The Effect of Enrichment Activities Based on Gamification on Motivation and Achievement in the English Language Course among 4TH Grade Elementary Students

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Abstract:

The present study aimed to identify the effect of suggested enrichment activities based on gamification on the achievement and motivation in the English language course among fourth grade elementary students in Adham Province. The quasi-experimental design was used to achieve the aim of the research. The research was conducted on a sample of fourth grade elementary students in Adham at the first semester in 1437/2016.The number of the subjects was (30) schoolgirls, divided into two equal groups, the experimental group that was taught using the enrichment activities, and the control group that was taught using the traditional method. The researcher built a teacher guide which consisted of the suggested enrichment activities based on gamification, an achievement test consisting of (28) items, and a motivation scale. The validity and reliability of the achievement test and the motivation scale were confirmed. Results showed that there were statistically significant differences at the significance level ($\leq$ 0.05) between the mean scores of students in the experimental group and the control group in the achievement test and the motivation scale in favor of the experimental group which indicated a positive development in the students' vocabulary acquisition and motivation.

The researcher recommended the integration of gamification elements into regular classes to develop students' motivation and to increase their achievement. The researcher also suggested conducting training sessions on how to use activities that are based on gamification elements to teachers of all courses, students in all educational levels and to curriculum and instruction designers.

Keywords: Enrichment activities-gamification-motivation-achievement

المستخلص

هدف البحث الحالي إلى التعرف على أثر أنشطة إثرائية مقترحة قائمة على التلعيب على الدافعية والتحصيل في مقرر اللغة الإنجليزية لدى طالبات الصف الرابع الابتدائي في محافظة أضم. ولتحقيق هدف البحث استخدمت الباحثة المنهج التجريبي. وطبقت الدراسة على عينة من طالبات الصف الرابع الابتدائي في محافظة أضم في الفصل الدراسي الأول للعام ١٤٣٨/١٤٣٧ هـ. وبلغ حجم العينة ٣٠ طالبة تم تقسيمها إلى مجموعتين متساويتين إحداهما المجموعة التجريبية والتي درست باستخدام الأنشطة الإثرائية المقترحة القائمة على التلعيب والمعدة من قبل الباحثة والأخرى المجموعة الضابطة والتي درست بالطريقة التقليدية. كما صممت الباحثة دليل للمعلم والذي اشتمل على أنشطة إثرائية مقترحة قائمة على التلعيب واختبار تحصيلي تكون من ٢٨ فقرة ومقياس للدافعية. وقد تحققت الباحثة من ثبات وصدق الاختبار التحصيلي ومقياس الدافعية. وأظهرت النتائج وجود فروق ذات دلالة إحصائية (عند مستوى ≥ 0.05) بين متوسطي درجات طالبات المجموعتين التجريبية والضابطة في الاختبار التحصيلي ومقياس الدافعية لصالح المجموعة التجريبية يشير إلى تحسن إيجابي في دافعية الطالبات وتحصيلهن لمفردات اللغة الإنجليزية. وأوصت الباحثة بدمج عناصر التلعيب مع التدريس بشكل منتظم لتحسين دافعية الطالبات وزيادة تحصيلهم الدراسي. كما اقترحت الباحثة عقد دورات تدريبية لمعلمات كافة المواد الدراسية وطالبات كافة المراحل الدراسية وكل من له دور في تصميم المناهج وتطويرها في كيفية استخدام الأنشطة القائمة على التلعيب في التدريس.

الكلمات المفتاحية:

2. Introduction

Since the 1970s, video games have been increasing their popularity over time as a form of fun and engagement. Education researcher has viewed this kind of entertainment with great interest. Koster (2005) reported that video games are effective sources of creative learning due to the fact that they encourage a situation of complete engagement in an activity. However, it can be challenging implementing video games in the classroom. As a result, Koster (2005) asked game designers to look deeper into the questions raised by games and try to identify the attractive features and elements in games to apply them in contexts other than playing games.

Accordingly, a modern orientation in education activities occurred which is called gamification. Gamification means "the introduction of game elements and gameful experiences in the design of learning processes" (Dicheva, & Dichev, 2015). It is also defined by Deterding (2011) as "the choice of the game elements and use them to form a similar environment of the game environment in contexts other than the game." Gamification is basically an educational activity that uses elements similar to the elements of the game such as rewards, rapid feedback, challenges, and competition to motivate students and engage them in activities that they may find boring. This aspect of gamification has attracted the attention of educators seeking to design learning activities that can engage students and increase their motivation.

Gamification elements have been shown to positively influence students' intrinsic and extrinsic motivation, which in turn can have a big effect on students' engagement and achievement (Deterding, 2011). Intrinsic motivation (e.g., unselfishness, competition, cooperation, sense of belonging, love or aggression) is driven by an interest or enjoyment in the activity itself and inspires students to start an activity for its own sake (Ryan & Deci, 2000). Students who are intrinsically motivated are more likely to engage in an activity willingly, as well as work to improve their skills, which will increase their capabilities (Wigfield, 2004). In contrast, extrinsic motivation comes from outside the student and refers to the performance of an activity in order to get an outcome (e.g., earn grades, levels, points, badges, awards) or to avoid punishment (Muntean, 2011).

In the process of language learning, students learn at different rates and with strikingly different levels of completeness because of factors within students themselves that influence their ability to learn. Crozier (1997) stated that factors within students themselves may lead to academic success or failure in the area of language learning. Student differences add to our ability to predict scores on tests of academic achievement and confirm that factors within students are as important as intelligence for educational achievement. The idea that language learning varies with personality characteristics may suggest that some of these traits are beneficial for students learning (Kezwer, 1987). As a result, it can be concluded that students' success or failure in language learning is partly due to factors such as attitude, self-perceptions, motivation, and the use of learning strategies.

Definitely, English has been an international language. So, to enhance English proficiency of students is becoming a critical issue. For English language student's vocabulary acquisition is an essential factor which significantly influences the process of English language leaning in general. Laufer and Sim (1985) emphasized that the most urgent need of foreign language students is vocabulary. Accordingly, vocabulary acquisition is regarded as the foundation of language learning. In addition, read (2000) proved that vocabulary lays the foundation for general language comprehension.

However, retaining vocabulary in non-English countries, to some extent, can be fairly challenging since students rarely have the opportunities to practice the language. Nation (2001) confirmed that English language students tend to forget words easily if the retrieval processes have not been frequently performed. Hence, language instructors have devoted their effort/research to the development of effective and efficient strategies or computer-assisted learning tools for facilitating vocabulary acquisition and vocabulary retention, aiming to help English language students master the language. Research have been conducted on identifying different strategies that may positively affect English vocabulary acquisition such as role-playing, games, short stories, physical activities, and online dictionary.

A few numbers of research investigated the role of gamification in English language vocabulary learning. In these researches for example, Yen (2016), and Lam (2013) confirmed the positive effect of online gamified applications on student's English vocabulary learning. Furthermore, different research identified a positive relation between motivation and English language vocabulary acquisition (Al-Shawi, 2014; Hadjer, 2014; Sedeghi, 2013; Thanh, 2012; Fontecha, 2012). Moreover, Beier (2014) and Cheong (2013) suggested the use of gamification as a successful process to support educational activities, and make them more effective and motivating.

Research suggested that gamification helps in enhancing the learning process and in improving the students' achievement at different academic levels (Deese, 2014 & Turan, 2016). Sanmugam (2016) stated that gamification elements helped to improve secondary level students' achievement, whereas Sahin and Namli (2015), & Cheng and Su (2014) recommended the use of gamification elements for increasing elementary grade students' achievement.

In Saudi Arabia, a non-English country, activities and practices in English curricula are traditional and they don't help to apply language in positions similar to the real life experienced by the students (Alseghayer, 2014). Activities also lack progression and correlation with the concerns students and needs. So, it is becoming imperative to design educational activities which raise the motivation of students and their level of achievement. Enrichment activities are defined as a set of activities that are directed to students and aim to increase their ability to understand and go deep into the course material and are conducted under the supervision and guidance of the teacher. These activities are like puzzles, mathematical games, scientific anecdotes, and historical anecdotes (Allogani & Aljamal, 2003). Enrichment is one of the most important education programs offered to students, as it allows them to expand their cognitive outcomes, participate actively during learning, develop academic achievement, excite curiosity, and reduce the boredom that students may feel" (Raml, 2010).

3.Research Problem & Questions

Saudi decision makers of education realized the importance of English language as a basic requirement in most educational and non-educational situations. They established English language as a compulsory subject from the fourth elementary grade. The Ministry of Education has worked in recent years, through King Abdullah Project for the Development of Public Education on a special program for the development of English language teaching and the development of high-quality curriculum. However, different research reported that although students spend nine years studying English in public education, most of them graduate with low English competence levels (Aljohani, 2009; Alhawsawi, 2013; Rajab, 2013).

Through the experience of the researcher as an English language teacher in an elementary school in Adham Province, she noticed the low level of her students in the acquisition of English language vocabulary and in retrieving them as needed. This is may be due to the lack of appropriate activities that are directed to raise students' tendency to learn.

Furthermore, the researcher interviewed the teachers of English language in Adam elementary schools to identify the most important difficulties they face during their teaching. They agreed that the low level of students' motivation, the intensity of vocabulary in the curriculum, and the lack of activities that are of interest to the students led to low levels in the students' vocabulary achievement.

Elementary school students are dynamic and have great energy. However, they need praise and encouragement to be self-confident and highly motivated. Gamification can be a possible solution for elementary stage students' low levels in motivation and English language vocabulary achievement. Also, up to the knowledge of the researcher, there is scarcity in the Arabic studies that dealt with assessing the effect of gamification on elementary stage students' motivation and achievement. The researcher thinks that there is a need to study the effect of gamification in developing motivation and raising the achievement of English language vocabulary among elementary stage students.

In response to this suggestion the following question can be determined:

What is the effect of suggested enrichment activities based on gamification on the motivation and achievement among 4th grade elementary students in the English language course?

Branching out from this question are the following questions:

1. What are the suggested enrichment activities that are based on gamification?
2. What is the effect of the suggested enrichment activities that are based on gamification on the achievement of 4th grade elementary students in the English language course?
3. What is the effect of the suggested enrichment activities that are based on gamification on the motivation of 4th grade elementary students in the English language course?

4.Research Objectives

1. Suggesting enrichment activities that are based on gamification to encourage motivation and achievement among 4th grade elementary students in the English language course.
2. Assessing the effect of the suggested enrichment activities that are based on gamification on the achievement of students in the English language course.
3. Assessing the effect of the suggested enrichment activities that are based on gamification on the motivation of students in the English language course.

5.Review of Related Literature

The Significance of Enrichment Educational Activities

In general, enrichment educational activities are significant educational factors because they can transfer the student role in the classroom from negative to positive (Almalki, 2008). Also, they can catch the students' attention through their unusual activities like puzzles, and games, so they can achieve positive learning outcomes (Alsaid, 2001).

In addition, some studies stated that enrichment activities play a big role in the development of the student personality, through the student dependance on himself during his/her performance of activities (Aljoghaiman et al., 2009).

Ramel, (2010) reported that enrichment activities are of great importance in the stages of public education and can be summarized as follows: Enrichment activities can:

1. Raise the students' levels inside the classroom through putting them in meaningful situations that will transfer them from their negative roles to effective roles.
2. Contribute to raise the students' motivation toward the academic topics therefore the learning outcomes will be positive.
3. Work on expanding the pupils' cognitive domain and developing their basic skills.
4. Contribute to raise the students' mental abilities, solving problems skills, and creativity skills.

Criteria for Selection of Enrichment Activities

Designers must take into consideration the criteria for selecting enrichment activities which will make it easier to achieve the desired outcomes. The following criteria were recommended by Shehata, (1994):

1. Enable students to identify the types of the enrichment activities which may suit their tendencies and abilities.
2. Motivate students to applied fields that help them to think.
3. Direct students towards working in the fields of target production.
4. Setting activities which commensurate with the ages of the students.

There are other specific criteria that must be taken into consideration during the designing of the enrichment activities (Ramel, 2010). They are listed as follows:

1. Activities must be linked to the curriculum and the students' environment.
2. Activities must be appropriate to the students' mental abilities and take into account student differences.

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3. Activities must provide materials, tools, and equipment that are necessary to perform the activities in a right way.

4. Activities must motivate the students thinking and draw their attention during the instruction process.

5. Activities must provide variety in education through various activities.

The following criteria are recommended by the researcher:

1. Activities must be appropriate to the students' mental abilities, tendencies, personality differences and ages.

2. Activities must be linked to the curriculum, the students' environment and the fields of target production.

3. Activities must activate the students thinking.

4. Activities must help students to achieve a right physical, psychological, and professional growth.

Enrichment Activities and English Language Teaching

Research stated that positive student and teacher attitudes should be directed toward successful language learning (Ngeow, 1998). The learning of English must be created to motivate learning and positive attitudes. The following factors may help to create such an environment:

1. A learning environment that has a "low affective filter" (Krashen, 1987) where the students learn to use the language in fun and non-threatening situations. Otherwise, they will feel insecure which will produce psychological barriers to learning (Littlewood, 1995).

2. Students must be exposed to various types of input which are visual, sensory, auditory, verbal and non-verbal. Also, the input should be a little beyond the level of the students.

3. Students must be exposed to the language consistently and continuously.

4. A situation where the students and the teachers are encouraging and supportive.

5. A situation where the students use the language as a "natural means of communication" (Littlewood, 1995).

The enrichment activities of a language curriculum must include these factors which motivate language learning.

Language enrichment activities and programs must not be separated from the school curriculum. However, it should strengthen and complement the development of the students' language. So, what happens in language classrooms must be extended. A link should be created between what is learned in the classroom and what happens in reality (Hussin et al., 2000).

Gamification in Education

Theoretical Foundation

Gamification is an innovative approach to encourage motivation and enhance learning. There are two major types of psychological theory related to gamification: motivational theories and learning theories. Self-determination theory and goal-setting theory both are dealing with motivation. Also, there are three types of learning theories that are related to gamification. They are gamified instructional design theory, learning via conditioning theory, and expectancy theories.

Self-Determination Theory

Self-determination theory (SDT) is derived from cognitive evaluation theory (CET) (Deci & Ryan, 1985), which states that there are two important features of rewards: they give reasons for performing a given task and they provide performance feedback. According to CET, if the control perceptions have more weight for the student, the subject of causality shifts from the student to the external environment. The main implication for CET is that paying for performance should reduce internal rewards by shifting students' concern to external one. CET could not explain motivation outside the contexts where the activity is intrinsically motivating.

This limitation led Deci & Ryan (2000) to develop the concept of extrinsic motivation which became known as SDT.

Extrinsic motivation is defined as a person being driven to complete a task to achieve other goals (Reiners & Wood, 20015, p.179). Intrinsic rewards are driven by need satisfaction while extrinsic rewards are driven by environment. Intrinsic rewards can be more effective to alter behavior in some contexts, whereas extrinsic can be more effective in others.

Intrinsic motivation satisfies three essential needs; competence, autonomy, and relatedness (Deci & Ryan, 2000). The first element competence is defined as a feeling of mastery and a need for challenge (Kapp, 2015, p.64). Another element is autonomy which refers to a student feeling that s/he can control her/himself and determines the outcome of her/his behaviors (Kapp, 2015, p.63). The third need is relatedness which means to be connected to others. The fulfillment of the three essential needs rely on the student personal perception (Brühlmann, 2013, p.6).

The Relation between Self-Determination Theory and Gamification

Gamification can use both intrinsic and extrinsic motivation to change people behavior. Students could get badges for doing optional tests. These badges could be considered as extrinsic motivators because students may be doing these tests just for getting those badges. In other hand, students might complete the tests for needs reword, and the social part of the site may meet the students' needs for relatedness.

Future Directions for SDT in Gamification

Bedwell et al. (2012) improved a taxonomy of game elements in educational settings. This taxonomy could be used as a guide to decide which of these elements is related to the essential needs specified in SDT (see appendix one A). Furthermore, the taxonomy includes elements like challenge/ conflict, rules/ goals, game fiction, and human interaction. Researchers could manipulate them through experiments and isolate their effects on motivation. Also, they can manipulate each element in real classroom situations to identify different settings in which it will be more or less motivating.

Goal-Setting Theory

Goal-setting theory states that by directing efforts and attention toward goal-relevant task, by energizing efforts, by increasing persistence, goals directly motivate task performance (Locke & Latham, 2002).

Goal-setting theory states four key moderators of the relationship between goal and performance (Locke & Latham, 2006). The first one is goal commitment which means that students must be committed to their goals. Those who view their goals as important and are confident, they can achieve them. The other moderator is feedback. The combination of feedback and goal affects performers positively (Latham, Mitchell, Dossett, 1978). The third one is task complexity. The last one is situational constraints such as, time until goal completion and role overload.

Relationship between Goal-setting Theory and Gamification

There are three elements to apply goal-setting theory to gamification. They are badges, levels, and progress bars. Progress bars are progress alerts whereas badges and levels are overt signs. Badges can be viewed as a goal. Progress bar serve as feedback (Hsu et al., 2013). Levels can be viewed as sub-goals. The goal-setting theory proposes that smaller and proximal goals can help students to achieve more complex and larger goals (Latham & Seijts, 1999).

Future Directions for Goal-Setting Theory in Gamification

With respect to gamification and goal-setting theory, one important step for research is to manipulate goal type and examine its effect on performance. Also, research has to examine goal regulation (either single or multiple goals) in a gamified context. How is the provision of a variety of badge types in a gamified learning environment effects learning? This is an interesting question for research (Reiners & Wood, 2015, p.177).

Gamified Instructional Design Theory

This theory states that the effect of this attitude differs depending on the nature of the attitude.

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Some attitudes are part of moderating process, whereas others are part of mediating process. The target attitude or behavior in the mediating process affects learning outcomes directly. On the other hand, the target behavior alerts the effectiveness of instructional design in the moderating process (Reiners & Wood, 2015, p.167).

The moderating process is critical when evaluating gamification success. If increased learning does not occur, when gamification is intended to operate through the mediating process, we can state that gamification is not successful. However, if learning does not increase, it may be because of poor gamification or poor-quality instructional content, when gamification is intended to operate through the moderating process.

Relationship between Gamified Instructional Design Theory and Gamification

This is the only theory that speaks specifically about gamification. It indicates the specific elements of games which should be adapted for use in gamification. Based upon Bedwell et al. (2012) work which constructed a taxonomy of game elements relevant to learning, the gamified instructional design applies this taxonomy to gamification. Thus, this theory proposes challenge/ conflict, rules/ goals, game fiction, action language, assessment, control, environment, immersion and human interaction are the most critical game elements to be applied in gamification (Reiners & Wood, 2015, p.167).

Future Directions for Gamified Instructional Design Theory in Gamification

The moderating process is still untested so more research is required in this field. Moreover, the theory does not propose which game elements are more effective than others and leaving this for future research. Thus, future research is needed to explore how variations in game elements and target behaviors cause variations in the effectiveness of gamification (Reiners & Wood, 2015, p.168).

Theories of Learning via Conditioning

Classical and operant conditioning are two of the earliest theories of learning. Classical conditioning refers to the association of one environmental stimulus and a

naturally occurring stimulus. There are three aspects of classical conditioning: unconditioned stimulus causing unconditioned response, conditioned stimulus not initially causing unconditioned response, repeated exposure to both conditioned and unconditioned stimuli-controlled manner (Hilgard & Marquis, 1940).

Operant conditioning is a learning process based on behavioral consequences (Irons & Buskist, 2007). It is described as the three-phase process (ABC): an antecedent stimulus, a behavioral response to it and consequence that is dependent upon that response. For example, a student who knows a difficult test is coming (antecedent), so s/he would study harder than usual (response), then s/he scores higher than usual as a result of hard studying (consequence) (Reiners & Wood, 2015, p.169).

Relationship between Conditioning and Gamification

Conditioned reinforcement in gamification is related to operant conditioning (Antin & Churchill, 2011). Conditioned reinforces in gamification can vary from points to badges to money (Antin & Churchill, 2011). These points or badges reinforce a desirable behavior to occur within the gamified system. Gaining more conditional reinforces refers to a strong record of desirable behavior, which pleases educators and leads to a feeling of self-satisfaction.

Future Directions for Conditioning in Gamification

Research will need to determine whether extrinsic rewards of gamified systems can lead to intrinsic motivation. Also, research should identify any differences between primary and conditioned reinforces in gamified environments. In addition, research should determine the most effective method to motivate students through testing operant conditioning against other motivation theories (Reiner & Wood, 2015, p.171).

Expectancy Theory

This theory has three components: valence, instrumentality, and expectancy (Vroom's, 1964). Valence refers to individual perceptions toward all possible outcomes.

Valence can be positive, or zero, or negative with a wide range of positive and negative possible values (Vroom's, 1995). These rewards or outcomes can be intrinsic or extrinsic (Pinder, 2008). The other component is instrumentality which refers to a probability belief linking one performance to other outcomes which have associated valence (Pinder, 2008; Vroom's, 1964). The last component is expectancy that refers to the relation between effort and performance (Pinder, 2008).

Relationship between Expectancy Theory and Gamification

Expectancy may be used to explain why a gamified system is motivating. If students value gaining badges or points and have a clear path from effort to performance and from performance to outcomes, then they will be motivated to perform the action. Also, the clear relationship between actions and outcomes is a very affective game feature which is consistent with instrumentality (Reiner & Wood, 2015, p.173).

Future Directions for Expectancy in Gamification

Future research needs to manipulate individual component of the theory to explain how levels of motivation and engagement are impacted. Also, future research can study instrumentality to answer the question, how clear is the link between performance and reward need to be in a gamified environment? Finally, it will be important for research to examine the effect of value and expectancy in a gamified system (Reiners & Wood, 2015, p.174).

6.Research Methodology

The materials and tools in this study can be divided into:

   a. **Educational Tools which Consist of:**

First, ClassDojo Gamification Application

This application is a ready-made application which can be downloaded on computers and tablets. The researcher downloaded the application and created a specific account using her email then created a virtual classroom.

The researcher named the class and added the students' names. She also downloaded parents' invitations from the application and sent them to parents to take their permission.

After creating the new class, the researcher added new badges (did it-on time) to the badges that were already in the application. Students were able to do the activity more than once; they had no fairs of failing which is one of gamification elements. When the student finished the activity on time, she got "on time" badge which had two points. Whereas, those students who didn't finish on time and did the activity again, they got "did it" badge which meant they did it but after some trails and had one point.

The screen was available for all to see so students felt that it was a competition and they had to do their best and collect more and more points. At the end of each class and after finishing the activities of the day, the teacher put the students' names on levels (a gamification element) according to their points and told them that they could collect more points next day and change their levels to create an environment of competition and challenge.

At the end of each unit, the teacher put the students' names according to their levels in a leader board (a gamification element) on a poster and posted it on the school outdoor boards.

Second, a Teacher's Guide Containing the Enrichment Activities

The content of these activities is to provide enrichment activities beside the actual content that is offered to all students at all levels. These activities depend on gamification elements to provoke students' motivation and to help them acquire English vocabulary easily.

b. Measurement Tools which Consist of:

First, MSLQ (Motivated Strategies for Learning Questionnaire)

The MSLQ is a 7-Likert-type rating scale, from 1 (not at all true of me) to 7 (very true of me). However, the researcher altered it into 3-point scale to be suitable for the research sample, from 1 (agree) to 3 (don't agree).

Then the researcher showed it to a jury of five English language specialists to support the changes (see appendix three C for the Arabic modified version of MSLQ).

Second, the Achievement Test

The achievement test aims to measure the experimental group and the control group acquisition of English vocabulary that are related to units 3 and 4.

The following steps were preceded in order to plan the test:

a.   Identifying the Main Concepts of the Units of Application

Units 3 and 4 content (House- Food) of Get Ready 2 book was analyzed in order to identify their main concepts (see appendix four A for a complete analysis of the units' concepts).

b. Identifying the Aim of the Test

The aim of the test was identified as measuring the fourth-grade students' acquisition of the English vocabulary after taking the enrichment activities that are based on gamification and related to House and Food units' content. Therefore, it was prepared to measure the cognitive aspects of units 3 and 4.   It was limited to measure the first three levels: knowledge, comprehension, and application.

c. Identifying the Behavioral Objectives of the Test

The test aimed to measure a range of behavioral objectives which has been drafted according to Bloom's cognitive levels: knowledge, comprehension, and application.

d. Preparing a Specification Table for the Test

The specification table was like a scheme combining the educational materials and the objective levels. The achievement test was built based on the specification table and through the following steps:

1. Calculating the relative weight of each subject of research.

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The units of research House and Food had four subjects and each subject needed one period to be taught. So, the number of periods needed to teach all the subjects was four and the relative weight of each subject was measured as follows:

$$=1/4 \times 100$$

$$= 0.25 \%$$

The following table represents the relative weight for each subject:

Table 6.1 the Relative Weight of Each Subject of the Research Units

Units	Subjects	Number of needed periods	The relative weight of each subject
Unit 3(House)	subject 1	1	0.25%
	subject 2	1	0.25%
Unit 4(Food)	subject 1	1	0.25%
	subject 2	1	0.25%

2. Calculating the relative weight of each behavioral objective.

Unit3 (House) and unit 4 (Food) which have been adopted in this research included fourteen objectives. The cognitive objectives of each subject of the two units were classified into their cognitive levels through content analysis. Then all the objectives at each cognitive level have been collected. Accordingly, the relative weight of objectives at each cognitive level was calculated as follow:

The relative weight of the objectives at the knowledge level = $14 \div 6 \times 100 = 42.85\%$

The relative weight of the objectives at the comprehension level = $14 \div 4 \times 100 = 28.57\%$

The relative weight of the objectives at the application level = $14 \div 4 \times 100 = 28.57\%$

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Table 6.2 represents the relative weight of the objectives at each cognitive level.

Table 6.2 the Relative Weight of the Units Objectives at Each Cognitive Level

The cognitive level	Knowledge	Comprehension	Application
The number of objectives	6	4	4
The relative weight	42.85%	28.57%	28.57%

3. Calculating the number of questions for each subject at each level of objectives through the following formula:

= the total number of questions × the relative weight of the subject × the relative weight of the objectives at a certain level

So, the number of questions for the first subject at the knowledge level=14 × 0.25% × 42.85% = 1.5

The number of questions for the first subject at the comprehension level =14 × 0.25 × 28.57% = 1

The number of questions for the first subject at the application level=14 × 0.25 × 28.57%=1

The same formula was applied to the other subjects.

4. Calculating the mark for each question at each level of the objectives through the following formula:

= the total mark of the test × the relative weight of the subject × the relative weight of the objectives at a certain level

So, the mark of the first questions at the knowledge level=14 × 0.25% × 42.85%=1.5

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The mark of the first questions at the comprehension level=14 × 0.25 ×28.57% =1

The mark of the first questions at the application level = 14 × 0.25 ×28.57% = 1

The same formula was applied to the other subjects. Table 6.3 represents the specification table for the achievement test.

Table 6.3 the Specification Table for the Achievement Test

Units	Subjects	Number of Periods	Objectives' Levels			Total Questions	Total Marks	Relative Weights of Subjects
			knowledge	Comprehension	Application			
Unit3	Subject1	1	2	2	-	3.5	3.5	.25%
	Subject2	1	1	-	1	3.5	3.5	.25%
Unit4	Subject1	1	2	2	2	3.5	3.5	.25%
	Subject2	1	1	-	1	3.5	3.5	.25%
Total Questions			6	4	4	14		
Total Marks			6	4	4		14	
Relative Weights Objectives			42.85%	28.57%	28.57%			100%

e. Determining and Forming the Test Items

A set of considerations were taken into account when drafting the test questions and they are mentioned below:

1. Avoiding questions that may bear more than one interpretation.
2. Distributing correct answers in a random way to avoid guessing mistakes.
3. Serving cognitive levels that must be judged.
4. Avoiding ambiguity, confusion, and redundancy.
5. Avoiding clues that may suggest the answer.
6. Compatibility between the test items and the time set for the test (See appendix four B for a complete form of the achievement test).

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a. **Statistical Methods for Research Tools**

First, the Achievement Test

a. Face Validity of the Achievement Test

The achievement test and the content analysis were sent to a jury of educational experts and college professors. They were asked to comment on the content analysis, the questions' fitness for objectives, language readability, test relevance, test coverage, test layout, and presentation of the items. According to their recommendations, modifications were made to suit the sample characteristics. A pilot study was tried out on a group of (30) students of the research population, other than the research sample, to measure the test validity, reliability, and to determine the time for the test.

b. Content Validity of the Achievement Test

Content validity of the achievement test was measured through calculating the correlation coefficient between the total score of the test and the score of every item in the test.

The measurement presents that the correlation coefficient between the score of each item in the test and the total score of the test is statistically significant as the value of significance was greater than 0.01 which indicates the consistency of the items included in the test and suitability for application on the research sample.

c. Reliability of the Achievement Test

The reliability of the achievement test was established by calculating Cronbach's alpha which was 0.81. The reliability is statistically significant as the value of significance is greater than 0.60 which indicates that the achievement test is suitable for application on the research sample.

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d. Determining the Test Time

Through the pilot study, the researcher recorded the time of the first student finished the test and the time of the last student finished the test in order to determine the test time. The following formula was used to calculate the test time:

$$\frac{\text{The time of the first student finished the test + The time of the last student finished the test}}{2}$$

$$= 20 + 30 \div 2$$

$$= 25$$

So, the required time to answer the test questions is 25 minutes.

Second, the Motivation Scale

a. Face Validity of the Motivation Scale

The Arabic version of the MSLQ was given to a jury of education experts and college professors. They were asked to comment on the item's coherence, exhaustiveness, and suitability and on the correctness of the language. The Arabic version of the scale was amended according to the feedback of the reviewers. The Arabic version of the MSLQ was tried out on a group of (30) students of the research population to measure its validity and reliability and to estimate the time needed for completing it.

b. Content Validity of the Motivation Scale

Content validity of the motivation scale was measured by calculating Pearson Correlation Coefficient between the score of each item and the total score of the scale. It presents that the correlation coefficient between the total score of the motivation scale and the score of each item is statistically significant as the value of significance was greater than 0.01.

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c. Reliability of the Motivation Scale

The reliability of the motivation scale was established by calculating Cronbach's Alpha. The reliability is statistically significant as the value of significance is greater than 0.60.

7.Data Analysis

Table 7.1 Equality of Both Groups in the Pre-Test

Pre	N	The test		T-test	
		Mean	**SD**	**T**	**P-value**
The Control group	15	8.233	1.841	-0.508	0.615
The Experimental group	15	8.567	1.751		

Prior to conducting the research experiment, the researcher conducted a pre-implementation of the motivation scale and the achievement test on the two groups at the same time to ensure the equality of both groups. The t test was used for this purpose. Table 7.1 shows the equality of both groups in the pre-test., whereas table 7.2 shows the equality of both groups in the first administration of the motivation scale.

Table 7.2 Equality of Both Groups in the Motivation Scale

Pre	N	Motivation scale		T-test	
		Mean	**SD**	**T**	**P-value**
The Control group	15	17.2	2.597	-0.822	0.418
The Experimental group	15	17.867	1.767		

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Data Analysis Related to the First Hypothesis

The first hypothesis states that there are no statistically significant differences at the significance level ($\leq$ 0.05) between the mean scores of students in the experimental group and the control group in the achievement test.

The t-test was used to determine the significance of the differences in the mean scores between the control group and the experimental group in the second implementation of the achievement test. Table 7.3 shows the results.

Table 7.3 the t-Value of the Differences in the Mean Scores between the Control Group and the Experimental Group in the Post-Test

Post	N	The test		T-test		Eta squared (η^2)
		Mean	**SD**	**T**	**P-value**	
The Control group	15	7.9	2.131	-6.446	0.000	0.597
The Experimental group	15	12.033	1.274			

Table (7.3) shows that there are statistically significant differences between the control group and the experimental group in the second implementation of the achievement test where t= 6.446 and the significance value= 0.000 which is less than 0.01 in favor of the experimental group. The mean of the control group is 7.9 and the standard deviation is 2.131 while the mean of the experimental group is 12.033 and the standard deviation is 1.274. This shows that the mean scores in the achievement test between the two groups are statistically significance.

To find the size of the effect of the independent variable in making the difference in the dependent variable, the Eta squared of the t value was used. The size of the effect associated with the value of Eta squared (η^2) takes three levels: if $0.06 > \eta^2 > 0.01$, the effect is small, and if $0.14 > \eta^2 > 0.06$, the effect is medium, and if $\eta^2 > 0.14$, the effect is large. Table (4.3) shows that the size of the effect is big as $\eta^2 = 0.597$.

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Based on these findings, the researcher refutes the first hypothesis.

Data Analysis Related to the Second Hypothesis

The second hypothesis states that there are no statistically significant differences at the significance level ($\leq$ 0.05) between the mean scores of students in the experimental group and the control group in the measurement of motivation.

The t-test was used to determine the significance of the differences in the mean scores between the control group and the experimental group in the second implementation of the motivation scale. Also, using Eta squared of the t value, and the size of the effect of the independent variable in making the winning difference in the dependent variable were calculated. Table 7.4 shows the results.

Table 7.4 the t-Value of the Differences in the Mean Scores between the Control Group and the Experimental Group in Post Implementation of the Motivation Scale

Post	N	Motivation scale		T-test		Eta squared (η^2)
		Mean	SD	T	P-value	
The Control group	15	17	2.035	-9.954	0.000	0 .780
The Experimental group	15	23.133	1.246			

Table (7.4) shows that there are statistically significant differences between the control group and the experimental group in the second implementation of the motivation scale where t= 9.95 and the significance value= 0.00 which is less than 0.01. The mean of the control group is 17 and the standard deviation is 2.04 while the mean of the experimental group is 23.13 and the standard deviation is 1.25. This shows that the mean scores in the motivation scale are statistically significance between the two groups.

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To find the size of the effect of the independent variable in making the difference in the dependent variable, the Eta squared of the t value was used. Table (7.4) shows that the size of the effect is big where $\eta^2 = 0.780$.

Based on these findings, the researcher refutes the second hypothesis.

8.Results

Based on data analysis, results show that there are statistically significant differences at the significance level (≤ 0.05) between the mean scores of students in the experimental group and the control group due to the use of the suggested enrichment activities that are based on gamification in the students' achievement of the fourth elementary grade in Adham.

In addition, results show that there are statistically significant differences at the significance level (≤ 0.05) between the mean scores of students in the experimental and the control groups due to the use of the suggested enrichment activities that are based on gamification in the fourth elementary grade students' motivation in Adham.

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