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Efficiency of Educational Games on Mathematics Learning of Students at Second Grade of Primary School

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Abstract

Nowadays, children learn a lot from games, in other word these games have a constructive and educative aspect. There has been a progress in science and technology and this progress changes the people's way of living. This development and progress also change the teaching and learning method. According to these changes, a new generation of educational tools has been designed to help the student to learn in a modern method. In general, the games are used as effective educational tools for enhancing the learning and comprehension of complex issues. The purpose of this research is the efficiency of educational games on mathematics learning of second elementary students of Tehran. This study adapted descriptive-survey method and collect data by questionnaire. Statistical population of this study is the female second student of Tehran elementary schools. 30 students have been selected as sample. These 30 students were divided into two groups of 15, one group is experiment group and the other is the control group. SPSS software was used to analyze data. Results showed that the educational games influence the motivation and mathematics learning of female second elementary students and enhance their intelligence quotient (IQ).

Keywords: Educational games, Learning, Mathematics teaching, Academic motivation.

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Introduction

Nowadays, with advances in technology and the generalization of electronic devices such as computers, more advanced game became common. In general, in lower ages, the games are environmental variables that can affect the acquisitive learning and conceptual ability of peoples. One of the effective games on children learning is computer game which needs fast processing of information and provides logical and extremely fast responses (Griffiths, 2010). Based on the conducted studies, most of the experts believe that enjoyment is one of the most important characteristics of game (Sohrabi Shegefti, 2011). Fun and enjoyment of a game will facilitate the process of learning and satisfy most of the basic needs of the kids (Dye et al., 2007). An educational and constructive aspect of the game is that individuals want to progress in the game and modify the way of playing. It seems that progress and desire to winning in game motivate the passive students to think (Asghari Nekah et al., 2013). Games especially computer games along with learning-teaching activities may help the learning of student and increase its inner motivation and interest by creating challenges and adventures and giving the control of the game to the player. Training and repetition with custom settings make the memorizing contents easier for the students. Providing immediate feedback to make a player spontaneous for testing her hypotheses will help her to learn from the results of their acts. Passing from different levels of game will provide a desire to continue the game progress in learning for her. Activating the past knowledge for answering the puzzles make her an active learner (Young, 2012). Since the general goal of education in general education course emphasize on the primary course for preparing students for lifetime learning and acquiring innovative scientific literacy to live in society as a citizen, employee, wife or parent, it is essential to acquire knowledge, skills, and necessity attitudes for a suitable life (Oldknow, 2005). Children will learn various colors, shapes, and directions within games and obtain valuable experiences when playing. The educational materials will be learned willingly and without stress during the playing. Game will enable the children to establish a better relationship with others. Educational games with a purpose for training specific goal must be programmed from the beginning. The learner is obliged to pass all missions step by step. Therefore, it cannot be called a game (Mahjoor, 2007). Learning courses such as mathematics is known as one of the most important mental activities. Mathematics associated with various signs, the signs that are used for discovery, perception, and understanding of various compounds, patterns, and relations in the world. Children are not eager to learning mathematics, that's because the subjects of mathematics are inflexible and logical issues. This issue is one of the major problems in this course (Mofidi and Teymori, 2007). Based on the examinations, ability to playing is an important feature of the human. Games are used as an effective educational tool for improving learning and comprehension of complex issues. Children that benefit from educational innovations have a higher academic level than the ones who lack theses tools. In other word games play an important educational role and discovery because of the connection and close relation with motivation to discovery and fulfilling the personal curiosity (Rastegar Poor, Marashi, 2015).

Educational Computer Game and Their Characteristics

Educational computer games are the most important educational games. In computer games the players are a producer, not only they are a reader, but also they are a writer. In general, the players in low level programming the game with their acts and decisions. A good game allows the player to solve a problem with various solutions and their own method. In a game the players feel agency, control and a real sense of ownership of what they have done, nowadays in education, the process of learning is rarely appealing. The process of a computer game is very appealing and attractive. The attitude of children to computer games is an attitude that we hope the learners has it toward learning. JEE in 2007 believed that the compound games gathered all the arousing factors that cannot be seen in any other media. When the person does not feel an obligation to what he is learning, the learning will not be achieved. A good computer game makes the individual obliged and involved by identity. This is an identity character which is the player create in game or game gives it to the player. The other factor in the appealing of computer games is their interactivity. Nothing will happen in the world of the game unless the player decides to do something. In a good game, words and deeds are placed in a mutual relationship between the player and the world (Davaran, 2012). The term educational-entertainment is given to the computer games at the present time. Computer games are a subset of real games and usually computer games have educational goal especially for pre-elementary students and beginners. The computer games have the following features.

- 1- Low internal motivation: motivation is important in educational games. Most educational games emphasize on the external motivation (reward) rather than internal motivation caused by the game. External motivation is not related to the game. It consists of optional rewards such as scoring for completing a mission. On the other hand, internal motivation may be the feeling of ability cause by completion of a mission. Motivation has an educational effect that will lead to strong learning. Providing internal motivation for computer games is low.
- 2- Non-integrated learning experience: it can be understood that learning achieved through the game experience and the player will focus on the game instead of learning from it. Usually the educational games are not able to integrate the game experience and learning.
- 3- Learning by repetition and practice: computer games usually encourage the player to memorize the responses. There is no need to teach the basic rules to them. Learning principals in computer games are derived from repetition and practice instead of subject comprehension.
- 4- Easy gameplay: most of the educational games have easy gameplay. Though easy gameplay is effective especially for younger players and beginners, there is a need for more advance games than the commercial games to motivate the player.

- 5- The absence of teacher: there is no need to the presence of teachers in educational games. The learners can learn the context and skills alone by these games (Nilsen et al., 2008).

Mathematics learning methods

- 1- Traditional method
- 2- Modern method

Traditional and modern are two factors that cause a great revolution in teaching and learning. Using computer for teaching and learning is essential. The teacher can present materials to teach the student in the form of multi-media software which contains audio, video and graphics by using a computer. Visual and auditory sense will be involved in learning by using computer and multi-media software. Empirical findings in the area of psychology showed that almost 75 Percent of learning is accomplished by visual sense and 13 percent via auditory sense. Therefore, the use of computer and multi-media software is one of the best methods for teaching and student learning. According to the studies about the use of computer and multi-media software for teaching, we can say that the educational software can improve the learning results when they are accompanied with the traditional method of teaching in the classroom. It will have a good efficiency in the area of solving the problem of learning, issues, and individual's differences by presenting numerous examples, adjusting the speed of training, and repetition of material. Another advantage of this software is an increase of interaction among students and also between teacher and learner (Safarian, 2010).

The Effect of Learning in Standards of Academic Progress

About the criterion of academic learning it should be said that academic learning is one of the various ways and determined by different criterion. One of these criteria is the GPA of the student in a semester and a whole academic year. Another criterion of academic learning is calculating the scores of students in a single course of study. Another method is using total scores of all courses of study in a year. The final criterion is academic learning during some years or a course (Sickinson, 2012). If we consider a score of a single course or a GPA of a group of various courses of studies in the area of a special subject, or GPA of various academic courses as a criterion for academic learning, these criteria will have diagnostic issues and problems. For example, the use of a single score from a specific academic course has less reliability and validity than a score based on the combination of some score. Applying the obtained scores from various academic courses in different areas for achieving the GPA of class scores is a difficult and problematic issue, because these scores include scores that are obtained from various fields of studies and are combined in a unified scale, while each of the students can have a various progress in each issue (Phonapichat).

In general, a multi-dimensional scale of learning has more function than a one-dimensional scale. The GPA of class scores for a set of academic courses is a better prediction of academic learning than the combination of a set of various academic courses of studies in a single scale. Anyway, we can classify the learning scale of a person in a specific area such as mathematics, science, history, and literature under the title of special class GPA. The general class GPA scales mostly refer to the learning of that person in all subjects. This will be possible that the academic learning of a person is determined in a special group of related subjects by selecting special class GPA scales, but when “general class GPA” is used, we cannot examine the learning of that person in various areas. In short, class GPA is a conventional criterion for evaluating learning and academic progress (Sedghpoor and Azimi, 2014).

Review of the literature

Rashid Far et al., (2016) in a survey under the title of ‘role of educational computer games in students learning’ said that we can consider computer game as a source of learning and entertainment. Kids will achieve generalized strategies for learning. Computer game will improve the spatial visualization and enhance abstract mental skills of testees. Educational computer games drew the attention of educational systems to itself because of the flexibility in accessing to various applications and the ability to respond to the need of others. The increasing popularity of computer and video games especially among children and youths cause some concerns for their harmful effects. Therefore, in this study the role of computer games in student learning is examined. The results showed that the educational computer games are effective as one of the ways for diversifying the materials and presenting courses in class. In addition, it effects on the social life of the students and their behavior out of the school. Some courses of action have been provided at the end of the study for the appropriate use of educational computer games.

Rahmat Bar et al., (2016) in a survey with the title of “the role of educational computer games on mathematics learning of students” said that educational computer games as a social phenomenon alongside with other audio visual medias in the world which are known as global village select their audience or users from the kids and youths and dedicated a significant part of their leisure time to itself and even the times that they should do their homework. Therefore, this issue must be concerned and reviewed more than past. Thus, the role of educational game in mathematics learning of students is examined. The results showed that the educational computer games not only as one of the methods of diversifying are effective in course materials especially courses such as mathematics and science which are known as difficult courses, and presenting educational materials in classrooms, but also influence the social and daily life of students outside the school and their behavior with

others. At the end, some course of actions has been presented for proper using of computer games.

Ozdogan (2011) said that kids are always interested in computer games. They start playing before learning to walk and talk. They have more concentration when they are playing. Playing can be an important tool in learning for the kids. Children live with mathematics and grow with it and use the mathematical processes during the playing.

Hirza et. al, (2014) in a survey examined the improvement of intuitive skills for realistic mathematics learning. The goal of this study was to examine the improvement of intuitive skills of students in a comparison of teaching realistic mathematics with teaching conventional mathematics. The sample was 164 students at fifth grade of Palm Bang primary school. The research plan was studying pre-test, post-test and control group test. Data were analyzed by SPSS. Results showed that the class based on REM showed more improvement.

Methodology

The present study has an applied goal. It adapted a descriptive-survey method. Data were collected by questionnaire and library method. This study is placed in the category of quasi experimental researches and pre-test post-test with the control group. Statistical population of the study consists of all the students at second grade of the primary school of Tehran. This study is a quasi-experiment because it is the examination of the efficiency of using computer game on mathematics learning of students at second grade of primary school. 30 students have been selected by convenience sampling method, because in experimental studies, the number of participants in each group must be 10-15 people. These 30 students have been divided randomly into experiment and control group. The criteria for entering the study are: educating at second grade of primary school, the age of the testees should be 8, IQ of them should be medium (85-115), the testee has no psychological disorder such as anxiety or physical disorders that disturb its performance. 30 students at the second grade have been selected as our sample that 15 of them were placed in experiment group and 15 of them were placed in the control group. Nothing was taught to the control group. SPSS was used to analyze data.

Results

Research hypothesis: educational games have an effect on the motivation for mathematics learning of students at second grade of primary school.

Table 1: mean and standard deviation of mathematics course of experiment group and control group in post-test and pre-test

group	Pre-test		Post-test	
	Mean	Standard deviation	Mean	Standard deviation
Experiment	99.393	10.7	113.5	10.9
Control	97.64	9.6	105.20	9.8

Information of table 1 showed the mean and standard deviation of motivation in mathematics learning in control and experiment groups at pre-test and post-test. The mean of control and experiment groups at pre-test has no significant difference, but there is a significant difference in the mean scores of both groups at post-test. This difference is in favor of experiment group.

Independent t-test for comparing the changes of mathematical concepts of students between two groups of experiment and control

Group	number	Standard err of mean difference	T	Degree of freedom	Level of significance
Experiment	15	2.4	6.2	11	0.00
Control	15	2.7			

The difference between two control and experiment group in the academic motivation of mathematics is significant at the level $p < 0.01$.

Conclusion and discussion

Mathematical education is in fact the creation of situations within which the cognitive structure of children can be appeared and changed. Piaget believed that cognitive structures will be developed only when the children build their own learning experience. Therefore, the learning must be spontaneous and full of sensory experiences. Mathematics is not just like other courses of studies. It cannot be learned by saying and showing. The mathematics education should be appropriate with the cognitive, emotional, mental, and motor growth of the person. According to the role of new technologies in modern world that create more opportunities for generalization and education of schools, and shift the emphasis from education to learning, the main issue is that how we can create effective and stable learning in students in the era of knowledge and technology so that they became spontaneous and be effective in learning and have high motivation. In this area, it should be understood that in the active environment (interactive) such as the use of information and communication technology in education will lead to the reconstruction of content in mind. In other word, it creates a new behavior in the learner and causes the person to believe in his abilities more than past and increasing the learning motivation in students. According to the results of this study we conclude that educational games influence the mathematics learning of the female students at second grade of primary school, and increase their IQ. Alongside this study, Kaperz (2009) in a survey concluded that educational games influence the progress and mathematics scores of the students. The results of Raskin (2004) showed the efficiency of

education by using game on the student's mathematics progress. The result of his study is similar to the results of the present study. The results of Anderson's study showed that educational game influence the students learning. As the students like game environment more than the typical class environment, they enjoy more and consequently they have better learning and higher academic performance. Amini Far, Saleh Sadegh Poor, and Zadeh Dabbagh, (2012) in a survey under the title of "Learning methods based on the computer game" showed that the learning methods based on the computer game can increase the students' motivation for mathematics and their academic progress. As a result, this learning method influences the mathematics attitudes of the students for achieving higher levels of mathematics learning, and increases the mathematics attitudes of the students. Games are more effective than pencil and paper activities in mathematics learning and students' motivation. Azimi et al., (2014) in a study under the title of "the efficiency of educational computer games in academic progress and attitude for science learning" said that their study results showed that the students who have done computer games have a significant progress and attitudes to learning than the students who were taught by traditional method ($P < 0.001$). Therefore, the use of educational computer games is suggested in the education of various sciences.

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