Effects of Gamification-Based Learning on Learners' Achievement Motivation at First-Grade Intermediate Level

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Abstract
The study aimed to pinpoint the effects of an educational environment based on gamification on developing achievement motivation among first-grade intermediate students. Using an achievement motivation scale, the study adopted a quasi-experimental design with experimental and control groups. The sample consisted of 52 students selected randomly from the first-grade intermediate students. They were studying in public intermediate schools in Jeddah at the time of this study. They were divided into two groups. The control group (n=24 respondent), and the experimental group (n=28 respondent). The results showed statistically significant differences at the level $\alpha \geq 0.05$ between the mean scores of the experimental group and the control group in the posttest of the achievement motivation measurement in favor of the experimental group. The study recommended using gamification in designing computer curricula and courses across educational stages in Saudi Arabia. It also recommends training the computer and information technology teachers on using gamification in their teaching.

Keywords: *Educational Environment, Gamification, Achievement Motivation*

1. Introduction

In recent decades, developed countries have manipulated information and communication technologies in education because of the incredible transformations these technologies have provided to the educational field. Such technologies have been helpful for teachers, learners, and the educational system in general. The significance of such technologies has been more evident during the Corona (Covid-19) pandemic. It has changed the traditional teaching methods and helped pedagogues pursue their educational goals. It prompts educational systems to create electronic learning environments that help learners achieve their goals and increase their motivation for learning.

In this regard, [1] confirm that electronic educational environments boost learning motivation. Such environments include many multimedia elements such as texts, sounds, still images, animations, and videos that enhance the content, facilitate learning, increase learners' self-confidence, enable them to interact with their peers, appreciate their self-esteem and increase their motivation for learning.

Educators concede that any human behavior must have energy that motivates and directs it. Individuals' success in performing positive behaviors or actions depends on the energizing energy that pushes their behavior. [2] points out that a learner's motivation plays a vital role in achieving the desired goals. It is rather an internal desire that guides learners' behavior during their learning activities to achieve success and avoid failure.

The concept of achievement motivation emerged in the past years as one of the distinguishing features of research on various aspects of human personality. Arguably, teachers' understanding of the achievement motivation of their learners helps them interpret learners' behaviors, ideas, imagination, and performance. [3] asserted that studying achievement motivation stem from its importance in education and academia. It is a prerequisite for good learning. It provides the desire to research, take risks, knowledge and perseverance in the performance and practice of educational tasks and activities.

Given the important role that achievement motivation plays in learning and teaching, several studies recommend a focus on developing achievement motivation in various educational stages. For example, [4, 5, 6, 7, 8, 9]), among many other educational research studies, confirmed the ability of electronic educational environments to develop motivation for achievement among learners. It increases their academic achievement and the need to activate it by educational institutions to keep pace with current developments [10,11, 5, 12].

Gamification is one of the methods based on modern technologies that educational institutions seek to harness. It has an additional dimension to the educational process. It motivates learners to learn and adds elements of play to educational situations. Truly, gamification is a promising investment market. It will reach, according to indicators, 7 $3 billion by 2021 in the 2017 Naseej Blog.

[13] indicate that gamification motivates learners to participate more effectively during learning. It is based on playing elements, which reduces learners' boredom. It emphasizes the importance of building the educational material in a way that breaks out of its boring stereotypes and introduces it to the world of motivation by integrating it with gaming elements.

Thus, the present study intends to promote achievement motivation among first-grade intermediate

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students by building an educational environment based on gamification. It takes its impetus from the following:

1. Recommendations of prior research findings

A plethora of previous studies that have undertaken achievement motivation indicated a weakness among learners at all levels of education. Such studies recommended the need to develop it among learners. [4, 9, 5, 7, 14, 8, 15] are among those studies.

2. Pilot study

An unstructured study was piloted on a sample of first-grade intermediate students in Jeddah to identify their level of achievement motivation. The measurement of achievement motivation was prepared of 20 items distributed over five dimensions (self-confidence, perseverance, mastery, ability to independence, level of ambition). It was implemented on a sample with similar characteristics to the actual sample. The results are outlined in the table below.

Data in the table shows low level of achievement motivation among the pilot study. The lowest of those dimensions, including proficiency and perseverance, came

Table 1. Results the Pilot Study of Achievement Motivation

(n=30)

	Dimensions	Achievement motivation Level					
		high		Moderate		low	
		N	%	N	%	N	%
1	Self-confidence	6	%20	9	%30	15	%50
2	perseverance	4	13.3 %	7	23.3 %	19	63.3 %

at (66.7%) and (63.3%), respectively. The least is relevant to the dimension of independence, which came at a rate of (46.7%). However, it represents a decline among students.

3. Surveying Teachers and students' opinions

The researcher prepared an unstructured questionnaire to pinpoint the first intermediate grade students' views on using educational games in computer and information technology course. It consisted of 20 items about students' preferences and attitudes towards educational games in computer and information technology courses. The results clarified the respondents' tendency towards educational games in learning, which indicates the necessity of using the elements of educational games in teaching the computer and information technology course.

4. Recent statistics of learners' use of educational games

The researcher noticed an increasing demand by learners to use electronic games, capitalizing on using electronic and educational games in learning. [16] indicated that such learning advances occupy most of the learners' daily time. The NewZoo company confirmed, in its report on most spender countries on electronic games until the end of 2017, that Saudi Arabia ranked nineteenth with spending amounting to 647.424 million dollars. This requires careful consideration of taking advantage of modern technologies in educational aspects, including creating educational environments based on gamification.

Problem Statement

With these points in mind, the researcher felt the need to conduct a study to build an educational environment based on gamification in developing achievement motivation among first-grade students. With the discussion above in mind, the problem of the study manifests itself in the low achievement motivation of first-grade intermediate students. Hence, the present inquiry addresses this problem by building an educational environment based on gamification. It hinges on the following central question: What is the effectiveness of an educational environment based on gamification in developing the achievement motivation of first intermediate grade students?

Objectives:

The principal objective of the study is to develop achievement motivation among first-grade students in the middle school in Jeddah by building an educational environment based on gamification. Towards this end, the following objectives drove the current investigation:

1. Designing an educational environment based on gamification.
2. Determining the effectiveness of the educational environment based on gamification in developing the achievement motivation among first-grade students in the middle school in Jeddah.

Significance of the Study

The current study derived its significance from the variable it addressed - developing achievement motivation among students in the first intermediate grade. Towards this end, the study designed an educational environment based on gamification , which is mooted as a modern trend in educational technologies. Hence, the researcher believes that the importance of the current study is twofold:

First: Scientific and theoretical importance

- The study enriches the literature germane to educational technologies through using gamification , which is one of the recent trends in educational technologies.

- It opens new venues for further studies on gamification and its impact on various educational outcomes and courses.
- It provides research tools that deal with achievement motivation measurements.

Second: Practical Importance

- Creating an educational environment based on gamification contributes to changing the educational process – a shift from the traditional model to modern technology-based learning that stimulates the learners' energies and motivation and involves them to shoulder the responsibilities of learning.
- Creating an educational environment based on gamification guides the curricula developers while designing similar learning environments with other gamification -based courses.
- Increasing learners' motivation through the gamification-wise educational environment.

Key Terms

Effectiveness

It is operationally defined as the extent to which the gamification -based educational environment can promote achievement motivation of first intermediate grade students, resulting from teaching them the fourth and fifth units of the computer and information technology course after the experimental endorsed in this study.

Educational environment

According to [17] , an Educational environment is a place in which learners interact with others, including the school's culture, mission, characteristics, and methods adopted by teachers during the educational process to achieve school goals, whether inside or outside the school.

Gamification

[18] define gamification as using the play elements in a context different from games with the purpose to motivate learners and help develop their thinking and motivation toward learning.

Achievement Motivation

The researcher defines it as the student's attempt to shoulder the responsibility and his or her aspiration to achieve the desired goals of the fourth and fifth units of the computer and information technology course to succeed and overcome the difficulties they face. It is measured by the total scores obtained from the achievement motivation scale.

Method

The study adopted the quasi-experimental research design with two groups: the control and the experimental groups with pretest and posttest. [19] speculate that this research design causes a change in the dependent variable under the effect of the independent variable. As the current study ascertains the impact of gamification (independent) on the achievement motivation (dependent) among first-grade intermediate students in Saudi Arabia, this experimental design corresponded well to the investigation.

The research tools (Achievement Motivation Scale) were used with the control and experimental groups prior to the experiment in the given design. Then the experiment was carried out. It comprised the traditional teaching of two units, namely My Computer Friend and Write My Achievements, to the control group. Plus, it involved gamification-based teaching of the two units to the experimental group. After the experiment on both groups, the tools were used again with close attention to the results to ascertain the effectiveness of the independent variable (gamification) on the dependent variable (achievement motivation). The design is displayed in the Table 2.

Table 2. Quasi-experimental Design

Groups	Pre-test	Experiment	Post-test
Control Experiment	achievement motivation measurement	Traditional teaching	achievement motivation measurement
Experimental Experiment		gamificaiton-based teaching	

It is to reiterate that the two variables of the study include (1) the dependents and (2) independent variables. The former is the achievement motivation, and the latter is an experiment pertinent to the gamification learning environment.

Population

The population of this study encompassed all first-grade students in the intermediate stage who studied in public education schools in Jeddah during the second semester of the academic year 1439-1440 (Hijri) (n=18.728 male students) as stated in the Jeddah Educational Statistics Manual. The Education Department included six education bureaus: the North Office, the East Office, the Central Office, the Safa Office, the Naseem Office, and the South Office).

Tools and Materials

1. Teacher's Gamificaiton Manual (Self-prepared)

This manual aims to guide the computer teacher on using the gamification-based learning environment to teach the experimental group the two units in the computer course - My Computer Friend and Write My Achievements for the first intermediate grade students in Jeddah. Both the teacher and student's guide were prepared with the following elements in mind:

Table 3. Tools and Materials

	Materials		Tool
1	Teacher's guide to gamificaiton	1	achievement motivation measuremen
2	Student's Guide to gamificaiton		

A. Introduction to the Guide

The introduction explains the progress in education in general and technology in particular. It included a description of gamification, one of the latest learning techniques, highlighting its nature, importance, and student-centered play elements that can be used in learning. Besides, The introduction included a brief account of the computer and its importance. Finally, the introduction touched on the nature of achievement motivation and its role in students' success in learning and development.

B. Objectives

The manual generally aimed to briefly explain the nature of a gamification-based learning environment, its advantages for learning, and the teacher using and manipulating it to improve the learning outcomes targeted for development with a particular focus on first-grade students. In addition, it aimed to provide timed teaching of the two units and help the teachers teach the two units in question via a gamification platform. Additionally, it aimed to introduce the teacher and the student to using the educational environment based on digital gamification by displaying an illustrated explanation of the steps for entering and operating the environment.

C. Introduction to Gamification-Based learning

This introduction outlines the environment of digital gamification, including the concept of gamification, its emergence, uses, and significance in education. Add to that its elements that can be used in learning and steps of using it based on its salient principles.

D. Student and Teacher's Guide to Gamification

This part included an overview of the importance of studying the two Units (My Computer Friend and Write My Achievements) at the first intermediate grade. It also illustrates the components of the educational environment based on gamification. Then it clarifies studying the educational units designed on gamification. This is the most important part as it comprises a pictorial explanation of how to use a gamification environment, starting with the entry screen for the environment, through educational tasks and activities, and an explanation of the interface of the educational environment for each unit and an explanation of the nature of screens. Moreover, clarification of the icons and symbols used within the environment, with a pictorial explanation of ways to solve the activities within the educational units. It also included an explanation of the means of communicating with the teacher and sending answers to activities or activities self-assessment assessment.

E. General framework for teaching the two units (My Computer Friend, Write My Achievements) to first-grade intermediate students using gamification:

This part is one of the important parts of the guide, and this part may consist of nine axes that can be clarified as follows:

1. Topic of the Two Units:

The topics introduced to the first intermediate grade students were presented in the two units (12 sub-topics). Under each topic there is a set of behavioral objectives, educational tasks, activities and some exercises as self-assessment for students.

2. General Objectives of the Two Units:

The guide included the general objectives of the two units, as they are found in the textbook for students.

3. Behavioral Goals (Cognitive, Skill, Emotional) for the Two Units:

The guide includes all the three aspects of the behavioral goals identified in the analysis stage. They were derived from the topics of the two units prescribed in the textbook.

4. The Scientific Content of the Two Units:

It is identical to the content in the student's book and in the same order. The content was organized within the educational environment through gamification with various images and videos in a way that supports students' learning, and some educational activities were included as direct applications.

5. Instructional Aids and Teaching Methods:

The gamification environment relies on some technologies such as the computer itself or mobile phones and the Internet, the Data Show Device. Besides, some computer accessories are used during the study of the unit, such as headphones, a receiver, and printer, and self-learning (each student works alone). The teacher generally guides students to perform the skills, tasks, and computer activities in the two units individually and competently.

6. Time plan for teaching the two units:

Time plan for teaching the two units: This includes the number of topics devoted to each unit and the time allotted for each topic. The total number of lessons was 12.

7. General directions for the teacher and the student:

This included a set of instructions the teacher and student should consider when using gamification in teaching the units "My Computer Friend" and "Write My Achievements.

8. Basic requirements for using the digital gamification environment in teaching the two units.

This includes the technical requirements, programs or devices that both teachers and the students should use in teaching the two units, My Computer Friend and Write My Achievements.

9. *Classroom activities and the assessment Appendix*.

This appendix contains the answers to the classroom activities and the assessment questions. It includes answers to all the classroom activities in the gamification environment. Each activity was presented, and its answer was presented.

F. Guide references:

This part of the guide includes a list of references in preparing the guide related to digital gamification and motivation for achievement.

1. Achievement motivation Scale (Self-prepared)

This study aimed at developing achievement motivation among first-grade students in the middle school in Jeddah in the computer and information technology course through gamification. Therefore, using or preparing a scale to measure the level of achievement motivation was required. Although several ready-made scales exist, a new scale was prepared with the following justifications:

a. Most of the achievement motivation measures, whether Arab or foreign, Arabized standards), were designed and used on environments and groups other than the target group in this study. To the best knowledge of the researcher, there are no gauges to measure achievement motivation in the computer course in the Saudi environment.

b. This study targets first-grade middle school students in Jeddah who were studying a computer and information technology course. Therefore they are at the beginning of the early adolescence stage. They have age, mental, emotional and social characteristics that necessitate the preparation of a scale that includes statements that fit that category.

1. Determine the Purpose of the Scale

The scale was designed to measure the level of achievement motivation among first-grade students in the middle school in Jeddah in the computer and information technology course. The results of the measurement to verify the hypotheses of the study.

2. Determine the Dimensions of achievement. Motivation Scale

The following procedures were performed to determine the dimensions of the scale:

- Reviewing relevant literature on the dimensions of achievement motivation and theories that explain motivation, including [20, 21, 22, 23, 24] . Besides, some achievement motivation studies were reviewed including [4, 5, 25, 7, 26, 27]).
- Examining several measures of achievement motivation, including the following scales:

- Atkinson and McClelland's scale for measuring achievement motivation. In 1948, the authors developed the Henry Murray scale, symbolized as TAT, which appeared in 1943. It derived its origins from the theory of needs ([28] , p. 140).
- Hermans' (1970) Scale. It is a scale for children and adults that focuses on ten characteristics to distinguish high and low levels of academic achievement. They include a high level of ambition, behavior with less adventure, the ability to move forward, perseverance, and desire to think about obstacles, realizing the speed of time passing, moving towards the future, testing competitive positions against sympathy positions, studying appreciation, and desire to perform better. The scale consisted of 28 items. Each one consists of an incomplete statement followed by five and sometimes four statements. Informants choose the phrase that completes the paragraph from their point of view. Farouk Mousa (1981) adopted this scale, arabized it and tailored it to the Egyptian environment ([28] , p. 141).
- Hau and Salili's (1990) scale. It consisted of 10 items in the form of five pairs to measure mastery and performance goals, to be answered through a scale extending from strongly agree to strongly disagree.
- Al-Hamid's (1996) scale consisted of 26 items. Each one included two options. The informants choose one of them, then show the extent of those items on a 3-options graded scale next to the given choices.
- Abu Alsal's (2016) Scale. It was prepared in light of 13 behavioral components: striving for excellence and success, performing duties without delay, a tendency to competition, perseverance and steadfastness, setting goals and striving to achieve them, and tendency to organize and invest time, self-confidence, an initiative to work and continuing with it until completion, tendency to set high levels of performance and ambition, tendency to take responsibility, a tendency to hard work and overcoming it. The scale consists of 40 items; in front of each item is a five-level scale

representing the extent of the content of each item (always, often, sometimes, rarely, never.)

In light of relevant literature and previous studies on the motivation for achievement, the researcher found a discrepancy. The dimensions of achievement motivation differ according to the target group of investigation. The dimensions fitting the current study were derived to precisely measure the achievement motivation of first-grade students in Jeddah in the computer and information technology course. Given the characteristics of this cohort of learners and the suitability of those dimensions to the nature of educational content and gamification, the study adopted these seven dimensions: self-confidence, mastery, perseverance, competitiveness, independence, ambition, and enjoyment.

3. Phrasing the scale statements

Having the scale dimensions determined, the scale items were constructed in their initial form: seven dimensions and 42 items. Each dimension comprised six items, 29 positive and 13 negatives. The conditions of suitable scientific formulation of items have been taken into account. The scale and its relevance to the characteristics of the study sample of the first intermediate grade students in Jeddah, as well as its relevance to the nature of the content of the two units under investigation, taking into account the simplicity of the method, clarity and scientific accuracy, and shortened wording, and to ensure that each item related to the dimension to which it belongs, and each items contains solo idea.

4. Scale Instructions

The scale instructions were formulated clearly and directly so that students could easily understand and respond to them and select their choice on each item. These instructions were on a separate page at the beginning of the scale. The instructions included the following:

- Determine the measurement objective.
- Determining the number of statements on the scale.
- Emphasizing the importance of reading and understanding the statements as well as instructions of on the scale.
- Clarify the idea of the scale and a detailed explanation of how to answer it.
- instructing respondents to select their preferred choices for all the expressions of the scale.
- Determine the response time on the scale.
- instructing respondents to write their details in detail in the space designated for that.
- Giving an illustrative example to explain how to deal with graduated scale statements.

5. Scale Correction

The Motivation Scale was constructed on a 4-point Likert Scale in which 3 is assigned when the positive statement highly corresponds to the respondent's behavior and zero to statements that do not correspond to the respondent's behavior. The grading is also reflected in terms of the negative statements. Respondents get zero when the item applies to their actual behavior and 3 when the item does not match their actual behavior, as in the following table:

Table 4. Initial Estimations of Achievement Motivation Scale

Type	Conformity of Scale items with Actual behavior - estimated in scores			
Positive	high	Moderate	low	Not applicable
	3	2	1	0
	high	Moderate	low	Not

Thus, the total score of the scale ranged between 126 (max) for those with high motivation, 84 for those with medium motivation, 42 for those with low motivation, and zero for those with no motivation.

6. Apparent validity of the scale

Upon completing the initial version of the scale, it was validated by a group of arbitrators specializing in psychology, evaluation and measurement, curricula and teaching methods, and educational technology. A questionnaire was prepared to obtain their opinions on the general objective of the scale, accuracy of its instructions, the general form of the scale in terms of the accuracy and clarity of the concepts and items, suitability of the items to the dimensions included in the scale, the number of those items and the extent of their relatedness to the corresponding on the scale, as well as level of response to each item, and rating of scores according to the 4-point Likert scale.

The arbitrators' input helped in making some amendments, including modifying phrasing of some items without deleting or adding any other items. The arbitrators also pointed out the appropriateness of the seven dimensions of the scale for the characteristics of the first intermediate grade students in Jeddah.

7. Piloting study

After preparing the achievement motivation scale in its initial form and ensuring its apparent validity through the arbitrators, it was applied to the members of the exploratory sample (n=20). They were selected from the same population of the study - first intermediate grade students at Jabal Al-Noor Intermediate School in Jeddah. The objectives of piloting this scale were the following.

- Ensure clarity of instructions.
- Calculate the response time for the scale.
- Calculate the internal consistency of the scale.

▪Calculate the reliability of the test.

a. Clarity of instructions

Before answering the scale, the respondents were keen to read the instructions and get clarification to ensure accurate answers. The instructions were made clear to all respondents.

calculated between the degree of each dimension of the scale and the total score of the scale as follows:

Table 5. Pearson Correlation Coefficients between Scores of Each Items and Total Score of Achievement Motivation Scale

No.	correlation coefficient	No.	correlation coefficient	No.	correlation coefficient
1	**0.579	15	**0.579	29	**642.0
2	**0.862	16	*0.547	30	*0.530
3	**0.565	17	-*0.452	31	*0.483
4	-*0.441	18	**0.601	32	*0.453
5	-*0.464	19	*0.496	33	-*0.452
6	*0.449	20	**0.563	34	**0.645
7	**0.611	21	*0.538	35	*0.473
8	**0.585	22	**0.699	36	*0.446
9	**0.665	23	-*0.495	37	*0.465
10	*0.51	24	*0.526	38	-*0.467
11	-*0.479	25	**0.572	39	*0.451
12	-*0.521	26	-*0.501	40	*0.463
13	-*0.461	27	**0.612	41	*0.448

b. Estimated answer Time

The average time taken by all students to answer the scale was calculated. It was found that the appropriate time for all students to finish answering the scale was 35 minutes. It was calculated according to the following equation:

$$\text{Answer time} = \frac{\textit{Total informants' responses}}{\textit{No.of informants}} =$$

700/20=35 minutes

c. Internal consistency of the scale

Internal consistency is used to exclude invalid items in the scale; In other words, it means the internal homogeneity of the scale. To determine the internal consistency, the Pearson correlation coefficients were calculated between the score of each items and the total of the scale and between the score of each dimension and the total sum of the test (see Table 5).

As displayed in Table 5, there is a correlation between the scale items and its entire structure. Similarly, all the items showed statistically significant correlation coefficients at the levels 0.05 and 0.01, ranging between 0.441 and 0.862. Thus the scale has a high degree of internal consistency, which confirms its validity of the scale. Additionally, Pearson's correlation coefficient was

Table 6 shows that there is a correlation between the sum of each dimension of the scale and the total sum of the scale. All scale dimensions showed statistically significant correlation coefficients at the level (0.01), which indicates the strength of the correlation of those dimensions with the scale, wherein the values ranged between 0.578 and 0.866. This indicates the strength of the correlation of dimensions with the scale, which confirms the validity of the scale, and thus the scale has a high degree of internal consistency

Table 6. Correlation coefficient between the degree of each dimension of the scale and the total score of the scale

Dimensions	correlation coefficient
Self-confidence	**0.598
perfection	**0.866
perseverance	**0.582
Competitiveness	**0.728
independence	**0.682
ambition	**0.739
enjoyment	**0.578

d. Reliability

The scale's reliability means that the respondent obtains the same score if the scale is applied again under the same circumstances. The reliability of the achievement motivation scale was calculated using the two methods: Cronbach's alpha coefficient and the split-half according to the Guttmann and Spearman-Brown equation. The following table shows the obtained values

Table 7. Reliability coefficients of the achievement motivation scale using Cronbach's alpha coefficient

Dimension	Number of items	Cronbach's alpha coefficient
Self-confidence	6	0.778
perfection	4	0.781
perseverance	6	0.743
Competitiveness	6	0.788
independence	8	0.799
ambition	6	0.801
enjoy	6	0.725
the scale as a	42	0.795

As Table 7 displays, Cronbach's alpha coefficient of the reliability of achievement motivation was high (0.795). The reliability coefficients of the sub-dimensions were also high, ranging between 0.725-and 0.801 .

The following table shows the reliability coefficients using the Split-half of the measure of achievement motivation as a whole and on each dimension.

Table 8. Reliability coefficients of the achievement motivation scale using the half-segmentation

Achievement Motivation	Reliability coefficient (Split-Half)	
	Getman's	Spearman-Brown
42	0.852	0.743

Table 8 shows that the reliability coefficients in the split-half of the scale were also high. The values indicate the validity of using the scale as a measurement tool in this study in light of the characteristics of its sample.

8. Final Draft of the scale

After completing the steps of the scale preparation and getting it validated by experts and making adjustments in the light of their opinions, piloting it, and checking its reliability, the scale in its final form consists of 42 items, including 30 positive statements, and 12 a negative expression, distributed over seven dimensions; Where all dimensions included six items, except the Independence dimension, which included four items, and Mastery, which included eight items. The answer key was gradual – from 3 to zero for positive statements and from zero to 3 for negative items. The minimum score is zero, and the maximum is 126.

Results and Discussion

The results are centered around the research question : What is the effectiveness of an educational environment based on gamification in developing the motivation for achievement among first-grade students in the middle school in Jeddah?

In order to verify the effectiveness of gamification-enabled learning on achievement motivation and its various dimensions among the first-grade intermediate students in Jeddah, the achievement motivation of the two groups (control and experimental) was measured after the experiment. The means values, standard deviations, and t-test values (Independent Samples T-Test) were calculated to ascertain the significance of the difference between the mean scores of both groups. Likewise, ETA (ή2) and the standard difference index between two averages were calculated, from which the Cohen index (d) was calculated.

Data in Table 9 clearly shows the following:

- There are statistically significant differences (at the level of $\alpha \geq 0.05$) between the mean scores of the experimental and control groups in the posttest of the achievement motivation scale as a whole in favor of the group with the highest mean value (the experimental group). The t-value is 6.13, which is statistically significant. The Significance value is 0.000, which is less than the significance level value of 0.05.

Table 9. T-Values of the Differences between Mean Scores of the Experimental and Control Groups in the Posttest of achievement Motivation Measurement

Dimensions	Group	N	Mean	St.D	F	t	(Sig)	ή²	d
								Impact factor	
Self-confidence	Exp.	28	11.75	1.6	50	2.43	0.019	0.11 large	0.68 moderate
	Control	24	10.54	1.98					
perfection	Exp.	28	17.61	1.75	50	4.45	0.000	0.28 large	1,23 large
	Control	24	15.13	2.27					
perseverance	Exp.	28	12.43	1.83	50	2.89	0.016	0.11 large	0.69 moderate
	Control	24	11.25	1.54					
Competitiveness	Exp.	28	12.43	1.4	50	3.61	0.001	0.21 large	1,01 large
	Control	24	10.58	2.24					
independence	Exp.	28	9.36	2.53	50	2.34	0.023	0.1 large	0.65 moderate
	Control	24	7.88	1.94					
ambition	Exp.	28	15.21	2.22	50	4.59	0.000	0.3 large	1,28 Big
	Control	24	11.83	3.07					
enjoyment	Exp.	28	13.04	1.48	50	2.94	0.005	0.15 large	0.82 large
	Control	24	11.83	1.46					
Total	Exp.	28	91.82	8.13	50	6.13	0.000	0.43 large	1,7 large
	Control	24	79.04	6.68					

- There are statistically significant differences (at the level of $\alpha \geq 0.05$) between the mean scores of the experimental and control groups in the posttest of the achievement motivation scale as a whole in favor of the group with the highest mean value (the experimental group) insofar the seven dimensions are concerned (self-confidence, mastery, perseverance, competitiveness, independence, ambition, enjoyment). The t-values fall between 4.59 and 2.34, which is a statistically significant. The Significance value is between 0.000 and 0.023, which is less than the significance level value of 0.05.

- The effect size of a gamification-based learning environment based on achievement motivation as a whole was large. The eta ή2 value of the scale as a whole is 0.43, meaning that 43% of the total variance of the dependent variable (achievement motivation) stems from the influence of the independent variable (gamification-based learning environment) whole was large. The eta ή2 value of the scale as a whole is 0.43, meaning that 43% of the total variance of the dependent variable (achievement motivation) stems from the influence of the independent variable (gamification-based learning environment)

This result confirms the corresponding value of the Cohen index (d), which amounted to 1.7. It is much greater than the minimum significant effect to explain the size of the effect (0.8).

- The effect size of a gamification-based learning environment based on seven dimensions (self-confidence, mastery, perseverance, competitiveness, independence, ambition, enjoyment) was large. The eta ή2 values fall between 0.3 and 0.11, meaning that 11-30% of the total variance of every achievement motivation dimension results from the independent variable's effect (gamification-based learning environment). This result is confirmed by the corresponding Cohen (d) values, which amounted to 1.28 and 0.65. Cohen's index (d) values were moderate in terms of the dimension of independence, self-confidence, and perseverance (0,65 ،0,68 ، 0,69respectively). In contrast, the values are much more prominent with the remaining skills than the minimum significant effect to explain the effect size (0.8).

Given these results, the gamification-based learning environment's effectiveness influences the achievement motivation of the first-grade students in the middle school in Jeddah. Hence, the research questions raised in the introduction are addressed with ample evidence of the effect of the independent variable. In other words, the results indicate that gamification-based learning is foundational for developing achievement motivation with all its seven dimensions.

Recommendations:

In light of the results, the following points are recommended:

1. Manipulating gamification in designing computer courses in the various stages of education in Saudi Arabia.
2. Training computer and information technology teachers to use gamification environments in teaching.
3. The materials and tools of the present study could guide designing and using gamification in teaching computer and information technology courses.

Suggestions:

Based on the results and recommendations, the researcher suggests the following:

1. Studying the effectiveness of gamification -based educational environments on developing technological concepts in a computer and information technology course.
2. Studying of the requirements for using gamification in education in the Saudi context.
3. Examining the effectiveness of gamification -based educational environments on developing metacognitive skills and enjoying learning in a computer and information technology course among secondary school students.
4. Undertaking studies on training competencies necessary for computer teachers that enable them to employ gamification in their teaching.

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