GAMIFICATION AND EFFECTS ON STUDENTS' SCIENCE LESSON ACHIEVEMENT

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ABSTRACT

This study aims to reveal students' achievement based on gamification use. The study is a study of quantitative type and single-group pretest-posttest experimental design has been used. The study has been conducted in the spring semester of 2014/2015 academic year, candidates who are studying in 6. Grade of students. In the experimental group of this study while dramatized science teaching software is applied to control group, a lesson is carried out based on the curriculum and the program prepared by MEB, research is carried on for 8 weeks in total. In the research, as data collection devices "Multiple Choice Science Test" carried out in both groups and "Educational software" were applied to the experimental group and "Plain text" were applied to control group. After 8 weeks, Multiple Choice Science Test" carried out in both groups again. As a result of this research, gamification in a science lesson, it is found that there is a meaningful improvement in students' problem solving skills.

Keywords: Gamification, Game-based learning, Computer-based learning.

INTRODUCTION

"Gamification" is a concept which aims to increase user experience and engagement with a system, while education is an area with high prospective for application of this concept. A lot of ideas about gamification has been growing over the past few years and a lot of interest on how to use gamification in education. "There is a lot of potential in the field of gamification in education because as humans we always have a desire to learn irrespective of age. This comes to us with a big question "how can we make education more interesting?"" (Surendeleg, 2014).

So, researchers always are looking for new techniques for better teaching and gamification is one of them. Lots of researchers agree with this idea. For example, according to Emekçi and Fidan, "game design programs use students to actively participate in the teaching process will enable the improvement of learning retention" (Emekçi, Fidan, 2012). On the other hand, Çatak thought that "The examination will be carried out on a learning culture in the educational field of computer games and it shows that students remaining passive and disinterested in traditional teaching could be carried out more efficiently and more effective learning" (Çatak, 2011).

Also, "gamification approach increases participation and motivation of the learner, the learning process will be more effective, efficient, attractive and fun" (Bozkurt, 2014). Gamification has an active role in learning process. There is a breath of research that identifies the range of benefits relating to gamification and it can be observed that in addition to benefiting learning, gamification enhances learning, student engagement and as a technological approach which is necessary and relevant to today's learner Cheong, Kapp, Martin, 2011). It is revealed that empirical evidence exists that games can be effective tools for enhancing learning and understanding complex subject matter. gamification can play a big role when we incorporate into the learning process by enhancing student engagement, learning and through this student's motivation levels are increased.

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The use of technology can help to increase lesson engagement. Learning becomes a more active experience, stimulating students at a deeper level. Many education products employ the principles of gamification, which is the "use of game mechanics in nonentertainment environments to change user behavior and drive engagement"(Lowendahl, 2011). The use of games to teach students is not new and the importance of play in facilitating learning has long been recognized. Today's technology provides for an even more immersive experience. Games increase enjoyment for students by providing rewards and feedback, which can improve students' attitudes toward learning traditionally challenging subjects like mathematics or science. Studies trying to show whether educational gaming increases learning have been mixed, but they have shown increased student engagement and motivation (Rubin, 2011).

In this research, experimental and control group was used. There are other studies in the literature which were applied experimental studies. According to their results, Aral (2012) claimed that the results of the Learning Approach Scale of experimental and control groups determined the application made by puzzle educational material was the influence of students' scores. Games about children's rights issues were applied to the experimental group and constructivist teaching was applied to the control group. It has been proven that the experimental group was more successful than the control group (Torun, 2014). In addition, when students attitudes towards mathematics intended to measure, experimental group who were used gamification was more successful than control group (Özer, 2010). Gamification has a positive effect on students' achievement levels were seen (Türksever, 2011).

Aim & Scope

The purpose of the current study is first to define the relation of 6. A grade students' academic achievement for taking gamification in their science lessons. The following research questions were explored in this study:

- Does student's academic achievement correlate with using gamification in their science lessons?
- Is there any significant difference between the students' pre-test and post-test lesson grade?

METHOD

Participants

Data were collected across a state school in Adana, in 2014-2015 spring semester. Participants were 6. Grade of students. At the end of semester 20 students participated in the study. Also, the study was conducted in a computer lab.

Research Model

The study, which was conducted to determine relationships between vocational college students' academic achievement and submitted online follow up tests, carried the characteristics of correlational research model.

Data Collection Tool

To address the research questions, pre-test and post-test was applied. Firstly, a pre-test which was about the topic of vitamins was consisting of ten multiple-choice questions was applied 20 students. Then, a plain text which was about the topic of vitamins was given to a control group who were selected randomly and they were asked to learn by reading. Likewise, the experimental group was selected randomly. A gamified training software was given to them. It was asked to review the program in order to play games respectively. Finally, a pro-test was applied by asking the same questions in the pre-test to the experimental group and the control group. Fifteen minutes were given to answer the questions.

FINDINGS & DISCUSSIONS

Test results are determined by comparing the difference between the two groups' pre-test and post-test scores. Whether there is a significant difference between the two averages are determined by paired samples T test and independent groups T test. In this section, the findings obtained as a result of the analysis of the data and the data obtained from the study are described in the form of tables arranged.

The paired samples T test for determining whether there is a significant difference between pre-test and post-test scores of the control group were applied and t-test results are presented in Table 1.

Table 1: Paired samples t-test results: For the comparison of the pre-test and post-test scores of the control group

Test Type	N	X	Ss	t	p
Pre-test	10	42	16,19	-1,103	0,299
Post-test	10	47	17,02		

*P<, 05

The scores obtained in achievement test results analyzed by applying the paired samples t test. The mean of the control group pre-test was X = 42 and the standard deviation was seen as Ss = 16,19. On the other hand, the mean of pro-test was seen as X = 47 and the standard deviation appears to be Ss = 17,02. As a result of the analysis, it is observed that there is not a significant difference (t=-1,103; p>0.05) between pre-test and post-test scores of the control group.

The paired samples T test for determining whether there is a significant difference between pretest- posttest scores of the experimental group were applied and t-test results are presented in Table 2.

Table 2: Paired samples t-test results: For the comparison of the pre-test and post-test scores of the experimental group

Test Type	N	X	Ss	t	p
Pre-test	10	34	14,46	-2,577	0,030
Post-test	10	56	15,05		

*P<, 05

The scores obtained in achievement test results analyzed by applying the paired samples t test. The mean of the experimental group pre-test was X = 34 and the standard deviation was seen as Ss = 14,46. On the other hand, the mean of pro-test was seen as X = 56 and the standard deviation appears to be Ss = 15,05. As a result of the analysis, it is observed that there is a significant difference (t=-2,577; p<0.05) between pre-test and post-test scores of the experimental group. Because degree of freedom is negative, it means that the post-test scores' means are much more than pre-test scores.

For the comparison of the experimental and control groups pre-test score, independent samples t-test results are shown in Table 3.

Table 3: Independent samples t-test results: For the comparison of the experimental and control groups pre-test scores

Groups	N	X	Ss	t	p
Experimental	10	34	16,46	1,095	0,288
Control	10	42	16,19		

P>, 05

The scores obtained in achievement test results analyzed by applying independent samples t test. The mean of the experimental group pre-test was X = 34 and the standard deviation was seen as Ss = 16,46. On the other hand, the mean of the control group pre-test was X = 42 and the standard deviation was seen as Ss = 16,19. As a result of the analysis, it is observed that there is not a significant difference (t=1, 095; p>0.05) between pre-test scores of both experimental and control groups.

For the comparison of the experimental and control groups post-test score, independent samples t-test results are shown in Table 4.

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Table 4: Independent samples t-test results: For the comparison of the experimental and control groups post-test scores

Groups	N	X	Ss	t	p
Experimental	10	56	15,05	-1,252	0,227
Control	10	47	17,02		

P>, 05

The scores obtained in achievement test results analyzed by applying independent samples t test. The mean of the experimental group post-test was X = 56 and the standard deviation was seen as Ss = 15,05 On the other hand, the mean of the control group post-test was X = 47 and the standard deviation was seen as Ss = 17,02. As a result of the analysis, it is observed that there is not a significant difference (t=-1,252; p>0.05) between post-test scores of both experimental and control groups.

CONCLUSION & SUGGESTIONS

Gamification can motivate students to engage in the classroom, give teachers better tools to guide and reward students, and get students to bring their full selves to the pursuit of learning. It can show them the ways that education can be a joyful experience, and the blurring of boundaries between informal and formal learning can inspire students to learn in life wide, lifelong, and life deep ways. The challenges, however, are also significant and need to be considered. Gamification might absorb teacher resources, or teach students that they should learn only when provided with external rewards. On the other hand, playfulness requires freedom - the freedom to experiment, to fail, to explore multiple identities, to control one's own investment and experience (Klopfer, Osterweil & Salen, 2009). In tandem with the creation of gamification projects, it must be developed meaningful assessments of whether they are achieving their aims. As gamification spreads throughout the real world, there is little question it will also impact schools. By leading to research-based, theory-driven gamification projects, it can be worked to ensure that the impact of gamification is a positive one. Gamification will be a part of students' lives for years to come. If teachers can harness the energy, motivation and sheer potential of their game-play and direct it toward learning, then teachers can give students the tools to become high scorers and winners in real life.

So, in this study, gamification project was applied and the results are compared. Firstly, in the light of the research questions, paired samples t-test results was shown in Table 1 for the comparison of the pre-test and post-test scores of the control group. However, there is not a significant difference (t=-1,103; p>0.05) between pre-test and post-test scores of the control group. It means that control groups' scores does not change based on these two tests. In addition, paired samples t-test results was shown in Table 2 for the comparison of the pre-test and post-test scores of the experimental group and there is a significant difference (t=- t=-2,577; p<0.05) between pre-test and post-test scores of the experimental group. It means that experimental groups' scores change based on these two tests. So, gamification application can change students' academic achievement. After that, independent samples t-test results was shown in Table 3 for the comparison of the experimental and control groups pre-test scores and again, there is not a significant difference (t=1, 095; p>0.05) between pre-test scores of both experimental and control groups. Therefore, it can be said that there is not a huge difference between experimental and control groups' knowledge level. At the end, independent samples t-test results was seen in Table 4 for the comparison of the experimental and control groups post-test scores. There is not a significant difference (t=-1,252; p>0.05) between post-test scores of both experimental and control groups. As it can be seen, there is a significant change only in Table 2. The reason of that can be gamified applications are typically goal-oriented with a clearly defined set of 'win' conditions and a number of obstacles to overcome in order to complete the activity (Figure 1).
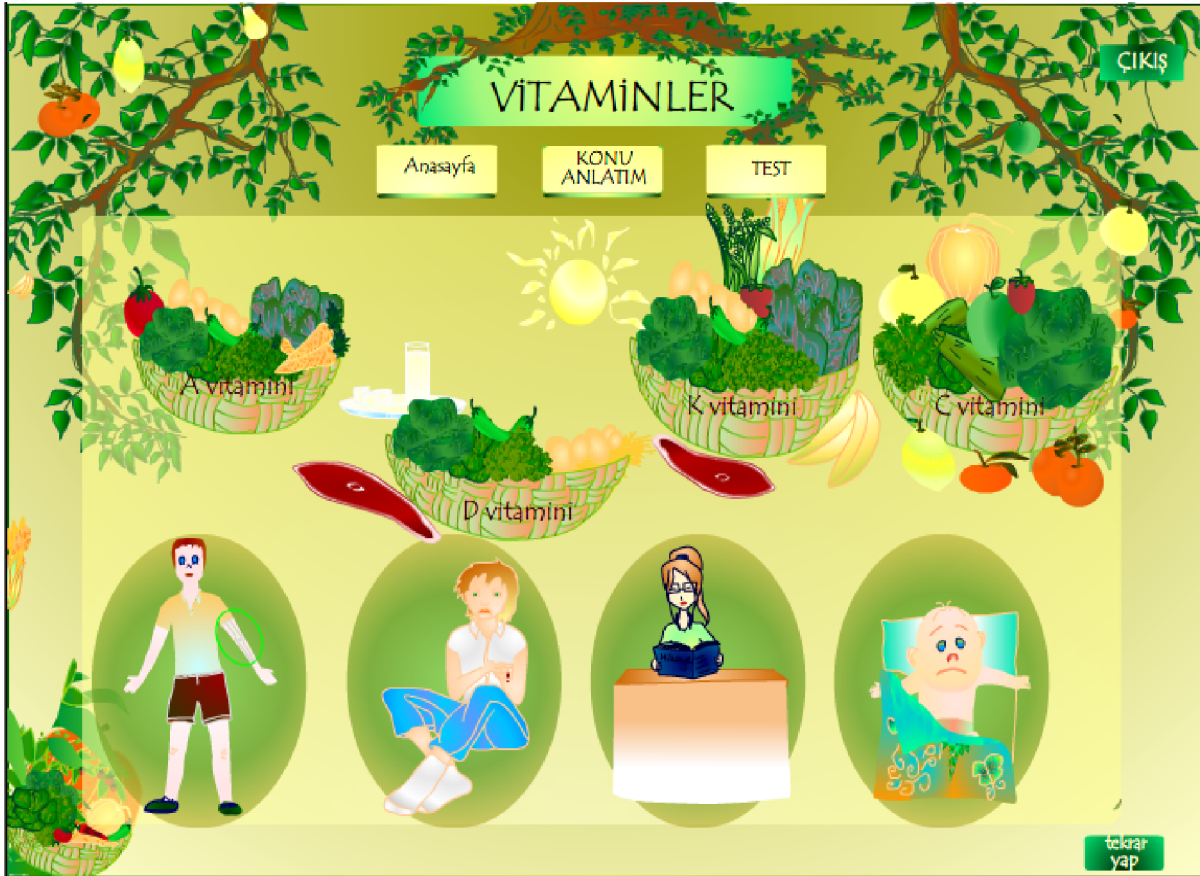
Figure 1: An interface of education software

From this definition, it is clear to see the similarity between games and learning, with players/learners being directed to undertake tasks in order to achieve a desired outcome, moving to the next level/mission in the case of a game, or complete understanding a complex topic in the case of education (Ames, 1990; Pintrich, 2003). This shared focus on achieving specific goals is a major reason for the applicability of gamification to education. If the literature was examined, according to Cansever (2015), gamification can be effective in satisfying their needs and it can be more interesting, making remarkable and enjoyable for students and with gamification, education will be fun and more remarkable (Bıçakcı, 2014). In short, most of the researchers agree with the idea of gamification. Although, there is both positive and negative side of it, positive effects outweigh the negative effects. In this research, the experimental group was more successful in their post tests. So, it can be said that gamification has positive effects. For the further researches, gamification can be applied in other lessons like social science or mathematics. Participants can be primary school students or university students.

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