Research Article

Effect of Gamification on Teaching-Learning Process: A Descriptive Study

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Abstract

Nowadays, education is going through a moment of methodological transformation. One of the active methodologies with excellent projection within the educational field is gamification. However, there is still a lack of awareness among educators about the acceptable implementation of the technique of gamification. This study analysed the effect of the gamification approach in teaching and learning, which covers students' benefits, especially understanding level, engagement level, motivating factor, the significance of gamification as an assessment tool and also the barriers to using gamification. The research design was descriptive research with a sample of 509 from two developing and academically advancing countries, India and Malaysia, which includes teachers, research scholars, and students. Data is being collected with a questionnaire. The study findings reveal that gamification can be a useful tool for teaching and learning and can increase learner's motivation and turn learning into an enjoyable process. We also find that gamified learning interventions have a positive impact on student learning. These findings will be of practical interest to teaching and learning practitioners working in a range of educational contexts; and at all levels of education; who wish to increase student engagement and enhance learning. The study also finds that gamification still has some barriers to implementation and acceptance all around, especially among age groups above 50.

Introduction

Nowadays, education is going through a moment of methodological transformation. The infusion of technology and education has seen its rise in practice, especially with the ease of access to technology-based equipments such as computers, laptops, tablets and even smartphones [1]. This has enabled the successful application of education technology among students. Also, with the constantly changing landscape of education and the needs of the current generation of students, educational technology has to be adapted and improvised to cater to them diligently. One such improvisation in education is the use of games in learning [2]. Games in learning or game-based learning have been touted as a method that not only engages students but also motivates them. The application of gamification to the teaching-learning process across different fields of knowledge constitutes an emerging practice applied across all levels of education, from primary school up to university. Gamification of education is a strategy for increasing engagement by incorporating game elements into an educational environment. The goal is to generate levels of involvement equal to what games can usually produce.

The main goals of gamification are to enhance certain abilities, introduce objectives that give learning a purpose, engage students, optimise learning, support behavior change, and socialise. The three breakdowns of games include digital games-based learning, serious games and gamification. Digital game-based learning is a form of learning incorporating games in the digital form [3]. It involves the use of games as the main medium of learning. Meanwhile, serious games involve the game's mechanics in learning something. It is deemed devoid of elements of fun as it plays with a serious purpose [4]. It is usually used in fields such as medicine and aviation [5]. The gamification approach is the use of game elements in a non-gaming context. This method has been used in other fields, such as corporate and marketing, and has recently seeped into education. With all these methods, in the present research we chose the gamification approach as it has a better application in a teaching environment [6]. The flexibility provided by gamification will not only help educators in creating gamification-based learning but also allow the students to get easily acquainted with the system. Gamification applies elements associated with video games (game mechanics and game dynamics) in non-game applications. It aims to increase people's engagement and promote certain behaviours [7]

Based on the literature review findings, it can be assumed that although there is research that has seen the effects of gamification on students learning, the inconclusive findings on the contribution and effects of gamification on teaching-learning and its impacts are to be further looked into.

Theoretical Background

i. Gamification and learning

Games typically allow players to restart or play again, making mistakes recoverable. This freedom to fail allows students to experiment without fear and increases student engagement [8] Gamification must not be mistaken for programmed learning or computer-based learning, even though some of the interpretations suggest the latter, only underlining the compatibility of the theory with the new technologies [9]. The essence of gamification does not lie in technology; but in the diverse learning environment and the system of decisions and rewards, all aimed at increasing motivation and reaching higher levels of engagement in the learning process [10]. Massive amounts of feedback, tasks too complex for any one individual to solve alone, and environments that change in response to learners' actions are availed through well-designed educational games. In literature and in practice, several attempts to introduce gamification into blended learning and e-learning can be found.

ii. Gamification and Teaching

The gamification theory in teaching is that learners learn best when they are also having fun. Not only this, they also learn best when they have goals, targets and achievements to reach for, of course in a way the learner still perceives as fun. Because of the addictive features of video games that intrigue children (and adults) and get them hooked, it's only natural that we see similar engagement results when these game-based elements are applied to learning materials. Gamification in teaching involves using game-based elements such as point scoring, peer competition, teamwork, and score tables to drive engagement, help students assimilate new information and test their knowledge. It can apply to school-based subjects but is also used widely in self-teaching apps and courses, showing that the effects of gamification do not stop when we are adults.

Objectives

This research intends to see the underlying benefits of gamification in learning. To observe the change in the understanding and engagement level of students in the teaching-learning process through gamification. To identify the advantages of using gamification as a motivation factor and enjoyment tool. To understand the ease of use of gamification tools and usage of it as an assessment tool. The study also looks into the predominant barriers to using gamification.

Data and Methods

The study focused on India and Malaysia as its selected sample areas. The choice of these countries is founded upon their status as developing and academically advancing nations. A random sampling method was employed, resulting in 309 samples drawn from India and an additional 200 from Malaysia. The respondents encompass diverse categories, including faculties, research scholars, and students. The rationale behind selecting India and Malaysia stems from their transition from traditional to advanced education systems while undergoing phases of technological advancement. These factors motivated the study's focus on these countries, aiming to explore the impact of gamification within their evolving educational landscapes. This research seeks to analyse how gamification influences the teaching-learning process amidst the educational transformation in both nations.

The Questionnaire is developed based on the objectives, and the reliability of questions is tested using Cronbach's alpha. Data are collected from each respondent separately and are analysed using various statistical tools like MANOVA, t test, ANOVA, and Factor analysis. The tables given below show the categorisation of respondents and reliability test results.

Table-1: Category of Respondents

Respondent Category	Count
Faculty	264
Others	10
Research Scholar	38
Student	197
Grand Total	509

Figure-1: Respondents

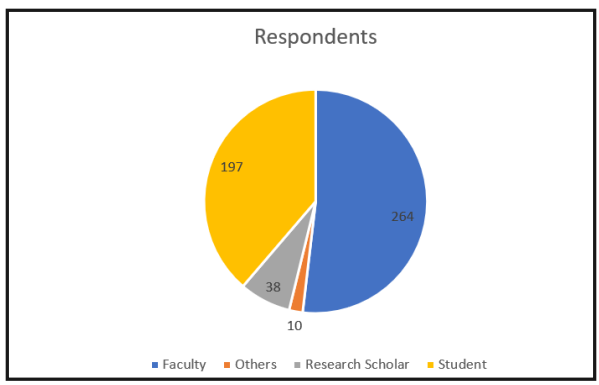

Table-2: Cronbach's Alpha Reliability Coefficient

Constructs	Cronbach's Alpha	N of Items
Understanding	0.9	5
Engagement	0.884	5
Enjoyment	0.898	5
Motivation	0.903	5
Easiness	0.881	5
Assessment	0.896	5
Barriers	0.919	5

Result and Discussion

The following tables will illustrate the descriptive statistics of the research variables.

Table-3: Gender wise classification in the usage of gamification as a teaching – learning tool

T- Test

VARIABLE	GENDER	N	MEAN	Std. Error Mean	t	Sig. (2-tailed)
Understanding Level	Female	314	4.3701	0.03379	-1.961	0.05
	Male	212	4.4783	0.04478		
Engagement	Female	314	4.3439	0.03346	-1.835	0.067
	Male	212	4.4453	0.04538		
Enjoyment	Female	314	4.3382	0.0381	-2.611	0.009
	Male	212	4.4896	0.04236		
Motivation	Female	314	4.3446	0.03569	-1.743	0.082
	Male	212	4.4453	0.04639		
Easiness	Female	314	4.1911	0.03704	-2.869	0.004
	Male	212	4.3623	0.04759		
Assessment	Female	314	4.2363	0.03797	-2.58	0.01
	Male	211	4.3905	0.04607		
Barriers	Female	314	3.9987	0.04677	-2.73	0.007
	Male	211	4.2019	0.05831		

Table 3 depicts that there is a chance for a difference in the gender-wise response since the P value is in the border for the MANOVA test, So Post hoc analysis is done using an independent sample t test to check out, whether there is any difference in attitude towards gamification in teaching-learning process. The result depicts that the gender-based difference is especially large for the variables Easiness of use, Barriers to use and enjoyment level. From the result, it is well clear that males have shown more interest in gamification and are of the opinion that gamification has a great impact on the teaching-learning process.

Table-4: Category-wise classification in the usage of gamification as a teaching–learning tool

Multivariate Analysis

Effect		Value	F	Hypothesis df	Error df	Sig.
Category	Pillai's Trace	0.028	0.705	21	1551	0.831

Table-5: ANOVA

Variables	Category	N	Mean	Std. Error	F	Sig.
Understanding Level	Student	202	4.3653	0.0438	0.838	0.473
	Research Scholar	42	4.5095	0.07535		
	Faculty	272	4.4338	0.03876		
	Others	10	4.44	0.2125		
Engagement	Student	202	4.3396	0.04288	0.577	0.631
	Research Scholar	42	4.419	0.08343		
	Faculty	272	4.4118	0.03911		
	Others	10	4.42	0.19425		
Enjoyment	Student	202	4.3129	0.04704	2.212	0.086
	Research Scholar	42	4.5429	0.07839		
	Faculty	272	4.4397	0.04002		
	Others	10	4.44	0.2247		
Motivation	Student	202	4.3376	0.04199	1.253	0.29
	Research Scholar	42	4.5429	0.08736		
	Faculty	272	4.3985	0.04229		
	Others	10	4.32	0.22549		

Easiness	Student	202	4.2327	0.04803	0.553	0.646
	Research Scholar	42	4.3762	0.08519		
	Faculty	272	4.2647	0.0418		
	Others	10	4.2	0.21499		
Assessment	Student	202	4.2406	0.04771	1.066	0.363
	Research Scholar	41	4.4098	0.08609		
	Faculty	272	4.3199	0.04191		
	Others	10	4.42	0.18962		
Barriers	Student	202	4.0416	0.06063	0.275	0.844
	Research Scholar	41	4.1268	0.12489		
	Faculty	272	4.1044	0.05015		
	Others	10	4.02	0.33393		

Table 5.3 depicted that there is no chance for difference in the category-wise response since the P value is 0.831 for the MANOVA test, Post hoc analysis is done using the ANOVA test to check out; whether there is any significant difference in attitude towards gamification in teaching-learning process based on their category. The result depicts that category-wise, there is no difference in the attitude towards gamification

Table-6: Age-wise in the usage of gamification as a teaching–learning tool.

Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.
Age	Pillai's Trace	0.075	1.409	28	2068	0.076

Table-7: ANOVA

Variable	Age Category	N	Mean	Std. Error	F	Sig
UnderstandingLevel	< 20	44	4.4364	0.11436	1.657	0.159
	20-25	162	4.3494	0.04648		
	25-35	146	4.3973	0.05047		
	35-50	133	4.4391	0.0575		
	50+	41	4.6195	0.06907		

Engagement	< 20	44	4.35	0.12167		
	20-25	162	4.3309	0.0427		
	25-35	146	4.3945	0.05102	1.636	0.164
	35-50	133	4.3835	0.05866		
	50+	41	4.6049	0.07761		
Enjoyment	< 20	44	4.3773	0.12746		
	20-25	162	4.2914	0.04957		
	25-35	146	4.4493	0.04635	1.821	0.123
	35-50	133	4.4481	0.06308		
	50+	41	4.5122	0.08753		
Motivation	< 20	44	4.4136	0.10927		
	20-25	162	4.3025	0.04601		
	25-35	146	4.4027	0.04986	1.83	0.122
	35-50	133	4.391	0.06777		
	50+	41	4.6	0.07225		
Easiness	< 20	44	4.3273	0.10824		
	20-25	162	4.1889	0.05304		
	25-35	146	4.3329	0.04802	1.553	0.186
	35-50	133	4.206	0.06723		
	50+	41	4.3854	0.09009		
Assessment	< 20	44	4.2636	0.11933		
	20-25	162	4.2173	0.05101		
	25-35	145	4.3531	0.04726	1.764	0.135
	35-50	133	4.2872	0.06819		
	50+	41	4.4976	0.08727		
Barriers	< 20	44	4.1727	0.13757		
	20-25	162	3.9963	0.06757		
	25-35	145	4.0014	0.06844	2.691	0.03
	35-50	133	4.1338	0.07394		
	50+	41	4.4195	0.09443		

Table 7 depicts that there is a chance for a difference in the age-wise response since the P value is in the border 0.076 for the MANOVA test, Post hoc analysis is done using the ANOVA test to check out; whether there is any significant

difference in attitude towards gamification in teaching-learning process based on their age. The result depicts that age wise there is difference in the attitude towards gamification especially on the variable barriers. Age group above 50 finds barriers in using gamification tools.

Figure-2: Understanding level of gamification

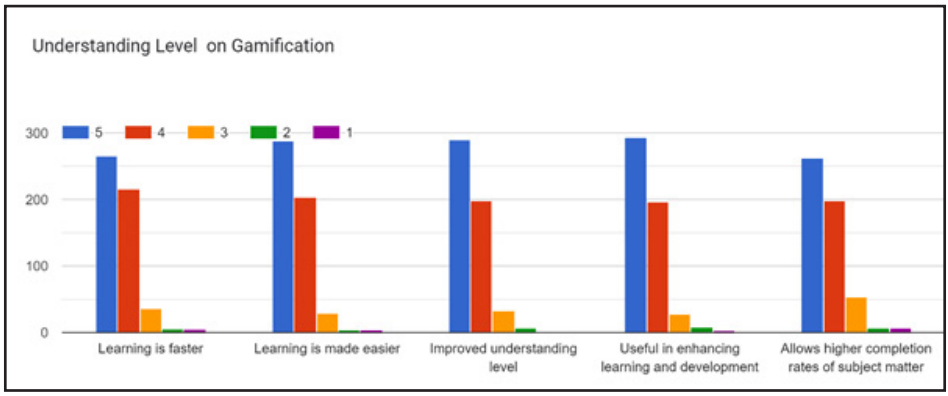

Figure 2 shows that the majority of respondents (61 per cent) have strongly agreed that gamification has helped them to improve their understanding level. It helped them to make their learning fast and easier and also allowed for higher completion of subject matter.

Figure-3: Engagement level of gamification

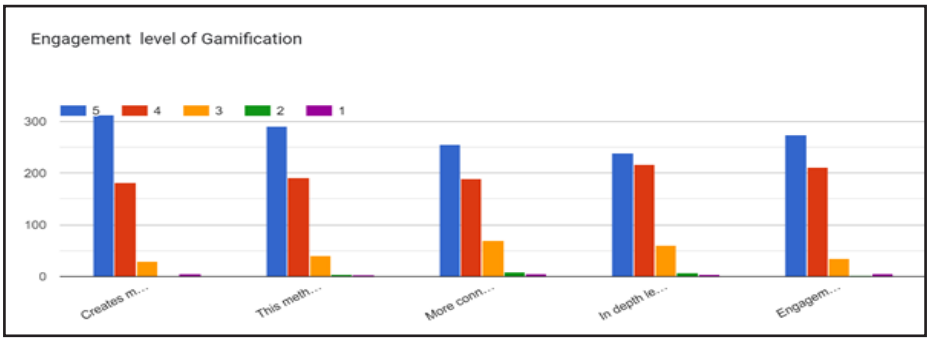

Figure 3 shows that the majority of respondents strongly agreed that gamification has helped them to improve their engagement level in teaching–learning process. This methodology of teaching-learning increases thinking capacity, more connection to the faculty and in-depth learning of the topic.

Figure-4: Motivation factor of gamification

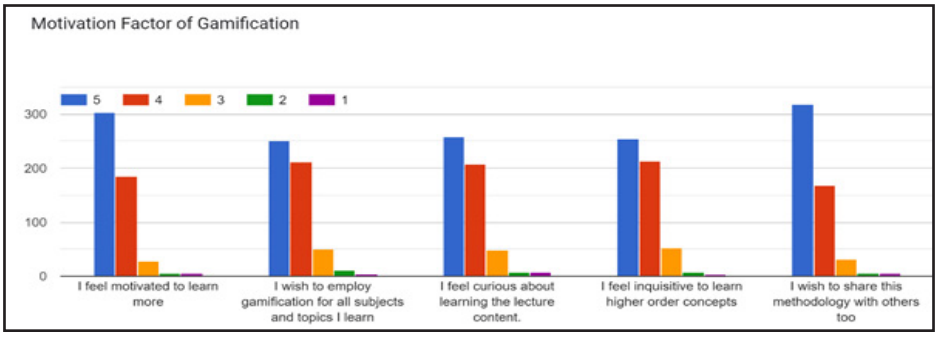

Figure 4 shows that the majority of respondents strongly agreed that gamification has helped them to motivate better learning. It helped them to feel curious about learning the lecture content and feel inquisitive to learn higher order concepts; they also wish to share this methodology with others.

Figure-5: Ease of use of gamification in teaching-learning

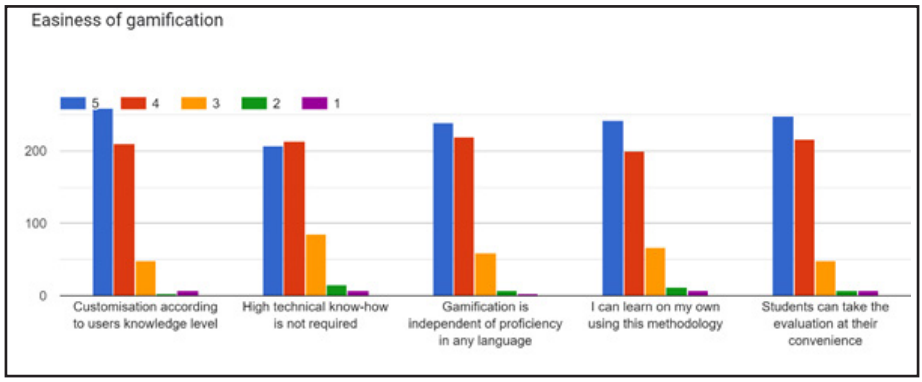

Figure 5 shows that the majority of respondents have agreed that gamification is easy to use. This methodology of teaching-learning can be Customised according to users' knowledge level, high proficiency is not required to use it. Respondents also agreed that they can learn on their own using this methodology.

Figure-6: Barriers in using gamification

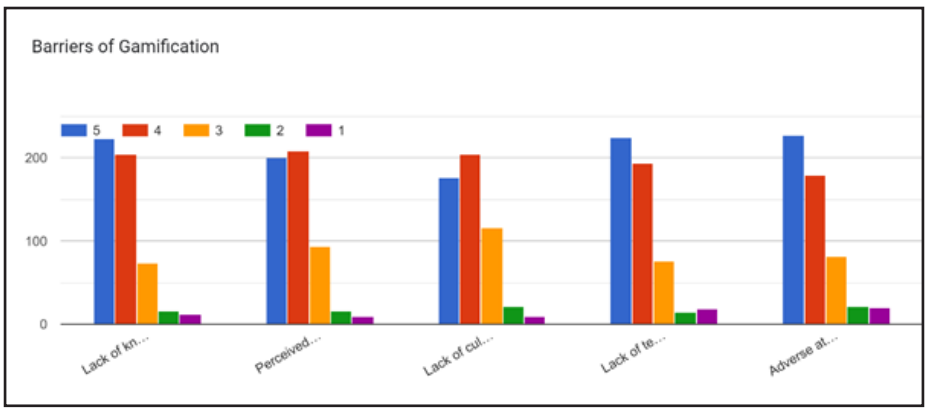

Figure 6 shows that respondents are of the opinion that there are still certain barriers to using gamification as an effective tool in teaching–learning process like a perceived cost for accessing gamified learning content, lack of cultural appetite, scepticism from learners, lack of technical facilities like stable internet connection, uninterrupted power supply, adverse attitude to change into new teaching pedagogy and lack of knowledge of how to implement it.

Table-8: Factor Analysis of different variables

Total variance explained

Component	Total	% of Variance	Cumulative %
1.	17.515	48.652	48.652
2.	2.867	7.964	56.615
3.	1.644	4.565	61.181
4.	1.143	3.174	64.355
5.	1.088	3.022	67.377

	1	2	3	4	5
Improved understanding level	0.729				
Engagement achieved through this methodology leads to achieving the subject's learning outcomes	0.725		0.356		
Useful in enhancing learning and development	0.71				
Allows higher completion rates of subject matter	0.678	0.313	0.36		
In depth learning of the topic	0.677	0.301	0.325		
More connection to the faculty and class is felt	0.672				
Learning is made easier	0.641				0.417
This methodology of teaching-learning increases thinking capacity	0.631				
Learning is faster	0.54	0.304			0.44
Manipulation and Malpractices can be avoided completely		0.737			
Personal bias of the evaluator is completely avoided		0.726			
Evaluation is error free and less time-consuming		0.708			
Gamification is independent of proficiency in any language		0.705			
Results are uniform and independent of where it is administered.		0.69			
High technical know-how is not required		0.688			

Students can take the evaluation at their convenience	0.405	0.613			
I can learn on my own using this methodology	0.347	0.597	0.378		
Speed of Response is measured		0.543			0.507
Customisation according to users' knowledge level		0.524	0.372		0.316
I am immersed when learning is through gamification	0.309		0.712		
I feel curious about learning the lecture content.	0.339		0.698		
I feel inquisitive to learn higher order concepts	0.348	0.379	0.65		
I have a heightened attention span due to the enjoyment I get from gamification	0.37	0.364	0.646		
I wish to share this methodology with 4 too	0.41	0.323	0.624		
I wish to employ gamification for all subjects and topics I learn	0.34	0.315	0.603		
I feel happy when learning through gamification	0.365	0.31	0.6		0.331
I forgot the time when learning through gamification			0.531		0.328
I feel motivated to learn more	0.324	0.326	0.501		0.397
Lack of cultural appetite, or scepticism from learners				0.859	
Perceived cost for accessing gamified learning content				0.843	
Lack of knowledge of how to implement it				0.839	
Lack of technical facilities like stable internet connection, uninterrupted power supply etc.				0.839	
Adverse attitude to change into new teaching pedagogy				0.805	
Learning through gamification makes me feel good.			0.515		0.606
Creates more engaging experiences in learning	0.49				0.588

Figure-7: Factors that make gamification an effective teaching – learning tool

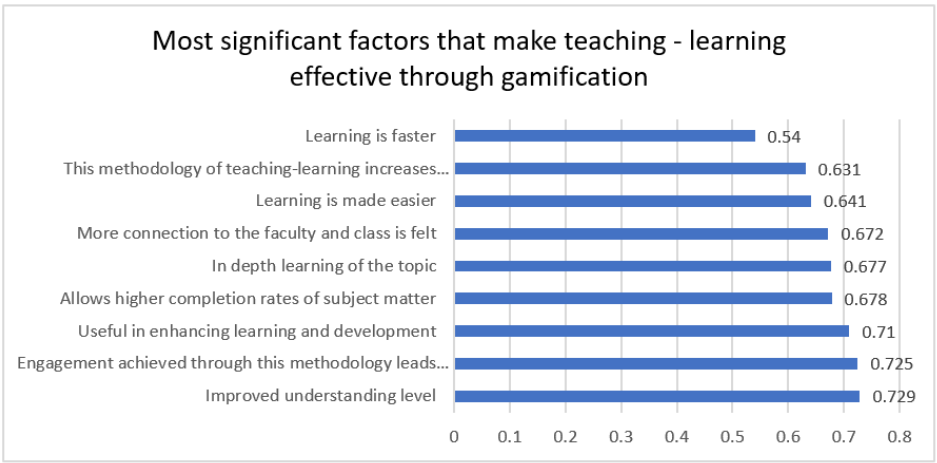

Table 7 shows the result of factor analysis. Results show that the first nine factors are very important in showing the impact of gamification in the teaching-learning process, as it contributes 48.652 per cent of the variance. Based on the analysis of this research, gamification is reliable and beneficial for teaching and learning mainly of nine factors: Improved understanding level, Engagement achieved through this methodology leads to achieving the subject's learning outcomes, Useful in enhancing learning and development, Allows higher completion rates of subject matter, In-depth learning of the topic, More connection to the faculty and class is felt, Learning is made easier, This methodology of teaching-learning increases thinking capacity and also Learning is faster.

Conclusion

Based on the analysis of survey results, it has been established that gamification holds potential as an effective teaching tool for educating adolescents with diverse needs. It serves to not only enhance the learning experience for students across various academic levels but also make it more engaging and entertaining and improve the motivation level of students. Furthermore, educators benefit from higher completion rates of subject material, fostering a stronger sense of connection among students, faculty, and the class community. Despite its evident efficacy in the realm of teaching and learning, gamification does encounter specific barriers to successful implementation and acceptance like perceived cost for accessing gamified learning content, lack of cultural appetite, or scepticism from learners, lack of technical facilities like stable internet connection, uninterrupted power supply, adverse attitude to change into new teaching pedagogy and lack of knowledge of how to implement it. Notably, certain challenges hinder its utilization as a learning tool. Among these obstacles, it has been observed that females, particularly those aged above 50, encounter difficulties when incorporating gamification into the teaching-learning process. This challenge might stem from a lower level of familiarity and exposure to technology among older females.

Consequently, the study underscores the presence of hurdles hindering the adoption of gamification tools. Given that gamification represents the emerging forefront of the teaching-learning paradigm, there is a universal call for nations to transition towards

this innovative approach. To facilitate such a transition, it is imperative to provide comprehensive training to both educators and students. This training should be particularly tailored to address the needs of older female learners, equipping them with an understanding of the intricacies, techniques, and strategies underpinning gamification. By integrating these insights into the teaching-learning mechanism, the objective is to facilitate a simplified, engaging, and captivating learning process. This approach acknowledges gamification's potential to reshape the educational landscape and urges educational systems worldwide to embrace this transformative shift.

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