Nanotechnology Perceptions
ISSN 1660-6795
www.nano-ntp.com

Gamification in Education: Boosting Engagement and Motivation

Abhishek Pandey

Assistant Professor, Centre for distance and online education, Manipal University, India
Email: abhishek.pandey@jaipur.manipal.edu

Objectives: The objective of this study is to explore the stages involved in gamifying education in order to increase student involvement. Many investigators have used a few steps from the gamification technique in our day and age. The instructors are the only ones who can vary the procedures. Gamification is becoming a hot topic in education these days. Gamification has been used in a variety of ways to involve students in the learning process, but it is not without criticism. Since lessons are being taught online, learning has gotten more difficult during the past year. To keep students interested, it has been vital to create teaching practices that go hand in hand with the usage of new technology. The goal of the current study is to better understand how instructional design and gamification work together to improve e-learning's usability in higher education programming.
Method: The study also looks at instructional design's mediation function. Academicians completed a self-structured questionnaire that and the data was gathered and analysed using the technique of Structural Equation Modelling (SEM).
Results: The study's findings demonstrated that elements, game dynamics, motivation, and mechanics of games all strongly predict gamification as a multidimensional entity. Additionally, there is a connection between gamification and e-learning usability that is partially mediated by instructional design. According to this study, gamification can improve the e-learning environment for participants.
Conclusion: Therefore, to present a novel paradigm of utilising gamification components to engage online students, suggestions for integrating gamification environments are also included. This study offers an instrument to quantify the outcomes and addresses the need for planning methods to help increase student motivation in online learning environments.

Keywords: Learning Engagement, Gamification, Online Classes, Online Student, Planning Strategies, Elements, Game Dynamics, Motivation, and Game Mechanics, Instructional Design, Multi-Dimensional, Structural Equation

Modelling (SEM), E-Learning.

1. Introduction

This concept of using game mechanics to encourage and engage pupils in their studies is known as gamification. Put differently, games have become an integral part of students' everyday lives. They play games for a long time. The gamification approach, which included game features and game design techniques in a non-gaming context, [1], was utilised to interest students in their learning. Additionally, employing this approach can enhance student engagement, accommodate different learning styles, and offer more flexible learning. Researchers have been using this gamification technique for a few years now [1, 2]. Previous research revealed that because students were frequently regarded like regular users of technology, there was a decrease in their engagement with knowledge acquisition [2]. To get out of this predicament, there must be a way for people to freely access this knowledge. Gamification has the ability to improve user engagement, productivity, [2, 3], and performance, [2], according to a number of researchers. Students will get better at achieving good achievements by using gamification. By utilising the gamification approach, students can access academic materials that incorporate gaming features and accommodate different approaches to learning [2, 3].

Gamification has been used in a number of ways to involve students in the learning process, but it has not been without criticism [3, 4]. A small number of researchers claimed that gaming might improve user engagement, productivity as a whole and performance. Gamification, however, may also fall short of maintaining user [4], engagement and encouraging participation. It goes without saying that game components are useful tools for raising user engagement, but the effects of various game features on user engagement vary [3, 4]. To increase user engagement, [5], different courses could also require different approaches or techniques [5]. Although a number of studies have provided theoretical justifications for the necessity of including game components to improve student engagement in learning, there is currently a dearth of empirical data on the actual effects. According to the various goals of the systems to be gamified, [6], game dynamics might have varying effects on engagement among users. Previous studies have also demonstrated that students are less engaged in acquiring knowledge because they are frequently regarded like regular users of technology [6, 7]. The majority of educational establishments gauge student accomplishment rather than engagement with the material [6, 7]. It is challenging to determine how to quantify students' participation, nevertheless. Therefore, good teaching and learning strategies should support pedagogy in the classroom and active learning in online learning situations [7].

It is well established that a key component influencing students' academic success is their level of engagement. Some of the elements that affect students' capacity to learn are their past knowledge (readiness), their zeal for learning, and the manner in which the information is presented to them. The students' varied learning preferences also influence how they participate in the activities that the teachers lead [6, 7]. The challenge of maintaining the pupils' engagement and attention puts the teacher in a difficult position [7]. This is due to the fact that student participation is crucial to their performance and achievement as determined by

formative or summative assessments [6]. Discovered that students who actively participated in educational endeavours retained more information and were more likely to perform well. Gamification is the application of game design features in nongame contexts to engage participants and drive behaviour that is desired. It has been mentioned in several studies as a strategy to boost student engagement [7, 8]. Technological advancements expand the methods that teachers can utilise to create lesson plans, [8], enabling the usage of game aspects in non-gaming contexts [9]. Some teachers lack the creativity necessary to include gamification into their courses [9]. Therefore, instructors have a plethora of alternatives when it comes to engaging and motivating students through a variety of lesson concepts and projects that can be found on online platforms like Kahoot!, Quizz, Socrative, and Quiz Alize [9, 10].

1.1 The gamification

Gamification is one of the learning methodologies used in online learning, and it has garnered a lot of attention recently because of its ability to increase user enjoyment and engagement. Gamification is a technique that encourages user enthusiasm and inspiration by utilising various game principles and strategies in non-gaming environments [11]. With the use of an interactive system, this methodology aims to persuade people to take part in the process of a certain task [11, 12]. The primary concept is incorporating features from games into real-life scenarios, frequently with the intention of incentivizing and supporting the user towards the desired behaviour, like engaging in educational activities [12].

Gamification is regarded as creative and useful in many different situations [12, 13]. The literature suggests that there are various approaches to implement this technology in an educational setting. Online learning is one of the key areas where gamification can have a good impact. It can help with issues like low student motivation [13]. There are various game design strategies that can be used in the classroom to enhance student interactions. Because these tactics have the ability to install a sense of empowerment in students to complete tasks and collaborate with others, among other values associated with games, [13], they facilitate the development of curricular, sociable about, and conceptual skills in students [13, 14].

1.2 Motivation and Participation

Numerous studies indicate that in order to complete their courses with greater success, students must be motivated and engaged. The inner mechanism that gives someone the drive to focus their efforts on meeting needs is known as motivation. Conversely, [14], engagement denotes how that motivation is exhibited; an activity advances the achievement of an objective. To get better results, both mind-sets are required, but they might be difficult, particularly in online learning situations [14, 15].

Self-Determination Theory (SDT) is a theory that is frequently utilised in gamification to comprehend the potential of games in motivation. According to SDT, [14], students are naturally motivated to participate in class and are further motivated by their demands for independence, competence, and relatedness [15]. The ability to select which difficulties to take on is referred to as autonomous; feeling competent is referred to as conquering the task at hand; and relatedness is referred to as the experiences of acceptability and acknowledgment that arise from these kinds of activities [15, 16]. The goal of games is to incorporate these ideas so that students become intrinsically motivated. Gamification makes it easier for teachers

and students to stay in touch with one another [16]. In order to support authentic education, [17], external and intrinsic variables are balanced to create this interconnection. Engage refers to a user's desire to learn or to take up someone else's goals or endeavours [16, 17]. In short, engagement is the process of holding students' attention for extended periods of time. In the absence of involvement, learners will not find the task engaging. The causes of students' disengagement from online education. There are at least four gaming groups in learning, as shown in Figure 1 [17].

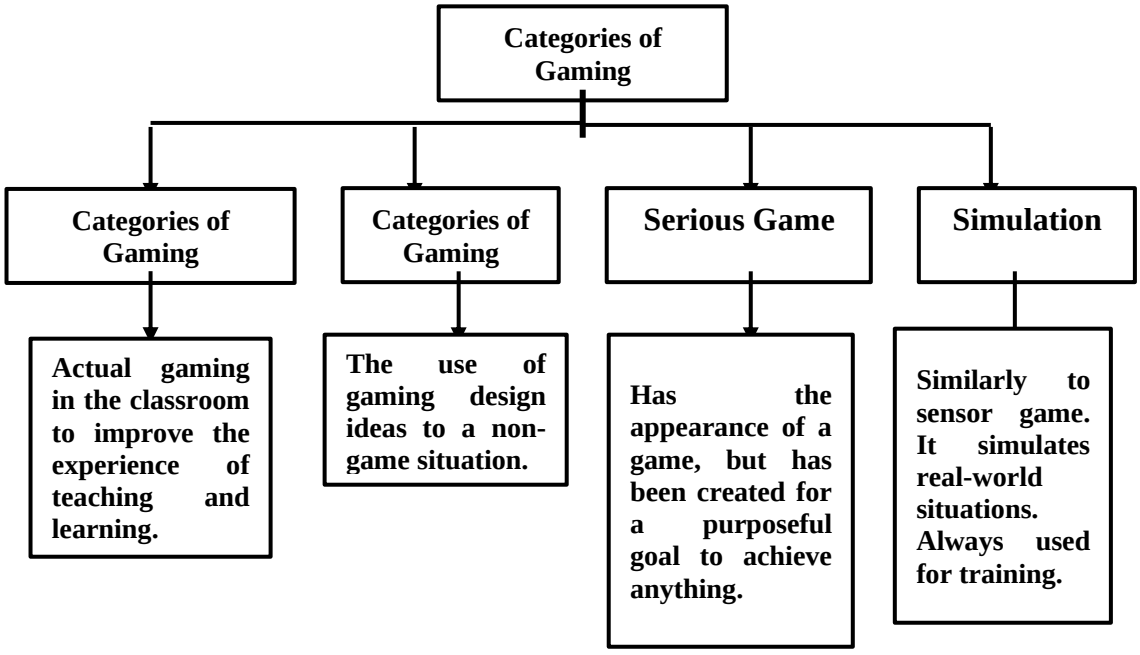

Fig. 1 Categories of Gaming. [16]

Despite being used interchangeably in e-learning, gamification and game-based learning are actually extremely different. While the latter employs game-related elements to teach learners specific skills required to achieve certain learning objectives, the former employs mechanics of games in a non-gaming setting [16, 17]. Gamification has increased in popularity over the last ten years as a result of developers of websites and education using it effectively to engage and motivate people [17]. Gamification in e-learning combine's game aspects with course content to improve learning [17]. Game components such as progress bars and many levels excite students more than the educational material's straightforward design [17, 18]. Badges, points, and money are complex aspects that keep pupils motivated because they feed the fundamental urge for collection.

1.3 The usability of e-learning

Because of the diversity of learners, technical improvements, and significant differences in learner-trainer interaction, assessing the usability of e-learning is an important task [18]. These substantial changes pose challenges and need the development and revision of learning

courses. Work-related usability paradigm and distance learning usability are not equivalent. As a result, while assessing the usefulness of e-learning, [18], attitudes among students must be considered. Evaluating the user appeal of e-learning has an opportunity to push usability practitioners outside of their comfort zone of expertise. As previously said, educational layout and e-learning usability are inextricably linked [18, 19]. Thus, before building any type of electronic learning programme, usability developers must become acquainted with learning pedagogies and theories. This study seeks to better understand the effects of gaming and e-learning usability combined with education design, providing a holistic approach to both students and academics [19].

1.4 Gaming Platform or Systems

Student reading and learning materials are motivated through the usage of a gamified system. Indicators regarding educational involvement, such as average pages per visit or average length of time on site, can also be generated by the system [18]. But in order to establish a dynamic engagement during the learning process, facilitators are required. Students can access content, view their score, badges, and prizes, and more through the gamified platform. Teachers have access to the forum's achievement track, total logging in, and visitation statistics. The aforementioned plot, defined aim, challenge, time restriction, advancement, [18], instantaneous feedback, reward, [19], stage, badge, position, success, context-specific, reward kind, and payment usage are the most helpful game mechanisms in the gamified software [19].

1.5 Using Gamification in Educational

The application of game design ideas outside of games to increase user engagement is known as gamification. Gamification is an effective technique for grabbing and holding people's attention while including them in activities and peers to achieve specific goals. As demonstrated by contemporary electronic applications, [19, 20], gamification also refers to the application of game features (Game Thinking) in non-gaming contexts to improve human-computer engagement and solve problems of a high calibre [21]. Gamification is a relatively new approach to education, and research on its application as a means of competition or participation is still ongoing [21, 22]. Additionally, it has been applied as a means of involvement in the rising popularity Massive Online Open Courses (MOOCs). Gamification, however, can occasionally have a negative impact on the course. Gamification of Online Courses Studies examining the methods and results of gamification through Massive Open Online Courses are few in number [22]. Very few MOOCs have integrated serious arcade games as part of their activity. The majority of studies concurred that gamification can boost motivation and engagement among students. Gamification has the potential to improve enjoyment and social relationships. While gamification uses a few game features, such as a prize, status, stage, point, badge, [22, 23], among others, game-based instruction uses actual games to teach information and abilities.

Apply principles from game design to improve instruction in a similar way. Increasing student participation is the aim. By incorporating game elements that can encourage learners to participate, gamification enables educators to create suitable learning environments. Mentioned the five steps in Figure 1's gamification of education method.

Fig. 2 Process of Gamification in Educational. [23]

The purpose of this study was to provide the findings from using a gamification method in education to increase student motivation and engagement [23, 24]. Gamification was used to make the intended activities more appealing to participation.

1.6 Objectives of the study

- Gamification improves student engagement by increasing engagement, interactions, and time spent on educational endeavours.
- Gamification can impact students' intrinsic and extrinsic motivation, and certain tactics may be more effective in inspiring them to learn.
- Examine how gamification affects academic performance, such as grades, test scores, and online course completion rates.

2. LITERATURE REVIEW

(Raju, R., 2021) [25] As the engineering education community adjusts to the new normal in the wake of the global COVID19 pandemic, online instruction has received a lot of scrutiny in recent months. While instructors adapt to this new manner of teaching, it is critical that the method of instruction and learning meets the needs of our millennials students. Given all of those influences, the instructor must constantly endeavour to keep the students interested. The authors of this article used a variety of creative gamification components throughout the semester across different courses to assess student engagement during lectures delivered online and their participation in the Learning Management System. The goal was to ensure that learners were engaged in all debates, which would positively benefit the online learning experience.

(Alsawaier, R. S. 2018) [26] Gamification is the use of game features, particularly video game aspects, in non-game contexts to promote inspiration and participation in learning. Gamification in the classroom can help many students who are dissatisfied with traditional teaching approaches. Gamification could provide a partial answer to the loss in learners' motivation and engagement that the education system is now experiencing. Colleges, in particular, might greatly benefit from using games in not only their recruiting for graduates

efforts, but also their course content and curriculum.

(Looyestyn, J., 2017) [27] Participation in online programmes is tough to sustain. Gamification is a contemporary fad that aims to enhance engagement by incorporating game-like elements such as points and badges into non-game environments. This evaluation will address the issue, 'Are gamification tactics successful in enhancing participation in internet-based offerings?' From 2010 to October 28, 2015, eight sources were examined using a comprehensive search strategy: Web of Science, PsycINFO, Medline, an INSPEC, ERIC, a Cochran Library, Company Source Completely, and ACM Digital Library.

(Khalil, M., 2017) [28] Massive Open Online Courses (MOOCs) demand intrinsic or extrinsic motivation from students to complete any of their courses. Even though MOOCs are quite popular and provide numerous advantages to the education community, some concerns have arisen regarding MOOC progress. In fact, MOOCs have a poor completion rate and confront challenges with interaction and participation among learners throughout the MOOC duration, which can lead to student boredom and dropout at any moment. An important finding of research in the last few years has proven that students' participation in MOOCs is strongly tied to their online activity.

(Rincon-Flores, E. G., 2021) [29] Virtual teaching modes that were hastily developed during the Covid-19 outbreak necessitate measures to encourage students to take an active role in higher education. Our research indicated that gamification with a reward-based system might enhance the experience of learning in exceptional instances. This article describes the outcomes of two gamified undergraduate programmes (Calculus and Growing of Transversal Competence) created with a system for rewards. The results resulting from analyses of online questionnaires, final grades, and their connections demonstrated that gaming promoted learners to participate actively and enhance their performance in school, in a context where the mode of teaching was remote, synchronised, and online.

(Shi, L., Cristea, A. I., 2014) [30] One of the most difficult difficulties in contemporary e-learning research is keeping learners motivated to engage in desirable learning behaviours and achieve learning objectives. Social e-learning makes a positive contribution to addressing this difficulty, but it needs methods that can lessen negative effects, such as leveraging social networking tools for 'chitchat', while also increasing student motivation. In this research, we suggest a set of contextual gamification tactics using flow and self-determination theory to increase intrinsic motivation in social online educational settings.

2.1 Hypothesis

H1: Gamification is a multifunctional construct that is largely predicted by game elements, dynamics, motivation, and game mechanics.

H2: Gamification is going to have a considerable beneficial relationship with the usability of e-learning among academics.

H3: Instructional design modulates the connections between gamification and the usability of e-learning among academics.

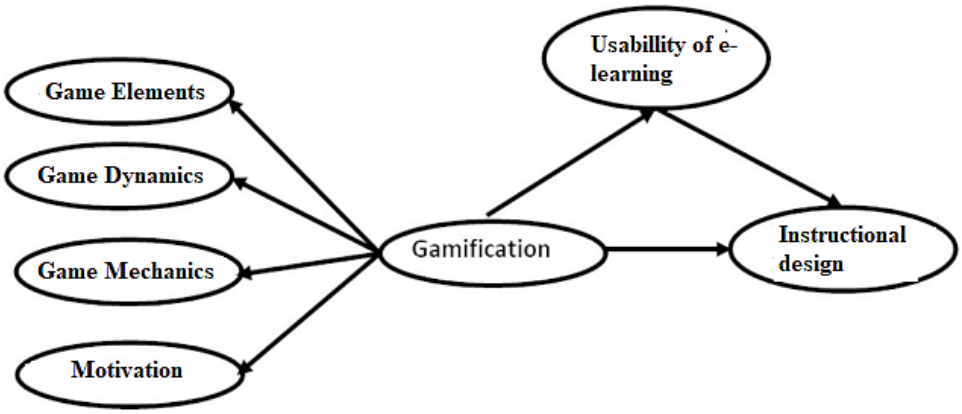

Fig. 3 Proposed Model. [31]

3 RESEARCH METHODOLOGY

This part has been divided into four sub-sections: sample strategy, instruments, collecting data processes, and the demographic profile of the respondents.

3.1 Sample strategy

A mixed method sampling technique was utilised to provide an acceptable number of samples while also reducing bias induced by using a single way of study [30, 31]. Non-probability sampling methods were used, including convenience and snowball selection. Furthermore, earlier e-learning research used non-probability sampling strategies appropriately. Structural Equation Modelling requires a sufficient sample size. Previous research revealed that the ratio of responses to total amount of scale items could be as low as 10 to 1 or even 5:1 [31]. In addition, the previous study found that the overall amount of variables influences the sample size. Thus, a sample size (n=382) was regarded sufficient for the statistical analyses conducted in this study [31, 32]. Existing literature shows that as a sample size increases, the results become more trustworthy and generalizable [32].

3.2 Instruments

3.2.1 Instruments Design and Scales

The study focused on academics enrolled in graduation and postgraduate programmes at various institutions and university in India's northern states [32]. Five state universities as well as private institutions were chosen as models for transitioning to online education and instruction due to COVID 19 [32].

3.2.2 Scaling Gamification

The scale evaluates Gamification was separated into four sub-constructs: motivation, game components, mechanics of games, and game dynamics. Items in these sub-constructs were updated to make them more intelligible [32, 33]. For example, using data from the previous investigation, unique scale items were developed for each sub-construct (motivation, game

components, game mechanics and game dynamics) [33]. Sub-construct motivation contained four scale items that focused on the motivational factors that led to rapid learning. Experts proposed a modified scale with one item, MOT4 (Gamification motivates engagement in group activities that enhance knowing). Similarly, sub-construct gameplay parts consist of five-scale pieces [33, 34].

3.2.3 Data Collection Methods

As a result, an online link was created that included scale elements for usefulness, gamification, and educational design. This link was sent via university websites and within faculty WhatsApp groups at the designated colleges and universities [33, 34]. Only responders who had implemented gaming elements into their courses were selected for this study.

A filtered questioning has been added to the Googling link, asking responders if they're applying utilised gaming for content to teach online. Those that responded "No" to the link were disconnected. There were 413 answers in all [33]. After reviewing the replies, a few irrelevant and unusual responses were deleted, leaving 382 responses for further research. To overcome frequent methodology bias, [34], Harman's one-factor testing was applied. The Varimax rotation was used to do an Exploratory Factor Analysis (EFA). Results indicated that 31.46% of the variation was due to changes in the component, which is below the acceptable value of 50% and so implies the absence of typical bias in the method [34].

3.2.4 Demographics and characteristics of responders

Table 1 shows demographic characteristics of the people who responded. Out of 382 responders, 51.8% were men and the balance of 48.16% were women. Doctorates made up 38.49% of all respondents, followed by post-graduates (33.77%) and bachelors (29.28%). The ages varied from 25 to 30 (49.84%), 31-40 (49.84%), [35], and over 40 (18.94%). 28.14% of the academics were giving Online instruction programmes from the last two years, and 48.94% had an online course of study of 11-15 hours [35].

Table 1 Demographic information profile.

Characteristic N=382		Response	%
Gender	M	197	51.9
	F	185	49.59
Educational	Graduates	105	29.89
	P.G.	130	36.98
	Doctorates	147	39.69
Age	25-30	81	26.96
	31-40	247	69.65
	Above 40	54	14.59
Modules delivered online	Less than 1 y	67	16.89
	1-2 y	143	68.95
	More than 2 y	172	16.98
Online Classes per week (hrs)	<10 h	139	36.96

	11-15	182	49.65
	>15 h	61	16.39

4 RESULTS

4.1 Measuring Modelling

The data analysing procedure consisted of two inquiry steps. Confirmatory Factor Analysis (CFA) was used to analyse the reliability and validity of scale items, followed by Structural Equation Modelling (SEM) for empirically evaluating the hypotheses presented. SEM was favoured over alternative methods because it includes many conventional techniques into a single software package, such as a correlation multivariate regression, [36], and factor analyses.

4.2 Structure Modelling

To get good results from our measurement model, the hypothesised model was developed for each element of gamification Table 2.

Table 2 Measuring Modelling.

	Model	Std. Estimate	Std. Error.	Critical Ratio.	Avg. Variance Extracted	Composite Reliability
Motivation (M=0.879, S.D.=0.879)	MOT 1	0.896	0.849	14.895	0.965	0.599
	MOT 2	0.849	0.579	15.498		
	MOT 3	0.589	0.519	14.289		
Game Elements (M=0.497, S.D.=0.497)	GME 1	0.989	0.549	11.879	0.599	0.550
	GME 2	0.548	0.518	14.210		
	GME 3	0.989	0.215	16.498		
Game Elements (M=0.187, S.D.=0.794)	GMD 1	0.896	0.960	11.08	0.596	0.29
	GMD 2	0.219	0.218	15.089		
	GMD 3	0.628	0.596	12.983		
Game Mechanics (M=0.187, S.D.=0.794)	GMM 1	0.896	0.518	15.492	0.259	0.596
	GMM 2	0.259	0.529	16.252		
	GMM 3	0.579	0.218	18.369		
Instructural Design (M=0.794, S.D.=0.497)	IND 1	0.298	0.896	11.02	0.296	0.986
	IND 2	0.369	0.648	19.653		
	IND 3	0.219	0.397	14.293		
Usability of e-learning (M=0.985, S.D.=0.296)	USB 1	0.965	0.892	16.59	0.692	0.698
	USB 2	0.959	0.594	18.965		
	USB 3	0.659	0.265	19.658		

Furthermore, Table 3 shows that discriminant validity, as the square of the root of AVE was

greater than the inter-item correlation. Thus, it can be argued that all of the measurements loaded significantly into their respective constructs, [35, 36], and the measurement model attained convergence validity.

Table 3 Correlation Matrix.

	Motivation	Game Elements	Game Dynamics	Game Mechanics	Usability of E-learning	Instructional Design
Motivation	0.968***					
Game Elements	0.596**	0.956**				
Game Dynamics	0.698**	0.987**	0.654**			
Game Mechanics	0.648**	0.648**	0.698**	0.965***		
Usability of E-learning	0.896**	0.654**	0.325**	0.648	0.895*	
Instructional Design	0.859**	0.689**	0.648**	0.698**	0.659***	0.858

Correlation is significant at the 0.01 level (2-tailed)

All of the fit parameters suggest an excellent matching (Table 4) [37]. As a result, the suggested model provides a logical portrayal of the frameworks that support the observed data [38].

Table 4 Structure Modelling.

		Std. Estimate	SE.	CR.	P	Results
Motivation	Gamification	0.948				
Game Elements	Gamification	0.849	0.986	29.89		Supported
Game Mechanics	Gamification	0.649	0.549	39.896		Supported
Game Dynamics	Gamification	0.289	0.549	14.895		Supported
Gamification	Usability of E-Learning	0.987	0.879	16.986		Supported

4.3 Modelling after a Mediation Process

Hypothesis 3 found that instructional design modulates the relationship between gamification and e-learning usability [38, 39]. Table 5 shows the mediating effect of design of instruction. Gamification had a strong direct effect on e-learning usability before mediating (β=0.985, p=0.000). However, following mediation, the impact was reduced to β=0.549, p=0.000, showing partial moderation. Gamification's indirectly effect on usage is considerable (β=0.256, p=0.000), showing partial mediation [39]. To confirm mediation, the Sobel test was used. Using instructional design as a mediator resulted in a significant the Sobel method test statistic of 2.809 ($p<0.013$) [40]. These findings suggest that instructional design has a partial mediation effect on the connection among gamification and the usability of electronic instruction [40, 41].

Table 5 Mediation Results.

No.	Hypothesis	Direct effect β	Total effect β	Indirect effect β	p-value	Remark

H4	Gamification/Instructional design/Usability of E-learning	0.879	0.895	0.529	0.000	Partial Mediation

The primary goal of electronic learning is to improve learners and educator's interactions, provide timely feedback, and ensure that assignments are finished on time, all of which may be accomplished by utilising various aspects of games, [41], which improves the usability of online education. Obtaining awards and points encourages a spirit of competition and increases engagement. The study made an important contributor by establishing the mediated impact of educational design on gaming and online education usability [42]. The instructional layout somewhat mediators this connection, emphasising its importance in e-learning. As a result, the findings add to Mayers' theory's contributions to understanding instructional layout and e-learning usability [42, 43]. The discovery of a large and favourable influence on usability validates SDT theory and games are considered as external motivators in the context of e-learning [43].

The study made a significant contribution by establishing the mediated impact of instructional layout on gamification and e-learning usefulness [43]. Instructional design somewhat mediates this connection, emphasising its importance in e-learning. As a result, the findings add to Mayers' theory's contributions to understanding educational design and e-learning usability. The development of a strong and favourable impact on usability verifies SDT theory, [42, 43], and gaming is viewed as an external incentive in the electronic learning setting. The data also indicate that SDT adds to the gaming and e-learning domains by clarifying ideas, making complex phenomena easier to comprehend, modifying learner control, and inspiring learner to study varied subjects.

5 CONCLUSION

This study has consequences for academics and universities focused on e-learning due to COVID-19. This work will contribute to improving the learning environment for e-learning students, resulting in greater understanding retention. Because gamification gives immediate feedback, universities and educational institutions have to educate academics to gamify curriculum for increased engagement, memory, and retention. Gamification in e-learning encourages, inspires, challenges, and enables learners to willingly reach greater goals.

This study not only highlights the novelty of gaming in education as a game changer and crucial enabler of inspiration, participation, and user experience, but also its implications for the design of instruction. This study advises educators and course creators to consider the instructional structure and gamification of an online course. The study's conclusions urge educators, instructors, and course makers to prioritise instructional layout and game development alongside contents. This study can be used by educational designers to incorporate Gamification components into their educational and educational course curriculum, hence shifting student-centred learning more successfully. All of these aspects that affect and touch students (better educational experiences, enhanced memory and retention, accelerated behavioural modifications, and so on) can result in an enormous performance gain for the institute/organization.

5.1 Limitation and Future Studies

The study contains some shortcomings that could be addressed in future research. The approach could be expanded by incorporating graphic design and gamification components. Because data were obtained solely from academics, future studies may take into account the perspectives from learners and designers of graphics. A comparison analysis that includes both groups (academicians and trainees) may yield intriguing results. It can also be repeated with larger samples and in various developing nations to increase the model's generalizability. It may be advantageous to validate demographic characteristics as moderators. To determine the model's applicability, future studies may include additional dependent parameters such as happiness and behavioural intention.

References

1. Hu, M., Li, H., Deng, W., & Guan, H. (2016). Student Engagement: One of the Necessary Conditions for Online Learning. In Institute of Electrical and Electronics Engineers (IEEE) (Ed.), 2016 International Conference on Educational Innovation through Technology (EITT). Red Hook, NY: Curran Associates, Inc. Tainan, Taiwan, 22 - 24 September 2016.
2. Bhat S., D'Souza R., Bhat S., Raju R., and Binu K. G. (2020b) Collaborative Learning for Outcome Based Engineering Education: A Lean Thinking Approach, Procedia Computer Science, 172, 927- 936.
3. Hamari, J. (2015). Do badges increase user activity? A field experiment on the effects of gamification. Computers in Human Behaviour, 71, 469–478.
4. Barata, G., Gama, S., Gonçalves, D., & Jorge, J. (2013). Improving participation and learning with gamification. In Proceedings of the First International Conference on Game-full Design, Research, and Applications - Gamification 2013, (pp. 10–17). New York: ACM Stratford, Ontario, Canada, 2 - 4 October 2013 Stratford, Ontario, Canada.
5. Wang, A. I. (2015). The wear out effect of a game-based student response system. Computers & Education, 82, 217–227.
6. Lozano-Rodríguez, A.; García-Vázquez, F.I.; Zubieta-Ramírez, C.; Lopez-Cruz, C.S. Competencies associated with Semestre i and its relationship to academic performance. High. Educ. Ski. Work-Based Learn 2020, 10, 387–399.
7. Zahedi, L.; Batten, J.; Ross, M.; Potvin, G.; Damas, S.; Clarke, P.; Davis, D. Gamification in education: A mixed-methods study of gender on computer science students' academic performance and identity development. J. Compute. High. Educ. 2021, 33, 441–474.
8. Hew, K. F. (2015). Towards a Model of Engaging Online Students: Lessons from MOOCs and Four Policy Documents. International Journal of Information and Education Technology, 5 (6):425431.
9. Huang, W. H. & Dilip S (2013). A Practitioners Guide to Gamification of Education. Rotman School of Management. University of Toronto.
10. Kapp, K. M. (2012). The gamification of learning and instruction: Game based methods and strategies for training and education. San Francisco, CA: Pfeiffer.
11. Khaleel, F. L., Noraidah, S., Tengku S. M. T. W &Amirah, I. (2016). The Architecture of Dynamic Gamification Elements Based Learning Content. Journal of Convergent Information Technology. 11(3), 164-177.
12. Attali, Y.; Arieli-Attali, M. Gamification in assessment: Do points affect test performance? Comput. Educ. 2015, 83, 57–63.
13. Seaborn, K.; Fels, D.I. Gamification in theory and action: A survey. Int. J. Hum. Compute. Stud. 2015, 74, 14–31.

14. Dikcius, V., Urbonavicius, S., Adomaviciute, K., Degutis, M., & Zimaitis, I. (2021). Learning marketing online: the role of social interactions and gamification rewards. Journal of Marketing Education, 43(2), 159–173.
15. Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. Psychological Science in the Public Interest, 14(1), 4–58.
16. Enders, B., & Kapp, K. (2013). Gamification, games, and learning: What managers and practitioners need to know? The eLearning Guild, 57–59.
17. Cruea, M. (2020). "Gaming the Mind and Minding the Game: Mindfulness and Flow in Video Games," in Video Games and Well-Being, ed. R. Kowert (Macmillan: Palgrave), 97–107.
18. Sailer, M.; Hense, J.U.; Mayr, S.K.; Mandl, H. How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. Comput. Human Behav. 2017, 69, 371–380.
19. Hashim, H., Salam, S., & Mahfuzah Mohamad, S. N. (2017). Investigating learning styles for adaptive Massaive Open Online Course (MOOC) learning. Journal of Advances in Humanities and Social Sciences, 3(5), 282-292.
20. Hsin-Yuan Huang, W., & Soman, D. (2013). A practitioner's guide to gamification of education (Tech. Rep.). Toronto, Canada: Rotman School of Management, University of Toronto.
21. D'Angelo, J. G. (2020). Choose Your Own "Labventure": a click-through story approach to online laboratories during a global pandemic. J. Chem. Educ. 97, 3064–3069.
22. Fitzgerald, & Ratcliffe, (2020). Serious games, gamification, and serious mental illness: a scoping review. Psychiatric Serv. 71 (2), 170–183.
23. Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. Journal of Marketing Research, 18(3), 382–388.
24. Ghai, A. & Tandon, U. (2021). Understanding Antecedents of Usability in E-Learning. 2021 International Conference on Decision Aid Sciences and Application (DASA), 2021, pp. 942–946.
25. Raju, R., Bhat, S., Bhat, S., D'Souza, R., & Singh, A. B. (2021). Effective usage of gamification techniques to boost student engagement. Journal of Engineering Education Transformations, 34(0), 713-717.
26. Alsawaier, R. S. (2018). The effect of gamification on motivation and engagement. The International Journal of Information and Learning Technology, 35(1), 56-79.
27. Looyestyn, J., Kernot, J., Boshoff, K., Ryan, J., Edney, S., & Maher, C. (2017). Does gamification increase engagement with online programs? A systematic review. PloS one, 12(3), e0173403.
28. Khalil, M., Ebner, M., & Admiraal, W. (2017, October). How can gamification improve MOOC student engagement? In Proceedings of the 11th European Conference on Games Based Learning, ECGBL (pp. 819-828).
29. Rincon-Flores, E. G., & Santos-Guevara, B. N. (2021). Gamification during Covid-19: Promoting active learning and motivation in higher education. Australasian Journal of Educational Technology, 37(5), 43-60.
30. Shi, L., Cristea, A. I., Hadzidedic, S., & Dervishalidovic, N. (2014). Contextual gamification of social interaction–towards increasing motivation in social e-learning. In Advances in Web-Based Learning–ICWL 2014: 13th International Conference, Tallinn, Estonia, August 14-17, 2014. Proceedings 13 (pp. 116-122). Springer International Publishing.
31. Rodríguez Simon, A.I.; Regina López, S. Strategies of teaching in the mediated environments: Results of the experience of the virtual educational performance. Rev. Educ. Distancia 2017, 17, 55.
32. Guckian, J., and Spencer, J. (2018). #Six Second Studying: the rise and fall of Vine in Med Ed.

Clin. Teach. 16, 164–166.
33. Hanghøj, T. (2013). "Game-based teaching: practices, roles, and pedagogies. In New Pedagogical Approaches," in New Pedagogical Approaches in Game Enhanced Learning: Curriculum Integration, eds S. de Freitas, M. Ott, M. M. Popescu, and I. Stanescu (Hershey PA: IGI Global), 81–101.
34. Dichev, C., and Dicheva, D. (2017). Gamifying education: what is known, what is believed and what remains uncertain: a critical review. Int. J. Educ. Technol. High. Educ. 14, 9.
35. Keene, E. O. (2014). Going beyond motivation to engagement: Small distinctions make all the difference. Portsmouth, UK.
36. Khaddage, F., Lattemann, C., & Acosta-Díaz, R. (2014). Mobile gamification in education engage, educate and entertain via gamified mobile apps. In Society for Information Technology & Teacher Education International Conference (pp. 1654–1660). Jacksonville, FL: Association for the Advancement of Computing in Education (AACE).
37. Alsawaier, R.S. The effect of gamification on motivation and engagement. Int. J. Inf. Learn. Technol. 2018, 35, 56–79.
38. Landers, R. N. (2014). Developing a Theory of Gamified Learning. Simul. Gaming 45, 752–768.
39. Koivisto, J.; Hamari, J. The rise of motivational information systems: A review of gamification research. Int. J. Inf. Manag. 2019, 45, 191–210.
40. Domínguez, A.; Saenz-de-Navarrete, J.; de Marcos, L.; Fernández-Sanz, L.; Pagés, C.; Martínez-Herráiz, J.-J. Gamifying learning experiences: Practical implications and outcomes. Comput. Educ. 2013, 63, 380–392.
41. Chadyiwa, M., & Mgutshini, T. (2015). Using mobile handheld devices as tools of learning and teaching for student EHPS: A blessing or a curse? International Journal of Humanities, Arts and Social Sciences, 1 (2), 85-91.
42. Chang, C. Y. (2017). Autonomy vs. assessment: To what extent the audience approval in a gallery game helps bring pleasure, pressure, and progress. International Journal of Humanities, Arts and Social Sciences, 3(4), 148-156.
43. Chauhan, J., Taneja, S., & Goel, A. (2015). Enhancing mooc with augmented reality, adaptive learning and gamification. In IEEE 3rd International Conference on MOOCs, Innovation and Technology in Education (MITE), Amritsar, Punjab (pp. 348–353).