The Study of the effect of Coin79 game on the academic achievement of 10th grade high school students' chemistry

Bahram saleh sedghpour , Alireza karami gazafi , shima zabihifar

Abstract

The purpose of this study was to evaluate the effect of educational mobile game based on theories of learning and educational psychology for the subject of the periodic table and also the effect of this method on students' academic achievements in the tenth grade of high school chemistry. The population of this study included all female students in the field of mathematics and experimental science in the tenth grade of high school who studied in Shahed and Fath Al-Mubin high schools in the city of Rey in the academic year of 2016-2017. Multi-stage cluster sampling method was used to select the sample. There were two groups of mathematics and experimental science in each of these schools. 20 students from the experimental school were randomly selected. They were presented and Q&A sessions were conducted online for the other group. In this study, finally, 20 people were randomly selected from the experimental group and 19 people from the control group due to the fall of the subject. Both groups were tested in ten sessions. After ten sessions, post-test was taken from the students again and at the end, the results were explained using statistical methods, analysis of covariance and block variance and the results showed that educational games (coin79) were effective on academic achievements. However, the effect of educational background on academic achievements was greater than the educational game and this indicated the condition that the educational game is more suitable for students with better educational background.

Keywords: Chemistry, Educational game, Academic achievement, Periodic table

Introduction

Academic achievement is one of the topics that has been discussed very much in terms of educational psychology. Numerous research findings have shown that academic achievement is not only influenced by knowledge structures and information processing processes, but also by motivational factors such as beliefs, attitudes and values. For academic progress, we're in need of changes in the educational system, and these changes will not be easy. Today through teaching and learning, the learning process and learner's active role in that process is heavily highlighted. Also meaningful and effective learning advancement strategies were also considered by experts, due to increased amount and complexity of human knowledge and technological progress. (Ahmadi and Mehdi Nia 0.1390).

Games are an engaging way to learn, providing a safe and secure environment for learners to make mistakes and make decisions in the real world without fear of failure. On the other hand, games can provide the player with a variety of challenges. And make the learner's progress tangible for him. What makes games such a powerful tool for providing various tutorials is that the games conform to the latest proven principles in the field of learning effectiveness. (Provincial, 1389).

Game-based learning is one of the techniques that can help facilitate and improve the implementation of knowledge management processes. A game can be an effective medium to transfer and share knowledge. Games can teach people difficult and complex problems in a simple environment. In game-based learning, the learner does not have to recognize that he has learned something, when similar situations occur in the real world, his hidden skills come in handy. Also, the process of learning transfer can be facilitated by using this educational method (Velayati, 2010). Given the above regarding gaming and information technology, the use of computer games in education is a trend that's increasingly growing. Motivational features and involvement of educational computer games are widely highlighted in the literature of educational games. (Velayati, 2010), so

we have decided to investigate the effect of using educational games on academic achievement.

Research purpose:

Investigating the effect of Coin79 game on the academic achievement of the chemistry lesson in 10th grade high school students

Literature and research principles

Educational games: Educational games are planned, competitive and purposeful activities. These games are a set of roles and designs that are performed in special circumstances. Also, the educational game provides a competitive environment for the child to achieve goals (Heinz, 2005; quoted from Shariatmadari, 1390) In fact, Educational games are among the solutions that are used to make teachers more active and creative, and are one of the main and specialized topics in the field of education. Educational game is one of the teaching-learning situations and is an organized activity with specific rules in which two or more students are in contact with each other to achieve pre-determined educational goals (Afrooz , 1389).

Game-based learning is one of the techniques that can help facilitate and improve the implementation of knowledge management processes. A game can be an effective medium to transfer and share knowledge. Games can teach people difficult and complex problems in a simple environment. In game-based learning, the learner does not have to recognize that he has learned something, when similar situations occur in the real world, his hidden skills come in handy . Also, the process of learning transfer can be facilitated by using this educational method (Velayati, 2010). Given the above regarding gaming and information technology, the use of computer games in education is a trend that's increasingly growing. Motivational features and involvement of educational computer games are widely highlighted in the literature of educational games . (Velayati, 2010), therefore, we have decided to investigate the effect of using educational games on academic achievement. In the research conducted by the big population and Alizade (1398) they designed and produced an educational computer game based

on puzzles and their effect on the levels of learning and critical thinking skills. The sample size was 30 fourth-grade elementary school male students in Shahriar city. The results showed that the puzzle-based educational computer game was effective and increased students' critical thinking skills. Also, Vahedi and Jourbanian (1398) investigated the effect of using educational computer games on motivation and learning math lessons of third-grade elementary school student. The sample size was 30 third grade female elementary students in Ramsar in the 1398-99 school year .the results of this research showed that educational computer games affect the motivation and learning of math lessons of third grade elementary school girls. In Roshan Ahmadi and Ahmadi Sufi Hassan's (2015) research, they investigated the effect of digital educational games on creativity, progress and academic motivation of students in the first grade of elementary school for mathematics in Islamshahr. The sample size was 72 first grade elementary school students and the findings showed that teaching through digital educational games has effects on creativity (fluid component), mathematical motivation (desire, avoidance) and academic achievement (knowledge, attitude and skill) of the students. And there is a significant relationship; But there was no significant difference between the two groups in the components of expansion, flexibility and initiative.

Motivation for academic achievement and the impact of games on education are explained. The results of research by Kelly and Frieg (2012) showed that educational games had a significant effect on four components of motivation (attention, communication, trust and satisfaction). Educational games can facilitate students' learning and lead to active participation in class. (Franklin, Beat, & Lewis, 2003) A study by Akho (2009) found that educational games can enhance the learning of mathematical concepts in students with intellectual disabilities. though the students have to Solve the exercises of the book in the classroom. In a study by Amiri Ahouni (2001) it was shown that educational games have an effect on short-term memory and dictation(spelling) of the students and this type of games can be used in primary schools and educational and rehabilitation centers. Due to the lack of research, especially foreign research in this study in the field of special learning problems, we seek to motivate the

students with special verbal and sound problems educationally by using the active method of educational games full of cognitive processes. They are particularly troubled in the skills of fragmentation and blending, that is, breaking words into smaller parts and putting them together (Arjmandnia and Shokoohinia, 2012).

Toozan et al. (2017) in a study aimed at investigating the effect of computer games on academic achievement and academic motivation in learning geography in elementary school concluded that students learn more through gaming and they have more intrinsic motivation to learn.

- Shahabadi et al. (2014) in a study titled The study of the effect of motivational factors in computer games examined the tendency to these games. The results showed that there is a significant relationship between educational variables, techniques and effects of motivational games with progress and motivation of self-esteem with a tendency to computer games; though, the variables of employment status and marital status of the respondents had no significant relationship with the dependent variable. As a result, it can be said that the existing motivation and sharia, in other words, satisfying the needs of the audience in the best way in such games, have an important role in attracting the audience to these games.

- Alimi et al. (2014) in a study entitled The effectiveness of computer educational games on academic achievement and attitudes toward learning science in the fourth grade of elementary school in Arak , low data quadratic analysis was used to analyze the data. The results showed that the students who played computer educational games had significantly higher academic achievements and attitudes toward learning than students who were taught in another way. Therefore gaming has a positive effect.

In a study titled The effectiveness of computer educational games on academic achievement and attitudes toward learning science in the fourth grade of elementary school in Arak , Azimi et al. (2014) used Covariance analysis to analyze the data. The results showed that students who played educational computer games had significantly higher academic achievements and attitudes toward

learning than students who were taught in the traditional way. Therefore, the use of educational computer games in science education is recommended.

Khazaei and Jalilian (2014) in an article titled The effect of educational computer games on academic achievement and creativity of elementary school students, The research was functional and methodically quasi-experimental. The statistical population consisted of 280 first grade female students of Shahed school in the academic year 1391-92. 50 students were selected as a sample by simple random sampling method. The experimental group was exposed to Misha and Koosha computer training games for three months and the normal teaching method was implemented for the control group. The Torrance Visual Creativity Test and the Student Mathematical Achievement Test are the measurement tools. Kovarian analysis test was used to analyze the data. The results showed that the experimental group had significantly higher scores for science and creativity than the control group. Among the components of creativity (flexibility, initiative, expansion and fluidity), only in the case of flexibility and fluidity components the control group had significantly higher scores.

- Bijari (2013) by examining the effect of math educational computer games on self-direction and academic achievement of fifth grade students in Birjand, concluded that math educational computer games have a positive effect on self-direction and academic achievement of students.

Mehrabifar et al. (2012) conducted a study to investigate the types and duration of computer games usage and its relation to academic achievement of Kerman school students, which was of the correlation type. There is a significant relationship between computers and academic achievement: Most village students prefer adventure games. In these games, one needs to be creative and help strengthen their thinking. As a result, in terms of academic achievement they're at a higher level and average and poor students, like war games more. And are at a lower level in terms of academic achievement. The results of the study in the relationship between the duration of computer game usage and academic performance showed that there is a significant relationship in this regard.

Antoine and Belza (2016) addressed the issue of the effect of educational computer games on learning, memory and academic achievement motivation of students with intellectual disabilities. The purpose of this study was to investigate the effect of educational computer games on learning, remembering and motivation for academic achievement of elementary mentally disabled students in mathematical and applied concepts and its quasi-experimental method with pre-test post-test design in control group. The results of this study showed that educational computer game of mathematics in the concepts of addition, increases learning and motivation for academic achievement of students with intellectual disabilities in mathematics, but does not increase their memory.

- Edwin and Jane (2013) in a study entitled The effect of computer games on motivation and mathematical achievement of students examined the effect of teaching methods based on computer games on motivation and academic achievement of students in mathematics. The results of data analysis using Manova method showed that teaching method based on computer game is effective on academic achievement in mathematics, motivation to develop interest and attitude towards mathematics, but has no effect on material progress.

Herold and Isaac (2011) in a study titled The effect of computer game usage on learning basketball free throw skills and a comparison with a skilled and learning pattern, examined the effect of computer game usage on the acquisition and remembering basketball free throw skills (accuracy and Pattern)and comparison of this method with two methods of skilled and learning patterns. The results showed that all 5 groups in the post-test significantly improved in both scores accuracy and throwing pattern compared to the pre-test and the most improvement was for the Computer game accompanied by physical training group, and by summarizing the results obtained in this study, it can be claimed that using simulated computer games improve the learning of motor skills, and this method is more effective than the two methods of skilled and learning.

Methodology

The present research based on purpose, is of the functional type. In this study, in order to evaluate the effectiveness of the educational game on the academic achievement of 10th grade high school students, an experimental research project with a control group with pre-test and post-test has been used. The population of this study is all female students in the field of mathematics and experimental science in the tenth grade of Shahed and Fath al-Mubin high schools in the city of Rey. Cluster sampling was used randomly to select the sample. There were two mathematical and experimental groups in each of these schools, one school was considered as the control group randomly and the other school as the experimental group was randomly selected. Twenty students from the experimental school were randomly selected and provided with an educational game, and questions and answers were conducted online for the other group. In this study, 20 people were randomly selected from the experimental group and 19 people from the control group due to the loss of subjects. Therefore, the number of subjects in the control and experimental groups was 39 students.

Assessment tools

The chemistry student book of the tenth year of high school consists of 3 chapters. Since the present research is about the properties of the periodic table and this content is related to chapter one, we first prepared and arranged the specifications of this course with the cooperation of the relevant teachers. Then we measured and assessed the academic achievements (cognitive domain). Based on the number of goals and contents of Chapter One and the importance of the topics in this chapter, several questions were asked in the cognitive domain, with the help of teachers for each goal, and a total of 50 questions were asked. From these 50 questions, we selected 30 questions that had educational objectives in mind, and according to the objectives and the type of questions, we converted them into two types of 15-question tests, and considered these two tests as pre-test and post-test.

Validity: Seif (2003) has mentioned that in order to make valid academic achievement tests, we should try to make the test questions a perfect example of the objectives and contents of the course. The specification table is the best way to do so. In order to create the Chemistry Academic Achievement Test ,the specifications table related to this topic has been used, so we can say that our tests have the necessary content validity (content target table).

Reliability: A test's reliability points out the accuracy of the results. In this study, Cronbach's alpha test was used to determine the reliability coefficient. In this study, the reliability coefficient for the academic achievement test questions is 0.86 and it indicates that the relevant questions have good reliability.

The inferential statistics section also used analysis of covariance (ANCOVA). SPSS 25 software was used to accelerate the results.

findings

In this section, the effect of Coin79 game on students' progress in the control group with pre-test and post-test was evaluated:

Table 1. pre-test and post-test

source	Total squares	Degree of freedom	Average squars	F
group	32.00	1	32.00	5.00
block	66.00	1	66.00	11.00
error	198.00	35	5.000	
total	315.000	38		

The results show that the effect of block factor has been statistically significant. In other words, block factor scores have affected post-test scores.

To test the effect of the group or intervention on the dependent variable, the effect of the block factor as a modulating factor must be removed.

In order to evaluate the purpose of the research that (Coin79 game has an effect on students' academic achievement) according to the information in Table (1) because ($F = 1$ and P less than 0.01) therefore the purpose of the research is confirmed. Also, according to the results, it can be said that about 10.05% of the game of interest has an impact on academic achievement. This research is generally 30% effective, Coin79 game has an effect on students' academic achievement according to their previous knowledge.

Discussion and conclusion:

In order to test the hypothesis that "coin79 game affects students' academic achievement" it seems that the game environment has the following characteristics:

Attractive environment with effective effects, defined and important goals that were brought in the game. Creating competition among students, the existence of a factor called a sense of loyalty to the game, giving points and encouragement during the game, the possibility of repetition and practice, Learning assessment and feedback to the student are among the factors that have led to students' academic achievement.

When the educational goals and features of the game overlap more, the educational impact will be greater. For example, in Coin79 game, where we examined its effect on academic achievement, the educational goals were prepared in advance, and according to the table of content and the importance of the content, we arranged the steps in order of importance and difficulty, and we also tried to Design the game for specified educational purposes only. Therefore, it can be argued that one of the reasons for the increase in academic achievement in the subject of the periodic table is the proper overlap of educational goals and game features. This result is consistent with the results of Kibritchi (2008 and Siddiqin (1998).

Although the most common method of teaching for the teachers is lecturing, Skinner has proposed an alternative method of lecturing called programmatic instruction, and the device developed to provide programmatic material is called instructional machines. The advantages of using a training machine are:

1. Small steps. Learners encounter a small amount of information at each stage and move from one frame or information item to another on a regular basis.
2. Explicit response. Because explicit response is needed to reinforce learners' correct answers and correct their incorrect answers.
3. Immediate feedback. Immediately after answering, learners are told whether their answer was correct or not. This is instant feedback
4. Personal speed. Personal speed means that learners move forward at a pace commensurate with their abilities throughout the program.

research limitations

The limitations of the present study are:

- 1) The sampling method used in the present study was a random cluster method. This method for experimental research contains a high sampling error that may make the research results suspicious.
- 2) The traditional method and the usual question and answer that was done on the control group, was done virtually, which can affect the result we got from the control group.
- 3) The game is not online and the teacher is dependent on students' reports for the time of gaming.

Research suggestions

The following suggestions are for future studies:

- 1) Due to the widespread global popularity of the use of computer games, conduct similar research in other courses and educational levels.

- 2) Re-conducting research in face-to-face classes and comparing it with the present research
- 3) The content and time of this research was limited to one topic of the tenth grade high school chemistry student book for ten days. It is suggested that the content and time of future research in this field include the entire textbook and be during one school year.
- 4) Computer and mobile games to review and practice textbook concepts in accordance with the textbook for different levels of education from elementary to high school be developed.
- 5) Use educational videos made in Iran for educational boxes.
- 6) Investigate and discover the disadvantages of educational mobile games and provide solutions to eliminate these disadvantages.

Recommendations to applying to the findings

- 1- Using more learning methods based on computer and mobile games, to increase the performance of learners at higher levels of learning.
- 2- Holding in-service courses for teachers by the Organization of Education in the field of conceptual maps of lessons and designing educational games and cooperating with a suitable programmer to implement this plan in order to produce educational content.