Educational Computer Games and their Role in Improvement of Teaching and Learning

Maryam Abbasi[1]*, Tayebeh Anabestani[2]

[1]BSc in Elementary Education, Department of Humanities, Mashhad Branch, Islamic Azad University, Mashhad, Iran
[2] Bachelor of Elementary Education, Islamic Azad University of Mashhad, Iran.

ABSTRACT

Today's learners are from another generation. A generation that are surrounded by computers, computer games, video cameras, mobile phones and other digital tools. The growth of digital technology which includes videogames has changed the ways of thinking and processing information. Video game industry had fastest growing trends. Educational computer games are one of the varieties of computer games which have the characteristics of both video games and educational games. The results of previous studies show positive effects of video games on the improvement of academic performance and learning abilities of student. Computer games due to their characteristics, features and popularity among new generation has great potential to meet educational expectations.

Corresponding author: Maryam Abbasi

1- INTRODUCTION

In today's world, the speed and acceleration of knowledge is such that developing countries need to work harder to achieve these developments and progresses. Now that we are experiencing a transition into 21st century, for reaching development, patterns of global change need to adapt and harmonize with native cultures. Developing countries should use modern communication technologies to develop methods for teaching, learning, and worldwide activities. With the appearance and development of new communication technologies, global trends are expanding rapidly; communication revolution and the way these information is transmitted, draws the Macro policies of dealing with these phenomena. The most important characteristics of modern communication technologies rely on production, dissemination and processing of information, and making it available to everyone in the shortest possible time with minimum cost and at any time and place. After World War I, much attention was focused on the scientific study of communication sciences, because with the expansion of industry and education, communication became important and significant issues (Berger, 28: 1987).

In a short time that has passed since the invention of Information and communication technologies, it created many changes in the teaching methods, spatially in learning. Learning develops in forms of learning new attitudes, problem solving, applying information to reasoning and thinking and so on. Researchers believe that learning is a change resulting from experience or training in behavior of the organism. There are a variety of tools and resources for optimal learning and development of technology which adds to their number (Poor, Mohammad Bagher, 69: 1387). Computer as one of the main tools of information and communication technology is used not only as a tool to help academic data, but also as a comprehensive tool for optimizing the education of students (Imai, 271: 2012). Computers have many varied capabilities and features. The availability of this tool for everyone enables the children and teenagers to interact in some ways with the device; and unconsciously, they are influenced by the positive and negative consequences of this tool. One of the features of this advanced technology is the ability to play games for passing time and it entertains people. Over time and with the increase of the attractiveness of games, children who are the future managers of society also play these types of games and entertainments; games that contain both scientific and immoral contents. With the flow of a large number of these entertaining software and hardware into the market and interactive characteristics of these entertainments which engage and involve individuals into playing scenario, many concerns had been raised (Saffarian Hamedani et al., 6: 2013).

Along with the issue of computer technology in all aspects of life, the games are also the source of this technology and have created one of the aspects of children's lives. Computer games can be a source of learning and entertainment, and children gain generalized strategies in order to learn for learning purposes. Computer games can improve spatial visualization skills and increase mental abstraction. Educational computer games became the central attention of many educational systems due to their flexibility for accessing a variety of applications, self-

dynamics, rich content and ability to meet the needs of learners (Khazayi and Jalilian, 24: 2014).

2- Problem statement

Increasing production and complexity of video games caused the increase of their popularity. Video and computer games are among cultural and mass media products. Therefore, they become important socially and educationally; and for many children and teenagers, they are a great first step into the world of information and communication technology and acquiring computer skills (Saffarian Hamedani et al., 7: 2014).

Educational computer games are one of the manifestations of technological developments in contemporary era. In the 1960s, educational games gained the attention of many education leaders, and they valued experiential learning approaches to increase motivation and enhance the understanding and interest of students in learning environments (Lehman Sun, 1999; quoted in The Bourne Hyde, 2006). In this study, we want to clarify the role of these games in teaching and reinforced learning.

3- Educational video games

The use of computer games in learning is known as game-based learning. In general, this term refers to a novel approach of learning that takes advantage of computer games with educational and learning values. Teachers in a game-based approach, use any computer and non-computer games that they think it will help students to reach learning goals; but teachers in computer game-based learning approach, uses only computer games for this purpose. It can be said that game based approach is a more general term comparing to learning based on computer games. (Zanganeh, 160: 2012). The main content of these games is to learn new information or learn new ways to use information (Manteghi, 2009: 48). What differentiates between computer games and educational computer games is the educational purpose of computer games; the most important goal of it is teaching concepts in the form of a game. Video games, educational games and educational computer games are classified in more general classes of games. Educational computer games are a combination of computer games and educational games. In other words, educational computer games contain the characteristics of both computer games and educational games. To distinguish between these concepts, we define each separately:

- Game: is an activity that is played enjoyably and voluntarily and separates the individual from the real world (Talebi and the Jalali, 3: 2011).
- Educational game: is designed to teach people (especially children) a particular subject or to help them obtain skills (Fearston, 12: 2016).
- Computer game: is a kind of a game that is used through computer technology; it is developed primarily with a goal for entertaining and recreation (Tang, Hangun and Rehalibi, 2: 2009)
- Educational computer game: is the use of computer-based technologies to provide a fun and entertaining way to teach learners (Herz and McDonia, 2002, quoted from Blake, 13: 2009).

The term educational-entertainment refers to a subset of serious computer gamers and most computer games with educational purposes are developed especially for preschoolers (Nielsen, Smith and Teseka, 2008: 213 and 212).

Computer games which are used for teaching and learning have different types. Distinguishing between different types of computers games is necessary from this perspective. The most important types of these games are simulation games, Legendary or strategic games and role playing games. Simulation Games, artificially creates a dangerous situation in the real world for students, but without any danger or harm to them. Legendary or strategic games allow students to reconstruct and guide a historical or legendary situation from their own perspective. Role playing games asks students to visualize themselves as another person and behave like that other person. From another perspective, we can say that educational computer games have two types. One type of these games is those that precisely aim a specific context of a specific course of study in a specific level of education. Like a computer game that tries to teach the concept of multiplication. Another type of these games is those that are not designed to teach a specific lesson in formal education; but they have the potential to teach; like games that try to teach road signs to students. Teachers, according to the time and class conditions, facilitate a variety of educational computer games for their students (Velayati, 48: 2012).

4- Learn

Learning is a desired behavioral change in students; and educational efficiency of the education system is evaluated and assessed on the basis of this behavioral change or changes. Learning is more important that teaching because learning is a goal and teaching is the way to achieve this goal. In other words, learning is a process based on experience and creates relatively permanent changes in feeling, thinking and behavior of a person. Behaviorists such as John Watson and Skinner considered the human nature to be flexible and they believed that learning plays a key role in growth; such that primary training can convert a child into any kind of adult regardless of his/her talents, desires, passions, abilities, race, or any inheritances from ancestors. (Manteghi, 26: 2001).

In another definition of learning, it has been said that learning means creating permanent changes in a person's potential behavior based on experience. Experience here means defining the impact of external and internal stimuli in learning. For example, a child is not able to tie his/her shoelaces before learning it or perhaps the child knows only a part of it. To teach him to tie her shoelaces correctly, a stimulus is provided. These stimuli can be teachings of parents or a picture in which shoelaces are shown properly or another kind of teaching stimuli. After receiving one of these stimuli (experiences), the child will be able to tie his/her shoelaces. So, when a stimulus affects learner in a way that his behavior is changed during the time that stimuli is effective (comparing to before the impact of the stimulus), it is said that learning has taken place. An experience leading to learning shouldn't necessary take place intentionally; it can take place unintentionally; for example, this type of learning may occur among friends. (Shojai, 2011; quoted from Mohammadi and Esmaeili, 2016:14)

5- The role of educational computer games in teaching and learning

In today's education, playing is considered as one of the most effective means for learning because playing is an instrument at the service of education and it is an aid for educating and teaching children; and also through playing (play therapy), any mental and behavioral problems of children can be treated. It is notable that playing, both as a way to learn or reinforcing learning and as social development in children as well as a mean of expressing emotions and feelings has significant capabilities for educating, and it gives children opportunities for growth and self-building; but this can occur on conditions in which teachers and parents leave children free in choosing their own games so that the children gain what they need in the form of games and activities (Faghihi Mohammadi and Ismaili, 6: 2016).

In recent years, interest in games that are distributed through computers and digital devices is emerging. Learning through computer games accompanies students' satisfaction comparing to other methods of learning. Game-based learning can be used by the teacher in the classroom. Through the use of educational computer games, students can use their knowledge for playing games and use the acquired experiences from the virtual world

to shape their behavior in the future (Velayati, 46: 2012). Computer games had been recognized as the most interactive types of digital media (Becker, 2011, quoted from Moradi and Nouroozi, 134: 2016).

In a good computer game, problems that the player encounters are designed in a way that primary issues will lead to the formation of hypotheses which is used in solving further problems. Also, during the game, individuals face problems which they will learn new things from and integrate these new learnings with their previous knowledge and skills. This new level of ability will be consolidated by repetition in various ways until the person faces new challenges. With the continuation of this cycle during the game, the individual gains skills. Over the years, most of the attention has been focused on the game itself and less attention had been paid to social factors, the basis of games and learning experiences (Nielsen, Smith and Teseka, 2008: 213 and 212).

Computer games use many learning basics such as identifications, practice, repetition, reward and reinforcement. Video games can teach children skills indirectly which leads to impressive achievements in employment and business grounds. Psychologists consider hand-eye coordination, a better understanding of space, better math problem solving and improve vocabulary and increase social experience as positive outcomes of these games (Aminifar et al., 178: 2012).

Video games due to their features can cause pleasure and satisfaction; it is very motivating and transmits the concepts and realities of many issues as well. Therefore, the combination of playing and learning will increase learning motivation of learners and makes learning process interesting. Providing computer software programs creates a charming atmosphere for academic performance of students. Production of educational and scientific programs in forms of computer software provides an interesting environment for the performance of students. Educational and empirical concepts that are transferable through computer have no equivalent in today's world; and may not achieve in any other way. Computer technology can provide multi-sensory training and makes this multi-sensory learning engagement possible in a deeper level. While video games increase computer literacy of students, it also expands their perceptual skills in understanding educational issues (Hensinger, 2012; quoted form Faghihi Mohammadi and Ismaili 21: 2016).

Studies have shown that intensive exercise, great interest and intrinsic motivation are predictors of high levels of assignment completion. Computer games provide tremendous opportunities for exercise, interest, and intrinsic motivation. However, intrinsic motivation and interest in the games with entertainment purposes are higher comparing to those with educational purposes. As a result, the exercise will be lower in educational games (Reterfielf and Weber, 401: 2006).

Recent studies show that teachers have important role in facilitating learning through computer games: the teacher guides the use of computer games in the correct direction and procced with explanation and examination regarding gained experiences that has been gained through the process of playing. While many educational games based on behaviorism, ignore the role of teacher and they consider any exterior intervention unnecessary. Many researchers agree that computer games are educational tools that provide opportunities for interested teachers. Thus, the teacher's role is essential for creating learning experiences (Nielsen, Smith and Teska, 2008: 213 and 212).

In a study by Aminifar et al. (2012) that had been conducted with the purpose of studying the effects of teaching methods based on computer games on motivation and academic achievement of students, they have concluded that the students who received education through computer games had more educational achievements comparing to those who received education in the usual way. Moreover, the results of this study showed that since video games can create an environment that is attractive and can give the ability to solve mathematical problems, it can cause motivation and therefore the students can advance more in mathematics.

A study by Dalire and others (2009) had been conducted with the purpose of investigating the effects of video games on IQ, reaction time and movement time of teenagers using causal-comparative method on age groups of 14 to 18. The results showed that computer games had a significant effect on IQ, reaction time and movement time. Results showed improvement in IQ, reaction time and movement time of teenagers as a result of computer games.

Mozhdeavar (2006) in their study on mathematics education with the help of computer on the attitude and learning mathematics of female students of second year concluded that using computers in teaching mathematics increases learning comparing to traditional teaching methods. Also, using computers in teaching mathematics increase a positive attitude toward mathematics comparing to tradition methods.

A study by Tavazon and colleagues (2009) aimed to investigate the effects of computer games on academic achievements and academic motivation in learning geography in elementary school. The results showed that learning thorough games is more effective and students have more intrinsic motivation (quotes from bijari, 2013).

According to previous studies conducted on special needs students, there is a relationship between games and gaining the attention of students with special needs; since students with special educational needs, especially students with intellectual disability, cannot focus their attention on instructions and have problems in this regard, providing a kind of education that attracts the attention of these students is important. Students with intellectual disability have less priority comparing to other students in receiving services and advanced training programs. Normal students in cases of lack of learning in the classroom can catch up through self-help books and with the help of other adults. But students with intellectual disabilities only learn and achieve success if appropriate equipment and technologies are used for their training methods (Velayati, 49: 2012).

6- Conclusion

Today, we are faced with an audience that their thinking, processing information, preferences and their motivations have changed comparing to the previous generation. One of the areas affected by these changes is educating new generations that require new education methods and creating motivation. It can be said that computer games regarding its features, functionality and popularity among new generation has great potential to meet educational expectations. Competitive features, complexity, experimenting, retractable observations, flexibility, self-dynamics, rich content and ability to meet the needs of learners has a lot of impact on creativity, promotion of learning, fostering concentration and accuracy, increasing IQ and learning complex concepts. Indeed, educational computer games can play a vital role by using motivational characteristics of computer games and learning rules and basics such as urgency of reinforcement in increasing educational success, creativity and other aspects. Using computer games in teaching concepts can promote learning levels by increasing motivation and desires. Moreover, using educational games by teachers and trainers can be beneficial in promoting different attitudes towards teaching educational concepts, identifying obstacles for lack of motivation and progress of students. In addition, for computer games to be more effective in education and learning, teachers should change their attitude towards these types of educational changes; become familiar with videogames and different types of education methods can help them to teach

students; and consider computer games as a media that can reveal hidden capabilities of students. The results of this study suggest that computer games should be integrated into the curriculum and training programs of schools. It seems that for operationalizing this, the ministry of education should constitute a group called designers and producers of educational computer games which consists of experts including educational technology experts, software engineers and graphic experts. Following this, teachers should use these games in the process of learning and teaching.

References
1. Aminifar, E.; Sedghpoor, S.; Bahram and Dabaghzade, H. (2012). The impact of computer games on motivation and mathematics achievement of students. Educational technology . 6 (3). 184-177.
2. Bijari, Malihe (2013). The impact of mathematics computer games on self-governance and academic achievement of fifth grade students in Birjand. Master's thesis. Birjand University, Faculty of Education and Psychology
3. Pour Mohammad Baghe; Latife and Pour Mohammad Baghe, E. (2009). The role of information and communication technology in teaching and academic centers. Technology and Education. (3) 80-67.
4. Khazayi, Kamia and jalilian, N. (2014). The impact of educational computer games on academic achievement and creativity of elementary students. ICT in Education: 5 (2). 39-23.
5. Seif, S. (1994). Developmental psychology. First Edition. Tehran: Samt
6. Saffarian Hamedani, S. et al (2003). The relationship between levels of computer game usage with mental health and academic performance. ICT in Education: Year 3 (3). 20-5
7. Talebi, H. R.; Jalali, A. A. (2001). A model for applying education based on social computer games. An article presented in the second International Conference and the Fifth National Conference on e-learning. Tehran, Amir Kabir University of Technology. 6-1.
8. Faghihi Mohammadi, M.; Ismaili, Z. (2016). The effect of video games on learning of elementary students. Islamic Human Sciences: 6 (10). 114-79.
9. Moradi, R.; and Nouroozi, D. (2016). Comparing the effectiveness of learning through computer games with traditional methods on critical thinking, skills and creativity of gifted students. School Psychology. 5 (2). 150-131.
10. Mozhdeavar, F. (2006). The impact of teaching mathematics with the aid of computer on the attitude and learning of mathematics of second year female students in mathematics field at high school level. Master's thesis, University of Tehran.
11. Manteghi, M. (2001). Examining the consequences of computer and video games. Tehran: Farhang e Moaset (Contemporary culture) publication
12. Manteghi, M. (2009). Parent's Guide for using new communication technologies: video-computer games. Tehran: Abed.
13. Velayati, E. (2002). Video games and its role in the teaching and learning of students with intellectual disabilities. Journal of exceptional education: 1(109). 54-46.
14. Adeyemi, B. A. (2012). Effects of computer assisted instruction (CAI) on students achievement in social studies in Osun state, Nigeria. Mediteranean Journal of Social Sciences, 3(2), 269-277.
15. Berger, C. R. and H. Chaffee. communication Science, Newbury Park, Calif: Sage, 1987
16. Burenheide, B.J. (2006). Instructional gaming in elementary schools. Master thesis. Doctoral dissertarion, Kansas state university.
17. Black, E. V. (2009). Towards a framework for understanding electronic educational gaming. In R. E. Ferdig (Ed.), Learning and teaching with electronic games (pp. 11-34). Association for the Advancement of Computing in Education (AACE).
18. Firestone, M. (2006). Computer game developer. Philadelphia, PA: Chelsea House.
19. Nielsen, Simon Egenfeldt; Smith, Jonas Heide; Tosca, Susana Pajares (2008) Understanding Video Games, The Essentional Introduction. Routledge, New York, First published.
20. Ritterfeld, Ute; Weber, Rene (2006) Video Games for Entertainment and Education. In P. Vorderer and J. Bryant. Playing Video Games, Motives, Responses, and Consequences. London, Lawrence Erlbaum Associates, Publishers. Pp 399-413.
21. Tang, S., Hanneghan, M., & Rhalibi, A. E. (2009). Introduction to game-based learning. In T. Conoolly, M. Stansfield & L. Boyle (Eds.), Game-based advancements for multi-sensory human computer interfaces: Techniques and effective practices (pp. 1-Hershey, PA: Information Science References (IGI).