DOI: 10.2478/9788367405805-012

# EXPLORING THE EDUCATIONAL POTENTIAL OF VIDEO GAMES IN THE DIGITAL AGE

FLORENTINA ALINA GRIGORESCU (PÎRVU)
*FAIMA Doctoral School from National University of Science and Technology POLITEHNICA Bucharest, Romania, alina.pirvu@lrfb.ro*

In today's world, technology is a part of people's lives more than ever before. This has also led to the development of video games, which are used not only for relaxation and entertainment but also as a potential educational tool. As traditional methods used by teachers are becoming increasingly less engaging for students who are so accustomed to technology, digitalized education and the use of video games could improve the quality of the educational process. This paper investigates the impact of video games on education and analyzes how they can be effectively integrated into the teaching-learning-assessment process. The main objective is to explore the educational potential of video games, highlighting their benefits and challenges. The study employs a mixed-method approach, combining a review of relevant literature with case studies and interviews with teachers who have integrated video games into their educational programs. The results indicate that video games can enhance students' motivation, facilitate active learning, and develop cognitive and social skills. However, their effective use depends on the proper selection of games and their integration into activities that allow students to develop specific skills, not just have fun. The study contributes to the understanding of how video games can be used as an innovative pedagogical tool, offering new perspectives on their implementation in education. Video games represent a unique opportunity for education, but they require a careful and well-planned approach to maximize educational benefits and minimize potential risks.

Keywords: video games, digital education, interactive learning

## INTRODUCTION

The 21st century is often considered the era of technology, which plays a crucial role in our lives today. Technology simplifies and streamlines many aspects of our work. Its influence is evident in almost every field, including education (Raja & Nagasubramani, 2018).

A considerable amount of financial resources are allocated to technology by schools, families and policy makers in the hope of improving educational outcomes. In addition to the investments made by schools, central governments often play an important role in providing or subsidizing computer equipment and Internet access (Bulman & Fairlie, 2016).

## THE ROLE OF TECHNOLOGY IN MODERN EDUCATION

ICT, or "Information and Communications Technology," refers to technologies that facilitate access to information through telecommunications. Although similar to information technology (IT), ICT focuses mostly on communication technologies, including the Internet, wireless networks, mobile phones, and other means of communication. Currently, we have more opportunities to integrate ICT into teacher training programs, thus contributing to improving the quality of teaching. Effective use of these technologies in teacher training can significantly increase the quality of the educational process. A well-structured training program is essential to meet the needs of contemporary teachers who want to learn how to use ICT effectively in their teaching work (Ratheeswari, 2018).

Today, knowledge and information are essential for productivity, competitiveness and development. For this reason, countries focus on improving the quality of education, essential


https://doi.org/10.2478/9788367405805-012

for the development of human capital. It is important that education keeps pace with the rapid developments of the world, and information technology plays a central role in this process, offering new opportunities, especially through collective communication. However, developing countries fear that they are being left behind in the "Information Revolution" by allocating funds to technology without sufficiently preparing the ground for its effective use.

Modern education requires simple and effective technologies to meet its needs, and to properly integrate IT, policies are needed that include: expanding IT skills through educational programs, using IT to make institutions more efficient, supporting IT research, creating an appropriate climate for the use of IT in education and the promotion of collaboration between various institutions. It is also important to expand the culture of using IT in education, constantly evaluating their needs and effectiveness (Hamidi *et al*., 2011).

Most educators will make the effort to integrate technology into their teaching only when they are confident that it will lead to substantial improvements in student learning outcomes. Therefore, for technology to drive educational change, it is essential to understand what learning outcomes can be improved by technology and the conditions under which these improvements can be achieved in practice. Providing clear guidance on how to effectively implement technology to enhance student learning is critical to its use as a catalyst for change in education (Means, 2010).

## Video Games as an Educational Tool

Video games have become deeply integrated into the daily lives of millions of young people around the world, having a considerable impact on today's culture and society. However, many authorities and most educators initially rejected them, focusing on the perceived negative effects. However, over the past two decades, extensive research has led to a more detailed, nuanced, and in-depth understanding of the impact of video games (De Aguilera & Mendiz, 2003).

Serious video games are valuable tools for learning specific strategies and acquiring knowledge, while contributing to the development of skills associated with the culture of the information society. This form of learning has the potential to have long-lasting effects (Gros, 2007).

Here are some examples of games developed for educational purposes as a result of this effort. Immune Attack (https://www.sciencegamecenter.org/games/immune-attack), a serious educational game created by FAS, Brown University and the University of Southern California, is a first-person strategy game designed to teach complex biology and immunology concepts to students by an alternative method.

Another example is Food Force (https://www.myabandonware.com/game/food-force-m1f), an educational game developed by the United Nations World Food Program in 2005. In this game, users are involved in food distribution missions in a country affected by famine, with the aim of helping her recover and become self-sufficient. Players assume the role of a scientist in a team of United Nations experts, including nutritionists, logistics officers, pilots, call officers and food procurement directors (Annetta, 2008).

Although video games and simulations (edutainment) are increasingly used in education, their mechanisms are still poorly understood. Most research has focused on comparing games to traditional teaching, but this approach can be problematic because each method represents different pedagogical strategies. These methods reflect distinct values of the instructional designer and are appropriate for different types of learning experiences (Squire, 2003).

**Using Video Games in the Classroom**

In 2002, a study at a public high school in Georgia evaluated AquaMOOSE 3D, a graphical environment designed to facilitate the exploration of three-dimensional mathematical concepts. The goal was to capitalize on the entertainment aspect of video games to create a more immersive learning environment compared to traditional methods. The research was conducted through a quasi-experimental study, comparing the AquaMOOSE intervention with classical curriculum-based instruction.

The researchers evaluated the impact of AquaMOOSE on students' understanding of the material in an experimental classroom. Four of the eight students interviewed found the software useless for learning, with some reporting that it was confusing and did not improve their understanding of mathematics. Although a few recognized some advantages, such as a clearer view of mathematical concepts, most of the feedback was negative.

End-of-year polls reflected similar views, with some students expressing dissatisfaction with AquaMOOSE, finding it confusing and ineffective. The discussion points out that prior to the study, students in the control group had expressed a desire to use the software and had high expectations due to their familiarity with video games. This created a sense of inequity as the control group did not have access to AquaMOOSE until the study was completed (Elliott *et al*., 2002).

Video games are seen as promising for teaching and learning in the 21st century, but their acceptance by students is not guaranteed. A study of 858 high school students used an analytical model to examine and predict their acceptance of video games.

The results showed that the students do not form a homogeneous group in terms of the use of video games, there are notable differences between the groups. Some students do not play video games at all, and gender differences are evident, with males having a more favorable attitude toward the use of video games in education compared to females. The Technology Acceptance Model (TAM) has proven useful in the context of learning through video games, emphasizing the importance of perceptions of usefulness and ease of use. These results are consistent with other studies of technology acceptance in education, but contradict previous research on video games for entertainment, where perceived usefulness had less impact.

The study identified learning opportunities as a crucial factor in determining student preference for video games in the classroom, along with ease of use and usefulness. It is important to distinguish between utility and learning opportunities because they have a process-product relationship in education. Gender differences are not directly related to video game preference, being mediated by experience and ease of use, with experience having a significant role in shaping students' perceptions (Bourgonjon *et al*., 2010).

Another study exploring the relationship between adolescents' video game use and their school behaviors and performance in different settings was conducted on a sample of 508 adolescents, boys and girls, randomly selected from secondary schools in Tehran, Iran. Data were collected through a questionnaire completed by parents at the end of the school year regarding school performance, student behavior, and video game use. Data analysis was performed using descriptive statistics, the contingency coefficient, and chi-square tests.

The results indicated that most teenagers are interested in video games, with 76.8% of them playing occasionally. Girls with older mothers tend to use video games more frequently than those with younger mothers. Boys whose mothers are homemakers and who have portable devices in their rooms spend more time playing video games and show higher levels of aggression. In addition, girls who frequently play video games exhibit unusual behaviors and a different mental state. Both boys and girls reported a significant percentage of yelling and binge eating related to time spent playing video games.

The table below records data on the behavior of students playing video games.

Table 1. Variables related to the effects of video games on behavior and school performance

| Variable | Option | Total |
|---|---|---|
| Student's ability to talk to his/her parents about his/her problems | Very much or much | 323(65.5%) |
| | Moderate | 136(27.6%) |
| | Little or very little | 34(6.9%) |
| Student's behavioral and mental status | Hyperactive | 29(5.9%) |
| | Too happy | 149(30.5%) |
| | Normal | 310(63.6%) |
| The sum of effect of the use on student's behavioral & mental status | Very much or much | 53(11.2%) |
| | Moderate | 127(26.7%) |
| | Little or very little | 240(50.5%) |
| | I do not know | 55(11.6%) |
| The quantity of change in student's behavior due to game | Too violent | 11(2.4%) |
| | Moderately violent | 99(21.7%) |
| | Not become violent | 347(75.9%) |
| The quantity of change in student's self-control due to games | Completely loosed | 6(1.3%) |
| | Moderately loosed | 69(15.1%) |
| | Without change | 381(83.6%) |
| The amount of student's dreaming due to games | Very much or much | 23(4.7%) |
| | Moderate | 67(13.8%) |
| | Little or very little | 161(33.1%) |
| | He/she does not dream. | 235(48.4%) |
| Overeating and shouting during using games | Overeating | 27(5.6%) |
| | Shouting | 66(13.6%) |
| | Both of them | 27(5.6%) |
| | None of them | 365(75.2%) |
| The quantity of change in student's scholastic performance due to games | Better than past. | 27(5.9%) |
| | Worse than past. | 53(11.5%) |
| | Not changed | 380(82.6%) |

Source: adapted from Dirandeh *et al*., 2015

Thus, video games have a considerable impact on adolescents' behavior, but not on their school performance. In addition, social factors influencing health significantly affect how adolescents interact with video games (Dirandeh *et al*., 2015).

## METHODOLOGY

The study employs a mixed-methods approach to investigate the educational potential of video games by analyzing existing studies on the use of video games in education to identify their benefits and challenges, examining cases where video games have been integrated into educational programs to assess their impact on student motivation and learning, and conducting interviews with eight teachers from Romania, representing both private and public schools, to gather their opinions on the use of video games in education. The interviews explored the frequency of use, perceived advantages and disadvantages, and the types of video games considered suitable for lessons. The collected data are analyzed to provide insights into how video games can be effectively integrated into the teaching and learning process.

## ROMANIAN TEACHERS' OPINION REGARDING THE USE OF VIDEO GAMES IN EDUCATION

A number of 8 teachers were interviewed regarding the integration of video games in the courses they taught. A number of 5 teachers teach in a private school, and 3 of them teach in a state school, both from Bucharest, Romania. The interviews took place by means of telephone discussions; the answers of the teaching staff being noted by the researcher during the discussions. The interviews took place in August 2024, according to an interview guide made by the author of the present study. The interview guide was composed of six main questions. Below are the collected questions and answers.

1. *Do you think that video games can contribute positively to the educational process? If so, in what way?*

Teachers' responses to this question varied, reflecting both their enthusiasm and skepticism about the benefits of using video games in the educational process. Those who argued in a positive way for the use of video games highlighted the fact that they can help improve student motivation and facilitate learning through interactive experiences. For example, one of the teachers at the private school mentioned that he used video games to explain some difficult physics concepts. He also said he has seen an increase in students' interest in his subject following the use of video games.

2. *How often have you used video games in class?*

All of the 8 teachers claimed to have used video games in the classroom at least once. However, only 3 of them said they used them consistently. This may be due to the specifics of the subject taught by the teacher, his skills, the interest of the students or other factors related to the materials and teaching aids.

3. *What do you think are the main advantages and disadvantages of using video games in education?*

One of the main advantages mentioned by all the teachers was related to the increase in students' motivation and interest in the taught subject. Also, many teachers have mentioned that learning has become much more practical due to the fact that in video games you can simulate various real or hypothetical situations that put students in various poses from which they can learn more easily. In addition, depending on the discipline taught, teachers also mentioned the development of certain skills through video games such as: critical thinking, problem solving, creativity, decision making, but also communication and teamwork skills.

Some teachers expressed concern that video games could be distracting or addictive to students, stressing the importance of using them sparingly and within well-defined educational contexts. A teacher from the state school pointed out the logistical difficulties and lack of resources needed to implement these methods in mainstream education, adding that continuous training of teachers would be essential for the success of this initiative.

4. *Are there certain types of video games that you think are more suitable for use in lessons? If so, what are they and why?*

The teachers interviewed provided some examples of suitable video games for use in the classroom. It should be noted that, depending on the discipline taught, each teacher mentioned a certain type of game. The table below shows the games listed by the teachers and their type.

Table 2. Examples of video games used by teachers

| Serious games | Simulation Games | Adventure and Interactive Storytelling Games: | Augmented Reality (AR) and Virtual Reality (VR) Games |
|---|---|---|---|
| Minecraft Education Edition | The Sims | Life is Strange | Google Expeditions |
| Working with Water | RollerCoaster Tycoon | Tell Me Why | Tilt Brush |
| Little Learning Machines | Flight Simulator | | VR Lab |

Source: author's own research

5. *How do students react to the integration of video games in the learning process? Have you noticed a change in their academic engagement or performance?*

All the teachers reported observing a significant increase in student engagement when video games were integrated into the learning process. They also noted that video games contributed to a deeper understanding of difficult concepts, as students could apply theoretical knowledge in a practical and interactive way. On the other hand, some teachers mentioned that although student engagement increased, they did not always see a significant improvement in academic performance. They also highlighted that integrating video games into the curriculum must be done carefully, emphasizing content and utility, so that the games do not become a distraction but an effective learning method.

6. *To what extent do you think additional teacher training is needed to effectively use video games in education?*

All the teachers agreed and even strongly supported the fact that teachers in Romania need training courses to help them use video games in the classroom as effectively as possible to increase the quality of the educational act.

Therefore, the opinions of the teachers interviewed suggest that, although there is an increased interest in the use of video games in education, their widespread implementation would require not only material resources, but also a change of mentality among teachers and decision-makers in the educational system. It is also necessary to train teachers so that they can use technology in the classroom in the most effective way.

## CONCLUSIONS

In conclusion, video games possess significant educational potential, offering both advantages and challenges when integrated into the learning process. The literature review indicates that video games can boost student engagement and motivation, although concerns about their effectiveness and the risk of distraction remain. Case studies show that, with careful implementation, video games can positively influence student learning outcomes, especially in terms of motivation and active participation. Interviews with Romanian teachers reveal a cautiously optimistic view, with educators acknowledging the potential of video games to enhance traditional teaching methods. However, they stress the need to choose appropriate games and maintain a balanced approach to ensure educational goals are achieved. Overall, the study suggests that video games can be a valuable educational tool, but their integration requires thoughtful planning and consideration of both their benefits and potential challenges.

## REFERENCES


Annetta, L.A. (2008). Video Games in Education: Why They Should Be Used and How They Are Being Used. *Theory Into Practice*, *47*(3), 229–239. https://doi.org/10.1080/00405840802153940

Bourgonjon, J., Valcke, M., Soetaert, R. & Schellens, T. (2010). Students' Perceptions about the Use of Video Games in the Classroom. *Computers & Education*, *54*(4), 1145–1156. https://doi.org/10.1016/j.compedu.2009.10.022

Bulman, G. & Fairlie, R.W. (2016). Chapter 5 – Technology and Education: Computers, Software, and the Internet. In: E.A. Hanushek, S. Machin & L. Woessmann (Eds.) *Handbook of the Economics of Education*, *5*, 239-280. https://doi.org/10.1016/B978-0-444-63459-7.00005-1

De Aguilera, M. & Mendiz, A. (2003). Video Games and Education: (Education in the Face of a "Parallel School"). *Computers in Entertainment*, *1*(1), 1–10. https://doi.org/10.1145/950566.950583

Dirandeh, E., Sohrabi, M.R., Dirandeh, A., Kaghazloo, L., Hajihazloo, Z. & Pouriran, R. (2015). The Effect of Video Games on Teenagers' Behavior and Performance: A Cross-Sectional Study in Tehran. *Social Determinants of Health*, *1*(3). https://doi.org/10.22037/sdh.v1i3.12094

Elliott, J., Adams, L. & Bruckman, A. (2002). No Magic Bullet: 3D Video Games in Education. Proceedings of ICLS 2002. Seattle, Washington, October 2002

Gros, B. (2007). Digital Games in Education: The Design of Games-Based Learning Environments. *Journal of Research on Technology in Education*, *40*(1), 23–38. https://doi.org/10.1080/15391523.2007.10782494

Hamidi, F., Meshkat, M., Rezaee, M. & Jafari, M. (2011). Information Technology in Education. *Procedia Computer Science*, *3*, 369–373. https://doi.org/10.1016/j.procs.2010.12.062

Means, B. (2010). Technology and Education Change: Focus on Student Learning. *Journal of Research on Technology in Education*, *42*(3), 285–307. https://doi.org/10.1080/15391523.2010.10782552

Raja, R. & Nagasubramani, P.C. (2018). Impact of Modern Technology in Education. *Journal of Applied and Advanced Research*, *3*(Suppl. 1), S33–S35. https://doi.org/10.21839/jaar.2018.v3iS1.165

Ratheeswari, K. (2018). Information Communication Technology in Education. *Journal of Applied and Advanced Research*, *3*(Suppl. 1), S45–S47. https://doi.org/10.21839/jaar.2018.v3iS1.169

Squire, K. (2003). Video Games in Education. *Computers in Entertainment*, *2*(1), 49-62. https://doi.org/10.1145/950566.950583