Developing and Validating a Scale for Gamification Acceptance: Insights from E-Learning Environments

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معرف البحث الرقمي DOI: 10.21608/JEDU.2025.345281.2165

المجلد الحادي عشر العدد56 . يناير 2025

الترقيم الدولي

P-ISSN: 1687-3424 **E- ISSN: 2735-3346**

موقع المجلة عبر بنك المعرفة المصري https://jedu.journals.ekb.eg/

موقع المجلة http://jrfse.minia.edu.eg/Hom

العنوان: كلية التربية النوعية . جامعة المنيا . جمهورية مصر العربية

Developing and Validating a Scale for Gamification Acceptance: Insights from E-Learning Environments

Abstract:

This study develops a validated scale to measure the acceptance of Gamification technology in e-learning environments, providing insights into improving user engagement and learning outcomes. The research was based on the descriptive survey approach. The research tool was a scale for the acceptance of Gamification technology. A purposive sample of 28 secondary school teachers was selected to pilot the scale, ensuring its suitability for broader application. To achieve the research objectives, a scale was built in its final form of (39) paragraphs distributed over four dimensions. The first is entitled "Expected ease of use" and includes (9) phrases. The second is entitled "Perceived benefit" and includes (9) phrases. The third is entitled "Perceived use intentions" and includes (10) phrases. The fourth is entitled "Perceived actual use" and includes (10) phrases. The Delphi method was used in developing the scale by consulting a group of experts in the field of educational technology, where their opinions were gathered regarding the appropriateness and quality of the items. Using appropriate statistical methods, the results showed that the scale had good psychometric characteristics based on the indications of validity using virtual(arbitrators) validity of internal consistency. The scale demonstrated high reliability (Cronbach's alpha = 0.976) across all dimensions. These findings suggest its potential for use in identifying areas where e-learning environments can be optimized.

Keywords: Gamification- e-learning environments- technological acceptance.

تطوير مقياس لتقبل تكنولوجيا المحفزات الرقمية: تطبيقات عملية في بيئات التعلم الإلكترونية

المستخلص:

هدف هذا البحث إلى تطوير مقياس مُتحقق الصدق والثبات لتقييم تقبل تكنولوجيا المحفزات الرقمية في بيئات التعلم الإلكترونية، مما يوفر نتائج وبيانات دقيقة تسهم في تحسين تصميم هذه البيئات لتعزيز تفاعل المعلمين والطلاب، واعتمد البحث على المنهج الوصفي المسحي، وتمثلت أداة البحث في مقياس لتقبل تكنولوجيا المحفزات الرقمية، وتمثلت عينة الدراسة من 28 معلم من معلمي المرحلة الثانوية، ولتحقيق أهداف البحث تم بناء مقياس تكون في صورته النهائية من (39) فقرة موزعة على أربع ابعاد الأول بعنوان سهولة الاستخدام المتوقعة ويتضمن (9) عبارات، الثاني بعنوان الفائدة المدركة ويتضمن (9) عبارات، الثالث بعنوان نوايا الاستخدام المدركة ويتضمن (10) عبارات، الرابع بعنوان الاستخدام الفعلي المدرك ويتضمن (10) عبارات، تم استخدام أسلوب دلفي في بناء المقياس من خلال الاستعانة بمجموعة من الخبراء في مجال تكنولوجيا التعليم، حيث تم جمع آرائهم حول ملائمة العبارات وجودتها وباستخدام الأساليب الإحصائية المناسبة أسفرت النتائج بتمتع المقياس بخصائص سيكومترية جيدة بناء على دلالات الصدق باستخدام صدق الظاهري(المحكمين)، صدق الاتساق الداخلي، كما أسفرت النتائج عن تمتع المقياس بثبات معاملات الفا كرونباخ والتجزئة النصفية.

الكلمات المفتاحية: المحفزات الرقمية– بيئات التعلم الإلكترونية– تقبل التكنولوجيا.

Introduction

Digital motivators are an effective tool in enhancing learners' motivation and interaction with the learning environment. These motivators provide distinctive mechanisms such as points, badges, and leaderboards, which encourage learners to actively participate and explore learning content. When designing learning environments based on Gamification, positive behavior is not only stimulated but also fostered openness to the use of technology and dealing with it daily. This constant and encouraging stimulation can directly contribute to the enhancement of technological receptivity in users, as learners overcome the psychological fears or barriers associated with the use of technology and develop positive attitudes towards it. Thus, Gamification become a strategic means of supporting integration between digital tools and learners, raising the level of technological acceptance and expanding their application in the educational process.

The tremendous revolution in information and communication technology has helped in the emergence of technological innovations and new methods in the field of education, and the emergence of many modern educational trends in the field of teacher preparation, training, and professional development as a direct result of these contemporary developments and the use of the best trends for the development of skills. Therefore, a need to employ technologies and technological innovations to solve the problems we may face within educational institutions and the most appropriate methods and means through which to provide experiences and knowledge in a way that raises the motivations of learners and meets their needs attractively and interestingly. These technologies are learning environments based on Gamification, and this is in line with what was recommended by the study of Abdul Sattar (2018), and many specialists and researchers called for the need to utilize digital stimulators and employ them to address those problems represented in the development of skills, as learning is a goal-driven social activity determined by motivational factors to be able to perform assignments and tasks effectively, so the employment of digital stimulators has spread in many digital education systems and all areas of life.

Zardari et al. (2021) highlighted the growing reliance on e-learning, yet their study insufficiently addressed the behavioral factors influencing Gamification acceptance, as Saleem et al. (2022) indicated that in recent years, there has been a lot of interest in the inclusion of Gamification in non-gaming domains. The use of stimuli in education has great benefits for stimulation, user interaction, and social influences. Items that have been used in games such as points, badges, feedback, levels, rewards, challenges, etc. have been used in e-learning.

The educational concept of Gamification, as Ibrahim (2020) sees it, means that it does not necessarily involve the use of a game, but involves the integration and use of design elements, mechanisms, and techniques of games or patterns of activity and methods used in their practice in contexts other than the context of the

play, that is, non-recreational to improve the level of performance or address a specific problem, as it depends on understanding the mechanisms and characteristics of games, and applying them in activities outside the scope of games to make them more interesting and stimulating, such as tests, competitions, activities, and exercises.

Many studies have shown that Gamification is applied in many different areas of life because this depends on understanding the mechanisms of games, their characteristics, and their application in external activities to make them more enjoyable, interesting, and stimulating, such as games. Examples of these areas include shopping, sports, learning, information literacy, health, money, entertainment, and security, and this has emerged to enhance positive aspects of life (Boopathi et al., 2015; Hanus & Fox, 2015).

Gamification that can be employed to develop skills is many and varied, including points, badges, leaderboards, progress bars, text titles, levels, and role-playing or characters (Seaborn & Fels, 2015). Özdener's study (2017) also pointed to the positive impact of using elements of Gamification in training courses and learners' participation rates in course activities and their ability to achieve academic success for the learner through their motivation and motivation for the learning process, while Carolyn's study (2016) indicated that Gamification takes into account individual differences between learners and allow them to make decisions, and these stimuli are presented in various forms, including points, badges, niches, and leaderboards within the learning environment, which improve learning results. In a related context, Phung's study (2020) aimed to find out the negative impact of Gamification in e-learning from the point of view of university students. It stressed that the shift to employing Gamification in e-learning is inevitable, but it stressed that Gamification has negative effects that remain largely implicit and are ignored. Its results also indicate that Gamification can make the learner feel bored instead of paying attention, loss of confidence, stressed, feeling helpless instead of trusting, annoyed, uncomfortable, dissatisfied, distracted, and willing to surrender.

Acosta-Medinaet al. (2021) pointed out that in e-learning environments, education institutions and teachers can include Gamification to create enjoyable environments that increase learners' motivation and facilitate learning. Therefore, designers and developers of educational tools based on Gamification should measure their acceptance of them, as this factor is crucial in achieving the purposes of these educational tools, and researchers may be able to prove more factors that affect the preference for using educational tools based on Gamification.

Akram Mustafa (2017) pointed out that it is important to study the user's behavior towards technology and its applications, so one of the most important criteria for the success of technology is the satisfaction and acceptance of its beneficiaries. Measuring the acceptance of technology is not just to identify the interaction between the application and the beneficiaries, but to look deeply at the

behavioral factors that affect the extent to which the beneficiaries accept it and according to the extent of the impact of the acceptance factors, the amount and rates of participation are determined to show the need to study the acceptance or rejection of technology and this is done according to the technology acceptance model (Tam).

Many studies have also indicated that the technological acceptance model is a strong indicator through which to predict the learner's desire to use technology in various life situations and that this model is suitable for studying and interpreting user behavior towards technology. One of these studies is the Dizon study (2016), which revealed the validity of the technological acceptance model in investigating the satisfaction and acceptance of Japanese university students in the use of electronic tests based on the Internet. The results of the study showed that students have a high degree of acceptance and satisfaction with Internet-based tests, the Cowan and Earls study (2016), which indicated the validity of the technological acceptance model to determine the trends of secondary school teachers in the use of tablets in the classroom.

Lee (2023) also noted that technological progress has greatly affected society, as it has developed technologies to meet its needs. She also explained that tablets have captured the attention of teachers and that there is a need to determine the importance of adopting effective strategies to promote their use among academics and to identify important factors affecting teachers' use of technologies and their associations with the technology acceptance model (Tam).

Given the vital role that Gamification plays in fostering educational interaction and achieving desired goals in digital environments, it becomes imperative to measure the extent to which users are receptive to these catalysts. Technological receptivity is a critical factor in determining the effectiveness of any educational technology, as it reflects individuals' willingness to use and interact with it positively. Therefore, building an accurate metric to measure technological receptivity is an essential step to understanding the impact of Gamification on learners. This metric can provide reliable data that contributes to improving the design of Gamification and adapting them to the needs of users, ensuring the sustainability of positive interaction with digital tools and maximizing their benefit in the educational process.

Research Problem and questions:

Despite the increasing adoption of Gamification in education, limited tools exist to assess its acceptance among teachers. This gap hinders understanding of how Gamification impacts engagement and learning outcomes. Technological receptivity is a critical factor in determining the effectiveness of any educational technology, as it reflects individuals' willingness to use and interact with it positively. Therefore, building an accurate metric to measure technological receptivity is an essential step to understanding the impact of Gamification on learners. This metric can provide reliable data that contributes to improving the

design of Gamification and adapting them to the needs of users, ensuring the sustainability of positive interaction with digital tools and maximizing their benefit in the educational process.

Many studies also aimed to find out the extent of technological acceptance of Gamification in e-learning environments, such as the study of Al-Sayed et al. (2024), which aimed to find out the extent of technological acceptance of Gamification patterns in e-learning environments, and the study of Al-Mutasim (2023), which aimed to measure the extent of technological acceptance of the leaderboard pattern as one of the Gamification in an e-learning environment based on Gamification, and the study of Al-Demerdash and Zaki (2022), which aimed to find out the extent of technological acceptance of the digital stimulus strategy.

The researcher believes that the rapid digital transformations taking place in the education sector, and the emergence of Gamification as an innovative tool to stimulate and enhance learners' interaction with the digital educational environment. There is still a gap in deep understanding of the impact of these catalysts and users' receptivity to digital catalyst technology, highlighting the need for accurate measurement of this receptivity. Researchers are challenged to determine how responsive learners are to these ramifications and how effectively they improve their acceptance and use of technology. Therefore, the research problem arises in the following question: How can a measure be built that reflects learners' acceptance of digital stimulus technology in e-learning environments

Research Objectives:

Building a measure of the acceptability of Gamification technology in e-learning environments and know the level of acceptance or rejection for use by secondary school teachers.

Research Importance

1. The research may contribute to enriching pedagogical literature and provide a systematic tool to measure learners' acceptance of digital stimulus technology in education, helping to understand their interaction with these environments.
2. The scale may provide accurate data that can be used to develop and design more effective and engaging e-learning environments.
3. This scale can help education decision-makers assess the impact of Gamification and adopt it as a strategy to improve learning.

Research Limits

- **Human Limits** - A group of (28) male and female secondary school teachers.
- **Time limits:** Applied during the academic year 2023/2024.
- **Objective Limits:** Current research has been limited to building a measure of the acceptability of digital stimulus technology in e-learning environments.

Research Methodology: Due to the nature of this research and the objectives it seeks to achieve, the descriptive survey approach was relied upon in building a measure of acceptance of Gamification technology in e-learning environments.

Research tools: A measure of the acceptability of Gamification technology in e-learning environments.

Research Terminology:

- **Gamification**: Procedurally defined as the use and integration of the principles and design elements of electronic games such as points, badges, leaderboard, progress bar, titles, levels, rewards, and challenges in an educational context through an e-learning environment based on Gamification.
- **Technological receptivity:** Procedurally, the researcher defines it as: Beliefs of rejection or acceptance formed by secondary school teachers and affect their behavioral attitudes towards the use of Gamification, making them intend to conduct their behavior and intend to use or not to use them.

Theoretical framework:

The Concept of Gamification: In linguistic terms, the term "Gamification" in English is closer to the term "Game"; this is what made the localization of the term more relevant to games, and this has appeared in several definitions, as the definition of Determinism one of the most accepted definitions of Gamification by many educators, as it was defined as "the use of game design elements in non-game contexts (Deterding et al., 2011, p2), and McIntos (2018) defined Gamification as: a unique educational approach that ensures different game elements (badges, leaderboards or points), and applies them in the context of learning; This motivates learners and makes them more active, enjoyable, and engaged when they interact with content, which in turn affects achieving higher levels of academic achievement and modifying their behaviors(p.36). Walid Youssef (2020) believes that Gamification in the educational context does not depend on adding a game to develop specific cognitive and skill aspects, but mainly on adding characteristics or elements of play that can simplify learning and increase motivation and thus attract the learner and increase engagement in the learning environment, and to reach the learner to the required educational output, and this remains the primary goal of applying game stimuli.

Basic Rules and Principles for Developing Digital Stimulus-Based Learning Environments:

Several factors help make learning more relevant in a learning environment supported by Gamification. Raymer (2011), Kumar and Eisenberg (2023) mentioned the basic rules and principles for developing learning environments based on Gamification, which are adopted in the current study, namely:

- Setting educational goals to be specific and measurable, graded with difficulty, with levels; long, medium, and short term.
- Provide frequent feedback, get feedback, and clarify how much progress has been made in their learning.
- Collecting points after the learner completes the lessons successfully; to rise in the levels, thus increasing the difficulty.

- Reach levels with speed and efficiency at each level; the learner achieves achievement, by earning badges.
- Each learner's speed in trying to answer, receiving feedback, collecting points, and increasing levels.
- Learning metrics for teachers to observe learners through tools such as time spent learning, badges, and levels.
- Measure progress to provide feedback, including flexible representations, as progress columns, rather than percentages and fractions.
- Symbolic progression to have a system that allows learners to gain personalities that have a trait of their own after completing the modules.
- The reward of effort, the multiplicity of small rewards is better than one large reward, in proportion to the effort exerted.
- Scheduling the reward to be granted throughout the learner's study, and it includes key elements: prerequisite, response, and reinforcement.
- Peer motivation, digital motivators include group or competitive tasks with colleagues, so they feel committed to their colleagues, which is a motivation for learning.

Types of Gamification: Kapp (2012); Mcintos (2018); Sailer et al. (2019); Marin et al. (2019), El-Sherif (2019), Kumar and Eisenberg (2023), Gamification are of two types: constructive Gamification, and Gamification for content. Ašeriškis and Damaševičius (2014) classified Gamification from an integrative and objective perspective.

The second axis is technological receptivity.

The concept of technological acceptance: Xiong (2018) defined technological acceptance as how students perceive, accept, and adopt the use of technology, and therefore it follows that the student's acceptance of technology is ready to use this technology, and know Lemay et al. (2019) defined it as "how learners perceive, accept and adopt a technological innovation, to be ready to use it"(p.30), as well as Kubilinskiene and Kurilovas (2020) defined it as a factor determining the benefit of employing technological innovations in educational tasks and the acceptability of their application later"(p.115).

Reasons for spreading technological receptivity:

Allawneh et al. (2023) pointed out that educational institutions worldwide face a period of unparalleled change in the progress of societies based on information. The size, density, impact, information flows and interaction of technology and global networks force educational institutions to reconsider their traditional leadership and spread the idea of technological acceptance of everything technological in the educational field, which contributes to improving the educational environment, as well as using digital leadership based on technology and information and communication systems. They have sufficient readiness to apply those technological innovations well.

Due to technological development and the knowledge explosion in the field of education, education systems had to keep pace with this knowledge explosion, to be able to catch up with the knowledge age. The multiplicity of innovative information systems and the large number of complexities and difficulty in dealing with them are all hindering elements for the end-user (End User), who usually faces a problem in the ability to deal with these new and complex technologies when applied in facilities or when replacing old systems with more modern systems, and therefore the failure of these new technologies and systems to reach the goal for which they were set, which is to achieve the greatest possible competition. There is a weakness in their acceptance, which led to the establishment of an important model that determines whether the user will be able to accept these new technologies and the extent of the possibility of dealing with them. This model is called the Technology Acceptance Model, which bears the acronym (Tam) (Al-Shammari & Al-Sheikhi,2022).

Characteristics of technological receptivity

Technological receptivity is characterized by a set of characteristics identified by Gabra et al. (2019) as follows:

a) **The comprehensiveness of aspects**: It includes various cognitive, skill, and emotional aspects in a balanced manner so that one of these aspects does not overwhelm the other.
b) **Vulnerability to global changes**: Technological receptivity to global changes is influenced by scientific and technological changes at the global level in surrounding societies.
c) **Influence by local changes**: Technological receptivity is influenced by social, cultural, and value changes at the local level in any society in terms of the nature of life in this society and the values, customs, and traditions prevailing in it.
d) **The necessity for inclusive education**: Technological acceptance is a necessity for all as the international community adopts the slogan of education for all, which enhances the importance of technological communication in the twenty-first century.
e) **Shared social responsibility**: The dissemination of technological acceptance is a collective responsibility of various institutions of society, including educational, educational, media, and cultural institutions, and not the responsibility of a specific institution.

Reasons why people accept technology:

Kamel (2017) pointed out that the two most specific reasons why individuals accept or refrain from using technology are:

- **First:** Individuals tend to use a certain technological source when they believe that this source will enable them to perform their jobs better, and this factor has been called the expected benefit, as Ibrahim (2015) refers to the expected benefit (Perceived usefulness) as the individual's expectations that his use of technology benefits him in improving the performance of his tasks

and tasks or the degree to which the individual believes that using a system will improve his job performance, as individuals tend to use a certain system when they believe that this system will enable them to perform their jobs better.

- The **second** is that if people are convinced that this source is useful to them, they may at the same time think that it is very difficult for them to deal with it, and this may suggest the expected benefit of using the Vodafone system for non-use, and this factor is called the expected ease of use, Mohamed and Abdallah (2019**)** indicate that the expected ease of use is the degree to which an individual believes that his use of a system will be the least effort it will perform, and there is a direct and indirect impact of the expected ease of use on the behavioral intention of the potential system user, and the more the user's view of the new technology as easy to use and useful, the more there is a positive trend towards it, and thus provides the desire and motivation to use it, and Kusumadewiet al.(2021) believes that the intention of use can be linked to individual feelings, whether positive or negative about the intention to carry out activities.

Evolution of the Technology Acceptance Model (Tam)

Finkbeiner (2017,59) and Okorie et al. (2023,326) that Davis (1985) modified the Technology Acceptance Model (tra) Theory of Reasoned Action, a conceptual model used to understand and interpret human behavior, especially in the field of technology adoption and innovation. Developed by Martin Azzen and Ajzen (Fishbein and Ajzen, 1975), it focuses on the psychological and social factors that influence decision-making and behaviors - this modification was called the Technology Acceptance Model (Tam), which was then used in several subsequent studies. Davis's goal was to predict the acceptance of computers by end-users through their intentions. He put the initial picture of the model in the following form:

Figure. 1

The first version of Davis' technology acceptance form

Note**.**

Source Okorie et al. (2023,326)

Ali (2017), Shaimaa Mohammed (2018), Finkbeiner (2017,59), and Okorie et al. (2023,326) indicated that the recent modification of the technology acceptance model consists of the following dimensions and factors, which are the dimensions

that the researcher relied on in dividing the measure of acceptance of Gamification technology, namely:

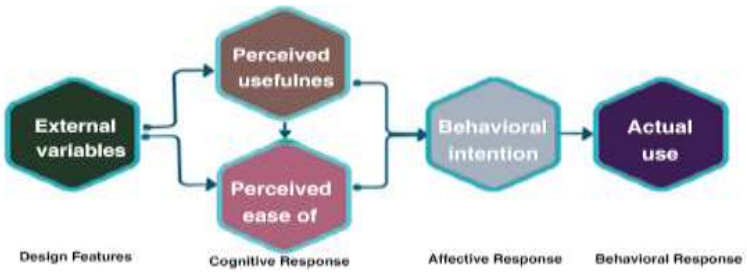
A- Behavioral variables (BV): These include the following:

- **Perceived ease of use (PEOU):** refers to the degree to which an individual believes that the use of technology (a particular system) is easy and free of physical and mental effort**.**
- Perceived **usefulness – PU:** refers to the degree to which an individual believes that the use of technology (a particular system) can enhance and improve their performance at work.
- **Behavioral intention (BI):** It means the planned behavior of an individual and is expected through perceived ease of use, and perceived benefit.
- **Actual use – AU:** The actual practice of using technology in an individual and is predicted by behavioral intention.

B- External variables (EV): Such as demographic variables. These external variables affect ease of use and perceived benefit.

Fig. 2.

The final version of Davis' technology acceptance form



Note**.**

Source Okorie et al. (2023,327)

Research Methodology and Procedures:

Research Community: Represents the research community of all secondary school teachers.

Research sample: It consisted of a random sample of secondary school teachers with a strength of (28) teachers.

Research tool: It was represented in the digital catalyst technology acceptance scale, where the vocabulary of the scale was distributed in four dimensions, and it is in its final form of (39) paragraphs representing the indicators that indicate the acceptance of digital catalyst technology, within (4) basic dimensions, and the researcher followed the following steps during the preparation and construction of the scale:

1. **Determine the goal of the scale**. The scale aimed Developing a Technology Acceptance Scale Suitable for Gamification technology in the e-learning environment and relied on the five-point Likert method in designing the scale.

2. **Sources for preparing the scale:** In preparing the scale, the researcher relied on reviewing the references and studies related to the subject of the study.
3. **Determining the axes of the scale:** In light of the review of previous studies, the axes of the scale of acceptance of Gamification technology were determined as follows: The first axis is entitled Expected Ease of Use and includes (9) phrases, including (6) positive, and (3) negative, the second axis is entitled Perceived Benefit and includes (9) phrases, including (7) positive, and(2) negative, the third axis is entitled Perceived Use Intentions and includes (10) phrases, including (8) positive, and(2) negative, and the fourth axis is entitled Realized Use and includes (10) phrases, including (7) positive, and(3) negative, and the positive and negative phrases were randomly distributed under each axis.
4. **Preparation and drafting of the vocabulary of the scale in its initial form:** The scale in its initial form included (38) phrases, distributed over (4) dimensions of each dimension under which a set of phrases indicates the dimension.
5. **Measure the intensity of the response and correct the scale.** Five weights were placed to respond to each of the statements of the scale so that their intensity varies between full approval and full opposition, which are (strongly agree - agree– neutral - disagree - strongly disagree), and these possibilities were placed based on the five-Likert scale in the paragraph grading to measure the teachers' response to the statements of the acceptance scale and the number of paragraphs of the scale in its final form was 39 paragraphs.
6. **Setting the scale instructions.** The instructions for the scale were drafted and placed on the cover page, and the researcher took into account when developing the instructions for the scale that the instructions should be clear and specific.
7. **Scale experiment:** The scale was applied to a sample of secondary school teachers, with a strength of (28) teachers. The exploration experiment aimed to: (Verify the validity of the internal consistency of the scale and verify the stability of the scale).

Calculation of statistical coefficients (psychometric properties) of the scale of acceptance of digital catalyst technology:

Apparent validity (the validity of the arbitrators): Integration of the Delphi Method for Evaluating the Technology Acceptance Scale in Gamification -Based E-Learning Environments, The Delphi method was utilized to gather and analyze the opinions of 35 experts to evaluate the Technology Acceptance Scale in Gamification - based e-learning environments. This method aimed to achieve consensus among experts to ensure the validity and reliability of the scale.

Steps for Applying the Delphi Method

Selection of Experts Thirty-five experts were selected according to criteria including practical experience in educational technology, e-learning, educational psychology, and the design of measurement tools. The selection criteria also required a minimum of five years of experience in the relevant fields.

Evaluation Rounds

Round One: The initial version of the scale was distributed to the experts, Experts were asked to review the items based on: The clarity of the scale's items, The relevance of each statement to its corresponding dimension, The appropriateness of the scoring method used, Suggestions for deleting, adding, or modifying items, Scientific accuracy and phrasing of the scale items, with recommendations for adjustments if necessary, Textual comments and suggested amendments were collected from the experts.

Round Two: The items were revised based on feedback from the first round, Experts were then asked to evaluate the revised items using a five-point Likert scale, The degree of consensus was calculated using Kendall's W coefficient, which was found to be 0.87, indicating a high level of agreement among experts.

Validity of internal consistency: To ensure the validity of the internal consistency of the scale, the researcher applied the scale to an exploratory sample of (28) secondary school teachers from the study community and outside the research sample, and then calculated the correlation coefficient (Pearson) between the degrees of each phrase and the total degree of the axis to which it belongs, as well as the correlation coefficients between the degree of each axis and the total degree of the scale. The results were as follows:

Table 1

Pearson correlation coefficients between the degree of each statement and the total degree of the axis to which it belongs (n= 28)

The first axis: Perceived ease of use		The second axis: Perceived usefulness		Axis 3 Intentions of Use		Axis Four: Actual Use	
Number	Correlation coefficient	Number	Correlation coefficient	Number	Correlation coefficient	Number	Correlation coefficient
1	0.760**	1	0.707**	1	0.867**	1	0.816**
2	0.599**	2	0.780**	2	0.799**	2	0.789**
3	0.806**	3	0.807**	3	0.847**	3	0.769 **
4	0.574**	4	0.647**	4	0.917**	4	0.756**
5	0.693**	5	0.648**	5	0.883**	5	0.457**
6	0.663**	6	0.826**	6	0.813**	6	0.823**
7	0.654**	7	0.933**	7	0.908**	7	0.894**
8	0.585**	8	0.922**	8	0.708**	8	0.731**
9	0.807**	9	0.783**	9	0.565**	9	0.786**
10	0.855**	10	0.751**			10	0.710**

(**) Sig 0.01 (*)Sig 0.05

It was clear from the above table that the values of the correlation coefficients between each of the axis phrases and the total degree of the axis are statistically significant and with positive values, as they ranged between(t=0.457) and (t=0.933) at the level of statistical significance (0.01) and the level of significance (0.05), which indicates a high degree of internal consistency and the correlation of the paragraphs of each axis of the scale with its total degree.

Table 2

Pearson correlation coefficients between the score of each axis and the total score of the scale

axis	Correlation coefficient
The first axis: Perceived ease of use	0.904**
The second axis: Perceived usefulness	0.916**
Axis 3 Intentions of Use	0.919**
Axis Four: Actual Use	0.967**
(**) Sig 0.01	

It was clear from the above table that the correlation coefficient between the axis and the total score of the acceptance scale is a statistical function with positive values, as it ranged between (t=0.904) and(t=0.967) at a level of statistical significance (0.01), which indicates the validity of the axes and their association with the tool and the confirmation of the structural validity of the tool with its four axes.

2-Stability:

To verify the stability of the scale, the researcher applied the scale to a survey sample of (28) teachers from the study population and from outside the research sample, which is the same as the validity sample, using the (Elva-Cronbach coefficient) and the half-partition to verify the stability of the scale. The results are shown in the following table:

Table 3

Stability coefficient (alpha-Cronbach) for the technological acceptance scale (n = 28)

Study tool	Number of Phrases	alpha coefficient	Half-split
The first axis: Perceived ease of use	10	0.872	0.819
The second axis: Perceived usefulness	10	0.916	0.893
Axis 3 Intentions of Use	9	0.934	0.927
Axis Four: Actual Use	10	0.913	0.692
Scale as a whole	39	0.976	0.938

It is clear from the previous table that the technological acceptance scale and its axes have statistically acceptable stability coefficients, as the value of the total stability coefficient of the scale by the half-partition method was 0.938 and by the Alpha-Cronbach method, the value of the stability coefficient was 0.976, while the stability coefficients of the sub-axes ranged between 0.692 and0.934. This indicates a high level of stability, and from the results of honesty and stability, the scale has excellent psychometric properties that allow its use and reassurance of its results.

8. Preparing the scale in its final form.

After making the amendments of experts and arbitrators to the paragraphs of the scale, which consisted of reformulating some words to clarify the meaning of the phrase

better for the sample, the researcher reached the scale in its final form to (39) phrases, distributed (4) each axis under which the group of phrases indicating the axis falls.

Results of the study:

To answer the main question of the study, which asks how to build a scale that reflects teachers' acceptance of gamification technology in e-learning environments, the methodology and procedures section of the research addressed this question. Additionally, the results of the evaluators' assessments were detailed as follows:

Amendments in Round One:

- Three items were removed due to their irrelevance to the scale's objectives.
- Thirteen items were revised to enhance clarity.
- Three new items were added based on expert suggestions.

Amendments in Round Two:

- The evaluation results showed an overall consensus of more than 87% on the revised items.
- Minor adjustments were made to the wording of two items to improve accuracy.
- Some items were reallocated to different dimensions for better alignment with the scale structure.

This comprehensive application of the Delphi method ensured the refinement and reliability of the Technology Acceptance Scale in gamification-based e-learning environments. The final form of (39) paragraphs representing indicators of acceptance of Gamification technology, within (4) basic dimensions, the first of which is entitled "Expected ease of use" and includes (9)phrases, of which (6) are positive, and(3) are negative, the second is entitled "Perceived benefit" and includes (9) phrases, of which (7) are positive, and(2) are negative, the third is entitled "Perceived use intentions" and includes (10) phrases, of which (8) are positive, and(2) are negative, the fourth is entitled "Perceived actual use" and includes (10) phrases, of which (7) are positive, and (3) are negative.

Based on the research findings, it can be said that the scale in question has a great deal of confidence in being an honest and consistent measure of the acceptance of Gamification technology in e-learning environments in a scientific manner. This scale can be an effective measurement tool for researchers and practitioners in the field of e-learning to assess the acceptance of Gamification technology in e-learning environments and analyze its impact on interaction and learning. The research also opens prospects for future studies aimed at employing this metric in diverse educational contexts, which contributes to improving the design of learning environments and promoting their use to make the most of Gamification technology.

Recommendations:

- Utilizing the scale in future studies to analyze gaps and improve gamification-based electronic learning environments.

- Integrating the scale as a standardized evaluation tool within the quality assessment instruments of gamification-based electronic learning environments.
- Designing training programs based on the scale's results to enhance teachers' awareness of the importance of gamification technology and its effective integration into teaching strategies.

References:

Abdel Sattar, W. S. (2018). The Effect of Group Size and Practice Mode in a Gamified Environment on Developing Skills in Using Assistive Technological Innovations and Attitudes Towards Them Among Special Education Teachers [Unpublished Doctoral Dissertation]. Al-Azhar University, Cairo.

Acosta-Medina, J. K., Torres-Barreto, M. L., & Cárdenas-Parga, A. F. (2021). Students' preference for the use of gamification in virtual learning environments. *Australasian Journal of Educational Technology*, *37*(4), 145–158. https://doi.org/10.14742/ajet.6512

Allawneh, Y. J., Maswadeh, D. M. S., Jabara, L. R., Ghattas, M., & Kabeah, M. (2023). E-Learning and Its Contemporary Challenges. Yazzouri Publishing and Distribution House.

Ali, A. F. M. (2017). Developing a Motivational Design Model for Flipped Learning Courses and Its Impact on Learning Outcomes, Information Processing Level, and Acceptance of Technological Innovations for Special Needs Students. *The Fourth International Conference on E-Learning and Distance Learning: Innovative Learning for a Promising Future.*

Al-Mutasim, A. M. (2023). The Effect of Interaction Between Leaderboard Styles ("Full/Limited") and Display Timing in a Gamification-Based E-Learning Environment on Developing Achievement, Motivation, and Technological Acceptance Levels Among Teacher Students. *Journal of Scientific Research in Education*, (24), 172-314.

Al-Shammari, H. A., & Al-Sheikhi, I. H. M. (2022). The Acceptance Level of "Madrasati" Platform by Secondary School Teachers in Al-Lith Governorate in Light of the TAM Model and Its Relation to Their Attitudes Towards It. *The Arab Journal of Special Education*, (22), 1-21.

Ašeriškis, D., & Damaševičius, R. (2014). Gamification patterns for gamification applications. *Procedia Computer Science*, *39*, 83-90.

Boopathi, K., Sreejith, S., & Bithin, A. (2015). Learning cyber security through gamification. *Indian Journal of Science and Technology*, *8*(7), 642-649.

Carolyn, F. A. (2016). Gamification of Individual Differences Inventories, Master a thesis, Graduate Faculty, St. Cloud State University.

Cowan, P., & Earls, J. (2016). Using the Technology Acceptance Model to determine Teachers' Attitudes towards the introduction of iPads in the classroom. In *Ed Media Innovate Learning* (pp. 921-926). Association for the Advancement of Computing in Education (AACE).

Deterding, S., Khaled, R., Nacke, L. E., & Dixon, D. (2011, May). Gamification: Toward a definition. In *CHI 2011 gamification workshop proceedings* (12), 1-79.

Dizon, G. (2016). Measuring Japanese EFL Student Perceptions of Internet-Based Tests with the Technology Acceptance Model. *Tesl-Ej*, *20*(2), n2.

El-Demerdash, N. S., & Eskandar, R. Z. Z. (2022). The Effect of Interaction Between Gamification Strategy and Display Style on a Virtual Training Platform in Developing Smart Management Skills for Hybrid Education Among Faculty Members and Technological Acceptance Levels. *International Journal of E-Learning*, 5(1), 71-179.

El-Sayed, A. S., Ibrahim, W. Y., Abdo, H. M., & Salah El-Din, S. A. A. (2024). The Effect of Different Gamification Styles in a Crowdsourcing-Based E-Learning Environment on Technological Acceptance Among Educational Technology Students. *The Scientific Journal of Specific Education and Applied Sciences*, 7(20), 59-116.

El-Sherif, E. Z. M. (2019). The Effect of Interaction Between Digital Gamification Triggers "Badges/Leaderboards" and Cognitive Style "Risk-Taking/Cautiousness" on Developing Rules for Digital Image Formation and Learning Motivation Among Educational Technology Students. *Journal of Educational Technology: Research and Studies*, (38), 137-260.

Finkbeiner, P. (2017). *Social media for knowledge sharing in automotive repair* (pp. 141-181). Springer International Publishing.

Fishbein, M., Ajzen, I., & Belief, A. (1975). Intention and Behavior: An introduction to theory and research.

Gabra, A. S. A. H., Ibrahim, W. S. M., Khalil, Z. M. A., & Ismail, A. R. M. M. (2019). The Effectiveness of Virtual Reality in Developing Computer Skills Based on Technological Acceptance Levels Among Preparatory School Students. *Journal of Research in Specific Education Fields*, (22), 249-286.

Kamel, D. A. S. (2017). Transition Techniques in Animated Infographics ("Cut/Zoom/Swipe") in E-Books and Their Impact on Developing Immediate and Delayed Achievement and Technological Acceptance Among Postgraduate Students. *Educational Technology Journal*, 27(1), 3-91.

Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & education*, *80*, 152-161.

Ibrahim, W. S. M. (2015). The Effectiveness of Blended Learning in Developing Scratch and Technological Acceptance in Light of the TAM Model Among First Preparatory Grade Students. *Journal of Research in Specific Education Fields*, (2), 120-192.

Ibrahim, W. Y. M. (2020). Gamification Triggers. *Journal of Educational Technology*, 30(2), 3-20.

Kapp, K. M. (2012). *The gamification of learning and instruction: Game-based methods and strategies for training and education*. New York: Pfieffer: An Imprint of John Wiley & Sons.

Khalil, S. S. M. (2018). The Interaction Between Augmented Reality Design Technology (Image/Marker) and Mental Capacity (High/Low) and Its Relation to Developing Learning Outcomes, Technological Acceptance Levels, and Academic Self-Efficacy Among Secondary School Students. *Journal of Educational Technology: Research and Studies*, (36), 291-414.

Kumar, P., & Eisenberg, J. (Eds.). (2023). *Synchronous and Asynchronous Approaches to Teaching: Higher Education Lessons in Post-pandemic Times*. Springer Nature.

Kurilovas, E., & Kubilinskiene, S. (2020). Lithuanian case study on evaluating suitability, acceptance and use of IT tools by students–An example of applying Technology Enhanced Learning Research methods in Higher Education. *Computers in Human Behavior*, *107*, 106274.

Kusumadewi, A. N., Lubis, N. A., Prastiyo, R., & Tamara, D. (2021). Technology acceptance model (TAM) in the use of online learning applications during the Covid-19 pandemic for parents of elementary school students. *Edunesia: Jurnal Ilmiah Pendidikan*, *2*(1), 272-292.

Lee, C. Y. (2023). *Drivers of tablets used by Universiti Tunku Abdul Rahman (UTAR) academicians: The technology acceptance model perspective* (Doctoral dissertation, UTAR).

Lemay, D. J., Doleck, T., & Bazelais, P. (2019). Context and technology use: Opportunities and challenges of the situated perspective in technology acceptance research. *British Journal of Educational Technology*, *50*(5), 2450-2465.

McIntos, N. O. (2018). The Impact of Gamification on Seventh Graders' Academic Achievement in Mathematics. *Online Theses andDissertations, ProQuest*, (10974660).

Mohamed, F. E. M. A., & Abdallah, S. A. O. (2018). Evaluating the Effectiveness of Learning Styles in Specialized Courses for the Accounting Program in Light of the TAM Model: Perspectives of Male and Female Students in a Survey Study at the Accounting Program of the Community College, Khamis Mushait, King Khalid University. *Ramah Journal for Research and Studies*, (27), 180-205. DOI: 10.33953/1371-000-027-008

Okorie, N., Ojebuyi, B. R., & Okpara, N. (Eds.). (2023). *Media and Communication Theory in Africa*. Springer Nature.

Özdener, N. (2018). Gamification for enhancing Web 2.0 based educational activities: The case of pre-service grade school teachers using educational Wiki pages. *Telematics and Informatics*, *35*(3), 564-578.

Phung, Q. D. (2020). The negative effect of Gamification in E-learning in the eyes of university students.

Raymer, R. (2011). Gamification: Using game mechanics to enhance eLearning. *ELearn*, *2011*(9).

Sailer, M., Hense, J., Mandl, H., & Klevers, M. (2019). Psychological perspectives on motivation through gamification. IxD&A, 19, 28-37.

Saleem, A. N., Noori, N. M., & Ozdamli, F. (2022). Gamification applications in E-learning: A literature review. *Technology, Knowledge and Learning*, *27*(1), 139-159.

Saunderson, R. (2011). Making Learning Fun: Gamification Utilizes the Experience of Fun, Along With Intrinsic Motivation and Rewards, to Engage and Captivate Individual Learners. Training, 70-71.

Seaborn, K., & Fels, D. I. (2015). Gamification in theory and action: A survey. *International Journal of human-computer Studies*, *74*, 14-31.

Xiong, T. (2018). *The Impact of Technology Innovations in High School Biology Courses on Science Learning for Hmong Students* (Doctoral dissertation, Walden University).

Zardari, B. A., Hussain, Z., Arain, A. A., Rizvi, W. H., & Vighio, M. S. (2021). Development and validation of user experience-based e-learning acceptance model for sustainable higher education. *Sustainability*, *13*(11), 6201.