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Exploring the dynamics of playing for knowledge: Unveiling students' intentions towards gamification adoption in Oman's higher education institutions

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Abstract

The study investigates the adoption of gamification in Omani higher education institutions (HEIs) and its effect on student engagement, behavioral outcomes, and learning outcomes. Gamification is driven by adding interactive and motivational components that are standard in games, including points, leaderboards, badges, and challenges. The research fills the gap in the literature relating to gamification adoption in Omani higher education. Despite increasing global interest in gamification in educational contexts, this domain is poorly researched. The quantitative research design is employed by surveying 148 students enrolled in different HEIs in Oman. The questionnaire measures levels of gamification influencing behavioral and learning outcomes. In addition, the research looks at how engagement acts as a mediator along with gamified tool usability and design, and the perceived value as a moderator in improving learning. The results from this study suggest that gamification has a strong, positive impact on both behavioral and learning outcomes, with engagement discovered to be a key mediator. The moderating effects of usability and design, as well as the perceived value of gamification tools, were also found to be significant. Policymakers and educators should emphasize the alignment of gamification with Oman Vision 2040's digital transformation goals.

Keywords: Behavioral outcomes, Gamification, Higher education, Learning outcomes, Student engagement.

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1. Introduction

Due to digital transformation and rapidly changing technologies, the education sector has been equipped with digital strategies, digital learning tools, and platforms [1]. One of the most promising educational strategies emerging in recent years is gamification, which leads to engaged and motivated students through game design, usability, and application [2]. These learning strategies are recognized as powerful tools for students' behavioral and learning outcomes [3].

Despite growing popularity, the extent to which gamification influences student behavior and learning outcomes remains an area of ongoing research [4]. Furthermore, the COVID-19 pandemic has digitalized and equipped this sector with new learning and student engagement tools. The integration of gamification in education is based on the premise that students respond positively to game-like elements, such as rewards, challenges, leaderboards, and interactive storytelling [2, 5]. However, the successful implementation of gamification consists of different factors, including the design and usability of gamification tools, the perceived value of gamification, and its impact on students' behavioral and learning outcomes [6, 7].

This study aims to investigate these factors by analyzing the association among the level of gamification, engagement, behavioral outcomes, and learning outcomes in HEIs of Oman. The study is underpinned by the gamified learning theory, which emphasizes the role of game-based elements in enhancing the educational experience. This theory explains that any learning gamification related to any general or specific game elements, such as badges, levels, and points, is applied for a desirable outcome of learning [8]. These elements work together to stimulate cognitive processes, sustain motivation, and improve the retention of knowledge [7].

This study's conceptual framework consists of the following key variables. The level of gamification performance is the antecedent or independent variable. The behavioral outcome consists of satisfaction, enjoyment, social interaction, and performance as the first dependent variables. The learning outcome consists of knowledge application, improvement in learning, skill development, and performance as the second dependent variable. This conceptual framework is defined by the mediation mechanism and engagement performed as mediator variables between the variables. Additionally, the usability and design of gamification tools and the perceived value of gamification serve as moderators between the level of gamification and engagement. To reach the findings, the study generated three research questions based on the stated variables.

- How can the level of gamification significantly impact students' behavioral and learning outcomes ?
- How can engagement mediate between the level of gamification and students' learning and behavioral outcomes ?
- How can usability and design of gamification tools and perceived value of gamification play a moderating role between gamification and engagement?

In the context of Oman, several educational institutions have introduced game elements for academic learning, investigating significant problems, such as a lack of motivation and student disengagement [4]. Oman's Ministry of Education emphasizes digital transformation and technological adoption with scientific approaches in higher educational institutions to advance educational sector innovation and student engagement [9, 10]. The educational sector needs to be equipped with digital technologies and knowledge [11].

Therefore, this research provides practical implications for instructional designers and technology developers, emphasizing the need for user-friendly and valuable gamification tools that align with students' educational goals. It holds significant potential for transforming traditional learning methods by making education more engaging and interactive. Finally, the study provides recommendations for integrating gamification strategies to improve educational practices in Oman's HEIs.

2. Gamification and Gamified Learning Theory

Gamification is the practice of applying game-like elements to non-gaming environments, and it has gained prominence as a pedagogical tool in higher education. Researchers have highlighted gamification's ability to enhance student engagement, motivation, and learning outcomes [12]. Various gamification strategies, such as point-based reward systems, badges, leaderboards, and interactive storytelling, have been implemented in educational settings to foster participation and knowledge retention [13]. If these gamification strategies are carefully implemented, they can improve students` behavioral and learning outcomes [4]. Moreover, while gamification has been widely adopted in Western academic settings Signori et al. [14] its effectiveness in Middle Eastern contexts, particularly in Oman, remains understudied.

Gamification learning theory (GLT) claims that the association between HEIs and learning success depends on students' learning tendency, which is referred to as students' learning behavior [8]. GLT introduced a process of using game elements and attributes within a controlled and categorized framework of game mechanics and dynamics to influence learning-related behaviors [15]. Moreover, GLT underpins a conceptual framework that investigates the impact of the level of gamification on the behavioral and learning outcomes. However, the usability and design of the game and perceived value of gamification play a moderating role and suggest that students' effective engagement depends on how intuitively and attractively game elements are integrated. Finally, when these levels of gamification factors are optimized for student engagement, it results in enhanced behavioral and learning outcomes. The conceptual framework based on GLT is presented below as Figure 1.

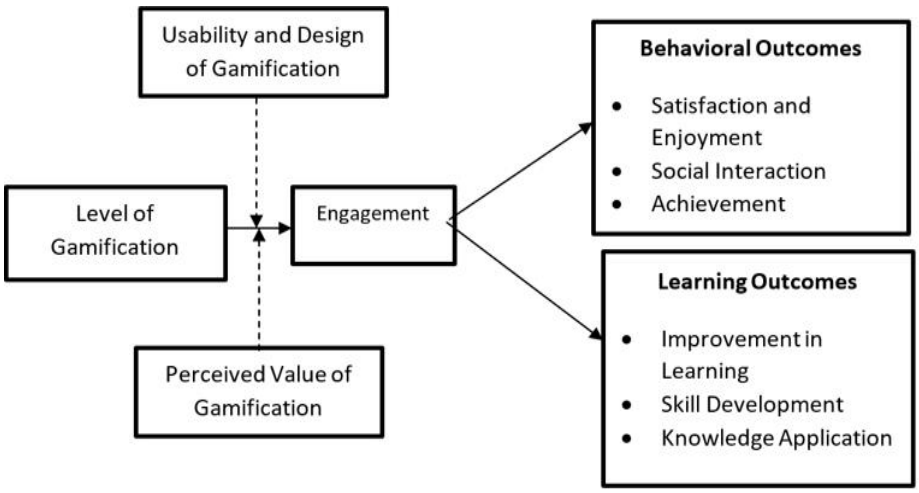

Figure 1.
The conceptual model for the study.

3. Hypothesis Development

3.1. Level of Gamification and Behavioral Outcomes

Gamification is gaining insights from the researchers, HEIs, and corporate sectors [16]. In HEIs, gamification is applied to enhance students' intrinsic motivation, engagement, and interest in learning [17]. It provides a unique environment and ecosystem for students to enhance their engagement and learning in a specific context [6, 18]. Previous literature review and meta-analysis studies on this phenomenon investigated that it significantly helps to support learning outcomes for students in HEIs [7]. Elements of gamification, including group competitions, leaderboards, feedback, level of the game, rewards, challenges, points, avatars, and achievements, are essential for engagement and interest and take control over their learning journey [1, 19]. This study categorizes behavioral outcomes into three key dimensions: satisfaction and enjoyment, social interaction, and achievement orientation.

Gamification is essential for students' interest and engagement, especially in the field of education [20]. Gamification increases students' motivation, enjoyment, engagement, and satisfaction [19]. Gamified learning environments enhance students' satisfaction and enjoyment by introducing elements of playfulness and challenge [10]. When students find learning activities satisfying and enjoyable, they are more likely to engage with course materials and participate actively in classroom discussions [1, 14]. If a well-structured game design is provided, then it results in behavioral and learning outcomes of students, including satisfaction and enjoyment [17, 21].

Gamification incorporates several domains to build strong relationships between students and their learning environment [7]. Recent studies investigating the theoretical and practical viewpoints of gamification in e-learning of students have suggested a positive impact on emotional and social interaction [14, 19]. Gamification fosters social interaction by encouraging collaboration, competition, and peer-to-peer learning [22]. It enhances social interaction by incorporating game elements like leaderboards, team challenges, chat boards, and rewards, fostering engagement and collaboration [20].

Achievement orientation is one of the core facets of gamification as it propels students towards striving for personal or collective goals. It is aligned with achievement badges, which are the rewards for completing the goal of a set of targets [23]. Gamification fosters achievement orientation by incorporating structured goal-setting mechanisms, such as progress tracking, adaptive challenges, and reward-based incentives, which encourage students to take an active role in their learning journey and are a prominent approach to motivation [24]. The interesting and dynamic nature of these gamification elements is directly related to a higher level of engagement and enthusiasm from the students [25]. Students with a strong achievement orientation are more likely to persist in challenging tasks, seek constructive feedback, and continuously improve their skills [26].

H_1: The level of gamification has a positive impact on behavioral outcomes (satisfaction and enjoyment, social interaction, achievement orientation) of students in HEI.

3.2. Level of Gamification and Learning Outcomes

Gamification for education learning outcomes can be defined as learning with gamification elements [27]. It is a design of a process consisting of gamification elements to change the learning context [3]. Many potential researchers documented the relationship between gamification and learning as the underpinning framework of the theory of gamified learning [28]. Grounded in GLT, learning outcomes (improved learning, skill development, and knowledge application) are significantly influenced by the level of gamification implemented in the educational framework.

Gamification improves the learning systems for students and is widely used for instruction delivery [29]. Several authors review the effectiveness of gamification techniques in educational improvement, which are applied for training and a fuzzy approach [30]. The interaction with the use of gamification through digital transformation technologies provides possibilities for developing new skills and learning in different ways [10]. Higher levels of gamification, which include elements such as adaptive challenges, real-time feedback, and personalized learning paths, foster student motivation and enable a more

structured approach to acquiring and applying knowledge [31]. Therefore, game-based learning using digital transformation technologies promotes learning behaviors and enhances students' desired learning results [26].

The level of gamification significantly influences students' skill development by incorporating engaging, interactive, and scenario-based learning experiences [13]. The principles of the game provided in nongame contexts promote engagement and motivation that modify students' psychological thinking, decision making, and problem-solving through new skill development [8, 28]. Higher levels of gamification integrate real-time simulations, problem-solving tasks, and decision-making challenges, fostering critical thinking, adaptability, and analytical reasoning [32]. By actively participating in gamified environments, students refine their cognitive and practical skills through iterative learning and immediate feedback [17].

Applying knowledge through gamification has garnered significant interest from potential researchers and has led to a growing body of literature on this phenomenon [27]. The transition from traditional educational systems to digital platforms encourages students to engage in behaviors aligned with new knowledge applications [33]. Through knowledge application, HEIs gain a potential role in education and value creation, which is no longer based on tangible resources [22]. In a dynamic and intensive business environment, HEIs can gain competitive advantages over other competitors through gamification applications [5].

H_2: The level of gamification elements positively impacts learning outcomes (improvement in learning, skill development, knowledge application) of students in HEI.

3.3. Level of Gamification and Engagement

Engagement is an individual's energy, which is related to different actions and tasks [34, 35]. Gamification transforms traditional learning into an interactive experience, making students more invested in their academic progress [14]. Engagement in gamified learning is a multidimensional construct involving cognitive, emotional, and behavioral aspects [28]. Some studies documented positive relationships and an increase in the engagement of students when gamification elements are introduced in educational systems [36]. Studies agree with the statement that gamification elements positively impact students' engagement and overall learning performance, collaboration, and feedback [1]. The level of gamification significantly influences student engagement by incorporating game elements that enhance motivation, focus, and participation in learning activities [37].

H_3: The level of gamification has a significant positive impact on student engagement.

3.4. Mediating Role of Engagement in Behavioral Outcomes

There are several features of gamification, for instance, badges, points, game levels, challenges, quests, and avatars Alsawaier [38], which provide components of enjoyment, engagement, and fun that help them transform their behavioral outcomes in favor of learning [28]. These elements enhance students' motivation, satisfaction, and enjoyment, essential behavioral outcomes in a learning environment [39]. In this scenario, engagement provides a mechanism between the level of gamification and behavioral outcomes [40].

H_{4a}: Engagement mediates the level of gamification and the behavioral outcomes of students in HEI.

3.5. Mediating Role of Engagement in Learning Outcomes

Engagement helps students remain focused, process information more profoundly, and cultivate higher-order cognitive skills essential for academic success [41, 42]. When the level of engagement is high, students demonstrate more learning activities with skill development and improve their abilities with the application of these real-world scenarios [43, 44]. Engagement provides a mediating mechanism between the relationship of gamification and learning outcomes by enhancing students' cognitive involvement, effort, and persistence [4].

H_{4b}: Engagement mediates the level of gamification and the learning outcomes of students in HEI.

3.6. Usability and Design as Moderator

The usability and design are essential in developing gamification elements, as it has a significant direct relationship with student engagement in an educational context [45]. A well-designed gamified environment with an intuitive interface, clear instructions, and seamless navigation enhances students' engagement, motivation, and willingness to interact with learning content [30]. Well-designed and effective usability of gamification is the basic principle behind the human-centered design approach [46]. These principles provide the guidelines for how to integrate technologies and knowledge with human ergonomics, which are aligned with game development and usability for the aim of students' learning engagement [45]. Therefore, the usability and design of gamification act as critical moderators by determining whether gamification enhances or hinders engagement.

H_{5a}: Usability and design moderate the relationship between gamification and student engagement.

3.7. Perceived Value of Gamification as Moderator

The level of gamification also offers perceived hedonic values, for instance, aesthetic experiences and flow [47]. The perceived value of gamification is defined as students' perception of the advantages of the game, and these perceptions align with an evaluation of gamification attributes [29]. When students recognize the benefits of gamification, such as effectiveness, improved motivation, social gain, goal achievement, enjoyment, and enhanced learning experiences, they are more likely to engage actively with gamified content [48]. By addressing students' expectations and demonstrating their practical benefits, the perceived value of gamification can serve as a powerful moderator that strengthens student engagement.

H_{5b}: The perceived value of gamification moderates the effect of gamification on student engagement.

4. Methodology

4.1. Sampling and Data Collection

This research conducted a survey and collected data from students in HEIs in Oman, who have experienced gamification in any of their courses [49]. This method aligns with the quantitative research approach, allowing researchers to measure variables and analyze social behavior patterns objectively [50]. The hypotheses were tested from the data collected from the HEIs of Oman [10]. The population of this study was HEIs in different cities in Oman. Depending on the population characteristics, researchers apply convenience sampling, which is a type of non-probability sampling [51]. The demographic characteristics consist of age, gender, and level of education. A sample size of 148 respondents has been chosen for this study. The sample size would be (No. of items in questionnaire × 5), which is 28 * 5 = 140 [52, 53].

The researcher chose online data collection through Google Forms, Yadav et al. [54], which covers a wide range of target audiences compared to traditional methods [55]. To minimize the common source bias, common method bias, and reduced non-engagement responses, this study takes some initiatives in the form of procedural remedies and statistical remedies [56]. In procedural remedies, researchers collected data from different sources as units of analysis, such as students of different semesters and degree programs. Researchers built questionnaires in random orders, reducing the order effect and consistency biases. In statistical remedies, researchers analyzed the Harman single-factor test by the variance explained by a single factor. Researchers analyzed the variance inflation factor to check the multicollinearity between the variables.

4.2. Ethical Consideration

The authors properly informed the participants about the study, the procedures involved, and the potential risks and benefits of participating [57]. The respondents were allowed to ask questions about the research and decline to participate. The authors also protected the privacy of the participants; besides, they do not share their personal information without their consent [58].

4.3. Construct Measurement

The 5-point Likert scale was used to measure the responses [59]. The response categories ranged from ‘strongly disagree’ to ‘strongly agree’, which signifies the degree of respondents’ disagreement and agreement with each item of a questionnaire [60]. In the study, the level of gamification (LGM) was adapted as the independent variable and measured by 5 items [61]. The behavioral outcomes (BO) was used as a first dependent variable and measured by an 8-item scale [61]. The second dependent variable of this study was learning outcomes (LO). To measure LO, using a 5-item scale [61]. The engagement (ENG) was included as a mediator and measured by a 3-item scale [61]. Researchers measured usability and design of gamification (UDG) as a 3-item scale [61]. The perceived value of a gamification (PVG) was measured by a 3-item scale [61].

5. Results

5.1. Demographic Profile of the Sample

The total number of respondents is 148, where 55.4% are female and 44.6% are male participants, which represents a balanced representation of both genders. In terms of Age, 53.4% of the participants fell within the 20-22 age range, 25% were below 20 years, and 20.3% between 23-25 years, reflecting a predominantly young student population. The education level shows that 13.5 % of respondents hold an advanced diploma, and 21.6% hold a bachelor’s degree. However, most participants held a diploma, 62.8%. This demographic composition (Table 1) suggests that the study primarily captures insights from young, diploma- and bachelor-level students, making their perspectives relevant for understanding gamification adoption in higher education institutions.

Table 1.
Demographic Summary.

Participants Demographics	Frequency	Percent
Gender		
Female	82	55.4
Male	66	44.6
Total	148	100.0
Age (in years)		
Below 20	37	25.0
20-22	79	53.4
23-25	30	20.3
Above 25	2	1.4
Total	148	100.0
Education		
Diploma	93	62.8
Advanced Diploma	20	13.5
Bachelor	32	21.6
Master	1	0.7
PhD	2	1.4
Total	148	100.0

5.2. Reliability and Validity

Table 2 represents the factor loadings and reliability measures, which consist of Cronbach's alpha values (α), rho_a, and rho_c. The convergent validity is assessed by the Average variance extracted (AVE). According to Podsakoff et al. [56] and Hair et al. [62], factor loading for every observed item for each construct is higher than 0.7, which ensures that all items for each latent variable are reliable. The reliability of all variables measured, such as Cronbach's alpha (α) values, shows greater than benchmark values of 0.7, ensuring high internal consistency [62, 63]. Composite reliability rho_a and rho_c also support the results of Cronbach's alpha (α), which are all greater than 0.7. Moreover, the AVE values that provide measures of convergent validity are greater than 0.5, exceeding the recommended threshold value [64-66]. These findings suggest the measurement model is reliable and valid, justifying its use for further structural model analysis.

Table 2.
Loadings and Reliability.

Constructs	Loadings	α	rho_a	rho_c	AVE
Behavioral Outcomes		0.952	0.952	0.960	0.749
BO1	0.885				
BO2	0.866				
BO3	0.897				
BO4	0.843				
BO5	0.876				
BO6	0.860				
BO7	0.855				
BO8	0.841				
Learning Outcomes		0.920	0.922	0.940	0.759
LO1	0.871				
LO2	0.918				
LO3	0.837				
LO4	0.851				
LO5	0.877				
Level of Gamification		0.921	0.921	0.941	0.761
LGM1	0.894				
LGM2	0.849				
LGM3	0.875				
LGM4	0.887				
LGM5	0.857				
Engagement		0.858	0.858	0.913	0.778
ENG1	0.889				
ENG2	0.875				
ENG3	0.883				
Usability & Design of Game		0.866	0.873	0.918	0.789
UDG1	0.857				
UDG2	0.900				

UDG3	0.907				
Perceived Value of Game		0.892	0.893	0.933	0.822
PVG1	0.920				
PVG2	0.888				
PVG3	0.912				

To assess the discriminant validity, researchers analyzed two measures, the HTMT and the Fornell-Larcker test. According to previous studies, if the square root of AVE for all variables is higher than other values of correlations, which represent the items of each latent variable, are distinct from each other [64, 67]. According to the findings of this test, all bold values of the AVE square root were greater than their other correlations. These findings validate the model by indicating that constructs are adequately differentiated. In Table 3, all bold diagonal values show the AVE square root values, which show higher values than the diagonal values.

Table 3.
Fornell Larcker Criterion.

Constructs	BO	ENG	LGM	LO	PVG	UDG
BO	0.866					
ENG	0.824	0.882				
LGM	0.799	0.785	0.873			
LO	0.881	0.860	0.756	0.871		
PVG	0.794	0.838	0.809	0.836	0.907	
UDG	0.806	0.803	0.858	0.810	0.845	0.888

To check the robustness of discriminant validity, researchers analyzed another test, the Heterotrait-Monotrait (HTMT) ratio. The benchmark for HTMT ratios is less than 0.9, suggesting satisfactory discriminant validity. If the values of HTMT are greater than 0.9, it means that observed items are overlapping when making latent constructs. Table 4 shows that some values for latent variables exceed the threshold values. For instance, ENG and BO (0.910), ENG and LO (0.942), LMG and UDG (0.958), and PVG and UDG (0.959) respectively. However, these values are acceptable in behavioral research when constructs are theoretically related. Overall, the findings indicate an acceptable level of discriminant validity, supporting the distinctiveness of the constructs while acknowledging some conceptual interrelations.

Table 4.
HTMT Ratios.

Constructs	BO	ENG	LGM	LO	PVG	UDG
BO						
ENG	0.910					
LGM	0.853	0.883				
LO	0.942	0.965	0.819			
PVG	0.861	0.957	0.891	0.921		
UDG	0.889	0.929	0.958	0.903	0.959	

5.3. Variance Inflation Factor

Researchers analyzed the VIF test to assess the multicollinearity between the variables. The multicollinearity is the bias of variables, which shows that two variables are considered perfectly collinear if the correlation coefficient shows higher values, generally greater than 0.5. However, for VIF, a threshold value of less than 5 shows the absence of multicollinearity between the variables. According to the findings of Table 5, all values are less than 5 instead of three paths (PVG x LGM -> ENG, UDG -> ENG, UDG x LGM -> ENG), which show slightly elevated VIF values, indicating moderate multicollinearity. Overall, the results suggest that multicollinearity does not pose a significant threat to the study's findings, ensuring the robustness of the regression estimates.

Table 5.
VIF Test.

Paths	VIF
ENG -> BO	2.606
ENG -> LO	2.606
LGM -> BO	2.606
LGM -> ENG	4.296
LGM -> LO	2.606
PVG -> ENG	4.157
PVG x LGM -> ENG	5.532
UDG -> ENG	5.553
UDG x LGM -> ENG	5.338

5.4. Model Goodness of Fit Indexes

Some indicators were applied to examine the model's goodness of fit. The first one is the Normed Fit Index (NFI); the benchmark of NFI is greater than 0.9 [68]. According to the findings, NFI shows 0.809 values, indicating that the model is a moderate fit with this measure. The second one is Standardized Root Mean Square Residual (SRMR); the threshold value of SRMR is less than 0.08. The outcomes of SRMR represented the value 0.048 for the saturated model and 0.063 for the estimated model, indicating a good fit, which is less than 0.08 and meets the criteria. Overall, the results of Table 6 indicate that the model exhibits an acceptable level of fit, supporting the structural relationships tested in the study. These results affirm the SEM model's suitability and the validity of the relationships between variables within the study framework [69].

Table 6.
Model Goodness Fit Indexes.

Measures	Saturated Model	Estimated Model
SRMR	0.048	0.063
d_ULS	0.863	1.487
d_G	1.118	1.236
Chi-square	861.964	920.593
NFI	0.809	0.797

5.5. Analysis of Direct Paths

The SEM results for the path analysis of the LGM predictor for ENG, BO, and LO are given in Table 7, respectively. The LGM demonstrated 73% ($R2 = 0.739$, $\Delta R2 = 0.736$) variance in behavioral outcomes, 75.4% ($R2 = 0.754$, $\Delta R2 = 0.745$) variance in engagement, and 75.6% ($R2 = 0.756$, $\Delta R2 = 0.753$) variance in learning outcomes of students. The results suggested that the level of gamification has a great impact on engagement, behavioral, and learning outcomes of students. These values are also demonstrated in Figure 2, the SEM diagram. To evaluate the hypothesis, the researcher analyzed the path analysis. The first path was demonstrated between LGM and BO. H1 posited that LGM has a positive impact on BO. According to path analysis, LGM showed a statistically significant positive relationship ($\beta = 0.395$, $p = 0.001$). Hence, H1 is supported and accepted. It is suggested that a higher level of gamification improves the behavioral outcomes of students. The H2 proposed that LGM has a positive relationship with ENG. The findings suggested positive beta values and statistically significant P values, which show a positive relationship ($\beta = 0.236$, $p = 0.026$). It means that a higher level of gamification ideally increases the level of motivation and engagement of students. H3 proposed that LGM has a positive relationship with the learning outcomes of students. The results indicate positive beta values with slightly significant P values ($\beta = 0.210$, $p = 0.076$). Hence, H3 is supported and accepted. Furthermore, engagement has a statistically significant and positive relationship with BO and LO ($\beta = 0.515$, $p = 0.000$), ($\beta = 0.696$, $p = 0.000$). It is suggested that higher engagement levels lead to improved students' behavioral and learning outcomes in the education context. The perceived value of gamification (PVG) has a statistically significant relationship with engagement ($\beta = 0.545$, $p = 0.000$). It suggests that students are more likely to engage when they perceive value in gamified learning tools. However, usability and design of the game have a statistically insignificant relationship with engagement ($\beta = 0.141$, $p = 0.228$). These results indicate that while usability is important, other factors might play a more dominant role in determining student engagement. These findings highlight engagement's central role in enhancing learning and behavioral outcomes while emphasizing the importance of perceived value in fostering student involvement.

Table 7.
Direct Paths.

Direct Paths	Beta	Mean	SD	T.State	P values
LGM -> BO	0.395	0.393	0.124	3.180	0.001
LGM -> ENG	0.236	0.233	0.106	2.228	0.026
LGM -> LO	0.210	0.217	0.118	1.774	0.076
ENG -> LO	0.696	0.690	0.097	7.166	0.000
ENG -> BO	0.515	0.518	0.101	5.074	0.000
PVG -> ENG	0.545	0.534	0.122	4.478	0.000
UDG -> ENG	0.141	0.155	0.117	1.206	0.228

5.6. Analysis of Indirect Paths

The mediation analysis highlights the role of Engagement (ENG) as a key mediator between the Level of Gamification (LGM) and both Behavioral Outcomes (BO) and Learning Outcomes (LO). H4a proposed that engagement mediates the relationship between LGM and BO. The bootstrapping test findings demonstrate that LGM's indirect impact on BO is positive statistically and significant ($\beta = 0.122$, $p = 0.045$, $T = 2.010$). It means that ENG provides a platform for LGM to enhance and increase the BO of students. Hence, H_{4a} is supported and accepted. H_{4b} proposes that ENP mediates the relationship between LGM and LO. According to bootstrapping test results, the beta value is positive, and the P value is statistically significant ($\beta = 0.164$, $p = 0.024$, $T = 2.259$). It is suggested that engagement acts as a crucial pathway through which gamification enhances the learning outcomes of students. The direct effect of PVG and UDG is also demonstrated in the above section; however, researchers also show it in this section due to the support for moderation analysis. The PVG shows a statistically significant positive association with ENG ($\beta = 0.545$, $p = 0.000$, $T = 4.478$), which means that students who

perceived gamification as a valuable tool for learning they more engaged with their educational learning. However, UDG has an insignificant relationship with ENG (β = 0.141, p = 0.228, T = 1.206), which means that while design plays a role, its direct impact on engagement is limited.

Table 8 also shows the moderating relationship between the interaction effect of UDG and PVG with LGM and ENG. The H_{5a} proposes that UDG moderates the relationship between LGM and ENG. According to findings, the beta value of this interaction effect was negative and statistically insignificant (β = -0.209, p = 0.077, T = 1.771). These results reported that the usability and design of games are valuable factors in enhancing students' engagement, while their moderating effect on gamification's impact is not strong enough to be conclusive. Hence, H_{5b} was rejected, and the null hypothesis was accepted. Similarly, H_{5b} proposes that PVG moderates the relationship between LGM and ENG and boosts the LGM effect on ENG. The findings of this interaction effect were positive and statistically insignificant (β = 0.191, p = 0.116, T = 1.572). It documented that perceived value alone may not amplify the effect of gamification on engagement. Hence, H_{5b} is rejected, and the null hypothesis is accepted. These results imply that while usability and perceived value are important, their interaction with gamification may not be as influential as their direct effects on engagement. Future research could explore additional contextual factors that may strengthen these moderating relationships.

Table 8.
Indirect Paths.

Indirect Paths	Beta	Mean	SD	T.State	P values
LGM -> ENG -> BO	0.122	0.120	0.061	2.010	0.045
LGM -> ENG -> LO	0.164	0.158	0.073	2.259	0.024
UDG -> ENG	0.141	0.155	0.117	1.206	0.228
UDG x LGM -> ENG	-0.209	-0.195	0.118	1.771	0.077
PVG -> ENG	0.545	0.534	0.122	4.478	0.000
PVG x LGM -> ENG	0.191	0.175	0.121	1.572	0.116

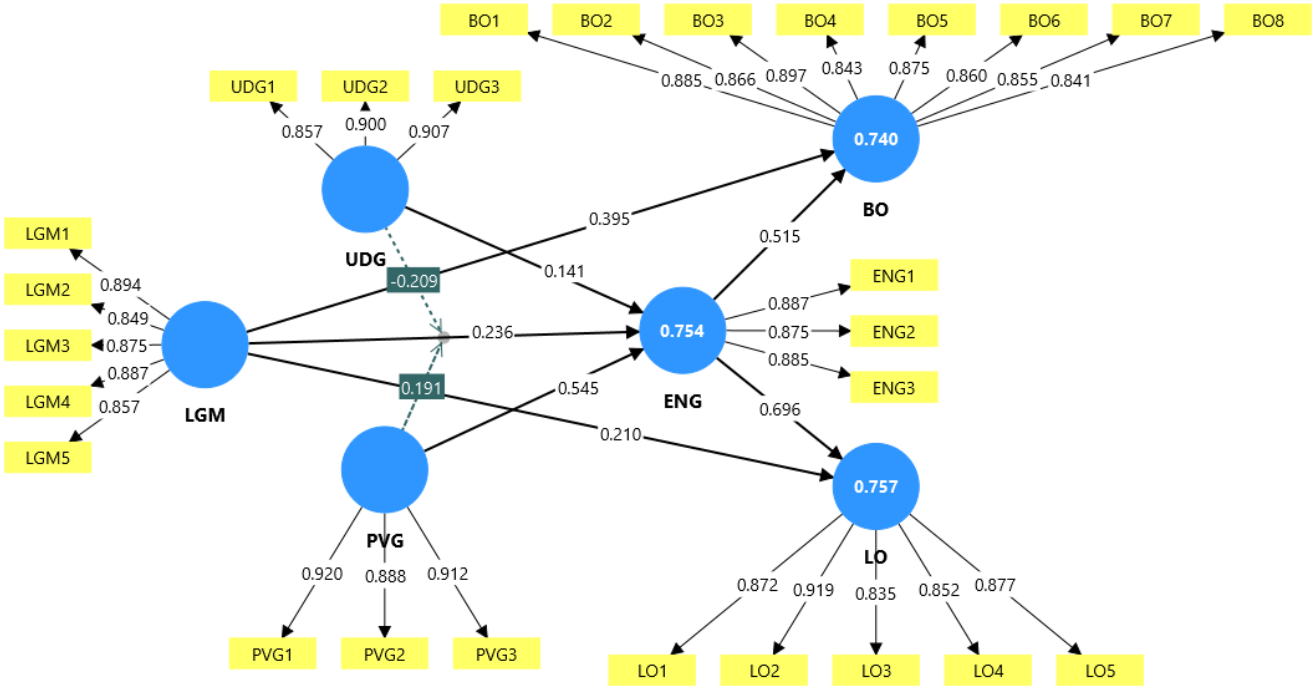

Figure 2.
SEM path diagram.

6. Discussion

The application of gamification in Oman's HEI sectors has a significant impact on enhancing students' expected behavioral and learning outcomes. Gamification has emerged as a transformative approach in Oman's education, leveraging game mechanics to enhance student engagement and improve behavioral and learning outcomes through gamification feature elements. Previous literature on gamification has investigated the effect of the level of gamification elements on different factors or variables [4, 29, 42]. Integrating gamification elements such as badges, awards, points, game levels, challenges, quests, progress monitoring avatars, leaderboards, and experience points fosters students' learning engagement and intrinsic motivation and increases their participation [30]. Meanwhile, motivation and engagement arise during game-based learning when students understand the usability and design of the game and perceive the value of the game and its impact positively. Therefore, our study focuses on investigating the impact of the level of gamification on behavioral outcomes and learning outcomes of students by mediating the mechanics of engagement in Oman's HEI sector. Furthermore, this study investigates the interaction effect of usability and design of a game and the perceived value of a game with a level of gamification on engagement and understands how these moderating variables boost the independent variable to the mediating variable. This

conceptual framework is supported by gamified learning theory, which emphasizes the role of game-based learning mechanisms in fostering motivation and improving educational outcomes.

When HEI policymakers effectively implement gamification strategies, it can positively impact students' motivation, engagement, participation, and persistence in activities [24, 43]. It enhances their knowledge-sharing behavior in the context of behavioral outcomes, creates a collaborative work environment, acknowledgment, and rewards [1]. This aligns with existing research that posits gamified environments encourage active learning and stimulate intrinsic motivation by making educational activities more interactive and rewarding [70, 71].

Furthermore, LGM indirectly impacted BO through the mediating mechanism of ENG. The results indicate that LGM working on the cognitive and psychological perception of students regarding gamification enhances their engagement [26]. The engagement of students contributes to their positive attitudes and behavioral change, such as great collaboration, social alignment, achievement orientation, satisfaction, and enjoyment [40]. These findings support previous studies that emphasize engagement as a critical factor in determining the success of gamification in educational settings.

The mediating mechanism of ENG also checks the indirect effect of gamification and learning outcomes. The beta value of this indirect impact is positive and significant ($\beta = 0.164$, $p = 0.024$), confirming that engagement plays a pivotal role in bridging gamification and learning effectiveness. Thus, according to the results of recent studies, depending on the educational strategies and elements of gamification used in games, the LGM can positively impact students' engagement, motivation, and learning outcomes. For instance, leaderboard competitions, achievement badges, and progress tracking create a sense of achievement and encourage learners to persist. The results indicate that ENG significantly influences, emphasizing that actively engaged students are more likely to benefit from gamified learning experiences. However, little attention has been given to the potential that student engagement demonstrates better skills development, knowledge application, critical thinking, collaborative work, and practical application of concepts [36]. This study highlighted this gap and showed a need to investigate LGM's long-term and short-term effects in promoting and sustaining behavioral and learning outcomes through engagement.

The effects of perceived value on gamification also positively impact engagement and stated variables. However, the multiplier effects of UDG and PVG reveal that these factors do not significantly enhance the relationship between gamification and engagement as moderators. The first path proposes that if UDG is higher in the context of LMG, then their impact is high, while the results showed a negative beta value and an insignificant p-value. This suggests that while usability is important, its role in amplifying engagement may be limited when other intrinsic motivators exist. The second path of the moderating role is PVG, which proposes that if PVG is high for the LMG context, then it has a higher impact on ENG, while the results for this path are a positive beta value and insignificant p-values. This implies that although students recognize the benefits of gamification, their level of engagement is primarily driven by the effectiveness of the game-based strategies rather than their perceived value. These findings reject two hypotheses, which indicate that UDG and PVG are also beneficial for boosting student engagement. However, enhancing the engagement when LGM is multilayered with these variables is unnecessary. Therefore, these findings indicate that while usability and perceived value are relevant, they may not independently enhance engagement unless coupled with well-designed and meaningful gamification elements. Moreover, this rejection of the hypothesis provides grounds for potential researchers who investigate more moderator variables in this same context, such as personality traits and social competition levels, to boost LGM and enhance the ENG of students.

7. Conclusions

Gamification learning programs make a major contribution not only in the HEI sector but are also essential for corporate training programs and offer substantial competitive advantages for every organization. Because it promises to enhance students' engagement and behavioral and learning outcomes in the HEI sector, this study explored the role of gamification in higher education institutions in Oman, examining its impact on both behavioral and learning outcomes by mediating mechanisms of engagement and two interaction effects of usability and design of the game and perceived value of games for students. To date, the idea of enhancing learning through gamification has been used primarily in HEIs and has provided several guidelines for potential researchers in multiple dimensions of studies. This study is underpinned by the gamified learning theory (GLM), highlights the significance of engagement as a mediating factor, and evaluates the moderating effects of usability and perceived value. Results of this research indicated that the level of gamification and its elements positively impact engagement, behavioral outcomes (Satisfaction and Enjoyment, Social Interaction, Achievement Orientation), and learning outcomes (Improvement in Learning, Skill Development, Knowledge Application). Students who actively participate in gamified learning environments exhibit higher levels of engagement, enthusiasm, collaboration, and knowledge application in the form of behavioral and learning outcomes. Nevertheless, the interaction effect of UDG and PVG on LGM engagement was not statistically significant. It is suggested that while these factors contribute to the overall experience, they do not independently enhance engagement levels. These results can be further used in future research to determine the factors that caused negative and insignificant results for engagement. It is also suggested that a more rigorous study's conceptual framework is needed to investigate the effectiveness of gamification in the context of UDG and PVG for increasing students' engagement, as well as how gamification can be applied to enhance behavioral and learning outcomes in the long term by boosting students' engagement.

8. Recommendations

8.1. Recommendations for Policymakers

Encourage Gamification in the National Education Strategy: Oman's Vision 2040 highlights the digitalization of education. Policymakers should include gamification in the national strategy to encourage engagement, motivation, and

efficient learning in HEIs. Gamified learning must be regarded as an essential part of contemporary educational strategies. It can be done by a specialized group tasked with researching, advocating, and leading the integration of gamification in HEIs. There is a need to make curriculum guidelines emphasize the significance of gamified learning environments to enable flexibility in using game-based learning tools and techniques.

Invest in Gamified Teacher Training Programs: Staff members need to be empowered with the capacity to create and deliver gamified learning experiences. The policymakers must invest in professional development programs that highlight gamification strategies, including intuitive gamification tools and the incorporation of game mechanics with educational goals. Conduct training sessions on gamification principles and tools so that faculty are equipped with both theoretical foundations and hands-on applications. These should include gamified lesson design, assessment techniques for students, and techniques to encourage intrinsic motivation. Design a national certification in "Gamified Teaching Methods," which can encourage teachers to use these approaches.

Guarantee Access to Digital Tools: Technology infrastructure is crucial in successfully implementing gamification. Policymakers should invest in equipping HEIs with digital tools and platforms that facilitate gamified learning spaces. This entails guaranteeing accessible internet, hardware, and easy-to-use software. Partner with technology businesses to ensure that HEIs possess fast and reliable internet connections and adequate hardware for electronic learning tools. Create a centralized, user-friendly repository in which faculty can view a range of gamified learning tools, exchange resources, and obtain customizable gamification templates.

Tailor Gamification to Student Requirements: The research emphasizes that individualized learning routes matched to a student's level of progress are more effective. Policymakers ought to facilitate HEIs' development and use of adaptive gamification models that address varied student requirements. Use pilot programs with various student groups (e.g., first-year students, disabled students, culturally diverse students) to see how gamification best fits their requirements.

8.2. Recommendations for University Faculty Members

Align Gamification with Learning Objectives: Faculty members need to incorporate gamification in a thoughtful manner into the curriculum so that the game mechanics (e.g., points, badges, and leaderboards) are aligned with the particular learning objectives of the course. For instance, if a learner earns a badge for passing a quiz, state how this quiz assists them in attaining major learning objectives, such as knowledge retention or critical thinking. Faculty need to collaborate with instructional designers in integrating gamification into existing course design without sacrificing academic intensity but rather amplifying student motivation.

Prioritize Engagement Over Rewards: The faculty members should focus on developing intrinsic motivation and engagement through gamification, instead of depending on extrinsic rewards. Engagement is a key factor in enhancing learning outcomes. Extrinsic rewards like points and badges may be stimulating, but intrinsic rewards like feelings of mastery or accomplishment are equally essential. Instructors should work on building challenges that encourage curiosity, creativity, and problem-solving instead of giving superficial rewards.

Include Feedback and Collaboration: To make gamification more effective, the faculty members should include aspects that promote feedback and collaboration. Game features such as challenges, collaboration, and problem-solving activities can greatly enhance student interaction and engagement. Utilize tools that provide students with real-time feedback so that they can monitor their progress and make necessary changes in their strategies. For instance, implement leaderboards or group challenges where students compete with or assist one another, promoting peer-to-peer learning and interaction.

Monitor and Evaluate Effectiveness: The faculty members must regularly evaluate the effectiveness of gamification in student participation, behavioral changes, and learning outcomes. Through student feedback and performance data, iteratively improve the gamified components to better meet students' needs. This may involve tweaking difficulty levels, changing rewards, or giving more collaborative chances.

9. Theoretical Implications

Our study expands the application of gamified learning theory by empirically testing its relevance in higher education settings in Oman. The findings validate the theory’s assertion that gamification enhances student engagement, which in turn leads to improved behavioral and learning outcomes. So, our study contributes to the existing literature on enhancing engagement and performance outcomes through gamification. The GLT relates to the student’s engagement, behavioral, and learning outcomes, providing an understanding of how LGM captures students' learning attitudes.

Our study confirms engagement as a critical mediating variable, providing empirical evidence that students’ involvement in gamified environments is pivotal in shaping their learning experiences. It points out that LGM adds a multiple design layer of gamification elements to increase student enjoyment, which leads to an increase in their engagement and encourages positive behavior. Moreover, our study examined usability and perceived value as moderators but found no significant impact on engagement. This challenges the existing assumptions about the importance of these factors and suggests that other elements, such as personalization or adaptive learning, might have a greater influence. Finally, our study makes a conceptual framework that consists of LGM, ENG, BO, LO, UDG, and PVG, which provides an understanding of how HEI policymakers and educators can apply gamification strategies to boost students' learning in an educational context.

10. Practical Implications

By evaluating the importance of LGM strategies that enhance learning and behavioral outcomes, as well as student engagement, educators and designers can develop gamification programs that maximize educational learning, knowledge sharing, student socialization, and collaboration. Educators should focus on incorporating dynamic and interactive elements

such as challenges, leaderboards, and rewards that maintain student interest over time. The HEI policymakers seek to enhance students' efficiency in gamification applications for understanding the positive impact of these strategies on engagement and performance outcomes. Educators can introduce multiple and efficient gamification techniques with the support of digital transformation in classrooms to improve students' skill development, knowledge, and competencies. It is most important that educators integrate gamification in a way that aligns with learning objectives and fosters intrinsic motivation rather than relying solely on extrinsic rewards. Our study also emphasizes multiple game developers and engineers, which provide significant insights for developing gamification from different perspectives. These different characteristics and perspectives might contribute to customized gamification development that varies students' engagement, behavioral, and learning outcomes. These customized gamification developments are also beneficial in UDG and PVG. Given the non-significant moderating effects of usability and perceived value, institutions should explore personalized learning pathways, where gamification elements are tailored to individual student needs and progress levels.

11. Limitations and Future Research Directions

Although most of our proposed hypotheses are accepted, rather than the moderating role of UDG and PVG, this research still has a few limitations that future potential researchers should address. This study was conducted in one country, Oman's HEI context, which may impact its generalizability and also limit its application in other corporate contexts. Future research should replicate this study in different countries or cultural settings to determine whether similar results hold across diverse educational systems. Our study consists of one point-in-time data collection from the questionnaires and a cross-sectional study design. However, the findings of this research cannot reflect changes in students' psychological and behavioral changes over time. This limitation can also contribute to social desirability and common method biases or common method variance. Therefore, future research could obtain a longitudinal study design with different points in time (time lag) or time intervals to minimize the potential effect of common method biases and social desirability biases. While this study analyzed usability and perceived value as moderators, future research could explore other factors, such as personalization, competition levels, or social influence, to understand how these variables shape the effectiveness of gamification. During the experimental and conceptual framework setting, researchers observed challenges in monitoring all variables that might cause students' engagement in an educational context. Future research can also consider that personal preferences may have impacted their learning outcomes and engagement. Finally, potential researchers should explore the technological barriers institutions face when implementing gamification, including access to digital tools, faculty readiness, and student adaptation to gamified learning.

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