



EFFECTIVENESS OF GAMIFICATION OF WEB-BASED LEARNING IN IMPROVING ACADEMIC ACHIEVEMENT AND CREATIVE THINKING AMONG PRIMARY SCHOOL STUDENTS

 Seham Aljraiwi

Professor of Educational Technology, College of Education, Princess Nourah bint Abdulrahman University, Saudi Arabia.

Email: dr.seham95@gmail.com Tel: 00966555193436



ABSTRACT

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Gamification is one of the most significant modern trends in educational technology. The present study aims to identify the effectiveness of gamification of web-based learning on academic achievement and creative thinking among primary school students. A learning environment was designed based on gamification of web-based learning. A quasi-experimental approach was utilized to identify the effect of the independent variable, gamification, on the dependent variables, academic achievement and creative thinking among participants. An academic achievement test and the Torrance test of creative thinking were applied to the participants. Results revealed that there was a statistically significant difference between the means of scores of the experimental and control groups in the post-test academic achievement test and the Torrance test of creative thinking in favor of the experimental group. This suggests a high level of academic achievement and creative thinking after using gamification. The study recommends training in-service teachers in the use of gamification for web-based teaching of English.

Contribution/Originality: This study contributes to the existing literature that deals with gamification and the possibility of employing it to improve student academic achievement. It also tackles its effectiveness in improving student creative thinking, a subject that very few studies have covered.

1. INTRODUCTION

Because of the technological revolution, educators are constantly seeking to update and improve the educational system at all levels. They also must apply modern teaching methods to help the educational system keep pace with challenges and updates by developing goals and improving the outcomes.

The first documented use of the term 'gamification' was in 2008. However, it was not widely used until 2010 when administration and human development in some American companies adopted it as a staff motivation tool (Park and Bae, 2014; Alshorouky, 2016).

This strategy is based on the self-determination theory developed by Deci and Ryan (2002). It relates to the innate psychological need for self-development, and the impact of the environment on self-motivation. In essence, competence seeks to achieve mastery. There are other concerns related to connection, interaction, the experience of caring for others, autonomy concerning the need to create alternatives, and a lack of independence.

Gamification means applying gaming principles to non-game contexts to improve program users' engagement. It is not a game, but a meaningful process that utilizes game principles and ideas to develop interaction in many

areas. It employs a set of concepts: motivation, work, feedback, loyalty, cooperation, and competence on the part of participants. It is inclusive in the sense that it requires interaction with many fields such as psychology, computer science, video gaming, and marketing (Deterding *et al.*, 2011; Zichermann and Linder, 2011; Swan, 2012).

The authors (Kim, 2000; Kapp, 2012; Adina *et al.*, 2015; Dicheva *et al.*, 2015) highlighted many features of the gamification of web-based learning and interactive learning environments, as follows:

- Granting full freedom for students to have the desirable learning mechanism.
- Giving the teacher an opportunity to consider students' individual needs.
- Motivating continuous self-learning via the strong senses, as well as improving skills and readiness.
- Promoting knowledge and developing the skills of problem solving and higher-order thinking because it activates students' thinking to absorb educational concepts and create cooperation and communication among learners.
- Giving the opportunity to learn using avatars.
- Offering rewards for learners who are involved in the completion of the required educational tasks in the form of points and badges of achievement or progress.
- Relying on a key element, namely competition, which supports the learner, qualifies them to pursue learning, and involves other learners.
- Allowing more freedom in trial and error without any negative implications.
- More fun in the classroom, encouraging learners to attend and engage in lessons, as well as to be more active in learning.
- Offering badges and points along with game techniques as the game is based on participation, storytelling, character imagination, and problem solving.
- Gathering all these items in an attractive manner within one concept and focusing on their relationships and consequences in a specific educational context.
- Allowing learning in various ways that simplify and help realize the educational concepts.
- Linking education to real life and practice fosters the educational concepts and makes the student active physically and mentally.
- Direct handling of the 21st century learners' characteristics who have a set of technological characteristics that motivated rethinking in the design of e-courses.

Lee and Hammer (2011) reported that gamification of learning enhances educational awareness, provides useful enrichment information, increases productivity, creates a healthy competitive spirit, and motivates life-long learning on the part of learners. It helps the teacher monitor learners' progress and give the appropriate feedback.

Fathy (2017) highlighted the features of e-games that utilize many audio and visual effects. Consequently, learning becomes more sustainable and effective. In addition, they enhance the students' learning motivation because playing is a natural tendency among learners. Such games can motivate the learner to learn the topics they had thought were undesirable.

E-Learning Africa Conference (2016) addressed gamification for distinguished learners, theories and principles of gamification, and examples of using gamification in e-learning for distinguished learners.

Because of the importance of gamification for learning, many studies that reported on its effectiveness including Alshorouky (2016); Aloteby (2018); Abosaif (2017); Qarny and Abosaif (2017); Alqahtany (2017); Mejia (2013) and Sauerland *et al.* (2015).

To conclude, the gamification of web-based learning is highlighted because it applies game principals and e-design techniques, makes real world activities more exciting, and transfers game mechanics to other contexts for problem solving and level improvement. It is based on grasping the mechanisms, characteristics, and elements that make for a good game, as well as scrutinizing players' behavior. Thus, it aims to make activities (beyond the game scope) more fun and exciting.

No studies, to the author's knowledge, were conducted on applying gamification of web-based learning to primary school students.

Thus, a study shall be conducted to investigate the effectiveness of the gamification of web-based learning in the teaching of English and on the achievement of primary school students.

Creative thinking, like reading and writing, is one of the most important skills acquired and developed by students based on environmental conditions that enrich knowledge and skills. Students can improve their creative thinking if the circumstances are appropriate and they are exposed to various activities that support higher-order thinking skills (Weleler *et al.*, 2002).

It can be improved based on training, learning, and practice in curricula or training programs that help develop thinking skills, in general, and creative thinking skills.

Therefore, more attention shall be paid to the methods of creative thinking improvement by utilizing modern technology that helps improve thinking among the students, instead of dictation and the citing of information as crude facts by the teacher (Alfar, 2002; Mubarez and Ismaiel, 2010).

Because creative thinking can be improved through games, students absorb many facts and concepts that improve their abilities and talents (Zahlouq and Aboelkhier, 2010). According to Qatamy (2008) creative thinking is a distinctive human mental activity resulting from the interaction of mental factors, and which introduces the capacity to devise innovative solutions to theoretical or practical problems in any field.

Karwowski *et al.* (2010); Qatamy (2007); Beghetto (2007) and Qatamy and Qatamy (2001) highlighted the importance of creative thinking, as follows:

- It improves learning and education because education quality relies on creativity, increasing learners' motivation and activity towards learning.
- It changes the thinking patterns of learners and promotes their problem-solving abilities enabling them to discover new solutions.
- It raises awareness of changes, of handling issues from various perspectives, and enhances the utility of experiencing different situations by learners.
- It increases students' mental efficiency in handling contexts.
- It improves students' attitudes towards school generally and the classroom experience.

According to Ahmed (2012) creative thinking development in the classroom helps:

1. Increase awareness of surrounding changes.
2. The handling issues from various perspectives.
3. Promote students' effectiveness in handling contexts and experience.
4. Increase students' mental efficiency in handling contexts.
5. Enhance students' vitality and activity in organizing or planning situations.

Loveless (2000) reported that without the ability to think creatively, students complain about the weakness of their basic life skills.

Because of its importance as an educational product, many studies have investigated the effectiveness of some methods and strategies intended to improve creative thinking among the students at the different stages of development (Alkhalda and Abdulaziz, 2012; Shamri, 2012; Abdelhamid, 2014; Sriwongchai *et al.*, 2015; Alawalma *et al.*, 2016; Sandro, 2016; Widiana and Jampel, 2016) and Ibrahim (2012). All reported the positive impact of applied methods and strategies on creative thinking.

English is one of the most important subjects because it is the means of communication in the work environment and a means of acquiring knowledge. Makahly (2015) and Mejaly (2008) argued that English is a difficult subject to teach, attributing this to the methods of teaching employed and a shortage of learning opportunities for students.

Reviewing the English test scores of 93 primary school students revealed that 52 or 55.91 percent achieved a score under 50 percent. Additionally, the author examined the performance of eleven English language teachers and found that eight of them utilized traditional teaching methods and performance indicators that do not mesh with the philosophy and objectives of the curriculum.

It is in consequence of these findings that this study will attempt to quantify the effectiveness of the gamification of web-based learning in the teaching of English, and in improving academic achievement and creative thinking among primary school students.

1.1. Issue and Objectives

The study is primarily concerned with addressing the issue of low achievement by primary school students in the study of English. Teaching strategies and programs in which the content is offered in an attractive and engaging way would seem to be one possible, positive approach. Such programs could enhance the motivation of students towards English by creating a learning environment that combines competition with fun, while linking learning to real life experience, and improving students' technological competencies. The study seeks to address the issue by posing two questions:

1. How effective is the gamification of web-based learning in improving academic achievement among primary school students?
2. How effective is the gamification of web-based learning in improving creative thinking among primary school students?

1.2. Significance

1. The study reflects modern educational methods that utilize educational strategies and e-learning environments to promote learning.
2. It designs a learning environment based on web-based gamification to teach the English language to primary school students.
3. It formulates an achievement test for evaluating the achievement of primary school students in English language.

1.3. Limitations

- *Spatial and human limits:* A group of primary school students.
- *Temporal limits:* "My language" course undertaken by primary school students in 2016/2017.
- *Objective limits:* A learning environment based on web-based gamification.
- *Creative thinking skills:* Fluency, flexibility, and originality.

1.4. Hypotheses

1. *There is a statistically significant difference between the mean scores of the control group (traditional method) and the experimental group (learning environment based on gamification of web-based learning) in the post-test achievement test in favor of the experimental group.*
2. *There is a statistically significant difference between the mean scores of the control group (traditional method) and the experimental group (learning environment based on gamification of web-based learning) in the post-test Torrance test of creative thinking in favor of the experimental group.*

1.5. Definition of Terms

- *Gamification of learning* is defined as a set of procedures for primary school students using game design elements in non-game contexts via the Website to create a more interactive world to motivate the learning English by turning the course into a funny game.
- *Achievement* is defined as mastery of the implied learning aspects in the "My Language" course by primary school students and is measured by the score received by the student in the prepared test.
- *Creative thinking* is defined as a mental activity in which primary school students practice a set of skills (i.e. fluency, flexibility, and originality) and is measured by the score received by the student in the Torrance test of creative thinking.
- *Creative thinking skills* are defined as a set of mental abilities that primary school students employ to generate a large set of new and creative ideas and solutions in the "My Language" course. They are characterized by fluency, flexibility, and originality, and are measured by the score received by the student in Torrance test of creative thinking.

The skills, namely fluency, flexibility, and originality are measured by:

1. The score received by the student in the Torrance test of creative thinking in fluency by generating the largest number of ideas on a topic within a prescribed period.
2. The score received by the student in the Torrance test of creative thinking in flexibility to make different responses, where the student tries to generate all the potential ideas or responses to a certain issue.
3. The score received by the student in the Torrance test of creative thinking in originality by generating creative ideas or solutions to a problem.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1. Gamification of Learning

Gamification means applying game mechanisms in a non-game scenario (Kapp, 2012). (Kim and Lee, 2015) argued that it means employing game elements to motivate students to learn and to make learning more fun. Nicholson (2015) contended that it means the application of grading items (points, levels, achievements) to a task or educational context. Huotari and Hamari (2012) defined gamification as using gaming principles and thinking in non-game contexts to promote behavior and application of these principles (not the game itself) and game thinking (where the idea is generated from game design and interaction) in a non-game environment (non-profit).

The author concludes that gamification means employing game principles in different life situations to make the real world more interactive, such as escaping a dull learning environment, and a series of lessons designed to explain the transfer of the subject matter into a fun game. In the educational context, gamification can influence student behavior and trigger the desire to attend classes while focusing on useful tasks and taking the initiative.

2.2. Difference between Game-Based Learning and Gamification-Based Learning

BunchballInc (2010) and Simoes *et al.* (2011) reported that gamification-based learning employs game principles and techniques (including awards, badges, points, tasks, and achievement), while educational games adopt a comprehensive form of the game. According to Zichermann and Cunningham (2011) there are four player types:

- Achievers think that the game is a challenge they must overcome.
- Explorers engage in a game to gain experience and discover hidden things.
- Socializers play games for the benefit of a social interaction.
- Killers enjoy beating others.

2.3. Reward Mechanism

Glover (2013) reports that the basic mechanism for gamification for learning is that learners perform the task based on accumulation of points, moving to other levels, and gaining awards. All these procedures aim to achieve previously established educational goals. Thus, training mechanisms depend on defining the goals, knowledge, and skills to be obtained. These mechanisms are:

- Points: A player receives points after doing several activities.
- Badges: They are a visual representation of the players' achievements.
- Leaderboards: They are lists of players ranked according to success within the game.
- Progress tracking: Shows information on the player, status, and progress towards the goal.
- Charts: Display information on the present level of the player compared to the former levels.
- Tasks: The tasks that the player must accomplish.
- Avatars: Symbols or cartoon characters that the player selects to present them in the game.
- Achievements: The developments, progress, and behaviors of the player.

2.4. Importance of Employing Web-Based Gamification in Education

Web-based gamification is the use of game mechanisms and principles in an e-learning environment based on modern information and communication technology by creating appropriate conditions for gamification, processing students' data and progress, and creating detailed reports (Kiryakova *et al.*, 2014).

It can be used to define certain behaviors that can benefit education (Muntean, 2001). Kapp (2012) notes that using gamification in web-based learning has increased because employing game elements (time, accuracy, and grading) motivates users to achieve the desired objectives. They also help improve thinking skills and e-learning, and the content can be accessed at anytime and anywhere.

Hsin-Yuan and Soman (2013); Johnson *et al.* (2012) and Rashid (2006) report that gamification of web-based learning can be used for activating students' responses in class, illustrating complex concepts, and conducting formative evaluations.

So, many studies have been conducted and reported on the effectiveness of the gamification of web-based learning. Alqahtany (2017) investigated the effectiveness of a gamification-based interactive educational environment on immediate and postponed achievement among secondary school students and their attitudes towards them. Results revealed that there was a statistically significant difference in students' immediate and postponed achievement in English, favoring the group to which gamification was applied.

Alhefnawy (2017) examined the impact of using gamification-based electronic activities to improve standards of mathematical conception among deaf students with learning difficulties. The study reported favorably on the effectiveness of these activities.

Mitchell *et al.* (2017) examined the impact of gamification of learning on motivation. The study employed software based on gamification and interactive mechanisms. It recommended supporting the educational use of gamification.

Tan and Hew (2016) evaluated the impact of gamification and its components on a traditional learning environment. Although the results reported increased student participation, they did not reveal a better level of cognitive development.

Lister (2015) studied the impact of gamification in improving motivation and achievement at the post-secondary level. The study utilized points, leaderboards, and badges into non-game contexts. It concluded that using game motivation greatly improved motivation and achievement.

Su and Cheng (2015) explored the impact of a mobile gamification learning system for improving the learning motivation and achievement among fourth-grade students in Taiwan, and concluded the strategy was effective.

Landers (2014) applied gamification principles to distance learning courses using leaderboard and points to enhance contributions in blackboard environment. Results revealed the effectiveness of gamification in promoting motivation, participation, and academic skills.

Buckley and Doyle (2014) reported the effectiveness of using gamification elements in e-learning and distance education. The study recommended improving users' motivations and positive contributions to the educational process using gamified learning.

Mejia (2013) reported that using gamification in digital applications helped to engage and attract learners because of its availability anytime and anywhere. Additionally, these applications can be linked to social media to maximize the benefit of gamification.

Barata *et al.* (2013) illustrated the impact of using gamification on the effectiveness and contribution of students in an engineering course. The study showed that gamification motivates students to contribute. Gamification in learning relies on clear goals and rewards, so influencing educational achievement and creating new learning opportunities. By integrating gamification into serious learning and complicated courses, learners promote motivation and acquire new educational behaviors.

2.5. Steps of Applying Gamification of Web-Based Learning to Education

Simoes *et al.* (2011) and Hsin-Yuan and Soman (2013) reported that to correctly apply gamification to learning, a set of steps and procedures that reflect a deep analysis of the situation, available software, and basic steps should be adopted, as follows:

- Defining learners' characteristics: when teachers implement new curricula, they shall define students' characteristics to decide on whether the tools and techniques are appropriate or not, as well as students' readiness to interact with the content. The skills required for achieving the objectives and fulfilling the tasks and activities are also considered.
- Defining learning objectives: These shall be clearly defined to establish learning objectives, those activities to be included, and the choice of appropriate game mechanisms.
- Creating the content and activities: These shall be interactive, participatory, and rich in multimedia.
- Structuring the experience: The teacher defines the stages and milestones of the experience.
- Identifying resources: The teacher specifies motifs to the previously defined stages of the experience.
- Applying motifs: These may be individual or collective, i.e. points, achievements, badges, and time constraints, and will help to achieve self-actualization, competitiveness, interactivity, and cooperation.

3. METHODOLOGY

3.1. Method

The study adopted a quasi-experimental approach to evaluate the effectiveness of gamification of web-based learning in academic achievement and creative thinking among primary school students. It selected two equal groups. While the control group was taught in the traditional method, the experimental one was taught using a gamification-based educational environment. Then, it pre-tested and post-tested an achievement test and a Torrance test of creative thinking among the participants.

3.2. Sampling

The sample comprised 60 primary school students in the academic year 2016/2017; 30 students in the control group taught by the traditional method, and 30 taught by gamification of web-based learning.

3.3. Procedures

1. Analytical survey procedures:

- Review literature related to gamification of learning, e-learning environments, and creative learning to help prepare the theoretical framework, material, tools, and hypotheses.
 - Prepare the content to be reviewed, edited, and applied.
2. Design
- Design experimental treatment material (gamification of web-based learning).
 - Display the materials to reviewers and make modifications based on their opinions.
 - Prepare measurement tools, i.e. achievement test and creative thinking test, display them to reviewers, make suggested modifications, and calculate statistical factors.

The following section displays these procedures:

i. Design of gamification of web-based learning:

The author proposed a model to be applied to the design of the gamification of web-based learning due to the lack of a model for this environment, as follows:

1. Analysis covers:

- Defining the issue and needs: The study's primary issue is the shortage of academic achievement and creative thinking in the "My Language" course among primary school students.
- Defining the features of students: The characteristics, progress, weaknesses, and strengths of primary school students, as well as the appropriateness of educational stages are defined to establish the objectives of gamification of learning.
- Defining learning tasks (learning content): The author utilized the analytic hierarchy process to analyze the content of the "My Language" course and to define the general and detailed objectives by reviewing literature on learning, e-activities, and gamification. Then, she defined and distributed the tasks to be transferred into an electronic format. She analyzed the expected production processes by defining the technical requirements, as well as selecting the type of technology and the appropriate learning and communication media.

ii. Design: Design of gamification of web-based learning:

- Establish the general objectives: Improvement of achievement and creative thinking among primary school students.
- Design the action learning objectives of the content:
- The general objective of the study is to enable the student to pass the assigned tasks. The action behavioral objectives are contained in the "My Language" course, showing the student's awareness of its cognitive aspects. After that, they were submitted to several reviewers to obtain their opinions on the proper wording of each objective. Modifications were made in the light of the reviewers' opinions.
- Content design:

The content of the "My Language" course was distributed to merge gamification into lessons. Each lesson represents a level. At the end of the level, the teacher runs a formative assessment and educational activities in which the learner receives points. If their points are less than the established percentage, the lesson is given again. By exceeding the established points, the student moves to the next level until they reach the top. Thus, the author applied the clearest and easiest parts first so as to be easily understood, and to motivate the student. In preparing the content, the author used language that was clear and devoid of errors.

In addition, the author designed and prepared some elements to be applied to the gamification of the learning program, namely:

1. Points: These are used to motivate learners to learn. It is a simple approach that motivates those who like to collect points. A method that links points to learning objectives was designed, and works well in a descending order. A timer is set to 60 seconds which equals 60 points, and the learner receives points based on elapsed time. Ergo, if a learner spends 30 seconds to answer, they received an extra 30 points as a

reward for the correct answer. Points can be used to manage whatever items a teacher wishes. For example, if a teacher wants to manage correct answers and speed, they employ points to give the learner more self-control.

2. Badges: They are employed as one of the most significant gamification elements. A learner receives one of the following badges:
 - The competitive badge is given based on the competitive of learners, i.e. the highest score in training and the first to receive the final score.
 - The collaborative badge is given when the team achieves certain results. Each member plays a role. Thus, a team with the appropriate skills is made.
3. Leaderboard: It is the third pillar of the gamification of learning. It gives context to progress based on points. It makes performance visible, and so may be a strong motif. However, it may be strongly disappointing when a learner observes how far they are behind. It has been utilized in designing gamification of web-based learning environment using the classdojo platform. Williamson (2017) defines classdojo as a commercial platform for tracking students' behavior data in classrooms and a social media network for connecting teachers, students and parents.
 - The leaderboard is submitted to reviewers to assure the adherence of the author to the course and the course's appropriateness to the age group. Then, the proposed modifications were made.

iii. Designing classdojo website:

- Webpages of classdojo
1. Homepage: It is the first page that appears for the user. It is loaded when a learner inserts the address (www.classdojo.com). It contains a set of options under "register" to create a new account as a teacher, learner, or director. In case of an existing account, log in is clicked.



Figure-1. Classdojo website, the first page that appears for the user to register or sign up.

Source: www.classdojo.com.

2. Classdojo homepage: It appears after registration and includes a number of main icons to move to other pages.

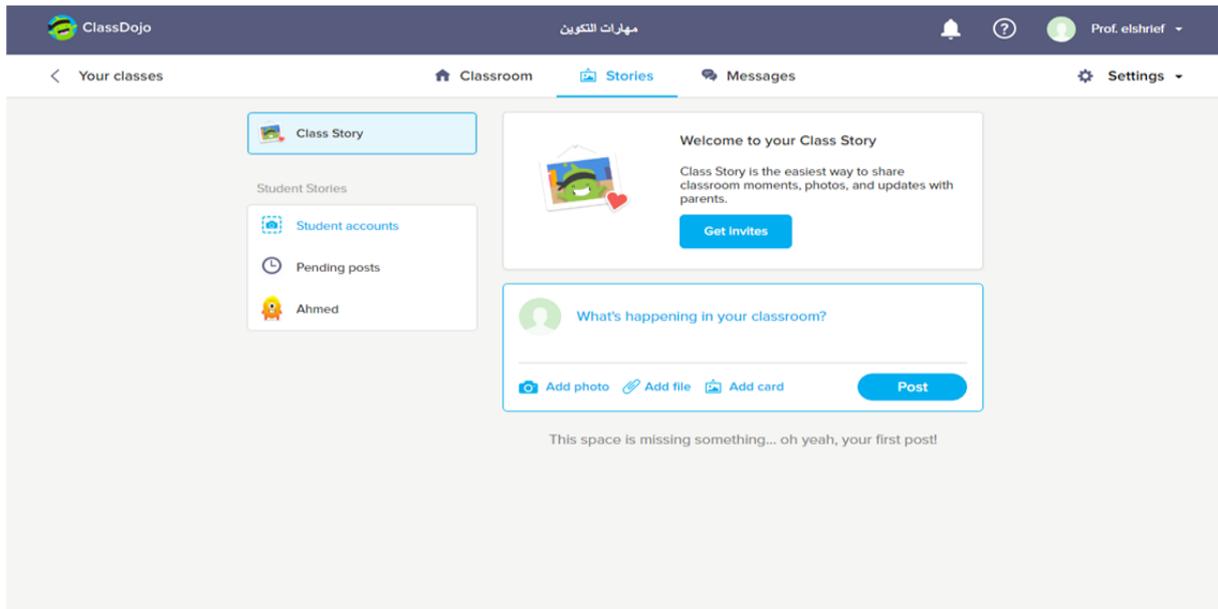


Figure-2. Classdojo homepage appears after registration or signing up and includes several main icons to move to other pages.
Source: www.classdojo.com.

- Evaluation: The author prepared evaluation tools for the gamification of web-based learning to verify students' mastery of the objectives. This took two forms.
- Formative evaluation: This is conducted during or at the end of the lesson as feedback. It takes the form of oral questions or discussions on the content of the games and curriculum.
- Summative evaluation: The achievement test and creative thinking scale are conducted, and the students' results in the pre-test and post-test are compared.
- Actual application: The present study was conducted in the academic year 2016/2017.

3.4. Measurement Tools

i. Academic achievement test:

1. Defining the objective: The test aimed to evaluate the achievement of cognitive learning aspects in the "My Language" course among primary school students.
2. Preliminary form: The preliminary form of the test comprised 30 multiple-choice items.
3. Validity: The test was submitted to a group of reviewers to survey their opinions on the appropriateness of the questions to the objectives, linguistic wordiness, addition, or deletion. Modifications were made based on their opinions.
4. Pilot study: After making the proposed modifications, the achievement test was applied to a pilot sample of 15 primary school students in 2016/ 2017 in order to calculate the validity, reliability, and timing of the test, as follows:
 - Validity: This was calculated based on the internal validity of the items by estimating the correlation coefficient between each item and the total score compared to the scores of the pilot sample. The correlation coefficients were [0.45- 0.88]. Thus, they are statistically significant at 0.01 level, suggesting validity.
 - Reliability: The author applied Cronbach's alpha to estimate reliability. She found out that the reliability coefficient of the test was 0.96, suggesting high reliability.
 - Timing: The computer recorded the time spent by each student to answer the test. The length of time was calculated at 20 minutes.

- ii. The Torrance test of creative thinking: The author utilized Torrance to measure the creative thinking scores of the participants. It comprises two sections:

3.4.1. Section 1 is taken from the Minnesota Tests of Creative Thinking. It covers four Sub-Tests

1. Uses: The student is asked to mention the largest number of unusual uses.
2. Implications: The student is asked to report when the sequence of items changes.
3. Contexts: The student is asked to show how they would react in two different situations.
4. Improvement: The student is then asked to propose several new methods to make familiar things better. Thus, they must not propose an existing method.

3.4.2. Section 2: Barrons Test of Anagrams

The student is asked to form new and meaningful words from the letters given, but a letter can be used only once in the same word.

3.5. Test Grading

The student receives four scores for each test, as follows:

- Fluency: The score received by the student by generating the largest number of ideas on a topic in a certain period in the first section and reporting the largest number of correct words in the other section.
- Flexibility: This is measured by the ability to provide different responses, i.e. the more diverse responses that are given, the higher the flexibility in the first section. In the second section, it is measured by providing the largest number of meaningful words.
- Originality: This is measured by mentioning uncommon responses to the group that the individual belongs to in the first section, and mentioning meaningful words in the second one. That is, the less frequent the idea or word, the higher the originality.
- Total score: This is the sum of fluency, flexibility, and originality.

3.5.1. Validity

The author calculated internal validity that equaled 0.86- 0.95, suggesting that it is very high.

3.5.2. Reliability

The author applied Cronbach's alpha to estimate reliability and found out that the reliability coefficient of the test was 0.82, suggesting highly reliability.

4. RESULTS AND DISCUSSION

1. To answer the first question and verify the first hypothesis, the T-test of independent groups was applied to estimate the significance of differences between the means of the control and experimental groups in the post-achievement test.

Table-1. Significance of differences between the means of scores of the students of the control and experimental groups in the post- achievement test.

Group	Number	Means	Standard deviation	T-value	Freedom degree	T significance	Eta Square	Effect size
Experimental	30	28.80	1.26	4.25	28	Significant at the level of 0.01	0.92	High
Control	30	23.40	4.75					

Source: The data was obtained by calculating the mean, standard deviation, t-value, freedom degree, t significance, Eta Square, and effect size.

Table 1 shows that there was a high difference between the scores of the students of the control and experimental groups in the post-achievement test at the significance level of 0.01 in favor of the experimental group. Consequently, the first hypothesis is verified, and the first question is answered. The effect of the size of the independent variable (gamification of web-based learning) on the dependent one (creative thinking) was high, suggesting the effectiveness of gamification of web-based learning in English language by the level of achievement among the primary school students. Consequently, the first question is answered.

This result matches the findings of Alhareshy (2018); Alhefnawy (2017); Alqahtany (2017); Lister (2015); Su and Cheng (2015) and Barata *et al.* (2013) regarding the effectiveness of gamification of learning in improving achievement. It differs from Tan and Hew (2016).

2. To answer the second question and verify the second hypothesis, a T-test of independent groups was applied to estimate the significance of differences between the means of the control and experimental groups in the post-test of the Torrance test of creative thinking.

Table-2. Significance of differences between the means of scores of the students of the control and experimental groups in the post-test of Torrance test of creative thinking.

Group	Number	Means	Standard deviation	T-value	Freedom degree	T significance	Eta Square	Effect size
Experimental	30	18,77	2.96	4.29	28	Significant at (0.01)	0.95	High
Control	30	13.55	1.37					

Source: The data was obtained by calculating the mean, standard deviation, t-value, freedom degree, T significance, Eta Square, and Effect size.

Table 2 shows that there was a high level of difference between the scores of the students in the control and experimental groups in the post-test of the Torrance test of creative thinking at the significance level of 0.01 in favor of the experimental group. Consequently, the second hypothesis is verified, and the second question is answered. The effect of the size of the independent variable (gamification of web-based learning) on the dependent one (creative thinking) was high, suggesting the effectiveness of gamification of web-based learning in teaching English on creative thinking among primary school students.

This result matches the findings of Landers (2014) regarding the effectiveness of gamification of learning on the development of academic skills.

5. DISCUSSION

The author argues that the excellence of the experimental group students in achievement and creative thinking results from gamification of web-based learning that assisted the understanding of learning aspects, their application to various questions, and the mastering of creative thinking skills. Gamification of learning helps promote learning motivation and makes the educational process more fun. Student participation in the website's activities include higher-order thinking, cooperation, communication, and problem-solving that improves academic achievement. Utilizing multi-media technology to provide the content addresses the senses of the student. Giving feedback, systematic follow-up, and instant evaluation of students' responses, while applying skills and sending comments and attachments via the website fulfills the website's tasks and assignments leading to improved performance by learners. Additionally, the availability of the content at all time enables the students to follow up and revise lessons independently and promotes self-learning.

Using the Classdojo website concerning gamification makes education more fun. Utilizing the activities and tests on the educational website helps the student study the course well and search for further information on the internet and the digital library of the site. Consequently, creative thinking is promoted.

The website gives students the opportunity to participate in the content and educational activities as they become active participants in learning, positively influencing their performance. Building positive communication

and cooperative relationships among the participants resulted in experience exchange, problem-solving skills, independence, and competitiveness.

6. RECOMMENDATIONS

The Study Recommends:

- Training in-service teachers on utilizing gamification of web-based learning in teaching the English language.
- Training instructional designers at e-learning centers of universities to design gamification of learning to enrich e-courses.
- Holding symposia, training courses, and workshops for teachers and educational supervisors of English language to explore the gamification of web-based learning, as well as its features, applications, and utilizations in the teaching of English.
- Evaluating the curricula of the English language at different stages based on the gamification of web-based learning.

6.1. Further Research

Based on the results of the present study, the following further research is recommended:

- Conducting a similar study on the students at different stages of learning.
- A training program for in-service teachers based on gamification of web-based learning and its impact on the achievement and creative thinking development of the students.
- An evaluative study on the utilization of gamification of web-based learning.

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