyzed or aggregated the research works in the field of game-based learning (GBL) in order to provide a sense of direction to educators and/or researchers. Most of the review studies have explored/approached GBL from different aspects focusing for instance on the GBL trends as they relate to learning outcomes (Bado, 2019; Hailey et al., 2016; Qian & Clark, 2016; So & Seo, 2018; Tan et al., 2017; Tokac et al., 2019), or targeting a particular educational level such as K-12 (Hailey et al., 2016; So & Seo, 2018) and higher education (Subhash & Cudney, 2018; Tan et al., 2017).

This study is different in that it follows an example-based analysis approach, attempting to identify the main advantages and difficulties that GBL implementation brings, focusing in the Greek education context.

The main contribution of this research is the identification of the key GBL types that have been implemented so far in Education, by presenting one representative example-game or GBL platform for each type. The study also provides an overall evaluation by discussing the main advantages and disadvantages of the identified approaches in primary/secondary and/or higher educational contexts.

Furthermore, this study examines the implementation of GBL approaches in Greece outlining the main benefits and difficulties that render GBL inapplicable in Greek educational contexts. Since the research material about the implementation of GBL in Greek education is far limited, this paper draws the first attempt towards aggregating GBL country specific material, identifying the lack in the field and encouraging researchers examine further the situation in Greece and/or other European countries.

Features of Game-Based Learning

GBL is in general a teaching method, which gives the opportunity to the teacher to attract the interest of students beneath different parts of games, in order to make them learn and assimilate specific skills in real situations (Fu et al., 2006; 2009).

The construction of the game must follow specific rules in order to be suitable for the group of children to whom it is addressed. The type and the purpose of the game must be carefully determined and tested by the teacher himself, to see if learning goals are achieved. Moreover, the parents should be informed about the game. So, this learning method should meet their expectations. In some cases, their participation could be mandatory due to the fact that it is proven by research, that when families and schools work together, children do better. In addition, it would be better if the time for learning through games was plenty enough in order to have very accurate results (Guido, 2016).

These educational games are usually designed to have different difficulty levels which are highly interconnected. Every skill and information that students learn in each level is necessary for the next problem-solving situations. In this way, students can

deeper understand the content of the lesson, through experiential learning. The majority of these games has a relevant to real life content and will make children able to make their decisions based in information when they face situations like these in the future. Some games are designed in the way which promotes the learner-educator collaboration in order to strengthen their relationship, which is not feasible with other learning experiences (Kapp, 2012; Peters, 2016).

Game-based Learning vs. Gamification

There is a very common phenomenon that people confuse these two meanings. Game-based learning is the process of learning and training that uses games in order to deliver a specific outcome and achieve new skills and innovative thinking. On the other hand, gamification is the application of game mechanics such as point scoring, competition with others and rules of play, that it is used to solve problems and as an online marketing technique to encourage engagement with a product or service. The main difference between them is the integration of game mechanics with training content.

In game-based learning the progress of each student depends on the understanding of the subject being taught. The training is fun and challenging provoking students' engagement. On the other hand, gamification fosters engagement. Gamification elements draw on human needs to collect, compete and succeed. Furthermore, gamification is not expensive but is fast to onboard into an existing training platform. Gamification provides engagement with simple training content and motivates students to complete more courses in order to beat their high scores, move up on the leader board, or earn rewards (Findlay, 2016).

Methodology

Databases Searched and Search Terms

A literature review of online material related to GBL and research studies mainly indexed in ACM, Google Scholar, Elsevier and Springer Link was conducted. The keywords used were ‘game-based learning’, ‘game-based learning in Education’, ‘educational games’ and ‘game-based learning in Greece’. The

keyword ‘game-based learning’ was the one that retrieved the maximum value of related results.

Inclusion Criteria

Full-length research papers, white papers, online material and studies found by keywords and the references taken from bibliography were short-listed. The studies that have been found are analyzed and included (or excluded) in the current survey following the criteria described in Table 1.

Table 1

Inclusion and exclusion criteria

Inclusion	Exclusion
Studies that have been published between 2011 and 2020.	Old studies (before 2011).
Studies concerning only the area of Education	Studies focused on non educational context (marketing, business, etc.)
Studies regarding only GBL approaches	Studies regarding Gamification or other non GBL approaches
Studies regarding only digital GBL approaches	Studies regarding learning-by doing approaches through physical interactions

Data Extraction and Synthesis

Each one of the studies that have been selected for this final stage was fully read to extract useful and relevant data. To synthesize data we extracted the following attributes: author, year, title, GBL methodology/type and educational context/level.

and depicts one representative example-game for each one of them.

Table 2 below provides a short description of the selected games, depicting the learners’ age-groups it concerns.

Results and Discussion

Main Types of Game-Based Learning Approaches

This study identified seven main types of GBL approaches implemented in Education, in all levels and contexts. Figure 1 presents the identified types,

Key Elements of Success for Game-Based Learning Approaches

Uniqueness: The key element of GBL success is the motivation and the engagement that students feel when

they take part in such a learning experience. Learners feel more like they entertain themselves rather than learning. There are objectives, rules and goals which creates a sense of competition to all the participants.

Students are able to complete objectives making their own decisions. In this way, students face the consequence of their action, which happen also in real life and produces so many emotions (Peters, 2016).



Figure 1. Main types of GBL approaches in Education and representative game examples

Immediate feedback: One very important element, from which both the learners and educators are benefited, is the immediate feedback they receive through the gaming procedure. In comparison with coursework where the students wait for days until they get a grade, through game-based learning they get immediate results for their decisions. In addition, students can learn about the long-term effect that some of their actions may have in real life, because in these games, the process is determined from their own decisions.

On the other hand, educators receive rapid feedback by watching how their students react and feel while they are playing. They can easily understand also some personality characteristics of students. For example, the “achiever” is a student who wants to be on top and the “socializer” the one who performs better in teams

using his communication skills (Kapp, 2012). It is also a good opportunity to discuss with the students the most common wrong decisions after the game, which promotes the learning from mistakes theory.

Game-Based Learning in Greece

In Greece GBL seems to be implemented only in some exceptional master or bachelor programs. In particular this teaching method is used in Ionian University, in the bachelor department of sound & color arts, at test level (CNN Greece, 2018). In this department, students are requested to end a game at intervals in order to pass some courses. Ionian University in cooperation with Texas University provides open tools for the construction and the usage of such digital games in higher education in Greece.

Table 2

Description of selected example games

Example Game	Description	Ages	Source
Duel	A video game, which is being played by two people and its type, is strategic. Specifically, you can develop your science and your army, constructs prestigious buildings, and lead your civilization to victory.	10+	(BoardGameGeek, 2016)
Plantville	A video game category, in which real world activities are stimulated. Usually there is no specific goal, but the game procedure depends on the decision making.	13+	(Zynga, 2012)
Funbrain	Funbrain is a free resource that includes books, games, and videos for preschool kids through the age of eight years old. Players can browse content by grade level or content. It offers interactive games that develop skills in math, reading, and literacy	5+	(Funbrain Holdings, 2020)
Kahoot	A quiz-based gaming platform where players/learners try to answer questions about a certain topic.	13+ (for U.S. players) 16+ (for non-U.S. players)	(Kahoot, 2013; 2020)
Crossword	A puzzle game usually tests the player's ingenuity or knowledge. In The learner/player is expected to sort some pieces n a logical form.	7+	(Independent, 2011)
Europa Universalis	A type of game which encourages strategic thinking, concentration and prediction making in order to solve problems.	10+	(Steam, 2013)
VR games- Chemistry VR	A type of game which allows players both to see and interact with a virtual world, imagined or real.	10+	(Technologies, 2018)

Recently, a bachelor thesis (Athnasopoulos, 2018) researched qualitatively the opinion of 12 Greek teachers of primary education for the use of digital games as a teaching method. The findings of this research are very positive about game-based learning since teachers believe that GBL is an engaging learning activity due to the motivation of the students, and the cooperation and communication skills which are enhanced through playing. However, teachers marked some possible difficulties to implement GBL in Greece. As they reported, the most important obstacles are the inadequacy of equipment and the shortage of class time.

“Gamelearn” GBL platform has been provided in Greek educational contexts as an outcome of the cooperation between “Gamelearn” and “Wide services” (Services). Gamelearn is the most award-winning game-based learning platform in the world, in the improvement of soft skills for corporate training (Gamelearn, 2012).

Furthermore, several GBL platforms like Kahoot (Kahoot, 2020) offer their features in Greek language, for all the educational levels. Kahoot has been generally preferred by professors in Greek

Kahoot is a worldwide known, GBL platform, used by educational instutoins, companies and parents, as a method to turn learning into entertainment. The project was founded in 2012 by university students of the Norwegian University of Technology and Science (NTNU). It was launched in 2013 in beta version and when it converted to public, it became successful very soon. Since it was launched, it has been played in all

Universities to employ GBL strategies in their courses (e.g. Tzafilkou and Economides, 2020). Moreover, the recent need for remote learning/teaching due to the COVID-19 pandemic situation has rendered kahoot or other similar platforms more popular for distant learning activities. A short description of the platform is provided in the next subsection. Primary results on kahoot GBL approaches have revealed positive feedback from students, promising its further exploitation in Greek educational contexts (Tzafilkou and Economides, 2020).

Taking everything into account, we would strongly recommend that game-based learning should gain space in the Greek educational system. We understand the difficulties at the younger ages but the teachers are positive. At least where it is possible, in the secondary and higher education, game-based learning could be very helpful because it cultivates skills and techniques that are not feasible with any other teaching method. According to these study findings, we believe that it would be very important to use ICT features and GBL tools and approaches in order to modernize the teaching methods and make learning entertaining.

Kahoot: A GBL platform popular in Greece

the countries around the globe, from more than 3, 2 billion players (Kahoot, 2013).



Figure 2. Kahoot GBL Platform

The game design process in Kahoot is a very easy procedure and takes only few minutes. Anyone can create questionnaires and quizzes for any subject, through a user interface, by following easy steps.

There are already more than 40 million ready-to-play games offered by Kahoot, inside the platform, for many topics. One very important feature is that the game can be played by smartphones through iOS or Android software, without any difficulty (Kahoot, 2013).

The majority of Kahoot games follow a specific pattern: the educator creates the game and becomes the 'gameshow' host. Learners enter the room by typing the specific game code (PIN CODE), provided by the educator. The game play is accessible through all different devices and easy for all age groups. The player who answers correctly and faster than the other players the questions is the one who wins the game. This creates a sense of competition between the players and this is something that usually attracts the interest of students. Especially, when the educator promises a prize for the winner, this emotion becomes even stronger. At the end of the game, the host can have a clear overlook of the detailed results of the game, in a graph model.

Compared to other learning methods, game-based learning and especially Kahoot GBL approach makes learning more entertaining and interactive. The key element which makes Kahoot unique is its easy-to-use interface, combined with catchy music and colors. All in all, Kahoot is one of the most used games for learning, and especially nowadays, during the COVID-19 pandemic crisis, it could be extremely helpful for the teacher work.

Gamelearn: The most awarded game-based learning platform in the world

The Gamelearn platform has been broadly integrated in the business and educational GBL contexts, mainly through start-ups cooperations, in several European countries, including Germany, Greece, Spain and Check Republic. In Greece, the Wide Learning¹ start-up has applied Gamelearn within its moodle-based e-learning solutions to increase e-learning courses completion rates and provide its clients with engaging video-based GBL experiences.



Figure 3. Gamelearn GBL Platform

Gamelearn develops video games and simulators to train, communicate, inform, and engage learners and employees. It is estimated that Gamelearn-based solutions achieve a 90% completion rate in e-learning courses, contrary to the 30% rate achieved by traditional e-learning approaches (Techcrunch, 2018). Gamelearn integration in several projects worldwide has showed to achieve higher levels of learners' confidence, self-control, self-awareness, creativity, teamwork, problem solving and decision making skills (Gamelearn, 2020).

Gamelearn sells internationally and offers its platform in four different languages while the startup's games are translated into dozens of different languages.

¹ <https://wideservices.gr/el/ypiresies-proionta-gr/content-library/game-learn>

Benefits of Game-Based Learning in Education

Video games have a great positive potential and value in the educational field and they can attract children's and adolescents' attention. Games can be utilized as research and estimation instruments. They can likewise help youngsters in defining objectives, guaranteeing objective practice, giving input, fortification, and keeping up records of social change. Also, they are valuable as they can gauge execution on numerous undertakings and be effortlessly comprehended. Besides, these sorts of games can analyze a few learning-related cognitive or affective items like self-efficacy, self-concept, individual differences, etc. They are fun and stand out for people for an extensive stretch of time. In addition, they can hone IT abilities and permit members to encounter oddity, interest and challenge (Griffiths, 2002). Despite all the above, there are indeed positive effects that some teachers and parents have already noticed. There are many experts such as William Massy that provide practical guides and created learning games in order to build games that communicate their knowledge and experience (Admiral et al., 2011).

Disadvantages Game-Based Learning in Education

Although several research works (e.g. Becker, 2007; Erhel & Jamet, 2013; Hou, 2015) have pointed out the positive effects that GBL brings to learning outcomes, only a few highlight the potential drawbacks and limitations that GBL brings. For instance parents, teachers, and other educators question the effects of this type of learning since they have doubt in whether students are benefiting the students rather than distracting them from their studies Coffey (2009).

In Table 3 we interpret the cited statement (text excerpts) retrieved from the reviewed study that was found to express some sort of difficulties or disadvantages regarding GBL features and implementation in educational contexts. The excerpt is interpreted to present the student learning related attitude, mental state or performance item (mainly based on the works of Bosch et al., 2015; D'Mello, 2013; Lehman et al., 2008; Pekrun, 2011 on learning related affective states) that is negatively affected. The interpretation of the reviewed information has been conducted following a qualitative thematic analysis approach, where common themes were identified. These themes mainly regard GBL features and/or students' attitudes and mental/learning states.

Conclusions

This study presents a brief state of the art about the popular Game-Based Learning approaches that have been recently implemented in educational contexts. Focusing on the implementation of GBL in Greece, this work is the first attempt towards analyzing the Greek landscape and providing with key evidence about its rare implementation which is limited in the context of Higher Education.

The first research question aimed to identify the main GBL types that have been used in all educational contexts, depicting one representative game-example for each type.

The second research question was formulated to examine the extent that GBL approaches are implemented in Greece, attempting to explore its effects on all educational levels.

Finally, the last research question aimed to contribute in the identification of the main benefits and the main

difficulties that GBL educational implementation might bring.

Table 3

Qualitative interpretation of the expressed negative excerpts

Statement on Disadvantage/Drawback	Source	Student Learning Related Attitude/State/Performance Item
<i>"the effort put into using the games is not worth"</i>	Coffey (2009)	Learning performance
<i>"..games may be more distracting than a typical learning.."</i>	Coffey (2009)	Attention (deficit)
<i>"...the goals of the games do not necessarily always align with the learning goals of the classroom"</i>	Coffey (2009)	Learning performance, Disengagement/interst
<i>"..students aren't actually learning anything"</i>	Admiral et al., (2011)	Learning performance
<i>"...students are only wasting their time"</i>	Admiral et al., (2011)	Learning performance, Boredom/disengagement
<i>"..constant computer use can affect a child's attention span and focus"</i>	Adams (2017)	Attention (deficit), Concentration
<i>"Constant switching between programs, games or videos makes it more difficult to focus on tasks for longer periods of time"</i>	Adams (2017)	Attention (deficit), Cognitive Load
<i>"...this can affect a student's studies and grades"</i>	Adams(2017)	Learning performance, Academic achievemnt
<i>"..sometimes it can lead to addiction"</i>	Adams(2017)	Computer addiction
<i>"...student will avoid physical activity and become less social"</i>	Adams (2017)	Social skills
<i>"..underdeveloped social skills can result in loneliness and depression"</i>	Admiral et al., (2011); Adams (2017)	Isolation, Depression, Self-Efficacy
<i>"..there is also an inability to express questions about the gaming exercises"</i>	Admiral et al., (2011)	Communication, Interaction

In the end, we have come to the conclusion that there are plenty of games for all the levels of the educational system, with proven learning results. It is also true, that in foreign educational systems of the developed

countries, game-based learning technics are used much more frequently than in Greece. Hence, this study seeks to encourage junior researchers to further investigate the topic, identify and effectively address

all the key features that render educational GBL implementation rare or impractical in Greece and other European countries.

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