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On the Role of Digitalization and Globalization for the Development of Mobile Video Games in the Education of the Future: Trends, Models, Cases

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Abstract: The global world processes of digitalization have influenced the development of educational services and products market. To provide qualified education modern educational institutions need to use effective tools for organizing, managing, and facilitating the educational process with the help of mobile video games. The article aims to analyze the modern processes of education digitalization and the role and prospects of mobile video games in the education. The implementation of mobile applications in the educational process can provide a competitive advantage for higher education, as well as enhance the quality of individual student learning, and be useful for teachers and educators who intend to improve the methodology of the educational process. The results of the study show the growing of the market for mobile video games in education, the increase of investment and

the formation of market leaders over the past 5 years. Based on the research methodology, the specifics of mobile video games use in today's global space were conducted, and the involvement of information giants such as Google, Amazon, and other companies actively involved in the digitalization of education was investigated. It is determined that modern models of the educational process should be integrated with digital ones, actually forming a mixed model, between traditional and digital, which can improve the professional students' qualification. The conclusions and suggestions indicate that the key areas of mobile video games in education will be the creation of applications for mastering technical specialties, the demand for which is rapidly growing in the world. The practical part of the article consists in the analysis of the mobile video games development prospects and the characteristics of their key advantages and main trends in the educational market.

Keywords: mobile video games, education, educational institutions, digitalization, digital technology, information society, mobile applications.

Introduction

The modern trend of digitalization, which determines the wide penetration of digital technology in all spheres of human life, education is no exception. Mobile video games, as a tool of the educational process, is an important factor in the development of professional skills of students and pupils, because it is through the use of mobile games, increases motivation, interest and contributes to the cognitive skills of the student. In addition, mobile video games are in high demand, because almost every student owns a smartphone, reinforcing the role of information companies in the market of educational services. Mobile video games can also be useful for the teacher, as they can be used to conduct interactive lessons, contribute to the development of emotional intelligence, to improve the analysis skills of the student, to introduce relevant methods of development of digital skills of the student. In today's digitization environment, the use of video games is spreading rapidly to the European, American, and Chinese continents. Current trends are the use of highly specialized courses in mobile game platforms that can teach real-world knowledge applied to professional activities.

Research Problem

The problematic of the study is the qualitative use of modern digital technologies in education, which can increase motivation, interest, and independent involvement of the student in educational activities. Mobile video games are highly popular among young people, which creates the need for research on their use in the educational process. Modern scientists are debating about the models of organizing the educational process with the help of mobile video games. Thus, according to Atwood-Blaine and Huffman (2017), the use of mobile video games can improve the development of emotional intelligence, communication skills of the student, even in a global lockdown. The importance of introducing mobile video games in learning, according to Chen et al. (2016), shapes not only the quality of the educational process, but also shapes the student's digital skills, which is a competitive advantage in the global digitization processes, both in the education market and in the international labor market. Researchers Panagiotis and Krystalli (2020) note that the use of mobile video games will be a key tool for student involvement in the learning process, because they improve the quality of perception of the material, allow the systematic repetition of the studied material, facilitate the organization of learning activities for the teacher. Contradictory is the view of Razali (2020), who believes that the use of mobile

games should be clearly defined by the university curriculum and have a mixed form of learning between traditional and digital because it is through a mixed model that students can master the discipline. There is a debate among foreign scholars (Wichadee & Pattanapichet, 2018) on how best to use mobile video games, it is believed that the implementation of mobile video games should be designed individually for each educational institution because the use of mobile platforms in free access can inhibit the process. Therefore, scholars believe that mobile video games should also have a clear means of control coupled with traditional means of assessment, testing, quizzes, etc. Scholars Sari et al. (2022) believe that important for mobile video games is a unified assessment system that would operate on the Bologna system or use the student's own indicators of success, which can create a unified international assessment system in the use of video games. However, this issue has not yet been sufficiently investigated in the modern academic community. Prospects for further development could be the development of rating, teaching materials, and modeling the most useful mobile video games according to the needs of educational institutions.

The research problem of using mobile video games and similar content in educational practice is actively addressed in scientific research papers (Table 1).

Table 1

Coverage of the Role of Mobile Video Games in the Educational Process in Scientific Research 2015–2022

| Author(s) | Research problem |
|---------------------------------------|--|
| Bonenfant (2021) | Hypermodern video games as elements of development |
| Egea-Vivancos and Arias-Ferrer (2021) | The use of virtual reality video games |
| Seok and DaCosta (2015) | Video games as elements of behavioral model formation |
| Göksu et al. (2020) | Evolution of content in mobile video games used in education |
| Gampell and Gaillard (2016) | Evolution of content in mobile video games used in education |
| Hewett et al. (2020) | Analysis of skills developed through game-based learning |
| Lee et al. (2016) | Video games as informational objects |
| Beltrán-Carrillo et al. (2016) | Psychological aspects of video game use |
| Jean Justice and Ritzhaupt (2015) | Identifying barriers to games and simulation in education |
| Udeozor et al. (2022) | Game-based learning in engineering education |
| Toh and Kirschner (2020) | Self-directed learning in video games |

Source: Compiled by the authors based on sources from scientific metric databases Taylor & Francis, ResearchGate, Sage Journal, Elsevier.

Research Focus

In order to determine the peculiarities of the development of mobile video games in the areas of education of the future, it is proposed to study the development of the international EdTech market, as well as the popularization of the most popular mobile video games, which are highly popular among students. The results of the study can be useful for universities wishing to create their own mobile video games, which will be used by students to fulfill the individual curriculum, as well as implemented in a modern educational system. The problematic of the research concerns the possible benefits of using mobile video games, given the global trend of digitalization and the integration of digital technology in all areas of human activity.

Research Aim and Research Questions

The key research question is the formation of the problems of using digital video games in education and whether they can really improve the quality level of mastering educational material by students who use such applications. The article aims to analyze the prospects of development of the educational market of mobile video games, which in the context of global geopolitical challenges, in particular through the spread of the pandemic coronavirus, and increased international migration processes, creates a demand for quality and affordable education, which can be implemented through the use of mobile applications in the form of video games. The current problematic is the ambiguity of the use of mobile video games in education, so it is important to investigate the availability of really useful platforms that can improve students' knowledge and contribute to the organization of learning activities.

Research Methodology

The methodology of the research consists in the use of scientific research methods, in particular, through the search method - to assess the market for mobile video games, which can be used in educational activities; the analytical method - based on its use the features of the modern development of mobile video games in education were characterized, as well as features of EdTech development in the modern world. To determine the benefits of using mobile video games graphical methods were used, which allowed to distribute the benefits according to the individual characteristics of students, the quality of the educational process organization, global trends in digitalization, as well as the introduction of creativity, as factors in the development of attention to mobile video games.

Sample / Participants / Group

The article proposes to use the materials of digital platforms - AppStore, as well as the materials of analytical reports of information companies Google, Facebook, and Amazon. Based on the analysis of the strategic policy of Google, the prospective goals of using mobile games in their own system of educational training of future employees are characterized. The obtained results allow comparing the obtained results and using the method of comparison and generalization to determine the key foundations for the development of mobile video games in the field of education.

Data Analysis

To conduct the analysis, modern reports of information companies are used, as well as research by the analytical center PitchBook, which offers a number of materials of a statistical nature concerning the circulation of venture capital, agreements in the digital technology market. In addition, based on available information, the prospects of mobile video games in the field of learning are analyzed, which based on statistical data allows you to identify key trends and predict future prospects for their development.

Using the materials of leading information companies, as well as open research of the ESU community, it is proposed to investigate the main problematic aspects of students' educational activities, as well as the level of development after the use of mobile video games in their educational activities. The proposed methodologies make it possible to determine the key foundations of the mobile video games market, as well as to determine the prospects of their use in the context of the global digitalization of education.

Research Results

As of today, mobile video games used in education are gaining popularity because of their effectiveness. In addition, the market for mobile video games is constantly growing due to the increasing digital culture in the world. A key catalyst for the development of the video game market has been the spread of the coronavirus pandemic, which has forced most educational institutions to switch to distance education, which can improve the educational process. However, because of distance work, the level of knowledge, according to ESU (European Students' Union) studies, has dropped significantly, so to improve the organization, management and management of the educational process, we need to introduce digital technologies that will be interesting not only in terms of quality of learning but also have a specific motivation for students and learners (Furio et al., 2015). That is why, in the last 5 years, the level of education is widely transformed to digital, because through the use of digital technology it is possible to improve not only the quality of teaching but also to help motivate the students themselves to learn. According to recent studies, the key factors in the development of distance learning have been the emergence of mobile video games, which is due to the high demand for the use of mobile smartphones and gadgets. As of 2021 and 2022, the use of smartphones far exceeds the use of personal computers. The widespread demand for mobile smartphones, as well as the availability of a mobile app to almost anyone, creates the need for the proliferation of an innovative EdTech marketplace. The current cases of this market are the rapid digitalization of any educational process, which can enhance not only the quality of learning but also offer truly effective courses and disciplines that stimulate educational development.

In addition, the prospects until 2030 are the result of increased investment in the mobile video game industry in the field of education. Every year, investors are looking for the most attractive investment projects in the field of EdTech, as well as mobile video games means, because the market is not saturated enough. Let's take a look at the specifics of investment in the development of mobile educational video games, over the last 5 years in Table 1.

Table 1

Investment in the Development of Mobile Educational Video Games, \$ billion

| Year/sphere | 2017 | 2018 | 2019 | 2020 | 2021 |
|---------------------------------|------|------|------|------|------|
| Educational mobile video games | 8,2 | 8,6 | 9,5 | 13 | 16 |
| Educational video game startups | 2,4 | 3,5 | 5,1 | 5,6 | 7,2 |
| Grant programs | 4,5 | 4,8 | 5,3 | 5,5 | 6,1 |

Source: Pitchbook (<https://pitchbook.com/>)

The results of Table 1, show that investment in the market of educational mobile games is constantly growing, which not only needs constant development, creative ideas but also has high

prospects for the use of mobile games not only in private institutions but to become a mass phenomenon, as an additional tool to improve the student's own knowledge. During 2019-2021, there has been a significant increase in investment in video game development and startups in education, due to the spread of the coronavirus pandemic. During 2019 and 2020 alone, the investment portion increased by nearly 55%, and in 2021 by 30%, and in 2022 and 2023, about \$19-20 billion in educational video game development is projected. Such trends are driving the widespread use of mobile apps in education. Besides, they can be useful not only for students or applicants of new specialties but also useful for teachers, as it is teachers who try to organize classroom work more effectively. In addition, mobile apps are a quality repository for material that can be used in the learning process, because with the available material, it can be systematized, corrected, and provide partial access for students.

Mobile apps for teachers are the prerogative of most technology companies involved in mobile video game development. Thus, according to PitchBook (<https://pitchbook.com/>), there is a priority for improving linguistic and technical majors in today's world. In addition, mobile applications such as Coursera allow you to learn applied technical sciences, in particular programming languages - Python, Javascript, Java, etc. The problematics of technical specialties and programming is becoming increasingly popular in the world, as there is a significant shortage of personnel in the market, stimulating companies to develop special game applications for children, students who want to master technical specialties.

The majority of such mobile video games have real tasks on business processes, and also use game forms of learning, which can improve the quality of memorization of children in accordance with the chosen subject. It is with the quality development of distance education, as well as the wide availability of mobile applications in today's world, that the role of globalization processes is increasing, responsible for the possibility of learning anywhere in the world, as well as getting practical skills in a specialty without having to study in a special institution at university.

For example, Google in 2022 plans to create the following means of developing educational programs:

1. Creating technical courses through digital platforms and mobile applications that require only 1-2 years of study, rather than the 4-5 years that most universities in the country do;
2. The use of practical cases in education, as well as the dissemination of game activities in the educational process, fixing the mentor;
3. Implementation of a digital assessment system and automated selection and evaluation of results based on the use of cloud services and technologies.

This approach challenges the traditional way of the educational process, which cannot compete with educational technology in today's geopolitical challenges. Therefore, most universities, as well as private educational institutions, are adopting digital technologies and mobile applications to strengthen their own advantages in the market, which can not only contribute to effective student learning but also improve the quality of education in general.

The current market for video games in education has only formed in the last 10 years, Table 2., presents the top 10 video games used to improve the educational process.

Table 2*Features of the Most Popular Mobile Video Games in Education*

| Educational mobile video game | Feature | Features of implementation in education |
|-------------------------------|--|---|
| DuoLingo | The mobile video game used for learning foreign languages contains a wide range of foreign languages to learn for any user: from level A to level C. This game is often used both for personal purposes and in educational institutions of universities or private educational institutions. | In modern education, DuoLingo is proposed to be used in parallel with the educational program to improve the linguistic skills of the student. |
| Ribbon Hero | A game that helps to improve skills in using Microsoft Office systems, as well as improves personal skills in using Windows | This game is implemented for students in schools and universities who want to improve their skills in using Excel, Access, and other Microsoft products |
| ClassDogo | A video game designed for teachers, which provides an opportunity to organize the learning process and classroom work online. | It is used mainly in American universities, as well as in a number of distance education institutions in Europe |
| GoalBook | This video game is actually a plan of the individual task of the student, which fixes his goals, learning outcomes, implemented in a game form. The key advantages are qualitative systematization of training | The video game is implemented mainly for students and schoolchildren who want to form their own learning goals and get statistical results. |
| The World Peace Game | The video game aims to develop knowledge of geography, political science, conflict studies, and history. Examines the characteristics of international diplomatic relations. | Introduced mainly as a tool to improve one's own self-education, and also used in the research activities of students in political science. |
| Coursera | The most famous mobile application among the courses of study of the applied discipline, containing levels, ranks, etc. | Used predominantly in technical courses, but a wide range of courses are available. |
| Mr. Pai's Class | Educational game used to organize the educational process in the classroom | A video game individually designed for educators and teachers wishing to improve the quality of communication in the classroom and educational process. |
| CourseHero | The mobile application, which contains special educational courses, and a number of materials that | Used in higher education institutions in America and Europe as an |

can improve the quality of learning, in addition, there is the possibility to realize communication with the teacher.

additional source of educational materials for the needs of students and learners.

| | | |
|---------------|---|---|
| Brainscape | A mobile video game that allows you to memorize the material and is also used to strengthen cognitive skills. The material is presented in the form of cards with a time limit, and then you have to reproduce the depicted material. | The video game is used for students who want to improve their memory skills as well as refresh their knowledge of a particular discipline. |
| Socrative 101 | Mobile video game created as a partial model of student-teacher communication in a welcoming way, and also provides a number of functional properties - own digital rooms, game tests, etc. | The game has gained popularity in private educational institutions in China and Europe, which is used to improve the organization of the educational process. |

Source: composed by the authors.

Video games are widely used mainly in private educational institutions and individually by students and faculty. However, the prospects of such video games can already be integrated into almost all institutions of higher education in the world by 2027, as they prefer to improve not only the quality of the educational organization but also to help motivate the student to learn, as well as to develop their technical skills. The ability to use digital technology is also important in today's world. Therefore, students from the American, Chinese and European continents are already invited to become familiar with the most popular operating systems such as Ubuntu, Linux, Windows, and their products (Li, 2021). The importance of being able to use the products of these companies can improve not only the quality of the educational process but also the development of the student's digital skills, which, regardless of the chosen specialty will have a key advantage in the labor market in the future. An important trend in the development of video games in education is the use of special means of teaching technical and communication skills.

The main benefits that can improve student learning are the following when using video games:

1. Continuous process of educational activities, because as a rule, every student uses a smartphone every day;
2. Systematization of knowledge and curriculum, most games have a structured learning plan;
3. Motivation in learning, by means of game activities, because it is the interest of students to use innovative means of learning and interesting, which is due to the age of young people;
4. Enhancement of cognitive development of the student by means of game activities. It is scientifically proven in pedagogy that the means of creative game activities activate the brain, improve

memory and form practical skills of a person. Therefore, the use of video games from a physiological point of view will have a number of advantages;

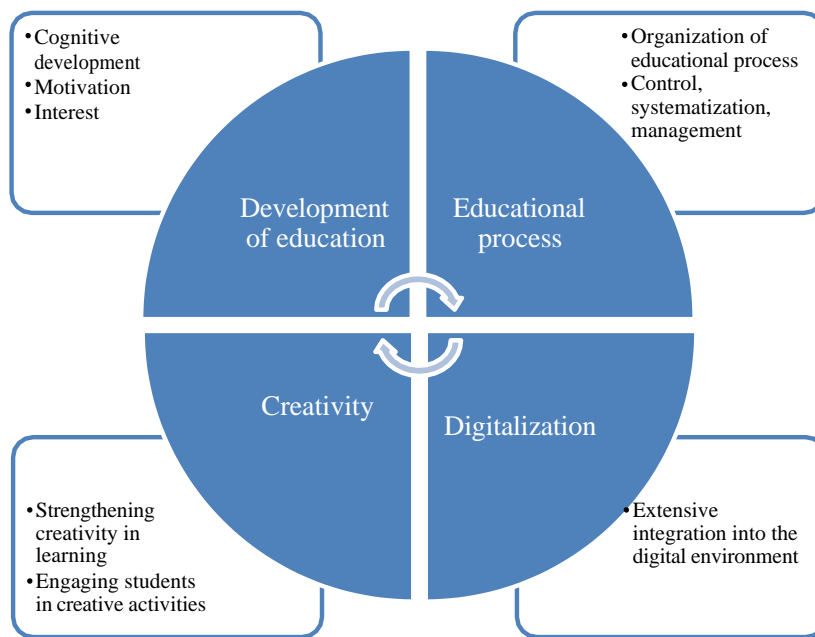
5. The possibility of distance learning, access to educational materials, as well as the low cost of obtaining them. Generally, video games are much cheaper than paper-bound materials or digital articles. Most video games offer a syllabus and the ability to use an app from \$5 to \$20 per month.

The above advantages of using video games in the education of the future may provide an opportunity to form the following scheme of benefits and organization of training by sector, as depicted in Figure 1.

World processes of globalization stimulate the search for effective solutions to the use of video games as one of the key means of the educational process since their implementation can qualitatively improve not only the applied professional training of students but also improve teaching methodologies in accordance with current trends. Prospects for the development of mobile video games are also due to the fact that most information companies create their own educational preparatory courses, which are much cheaper than training in higher education institutions and have much better training than most universities. Such factors are due to the low level of theoretical material, as well as its wide practical application, which can help students settle in after taking special profile courses. The use of video games and digital technologies provide a competitive advantage for those universities that use these technologies to develop their own educational process because it is based on it form the skills of the student and improve the level of interest in the educational process. The problem of the spread of the coronavirus pandemic stimulates the development of distance education, increasingly reducing the real need for the physical presence of the student at the educational institution. In addition, digital education has many more advantages than traditional education, which is due solely to efficiency. Digital technology is a tool to develop the skills of students and learners.

Figure 1

Areas and Benefits of Mobile Video Games in Education



Source: authors development.

The results of the study indicate that the main models of the modern educational process are the use of digital technology tools, as well as the introduction of video games as a key activity for students and students in accordance with their need for skills. An important factor in the organization of learning is the use of a mixed model, which involves the use of digital technology, as well as physical attendance at the university or private educational institution. Nevertheless, with the problem of accessibility of learning in India, Africa, as well as a share of the Asian continent, the demand for digital technology and low-cost tools for education is constantly growing, so it is predicted that in the near future, namely by 2027, according to UN estimates, digital technology education in mobile video games will be the main trend of the 21st century.

Leading technological companies of the world, in particular, such companies as Google, Amazon, Facebook, and Apple widely implement educational startups, develop their own programs for specialists, and create mobile applications that can be used both in the educational process and in internal business processes. However, the key goal is to gain a competitive advantage in the education market specifically through the use of mobile video games.

Thus, we can conclude that today's education market is transforming rapidly to digital, increasingly using digital learning platforms and digital education tools in the form of mobile applications, which provide an educational institution with a competitive advantage in the education market, and students and teachers with the opportunity to improve the organization and management of the educational process. The prospect of mobile video games in education will be aimed at mastering technical specialties, in particular programming languages, engineering specialties, as well as the development of creative, creative abilities of the student.

Discussion

The importance of using mobile video games will serve to ensure competitiveness for universities, private educational institutions, as well as to influence the quality of mastering technical specialties. Modern digital technologies determine the integration of educational processes into digital, such a trend to transform traditional means of education into information is due not only to the spread of the pandemic coronavirus, but also the strengthening of the globalization processes of information society formation, geopolitical challenges - the war in Ukraine, staff hunger between the Chinese and American scientific space. and the need to find modern innovative solutions to solve technological, environmental, and industrial problems. For this purpose it is necessary to use the most relevant means of education, forming applied skills of students, one of the powerful such tools are mobile video games.

Prospects for further research may be the study of the use of mobile video games in the context of skills development in the field of Big Data, cloud technologies, improvement of programming skills in low-level languages, as well as dynamic because they will serve as a catalyst for the development of information society and every year, the lack of personnel in this area is only increasing. Therefore, for quality training of such personnel, research should be conducted on what technologies could be applied in mobile applications to improve the skills of students. Conduct a regression analysis of the available platforms and the performance of the students who used their materials in the training process. An important aspect of the research prospects on video games in the educational process is the analysis of the design (DeShazo et al., 2010) of such content and its perception by participants in the educational process.

A major trend of globalization is the development of video games aimed at independent mastery of certain subject disciplines - linguistic, marketing, technical, engineering, and even creative. To identify the quality of such influence, an important area that can confirm the quality of mobile video game implementation is the promptness of mastery of learning material compared to students who do not use such technology in their learning process. To this end, the use of a correlation analysis from the onset of mobile video game use in learning to employability, which can be done through empirical research through a survey, would be a positive study.

In general, the issue of using mobile video games in education should be a research priority for representatives of educational institutions, because the success and vitality of universities depends on it. Due to the high competition in the market of educational services, digital platforms, cloud services for learning, highly specialized courses, and mobile video games are the key competitors of the traditional educational institution, which should be transformed into the conditions of the modern digital environment.

Conclusions and Implications

Thus, the study shows that in today's market of educational services and products more and more digital platforms for learning are required. Investments in the development of mobile video games and EdTech startups are growing rapidly, which in the long term by 2030 may become one of the key means of education. Among the significant advantages of using mobile video games is the possibility of

optimizing the organizational activities of the teacher and teachers, as well as strengthening the discipline of students in the study of a particular discipline. The peculiarity of the introduction of mobile video games is widely used by leading information companies, such as Google, Facebook, Apple, Amazon, and a number of others. European and American universities use a mixed model of learning, which implies a combination of digital technologies in the form of mobile video games with the traditional concept of the educational process. The main challenge in the modern market of mobile video games in education is the development of effective applications for mastering technical specialties, in particular the study of programming languages, the demand for which is constantly growing in the world and there is a shortage of personnel in this segment.

Analysis of today's popular video games in education shows that the key areas of their development are linguistics, the organization of the learning process, access to learning materials, as well as the automation of curricula and goals, which allows the student to monitor the quality of their learning process. An important factor in the development of video games is the strengthening of companies like Google in developing their own learning programs, which by 2027 could be a global challenge for educational institutions focused on traditional means of teaching. Therefore, when organizing training, modern private institutions and universities to use digital platforms, and fully integrate the learning process into the digital.

The results of the study show that the market for mobile video games is constantly evolving and undergoing its changes, the key benefits in their use are the improvement of students' attention, the development of cognitive abilities, the ability to use digital products, as well as the enhancement of creativity. With such positions, the use of video games in today's globalized processes of digitalization is a priority for the educational market.

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