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The effects of gamification-based teaching practices on student achievement and students' attitudes toward lessons☆

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ABSTRACT

Gamification is defined as the use of game design in non-game contents. Gamification of educational processes can be described as the successful integration of the gamification framework into the curriculum in order to improve students' motivation, academic achievement, and attitudes toward lessons. In this regard, the present study aims to determine the effects of gamification-based teaching practices on student achievement and their attitudes toward lesson. Investigating the effects of gamification on instructional processes and educational outcomes is expected to contribute to the relevant literature as it is a relatively new mechanism. The study is designed with quantitative research methodology and a true experimental design using pretest–posttest experimental and control groups. The study's participants included 97 sophomores from the Department of Elementary Mathematics Education of a state university in southern Turkey in 2014–2015. The experimental group comprised 49 students compared to 48 students in the control group. According to the research results, gamification-based teaching practices have a positive impact upon student achievement and students' attitudes toward lessons.

1. Introduction

The concept of distance learning has become increasingly prominent due to the dissemination of the internet and the availability of technology while the educational process has traditionally been carried out in a face-to-face manner. Odabaş (2003) points out that interactive transference is vital in face-to-face instruction, but the process will be ineffective if the interaction is missing or inadequate. Although distance education fails to provide an interactive learning environment, blended learning has emerged as a more useful model as it offers various educational options to learners, minimizes the inequality of opportunity, provides individualized solutions pertinent to learning differences, and eliminates factors related to space and time (Altiparmak, Kurt, & Kapidere, 2011; Kaya, 2013). According to various research results (Al-Qahtani & Higginst, 2012; Rovai & Jordan, 2004), students' achievement and their attitudes toward lessons in a blended learning setting are more positive compared to either distance learning or face-to-face instruction. Blended learning brings together the positive aspects of distance learning and face-to-face instruction to some extent. Blended learning can be defined as carrying out face-to-face learning together with online learning (Yapıcı, 2011).

Blended learning includes different procedures, and various models are available based on the characteristics of course content or the learner group. According to Staker and Horn (2012), a flipped classroom is one of the blended learning instructional designs. Yet Tucker (2012) claims that flipped classrooms are an independent model in which there is no obligation to use online learning. Flipped classrooms necessitate the replacement of in-class learning processes by non-class activities (Tucker, 2012). In other words, students get the core of the topic in advance, and interaction between students and teachers is boosted by carrying out complementary non-class activities in class. Course materials can be provided online or handed out as homework in advance. If the first option is adopted, the flipped classroom model will be carried out using a blended learning design. Gamification as a recent mechanism may help determine how to improve the efficiency of blended learning and the flipped classroom. The gamification of instructional design might dynamize the educational processes. However, the scope of games should be clarified before gamifying any kind of mechanism.

Games reflect the culture of the period in which they are played. Chess and other games that have been played for centuries are now played online in today's information age. The diversity of games has been expanded as they are played in the cyber world. People have easy access to a variety of games, such as Farmville, Angry Birds and Candy Crush Saga, via laptops and smartphones thanks to the internet. Accessibility increases the frequency of gameplay, and people spend more time on games. People spend both money and time on games in the digital world. Warman (2015) states that people spent 91.5 billion

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dollars on digital games worldwide in 2015. He adds that China spent the most on games (i.e., 22.2 billion dollars), followed by the USA (22 billion dollars). Therefore, the digital games industry has grown. Digital games such as Farmville, Angry Birds, and Candy Crush Saga have become so popular because they use the specific structure of the games. This specific structure is comprised from dynamics, mechanics, and components. Dynamics are the result of desires and motivations. They are fewer in quantity, but paramount in quality. To illustrate, these elements resemble the grammar of a language as they provide integrity and consistency. They consist of elusive elements, such as constraints in design, emotions, advancement structure, and a narration technique. Mechanics are the elements related to the advancement structure of the process. They are like the verbs in a language. Mechanics contain elements related to chance, competition, cooperation, exchange, and challenge. Whereas dynamics and mechanics describe how the system works, components focus on the outputs of the system. They are like the nouns in a language. The components of game design can be listed as points, badges, level, experience points (xp), and leaderboards (Bunchball, 2010; Şümşet, 2014; Werbach, 2014).

Such games are played by large masses for very long periods, which led to the original idea to transfer this attention-grabbing process to other settings. Nick Pelling defined this as gamification in 2002, but it was not addressed in the literature until 2010. Despite the fact that different concepts referring to gamification have been used since the beginning of 2008, such as surveillance entertainment (Grace & Hall, 2008) and productivity games (McDonald, Musson, & Smith, 2008), the concept of gamification was first referenced by Jesse Schell in his presentation (The Future of Games) at the 2010 DICE Summit (Bayraktar, 2015; Deterding, Dixon, Khaled, & Nacke, 2011; Xu, 2011). Zicherman and Cunningham (2011) define gamification as the process of game-thinking and game mechanics to engage users and solve problems (p.14). Deterding et al. (2011) describe it as the use of game design in non-game contents (p.1). Gamification can be defined as the transference process of these three elements (dynamics, mechanics, and components) in harmony to non-game contexts. At this context, the relation with gamification and education may come into prominence.

Students' attention, interest, and motivation are strictly correlated with student achievement. Gamification may mitigate student-driven issues in the teaching process, such as lack of motivation and interest, through the effective use of learning from mistakes and the promotion of students sentimentally and socially (Lee & Hammer, 2011). In this regard, gamification of education can be defined as the transference of game design to the educational process for the purpose of increasing students'attention and motivation and improve student achievement and attitudes toward lessons.

It is important to note that the gamification process of education and educational games are conceptually different (Deterding et al., 2011). The game is a subsidiary component of educational games while the entire process is converted into a game in gamification. Gamification as an original and comprehensive framework would be more effective in education as some studies have indicated the positive effects of educational games (Ebner & Holzinger, 2007; Kiili, 2005).

The present study aims to determine the effects of gamification-based teaching practices on student achievement and their attitudes toward Teaching Principles and Methods lesson at the university level. And, research questions are as follows.

1. Will gamification-based teaching practices impact student achievement in Teaching Principles and Methods lesson at the university level?
2. Will gamification-based teaching practices impact student attitudes in Teaching Principles and Methods lessons at the university level?

It is an experimental study with experimental and control groups. The Teaching Principles and Methods curriculum was organized for each group separately. Student achievement and attitudes toward lessons in the control group, in which blended learning and a flipped classroom were incorporated into the teaching process, will be compared with student achievement and attitudes toward lessons in the experimental group, in which blended learning and a flipped classroom were integrated with a gamification-based teaching process. Detailed explanations about gamification-based teaching practices are given in the Section 2.4 “Gamification of Educational Process”. It is believed that the present study will contribute to the relevant literature by providing information on how to conduct the gamification process in education. This study is also important in terms of investigating the effects of gamification-based teaching practices on student achievement and attitudes toward lessons with contemporary models (blended learning and flipped classrooms) instead of traditional ones. The blended learning procedure is carried out and promoted through internet usage. In other words, the gamification structure in this research has been conducted with the support of internet usage. In addition to the findings related to the gamification procedure conducted via internet usage, the research comes up with original results based on implementation with 48 higher education students during an entire course of a specific lesson at the university level.

2. Methodology

The study is designed as an experimental research using quantitative research methodology. A true experimental design with pretest–posttest experimental and control groups are used (Baştürk, 2014). The experimental and control groups are randomly distributed, and data collection instruments are administered to the participants before and after the implementation in both groups.

In the control group's educational processes, blended learning and a flipped classroom are used together; for the experimental group, a gamified framework is used in addition to blended learning and a flipped classroom. The research methodology allows for not only the investigation of gamified teaching practices' effects on student achievement and students' attitudes toward lessons, but also the description of a procedure to improve the efficiency of blended learning and flipped classrooms.

2.1. Participants

The study's participants consist of sophomores in the Department of Elementary Mathematics Education at a state university in southern Turkey during the 2014–2015 academic years. The study was conducted during the Teaching Principles and Methods lesson, in which 97 students were enrolled. The participants were randomly assigned to experimental and control groups based only on their gender. At first, the participants were divided into two groups as girls and boys. After that, girls and boys divided into experimental and control groups randomly. The experimental group comprised 49 students (38 female, 11 male) whereas 48 students (38 female, 10 male) were participated in the control group. The two groups attended class on different days. Both groups also used different websites for their distance learning processes.

2.2. Research procedure

The study was conducted within the Teaching Principles and Methods lesson during the 14-week fall semester of 2014–2015. First, the Teaching Principles and Methods curriculum were designed; it was then organized for each group separately. The process for designing the distance learning was carried out with the help of Moodle system. In addition, data collection instruments were obtained after the reliability and validity analyses. The experimental process lasted for 14 weeks, during which time the curriculum was carried out. Data were obtained via instruments at the very end of the implementation; findings were extrapolated with the data analysis, and the results were disclosed.

2.3. Curriculum and blended learning procedure

The Teaching Principles and Methods course meets for 150 min a week, for 3 credits. In the research process, 90 min were allocated to face-to-face learning and 60 min to distance learning. In other words, a blended learning procedure was used including traditional education (60%) and distance education (40%). In the distance education phase, Moodle—open source educational software—was employed on the website http://gul3.bim.gantep.edu.tr/~demir/moodle/. Every student logged into the system with his/her user name and password in order to monitor improvement through the website. Course materials were provided via the website to increase students' readiness and engagement according to the flipped classroom mentality.

It is likely that more time needs to be devoted to discussion and exercises during a lesson as the students become familiar with the course content in advance. Students could monitor the weekly course schedule through the website. All the educational procedures were the same for experimental and control groups. Although course content and exercises (blogging, writing on the wall, participating in quizzes, reviewing articles, completing project assignments, etc.) designed for experimental and control groups were exactly the same, they were presented with gamification in the experimental group. The next section clarifies how the gamification of educational processes was carried out for the experimental group.

2.4. Gamification of educational process

Gamification principles were taken into account for the experimental group, and additional educational attainments for students were determined for a gamified curriculum, as follows.

i. Knows that the lesson is actually a game and succeeds in finishing the game by completing the tasks.
ii. Is aware of the advancement structure and fulfills the requirements.
iii. Cooperates with friends inside and outside of the class.
iv. Is more successful in a favorable competitive environment.
v. Knows what is required to earn points and earns points by putting his/her knowledge into practice.
vi. Knows what is required to earn experience points (xp) and earns experience points by putting his/her knowledge into practice.
vii. Knows what is required to level up and levels up by putting his/her knowledge into practice.
viii. Knows what is required to earn badges and earns badges by putting his/her knowledge into practice.
ix. Knows what is a leaderboard and makes efforts to advance in the league.

After the determination of educational attainments (i.e., objectives), the next step is to integrate the gamification procedure into the teaching process, which includes the effective use of dynamics, mechanics, and components (Bunchball 2010; Şümşet, 2014; Werbach, 2014).

The dynamics of course design consist of emotions, constraints in design, advancement structure, and narration technique. At the very beginning of the semester, a narration technique was used to expose students to the idea that the course was actually a game and finishing the game would result in a reward at the end of semester to encourage them for to implement the procedure. In addition, the course content and schedule designed for the experimental group were not done in bulk, meaning students would need to complete the available activities and exercises before obtaining subsequent ones. Optional activities were included as well. These processes represent to constraints and advancement structure (Fig. 1).

Mechanics include chance, competition, cooperation, exchange, and challenge. The competition mechanism was created through game components in the educational framework. Students become willing to make progress as they become aware of their friends' levels, medals, cups, and badges. Furthermore, as each student observes his/her own improvement process, the student is challenged by his/her potential. Cooperation and exchange mechanisms were put into practice by awarding helpful badges to students who work in groups in the writing on the wall exercise or assisting a friend in class.

The components of game design are points, badges, level, experience points (xp), and leaderboards; they were integrated into the assessment and evaluation stage as well as teaching and learning procedures of the implementation. Students were rewarded with achievement points for engaging in in-class activities and blogging. They could also earn bonus points for participating in class activities. Another source of bonus points was students' voluntary involvement in non-obligatory activities. In addition, blogs were scored according to their authenticity and fitness to the purpose every week. These points were noted on the website's home page on a weekly basis. In the study, six kinds of badges were used. Badges are of particular importance as an element of prestige despite the fact that they were not taken into consideration in

Fig. 1. Constraints and advancement structure on the website.

assessment and evaluation, unlike achievement points. Students acquired some of the badges (super cup, blogger, diligent, contributor, helpful, speedy) in class activities while others were gained through distance learning. The students could see the badges they earned on their own website page.

Experience points were illustrated via the medals students earned. The medals were distributed to students who spent time on course materials voluntarily without the expectation of any kind of award to keep students' attention and encourage them to complete the game-like course. Two bronze, eight silver, and six gold medals were available; whereas it was easier to earn a bronze medal, the gold medal required harder work compared to the silver medal (Table 1).

The students leveled up as they earned medals. Seven levels indicated students' status in the course. The first two levels were called apprentice, the next three were assistant master, and the last two were master. Allen's (2007) framework was used to balance the difficulty of levels. According to this framework, students begin with a simple activity as an apprentice; activities become harder to be an assistant master. A student must make greater effort to become an assistant master and abide by the process due to the self-confidence resulting from the sense of achievement. The difficulty of fourth and fifth levels promoted students' progression. The transition from assistant master to mastership was more difficult than the previous one because the student had a higher level of motivation when leveling up the two previous times and built self-confidence. Finally, the student completed the process, and the course was finished.

In addition to the assessment system of the course procedure, students' overall achievement was quantified by means of percentages. The top 15 and bottom 5 students were consistently announced on the website. This process was also carried out for quizzes and assignments.

2.5. Data collection tools

Two types of instruments were used in the study: achievement test and attitude scale.

2.5.1. Achievement test

An achievement test was developed to determine the participants' level of knowledge concerning the subject area before the implementation and to evaluate them at the very end of the experimental procedure. The principles of test development were followed in a scientific manner. The initial steps for developing an achievement test are identifying the objectives and constituting an item pool to evaluate these objectives. For this purpose, exam questions came from 5 different lecturers of this specific lesson, and questions from other supplies were also examined. Based on the result of validity and reliability analyses, a 30-item achievement test was generated from an item pool with 65 questions. The achievement test was distributed to 138 students who had completed Teaching Principles and Methods in previous semesters for the pilot scheme. According to the analyses, discrimination and difficulty indices for each item were as follows.

As a result of the statistical analyses, the 20-item achievement test was validated. In the preliminary version of the test, 10 items with discrimination indices lower than 0.2 were eliminated, those with discrimination indices between 0.2 and 0.3 were revised, and those with discrimination indices > 0.3 were accepted without any alterations. At the end of this procedure, the final version of the achievement test had the capacity to distinguish between knowledgeable students and unknowledgeable ones. The average difficulty index of the achievement test was 0.53, demonstrating that the exam was of average difficulty (Table 2).

Three experts from the Department of Curriculum and Instruction concluded that the achievement test was convenient for use in the study. The experts' assessment of the table of specifications also indicated that the test had content validity. In sum, the 20-item multiple-choice achievement test was developed in line with the objectives of the study.

2.5.2. Attitude scale

An attitude scale was used to determine the effects of gamification on students' attitudes toward the lessons; it was the only difference between the course procedures in the two groups. The students' attitudes toward lessons were determined using Türker and Turanlı (2008) Attitudes toward Courses in Mathematics Education scale. The Teaching Principles and Methods lesson was part of the mathematics education courses. The scale was administered to 450 students studying in the Departments of Mathematics Education and Elementary Mathematics Education at Hacettepe and Balıkesir Universities in Turkey. It consists of 18 items, 12 of which are positive and 6 of which are negative statements. Its Cronbach's alpha reliability coefficient is 0.928. The test–retest reliability coefficient was found to be 0.791 on 51 participants. A factor analysis demonstrated that scale items composed only a subdimension.

Turker and Turanli's (2008) scale comprises all the courses in mathematics education. However, the main aim of the study was to determine students' attitudes toward the Teaching Principles and Methods lessons. Therefore, the scale had to be revalidated due to adjustments made in line with the research objectives. All the scale items were adjusted for the Teaching Principles and Methods lessons, and the 18-item scale was administered to 182 undergraduate students of the Faculty of Education at Gaziantep University. All the participants of the pilot scheme had completed the Teaching Principles and Methods lessons in the previous two semesters. The Cronbach's alpha reliability coefficient of 0.94 indicated that the scale has a high level of reliability.

An exploratory factor analysis (EFA) was conducted for the construct validity. The analysis revealed that the KMO index was 0.923 and Bartlett's sphericity test was statistically significant ($\chi^2 = 1772.835$, $df = 120$, $p < 0.01$). Thus, the data fit the factor analysis. Those items whose factor loadings fell below 0.4 were eliminated (Büyüköztürk,

Table 1
Levels and their descriptions.

Levels		Medal to be earned
Level 1	Apprentice	1 bronze medal
Level 2	Apprentice	2 bronze, 1 silver medals
Level 3	Assistant master	3 silver, 1 gold medals
Level 4	Assistant master	5 silver, 2 gold medals
Level 5	Assistant master	5 silver, 3 gold medals
Level 6	Master	7 silver, 5 gold medals
Level 7	Master	8 silver, 6 gold medals

Table 2
Item difficulty and discrimination indices.

Item no	Item discrimination index	Item difficulty index	Item no	Item discrimination index	Item difficulty index
−1	0.14	0.62	+16	0.20	0.34
+2	0.23	0.78	+17	0.23	0.90
+3	0.57	0.52	−18	0.14	0.66
+4	0.26	0.70	+19	0.37	0.49
−5	0.06	0.23	+20	0.20	0.87
+6	0.43	0.66	+21	0.20	0.39
−7	0.00	0.21	−22	0.03	0.58
+8	0.20	0.09	+23	0.60	0.45
+9	0.31	0.80	−24	0.11	0.48
+10	0.31	0.55	+25	0.26	0.25
−11	0.14	0.90	+26	0.26	0.18
+12	0.34	0.72	+27	0.43	0.31
−13	0.03	0.94	+28	0.26	0.61
+14	0.26	0.66	−29	0.14	0.95
−15	0.09	0.95	+30	0.23	0.44

+ Items included in the test.
− Eliminated items.

Table 3
Exploratory factor analysis of the scale.

Item no	Total variance of factor	Loading of factor 1	Factor loadings after rotation	
			Factor 1	Factor 2
8	0.706	0.783	0.784	0.302
10	0.646	0.737	0.760	0.261
17	0.623	0.735	0.737	0.283
18	0.537	0.558	0.732	
4	0.557	0.713	0.674	0.320
9	0.538	0.699	0.667	0.306
6	0.581	0.753	0.637	0.419
13	0.650	0.805	0.621	0.513
11	0.400	0.618	0.545	0.320
12	0.750	0.620		0.864
14	0.657	0.687	0.216	0.781
2	0.752	0.840	0.476	0.725
16	0.570	0.685	0.292	0.696
1	0.574	0.709	0.343	0.675
7	0.565	0.727	0.409	0.630
3	0.528	0.719	0.462	0.561
Explained variance (Total: % 60.2)			% 31.992	% 28.208

2008; Kline, 2011). It was then verified that each item had a high factor loading on only one dimension. At least a 0.1 variation must occur between an item's factor loadings on different dimensions (Büyüköztürk, 2008), which is why the fifth and fifteenth items were eliminated. A 16-item, 5-point Likert type scale was structurally finalized with 11 positive and 5 negative statements. A two-dimensional scale explaining 60.2% of the total variance was validated as a result of principal components analysis and varimax rotations. The findings of the exploratory factor analysis are presented in Table 3.

Factor rotations established that the first dimension consisted of 9 items (4th, 6th, 8th, 9th, 10th, 11th, 13th, 17th, and 18th items) while the second had 7 items (1st, 2nd, 3rd, 7th, 12th, 14th, and 16th items). The first factor is the emphasis dimension whereas the second is the affective dimension based upon an examination of the relationships between the items in the factors. The emphasis dimension is about the importance of the Teaching Principles and Methods lessons (e.g. the necessity of the lessons or to reinforcement of theoretical knowledge) whereas the affective dimension is about emotional reactions to the Teaching Principles and Methods lessons (e.g. to like lessons, to bored from lessons or to enjoy lessons).

2.6. Data analysis

The data was collected from 97 participants with data collection tools. The achievement test was conducted before the implementation and at the end of the experimental procedure whereas the two-dimensional attitude scale was administered to participants at the end of the procedure. In the data analysis, a covariance analysis and an independent samples *t*-test were used based on statistical significance. Effect sizes were also calculated using eta squared. Whereas the covariance analysis and independent samples *t*-test estimate the chance factor in research results, effect size is an indicator of practical significance (Fan, 2001). Murphy and Myors (2004) define effect size as a standard criterion showing how much the independent variable influences the dependent one.

2.6.1. Data analysis of achievement test

The data from the achievement test were analyzed using the SPSS 20.0 software package. Covariance analysis was conducted to examine the differences between pretest and posttest scores of the experimental and control groups related to student achievement. The covariance analysis allowed for the determination of student improvement by comparing the posttest scores and controlling the effects of the pretest scores. Before conducting a covariance analysis, it must be determined whether the assumptions of analysis have been met. These assumptions are as follows (Büyüköztürk, 2008).

- The samples were unrelated in terms of which means will be compared. Experimental and control groups attended class independently of each other on different days and used a different website design.
- The posttest scores of the experimental group *(Kolmogorov-Smirnov* $= 0.801, N = 48, p > 0.05$) and the control group *(Kolmogorov-Smirnov* $= 0.828, N = 49, p > 0.05$) were normally distributed.
- According to the Levene test relevant to the posttest scores, the variance between the experimental and control groups was homogeneous ($F(1,95) = 3.182, p > 0.05$).
- The ANOVA results testing the slope equality of the regression lines showed that the effect of group*pretest seemed to be insignificant on student achievement ($F(1,93) = 0.195, p > 0.05$), indicating that the slopes of the regression lines were equal.
- Scatter diagrams of posttest scores should be elliptical for linearity. An examination of scatter diagrams suggested that it is very close to the elliptical shape and there was no deviation.

Thus, the research data met the assumptions for conducting a covariance analysis.

2.6.2. Data analysis of students' attitudes

Data related to students' attitudes were also analyzed using SPSS 20.0. The Teaching Principles and Methods lessons are dissimilar from math, science, etc. in terms of duration. Students in the faculty of education complete the course in one semester. Hence, they did not have any attitudes toward Teaching Principles and Methods lessons in advance as they were completely unfamiliar with the lesson at the very beginning of the semester. Therefore, students' attitudes toward the course that they developed during the semester were compared in terms of their groups. The normality of data was tested to determine the statistical analysis, and the data of the experimental group *(Kolmogorov-Smirnov* $= 1.131, N = 48, p > 0.05$) and the control group *(Kolmogorov-Smirnov* $= 1.035, N = 49, p > 0.05$) were normally distributed. As both data were normally distributed, an independent sample's *t*-test among parametric statistics was conducted.

3. Results

The research findings will be presented separately with regard to student achievement and their attitudes toward lessons.

3.1. Effects of gamification on student achievement

In this part, the effects of gamification-based teaching practices on student achievement are examined. Student achievement in the control group, in which blended learning and a flipped classroom were incorporated into the teaching process, will be compared with student achievement in the experimental group, in which blended learning and a flipped classroom were integrated with a gamified course procedure.

A covariance analysis was conducted to examine the differences between student achievement as a result of pretest–posttest implementation in the experimental and control groups. The students' posttest means adjusted for pretest scores are shown in Table 4.

The adjusted means of students in the experimental group was 73.4 compared to 68.09 for the control group. An ANCOVA test was conducted to demonstrate the significance of the difference between the

Table 4
Descriptive statistics of achievement test scores by groups.

Group	N	Mean	Adjusted mean
Experimental	48	73.44	73.40
Control	49	68.06	68.09

Table 5
ANCOVA results of posttest scores by group.

Source of variance	Sum of squares	df	Mean of squares	F	p	η2
Model	869.286	2	434.643	3.382	0.038	0.067
Pretest (reg.)	168.430	1	168.430	1.311	0.255	0.014
Group	683.399	1	683.399	5.318	0.023	0.054
Error	12,080.198	94	128.513			
Total	12,949.485	96				

adjusted posttest means of both groups related to student achievement. The results are shown in Table 5.

According to the ANCOVA results, the difference between the adjusted posttest means for pretest scores of the students in the experimental and control groups was statistically significant ($F(1,94) = 5.318$, $p < 0.05$). The examination of the adjusted means indicated that the experimental group was more successful than the control group. In other words, students' improvement from pretest to posttest in the experimental group was significantly higher than in the control group. Therefore, it can be asserted that the gamification procedure had a positive impact upon student achievement.

The eta-squared value was 0.054, indicating a moderate level of impact (Cohen, 1988). In other words, 5.4% of the variations in the posttest scores were explained by gamification-based teaching practices.

3.2. Effects of gamification on students' attitudes toward lessons

This section examines the effects of gamification-based teaching practices on students' attitudes toward lessons. Attitudes of students in the control group (i.e., blended learning and a flipped classroom) are compared to those of students in the experimental group (i.e., blended learning and a flipped classroom were integrated with a gamified course procedure). In addition to total scores, the scale of attitudes toward the Teaching Principles and Methods lessons consisted of two dimensions: the emphasis dimension and the affective dimension. The students' attitudes were examined on the basis of both dimensions and the overall total. Independent sample *t*-test results of students' attitudes toward lessons for the experimental and control groups are presented in Table 6.

Students' attitudes toward lessons differed significantly according to the group in which they participated ($t(95) = 2.26$, $p < 0.05$). The students' attitudes toward lessons in the experimental group ($M = 61.48$) were more positive than those of the control group ($M = 55.88$). Thus, it can be claimed that gamification had a positive impact upon students' attitudes toward the lessons.

The eta-squared value was 0.051, indicating a moderate level of impact (Cohen, 1988). Thus, 5.1% of the variations in the posttest scores were explained by gamification-based teaching practices.

3.2.1. Attitude scale emphasis dimension

Independent sample *t*-test results of students' attitudes toward the lessons for the experimental and control groups are presented in Table 7.

The students' attitudes toward the lessons in terms of the emphasis dimension did not differ significantly according to the group in which they participated ($t(95) = 1.68$, $p > 0.05$). Thus, gamification did not have any impact upon students attributing importance to the lessons.

Table 6
t-Test results of students' attitudes by groups.

Group	N	$\bar{x}$	SD	df	t	p	η^2
Experimental	48	61.479	11.972	1.728	2.255	0.026	0.051
Control	49	55.878	12.479	1.783			

Table 7
t-Test results of emphasis dimension related to students' attitudes by groups.

Grup	N	$\bar{x}$	SD	df	t	p	η^2
Experimental	48	37.250	6.657	95	1.683	0.096	0.029
Control	49	34.84	7.437				

3.2.2. Attitude scale affective dimension

Independent samples *t*-test results of students' attitudes toward the lessons in terms of the affective dimension for the experimental and control groups are presented in Table 8.

The students' attitudes toward the lessons in terms of affective dimension differed significantly according to the group in which they participated ($t(95) = 2.61$, $p < 0.05$). The affective attitudes of students in the experimental group ($M = 24.23$) were more positive than those in the control group ($M = 21.04$). Hence, it can be concluded that gamification had a positive impact upon students' affective attitudes toward the lessons.

The eta-squared value was 0.067, indicating a moderate level of impact (Cohen, 1988). In other words, 6.7% of the variations in the posttest scores were explained by gamification-based teaching practices.

4. Discussion

Scientific research results have shown that a blended learning procedure has positive effects on students' achievement (Al-Qahtani & Higginst, 2012; Rovai & Jordan, 2004; Usta, 2007). In this study, a blended learning procedure was gamified to level up the positive effects of the procedure to determine the effectiveness of the gamified blended learning procedure by comparing it with the standard one.

In examining isolated effects of gamification, various studies (Barata et al., 2013; Buckley & Doyle, 2014; Domínguez et al., 2013; Faghihi et al., 2014; Rouse, 2013; Toda, Do Carmo, Silva, & Brancher, 2014) ascertained that gamification-based teaching practices positively affect student achievement. However, in his year-long study with 20,000 primary and secondary school students, Tomaso (2014) concluded that gamification-based teaching practices have a weak positive impact on student achievement. It should be noted that it is very difficult to control the gamification procedure with such a huge sample. Tomaso's (2014) study confirmed that gamification-based teaching practices positively affect student achievement, even at weak levels. Although De-Marcos, Domínguez, Saenz-de-Navarrete, and Pagés (2014) found that student achievement in a group supported by social networks is higher than in a gamification group, he verified that gamification-based teaching practices enhance student achievement. Present research did not take into account the effect of social networks as both research groups were supported by a Facebook group. Furthermore, Attali and Arieli-Attali (2015) extrapolated that achievement scores do not boost the accuracy of answers. Their finding concerning the ineffectiveness of gamification-based teaching practices on student achievement can be regarded as the result of using achievement scores only, without the other components of game design. In Yilmaz's (2015) interview, Yu-kai Chou stated that it is inadequate to gamify a process—even the use of three components (points, badges, and leaderboard)—without other procedures. Therefore, the use of achievement scores alone cannot be considered a gamification design. Overall, these results suggest that a growing body of literature indicates the effectiveness of gamification-based teaching practices on student achievement.

Table 8
t-Test results of affective dimension related to students' attitudes by groups.

Grup	N	$\bar{x}$	SD	df	t	P	η^2
Experimental	48	24.229	5.937	95	2.612	0.010	0.067
Control	49	21.041	6.083				

The current study concluded that gamification-based teaching practices enhance students' attitudes toward lessons. Various studies (De-Marcos et al., 2014; Harrold, 2015; Polat, 2014) have also extrapolated that gamification-based teaching practices have a positive influence upon students' attitudes toward lessons.

5. Conclusion

This experimental research was conducted to determine the effects of gamification-based teaching practices on students' achievement and their attitudes toward lessons. The study was conducted during the Teaching Principles and Methods lesson, in which 97 students (97 sophomores: 49 in the experimental group and 48 in the control group) were enrolled. Findings are limited with this context and collected data. The research results indicated that gamification-based teaching practices had a positive impact on students' achievement and their attitudes toward the lessons. Although the participants appreciated the gamified course procedure, gamification-based teaching practices did not make any differences in terms of attributing importance to the lesson. In other words, despite the fact that the gamification-based teaching practices did not affect students cognitively, it provided students with positive sentimental attitudes toward the lessons. The effects of gamification-based teaching practices on students' achievement and their attitudes toward lessons were tested with a control group with blended learning and a flipped classroom rather than traditional methodological approaches. The results clarified the importance and effects of the gamification of educational procedures. Therefore, it is highly advisable to integrate gamification into educational procedures due to its dynamism.

Furthermore, the effect size of gamification-based teaching practices on students' achievement and attitudes toward the lessons was moderate, which makes sense considering that much of the social sciences research has found weak or moderate effect sizes (Cohen, 1988; Murphy & Myors, 2004). In other words, the research revealed that the practical effect of gamification-based teaching practices on students' achievement and attitudes toward lessons cannot be abnegated.

The research results explicitly indicate that the gamification structure created for internet usage in the context of a blended learning procedure had statistically and practically positive effects on students' achievement and attitudes toward the lessons. Although it is possible to observe these kinds of positive effects at lower levels due to the nature of games and gamification, it is highly advisable to keep them under control by means of long-term experimental studies. On the other hand, the research results suggested that internet usage integrated into a blended learning procedure is compatible with the gamification structure. It will also contribute to the relevant literature to examine the effectiveness of gamified face-to-face learning procedures in a similar research design conducted without the support of Internet usage in both control and experimental groups.

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