



TOWARDS AN ENGAGED EDUCATION: EXPLORING THE CRUCIAL IMPACT OF ENGAGEMENT AND MOTIVATION IN THE SUCCESSFUL INTEGRATION OF SERIOUS GAMES (PRACTICAL WORKS OF PHYSICS)

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ABSTRACT

Serious games are currently being used in learning environments (Zheng et al., 2021), which indicates that teachers have already adopted this phenomenon as a possible means of learning. Therefore, it is possible to consider video games played in leisure time as a kind of learning tool, not only for the development of subject matter but also for the development of other qualities. Our article focuses on how serious games can play an interesting role in the learning of science subjects in a school environment. It shows how entertainment tools (playing) can be used to achieve educational goals (learning). Moreover, knowing how to take advantage of use games in the science educational environment, will help students to learn and concentrate on their studies in a way that is more enjoyable, more amusing, and, above all, not boring, especially as learners spend a considerable amount of time playing games, which can sometimes be as long as the hours spent in class (Lillo & Burelli, 2020).

INTRODUCTION

Since the advent of digital tools, numerous studies have focused on the role of serious games in the teaching/learning act (Gee, 2003; Whelchel, 2007; Berry, 2011; Linderoth, 2012; Alj & Benjelloun, 2013; Hamari et al., 2014; Lillo & Burelli, 2020) most of these studies suggest that serious games can develop advanced forms of thinking and learning, including encouraging problem-solving and critical thinking. Others examine the educational effectiveness of digital games and their influence on student motivation (Hamari et al., 2014). Some have even looked at the impact of games on the assessment process (Zheng

et al., 2021). These tools have become a necessity in education, and the technologies available to teachers are constantly improving and offering new possibilities. This depends on how the school uses its potential, which should be a major asset in promoting student success (Sanchez et al., 2011). To this end, The Moroccan Ministry of National Education, Vocational Training, Higher Education, and Scientific Research has been promoting the integration of ICT (information and communication technologies) into education since the 2000s (Mastafi & Mabrou, 2016). Some of the measures taken by the Moroccan Government are

-GENIE Program (Generalization of Information and Communication Technologies in Education):

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Morocco aims to financially promote the use of ICT in education and support for learning. The program aims to equip schools with computer equipment, train teachers in the use of ICT, and develop digital teaching content.

-Teacher training initiatives: The Ministry of Education has set up a training program to familiarize teachers with the integration of ICT into teaching practice. This includes training on the use of digital tools and the design of interactive courses.

-Providing schools with ICT infrastructure: The Moroccan government will invest in the technological infrastructure of schools by providing computers, internet connectivity, and other equipment necessary to facilitate access to technology in the educational environment.

-Creation of digital educational content: he has worked to develop digital educational content to enrich the learning experience of students. This can include online educational resources, learning platforms, and interactive materials.

-Networks and partnerships: Morocco has sought partnerships with international organizations, technology companies, and civil society organizations to support the integration of ICTs in education. Such partnerships may include joint initiatives to develop educational technology solutions.

-e-Education Strategy 2015-2021: Morocco has developed an e-Education Strategy 2015-2021. The strategy aims to create a digital learning environment that facilitates learning, teaching, and educational management. With these guidelines, the ministry wanted to encourage teachers to change their ways of doing things to include technology in their teaching (Mastafi & Mabrou, 2016; Nafidi et al., 2018; Rechidi et al., 2020; Nachit, 2021; El bouffy, 2022).

Moreover, since technology is now part of our daily lives and most students have access to it from multiple locations, it is reasonable to believe that teaching will no longer be limited to the classroom. To this end, the use of games, both inside and outside the classroom, allows students to express themselves freely, learn at their own pace, learn individually, and self-evaluate, away from the psychological

constraints that the usual school space opposes (Sanchez et al., 2011).

Now that all these reasons have been given, it is clear why it is so important to adopt and integrate serious games into the teaching/learning process. In other words, what is the potential of using a serious game to replace a physics course for secondary school students? And what is the current role and importance of serious games in the practical work of teaching physics?

1. Use of serious games in Physics Education:

The teaching of science, especially at the secondary level, is characterized by dysfunctions and shortcomings in the quality of the pedagogical approaches used. The skills of the teachers and the nature of the educational activities developed are far from enabling significant and lasting learning (Eddaif et al., 2017, Jarmouni, 2021). The actions taken and how learners are supported do not in any way make it possible to achieve the objectives assigned to this teaching (Eddaif et al., 2017).

The problem of the quality and efficiency of physics education is still strongly characterized by recurring obstacles. Take, for example, the inadequate infrastructure: educational organizations in Morocco could face difficulties such as laboratories that are simply not well equipped or classrooms lacking the necessary equipment for practical experiments. Secondly, there is the problem of the scarcity of educational resources. Having limited access to high-quality textbooks and online materials can undermine the effectiveness of physical science education. Consider a third potential challenge: inadequate teacher training. On closer inspection, a major problem emerges the lack of teachers equipped specifically to teach the physical sciences. Another puzzling problem is the low availability of continuing education, which could have a significant impact on the quality of education. Let me now turn to the fourth challenge, Student Disinterest. A lack of enthusiasm for, and apathy for,

the physical sciences can be an obstacle in student life (Bryan, 2014; Mazouze & Lounis, 2015). Often, this is related to old-school teaching techniques or perhaps even a perceived irrelevance to the subjects taught. The major educational reform currently underway contains few "clauses" capable of bringing about significant changes like the educational activities developed. Generally speaking, these problems are related to the complexity of the concepts studied, the difficulty of relating the models and theories taught in their physics courses to the 'real world', psychological 'blocks' regarding the usefulness and difficulty of physics, on the one hand, and the nature of the educational activities employed, on the other. Traditional approaches are characterized by teaching and training habits (Eddaif et al., 2017; Jarmouni, 2021). Similarly, secondary school students perceive physics education as very difficult, which leads to a poor perception of the subject. This perception is reflected in a very sharp decline in the average level of marks in examinations, and there are several causes and factors behind this problem. One of the reasons for this failure is the virtual absence of practical work sessions, which should be a feature of all physics teaching. Many causes and factors have been put forward to explain this, including budget constraints, the massification of teaching, and the lack of skills among teachers to undertake and use practical work (Bryan, 2014; Mazouze & Lounis, 2015). In the same vein, activities based on problem-solving are an effective pedagogical tool for promoting learning and consolidating learners' achievements in secondary education, as well as being an essential part of science teaching (Guedj, 2005). In the same vein, science educators and didacticians stress the importance of practical work in conceptualizing and giving meaning to the various concepts under study. A theoretical presentation of this work in no way makes it possible to grasp the meaning and scope of the concepts under study.

This is the time to mention that the recurrent use of such activities can also be explained by the inability of teachers to set up and test alternative

teaching solutions, which has multiple causes: lack of knowledge or skills to use these solutions, difficulty in accepting changes in working methods that have sometimes been tried and tested for many years. Too often, courses are still presented using traditional teaching-learning methods, whereas there are many opportunities to present these courses engagingly and attractively using digital games (Alj & Benjelloun, 2013). To this end, the teacher can be led to propose games that offer the possibility of seeing, in a reduced or accelerated model, reactions that are not accessible to direct observation for reasons of time (for example, the very low speed of certain reactions) or material (lack of mostly dangerous products, banned or very expensive) (Alj & Benjelloun, 2013; Hamari et al., 2014). To contribute to the search for some explanatory elements for this major problem, our work will consist of evaluating the place and importance of serious games in the implementation of practical work in the teaching of physical sciences (Guedj, 2005).

In short, these games have led to significant progress because they have a positive impact on learning and are a real solution to stimulate learners' learning. Optimal use of these games will improve the acquisition of knowledge and skills by learners and researchers in different fields in general and science in particular (Berry, 2011; Hamari et al., 2014; Lillo & Burelli, 2020).

2. Identification of integration factors:

Thanks to serious games, and simulations in particular, science education has made significant progress and added value. Practical work, which used to require expensive, specific, and sometimes dangerous equipment, has been transformed into games and simulations thanks to computer resources that represent virtual experiments very close to models of real experiments, to simplify reactions and facilitate physical phenomena. In this way, the learner is transformed from a passive recipient of information to an active learner who constructs the

information and interacts with the elements presented. In other words, the learner constructs their scientific knowledge rather than simply receiving it (Pittman, 2013).

Serious games require a higher level of engagement from learners and capture their attention and concentration in a way that is more heightened than is appropriate in the classroom. Learners would therefore spend as much time playing in their interests as they would studying in class. "Mr. Young has been teaching physics at a school in Quebec for 16 years and has turned to video games as a way of getting students in his class to pay more attention to their learning. He has noticed that they start working (playing) 'like crazy' with a high level of motivation and commitment". (Ferreira et al., 2016; Khouna et al., 2017, p.15). Mr. Young demonstrates that physics, which has been a difficult or inhibiting subject for learners, becomes a pleasure and entertainment for his learners (Ferreira et al., 2016). His experience has shown that games can change a student's attitude toward a subject. Similarly, games can ensure student engagement, participation, and perseverance (Khouna et al., 2017).

Learners who play games are also characterized by a significant increase in motivation and the acquisition of cognitive and psychomotor skills, as well as positive attitudes (Sauvé et al., 2005). Games are becoming a very familiar culture for secondary school students. The average young person in a country with a strong gaming culture will have spent more than 10,000 hours playing online before the age of 21. Ten thousand hours is an interesting figure [...] for the most part children in the world, 10,000 hours is close to the number of school hours from primary education to high school (Mandart, 2013, p.3). Generally speaking, games are associated with high motivation due to their particularly exciting nature (playfulness, interactive and competitive aspects, challenge...) and their community. The use of educational games creates an 'engagement loop' that enhances feedback, encourages peer interaction, and

differentiates according to the needs of the learner (Khouna et al., 2017; Mandart, 2013).

In addition, serious games, especially simulations offer the opportunity to study and analyze physical phenomena that are impossible in practice, but feasible to reveal real physical laws. They can build virtual experiments that are as valid as their physical counterparts in a very short time and with less effort. Teaching physics with serious games is about encouraging and helping learners to effectively construct, explore and apply the laws of physics (Pittman, 2013; Plante, 2016; Sutter Widmer & Szilas, 2017).

According to Ferreira et al. (2016), learners come with the ability to engage and fully immerse themselves in the world of the game. They spend many hours immersed in every task and detail of the games. Why not replicate the same skills and atmosphere of the game in the classroom? Alvarez & Djaouti (2010) say the integration of different elements of play into teaching can take different forms, these elements involve the use of game mechanisms, such as points, levels, badges, and rankings, in contexts other than gaming, to improve engagement, motivation, and retention of information. By integrating these elements, learners are more likely to remain attentive and focused on the subject taught. It has been observed that this approach can also lead to a more enjoyable and rewarding learning experience. Integrating game features such as point systems, incentives, multi-level steps, challenges, and progress tracking can improve the educational experience. Creating compelling stories or engaging stories related to educational materials is a valuable skill. By doing so, you can create scenarios that engage learners and make the learning process more enjoyable, challenging, and memorable. If we can redirect their interest from killing each other (an all-too-common theme in video games) to useful and educational pursuits, then video games become a great asset for teachers (Plante, 2016). In addition, Sandford et al. (2006) study on the use of games in schools showed

that students were less engaged in their education and more engaged in games as a leisure activity (Ferreira et al., 2016). Therefore, the idea of using computer games in learning responded to students' interests and got them more involved in their education. Sandford et al. (2006) point out that combining students' interests outside of school with what is expected of them in school would be ideal for learning.

On the other hand, although the use of games in learning increases students' motivation at school, it is important to analyze the characteristics of video games so that their use in the classroom does not become as familiar as those used at home. If teachers do not pay attention to this dilemma, students may use the game as a means to show off their gaming skills rather than as a learning tool (Sandford et al. 2006).

Stanley (2012) states that teachers should ask their students about the computer games they play at home, that this would be a good way to bond with the students. In addition, Stanley (2012) states that teachers should try to play the games their students play, even if it is not necessary to use the games in the classroom. It would be beneficial to gain experience in game design to make teachers aware of the different interests of students Stanley (2012). His statements imply that online gaming has become such an influential activity for young people that teachers are urged to investigate this phenomenon. Therefore, attempting to capture students' current interests and apply them in the classroom would make students feel that they are participating in the evolution of the school system.

On the other hand, now that technology is available in schools and laptops have been made available to a large percentage of students, it is possible to believe that teaching will no longer be confined to the classroom but will be able to take place in more varied places and at more varied times. To this end, the use of games, both inside and outside the classroom, allows students to express themselves

freely, learn at their own pace, learn individually, and assess themselves, far from the psychological constraints of the usual school environment (Sanchez et al., 2011).

In short, the integration of educational games can be a powerful tool for mobilizing mental activity and acting as a catalyst for learning, especially as conventional or traditional teaching methods have proved unable to capture the interest, enthusiasm, or curiosity of learners. Indeed, a learner playing puzzle video games have to mobilize all his knowledge to find the solution, and in the case of board games, he uses not only his knowledge but also his know-how. Consequently, games need to mobilize skills and develop personal strategies while respecting the rules, and not just by applying learned procedures as in educational software.

3. DISCUSSIONS:

Lillo & Burelli (2020) state that serious games help players to develop various qualities such as the ability to analyze, contemplate and observe details. This implies that the learner not only receives the result of a physical phenomenon but also analyses and interprets this result. As in Rieber's (1991) experiments, the course content (presented in the form of a game) relates to Newton's laws. In this way, the subject can directly control the movement of the ball and try to direct it toward the target. The authors compared simulations with textual feedback with animated graphics. In addition, half of the subjects were given an explanation consisting of five screens that used a combination of text and animated graphics to describe the principles of motion. The results showed that the subjects who received the explanation performed better on the post-test than the subjects who did not receive the explanation. In addition, subjects who received graphical commentary also performed better than those who received textual commentary. The game scores were better for the subjects who received the graphical comments. The fact that such qualities develop from

computer gaming activity suggests that gaming has a positive effect on gamers.

In addition, Linderoth (2012) mentions that the serious games industry is booming, and new technologies are constantly being developed. It is therefore difficult to distinguish games that are useful in the learning process from those that lead to dangerously high levels of consumption and have a detrimental effect on students/gamers. Linderoth (2012) may be referring to the fact that investing too much time in these games could have as many undesirable effects, such as a lack of social skills, as it could become an isolating activity in the worst case. Teachers must know how to adapt teaching methods to the technology being used and that these teaching methods interact with the technology rather than being two separate processes.

Lillo and Burelli (2020) have added other benefits of games for students: games enable them to

Engage and motivate learning through play fosters motivation to succeed in school.

Co-construct knowledge: according to socio-constructivist researchers, social interaction is beneficial for learning.

Improve cognitive skills: the different uses of the new tools enrich learners' performance; thanks to the reflexivity they acquire in processing information.

Autonomous learning: we are gradually seeing the decline of the lecture method to the detriment of autonomous teaching, in which technology plays a key role...

CONCLUSION

Currently, video games are being integrated into educational contexts (Ferreira, 2016), suggesting that teachers recognize their potential as learning tools. For example, recreational video games can be viewed as learning tools, contributing not only to the development of academic knowledge but also to the acquisition of other skills.

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