Game-based student e-learning experience: Empirical evidence from private universities in Jordan

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CHRONICLE	ABSTRACT
	This study investigates the impact of game-based (gamification) e-Learning techniques on students' engagement, thereby, their satisfaction with e-learning in Jordanian private universities. A conceptual model was developed based on existing empirical evidence from the literature. Data was then collected through a self-administered questionnaire survey from 198 private university students, who were conveniently selected for the study. The data was analyzed using Structural Equation Modeling (SEM) with smart PLS 23. Data analysis revealed a positive effect of gamification on both student engagement and satisfaction, suggesting that incorporating gaming elements into the e-learning process in Jordanian private universities led to higher levels of student engagement, thereby greater student satisfaction with the e-learning experience. A mediating role was also found for student engagement on the effect of gamification on student satisfaction. The findings provide insights to practitioners on how gamification can be utilized as an effective strategy to deliver a more enjoyable and interactive e-learning experience. Research findings were discussed, and conclusions and implications were lastly provided.

1. Introduction

Over the last few years, gamification or using games in education has become among the trendy topics revolutionizing students' e-learning experience (Bovermann et al., 2018). More than ever before, scholars are now more interested in exploring how the use of games can contribute to enrich customer experience and boost their engagement, and thereby their satisfaction with different services in a variety of business sectors (Gil et al., 2015). However, the subject is still a promising area of research in the education sector given the crucial role that gamification may play in fostering e-learning (Raitskaya el al., 2019; Hammouri & Abu-Shanab, 2018; Masadeh et al., 2022). This has become more important considering the challenges brought by COVID-19 over the last few years (Almajali et al., 2021). The COVID-19 pandemic has brought significant changes to the higher education sector, suggesting a definite need for interventions to foster more student engagement and satisfaction with the emerging learning experience (Almajali et al., 2022; Haider & Al-Salman, 2020; Canedo, 2017).

Although online courses represent a good business opportunity for many education institutions all over the world, the problem remains with electronic education mechanisms. Students complain about being bored in online class or while studying and the e-learning courses still report substantial dropout rates (Tze, 2016). To this extent, Isaías, et al. (2020, P. 834) pointed out that "reducing the dropout rates in e-learning is a complex endeavor that requires multiple approaches to address the various factors causing it". Researchers and practitioners are striving to find solutions to keep students more engaged and satisfied

with the e-learning process (Ramadan, 2020). One way to make this possible is to link gamification to learning (Seaborn, et al., 2015). Isaías et al. (2020) recommend further research to measure students' satisfaction and engagement that can be undertaken to evaluate the students' perceptions of benefits of incorporating games into the e-learning process and their potential influence the academic performance of students.

Adam (2017) shows the importance of integrating gamification into e-learning. That is, students may become more motivated to participate, collaborate and engage with academic content, leading to better knowledge absorption and skills' acquisition. In this venue, students are increasingly spending a substantial amount of time and money on gaming, resulting in a substantial growth of the gamification industry, estimated to reach 30.7 billion USD by 2025 (Markets and Markets, 2020). Interestingly "Gamification" is a powerful tool to attract students and draw attention. A good gamification educational project can produce a very attractive educational experience (Freitas el al., 2017; Masadeh et al., 2022).

Accordingly, this research is intended to examine how gamification in e-learning can enhance students' engagement and therefore their satisfaction with e-learning in Jordanian private universities. To this end, three gamification dimensions were particularly examined in this study including game mechanic, game dynamics and aesthetics.

2. Conceptual Foundation and Hypotheses Formulation

2.1 Gamification and student satisfaction

The term "Gamification" is generally referred to using game mechanics to encourage users engagement and enhance problem solving (Isaías et al., 2020), and to utilize design essentials in non-game contexts to make non-game contexts more game-like (Deterding et al., 2011; Sailer et al., 2017). Among the most common underpinning theories provided to understand gamification is the MDA framework, which introduces game design as a three components model involving; mechanic; dynamics; and aesthetics (e.g. Kusuma et al., 2018; Majali et al., 2022; Zichermann & Cunningham, 2011). In this research and in accordance with the MDA model, three dimensions were considered to assess the use of games in e-learning including game mechanics, game dynamics, and aesthetics/emotions. Game Mechanics on one hand is mainly related to the rules (i.e., points, levels and badges) a player follows in the game and how they interact with (Grünberg, 2014). Whereas "Game Dynamics" refer to how the game and the players interact with the game mechanics and with the other players (i.e. rewards, status and achievements) (Ramadan, 2020). "Aesthetics" on the other hand, are the players' affective status resulting from their interaction with game mechanics, which in turn leads to specific appealing experience (Al-Hammouri et al., 2022; Nusairat et al., 2020; Ramadan, 2020; Scholtz, et al., 2016). The dynamic nature of the MDA model in game systems lends e-learning activities greater fun, more engagement and satisfaction (Kusuma et al., 2018). Students should feel positive and get a more satisfactory learning experience (Handayani, 2021; Hakulinen et al., 2015; Nusairat et al., 2023; Ramdan, 2020). Accordingly, we hypothesize that:

H1: *There is a statistically significant positive effect for e-learning gamification on students' e-learning satisfaction in Jordanian private universities.*

2.2 Student Engagement

In educational contexts, particularly in online or blended learning environments, a student's engagement can be either interacting or inspiring by nature. Interactional engagement on one hand encompasses a wide variety of observable indicators such as how many students are engaged in online class discussions, how much time they spend on e-learning, and how many posts they make. Inspiring engagement on the other hand is related to students' sentimental interaction, interest, enjoyment, willingness and motivation towards the learning process and the learning environment (Al-Bashayreh et al., 2022; Garcia-Cabot et al., 2020). Extant literature shows the significance of gamification aspects to raise attention, interest, investment, and effort students spend in the work of learning and interacting with others (Appleton et al., 2008). For instance, Denny (2013) showed that the gamified online discussion tool) had positive influence on student behavioral, emotional, and cognitive engagement. Empirical evidence indicates that the use of game mechanics encourages students to engage further with more difficult tasks (Hew et al., 2016), and to fulfill students psychologically in terms of autonomy, competence, and relatedness, so that raising their engagement (Suh et al., 2018). Gray and DiLoreto (2016) reported that students are more likely to be satisfied with courses offering more opportunities to interact with each other and their instructors. Accordingly, the following hypotheses were proposed:

H2: *There is a statistically significant positive effect for e-learning gamification on students' e-learning engagement in Jordanian private universities.*
H3: *There is a significant positive effect for students' e-learning engagement on their e-learning satisfaction in Jordanian private universities.*
H4: *The relationship between gamification and students' e-learning satisfaction is mediated by students' e-learning engagement in Jordanian private universities.*
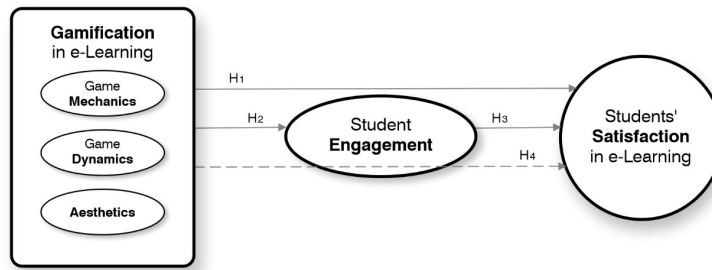
Fig. 1. Research Conceptual Model

3. Methodology

A dataset comprising 198 valid questionnaires was utilized to validate the research model and test hypotheses. These questionnaires were gathered from a convenient sample of university students through a self-administered survey. To capture the research constructs, well-established measurements that had been validated in previous studies were employed. Both first order and second-order reflective measurements were utilized. In assessing gamification, we focused on first-order variables related to "Game Mechanics", which were gauged using three items borrowed from Hew et al. (2016). "Game Dynamics" were measured using three items adapted from Suh et al. (2015), and "Aesthetics" were operationalized using three statements adapted from Scholtz et al. (2016). Student engagement and student satisfaction were examined as first-order variables, and their measurements were adapted from Garcia-Cabot et al. (2020) and Velaora et al. (2022), respectively. All measurement items were evaluated using a five-point Likert scale. Before collecting data, the research questionnaire was translated into Arabic using the back-translation technique. Subsequently, it underwent a thorough review by a panel of specialized academics and field experts, and its reliability was tested. The results of validity and reliability tests confirmed the validity and reliability of the measures. The primary data analysis was conducted using Smart PLS, with the initial validation of a conceptual model and subsequent utilization of a structural model to examine direct and indirect effects among the variables

4. Analysis and Results

4.1 Measurement model

The study is based on a dataset consisting of 198 valid questionnaires, focusing on three primary variables: gamification, student engagement, and student satisfaction. Additionally, three dimensions were examined to assess gratifications; game mechanics, game dynamics, and aesthetics. All these variables utilize reflective measurements, falling under the reflective-reflexive category. In accordance with Hair et al.'s (2014) recommendations for achieving a more economical and interpretable PLS path model, a second-order approach was adopted to reduce the number of relationships and hypotheses to be tested in the structural model. This approach followed a two-stage procedure, as outlined by Becker et al. (2012). In the first stage, the repeated indicator approach was employed, resulting in the collection of first-order scores for first-order constructs. In the second stage, the weighting of the first-order variables was used to calculate the second-order construct's composite reliability (CR) and average variance extracted (AVE). To assess the measurement model, convergent validity and discriminant validity were evaluated. Convergent validity was examined through an analysis of composite reliability, average variance extracted (AVE), and factor loadings. As shown in Fig. 1 and Table 1, the results demonstrated that each item's loading was above 0.5; AVE scores were above 0.5 and CR figures exceeded 0.7.

Table 1
Measurement model indicators

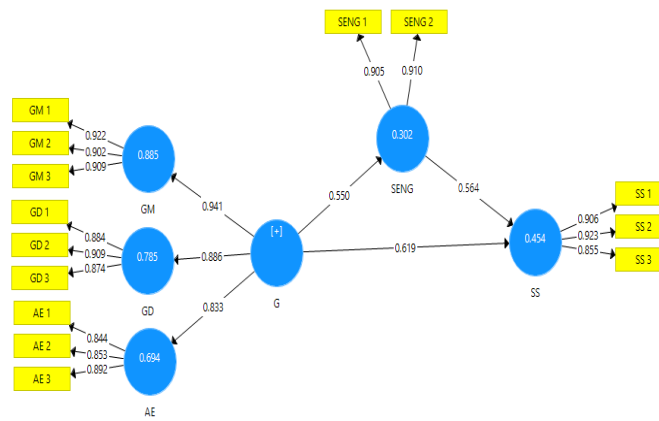| First order variables	Items	Loading values	CR	AVE
GM	GM 1	0.922	0.874	0.634
	GM 2	0.902		
	GM 3	0.909		
GD	GD 1	0.894	0.833	0.626
	GD 2	0.909		
	GD 3	0.874		
AE	AE1	0.844	0.881	0.650
	AE 2	0.853		
	AE 3	0.892		
SENG	SENG 1	0. 905	0.944	0.849
	SENG 2	0.910		
SS	SS 1	0.906	0.940	0.759
	SS 2	0.923		
	SS 3	0.855		
Second order constructs				
G	GM	0.941	0.798	0.580
	GD	0.886		
	AE	0.833		

Fig. 2. Measurement Model

The model's discriminant validity is established based on HTMT values which was below the cutoff point of 0.90 as suggested by Henseler et al. (2015), and ranged between 0.325 to 0.887, as shown in Table 2, suggesting that the latent construct measurements were sufficiently discriminate against each other.

Table 2
Discriminate validity (HTMT)

	G	GM	GD	AE	SENG	SS
G						
GM	0.887					
GD	0.681	0.721				
AE	0.359	0.556	0.846			
SENG	0.345	0.543	0.755	0.442		
SS	0.833	0.743	0.743	0.356	0.325	

After conducting an analysis of convergent validity (as shown in Table 1) and discriminant validity (as presented in Table 2) for the measurement model, it is evident that the measurement scale utilized for assessing the constructs and their respective items in the CFA model was not only suitable but also precise.

4.2 Direct effects

Direct effects of the IV on both the MV and DV were reported based on the structural model (Fig. 3) results as shown in Table 3.
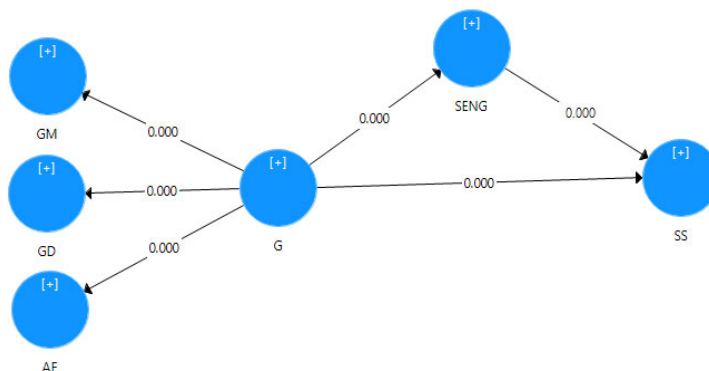

Fig. 3. Structural model

Table 3
Hypothesized Direct Effects Structural Model

Path	St, β	St. d	R^2	Q^2	F^2	VIF	T-value	P-value
G → SS	0.619	0.155	0.302	0.301	0.239	1.612	3.993	0.000
G→ SENG	0.550	0.163			0.231	1.856	3.374	0.000
SENG→SS	0.564	0,090	0.454		0.612	1	6.266	0.000

As can be noticed in Table 3, the scores of R^2 for SENG, SS were 0.302 and 0.454 respectively. This indicates for example that, 45.4 percent of variations in SS is interpreted by its factors (G, SENG) and 30.2 percent of variations in SENG is explained by its predictors (G), Accordingly the R^2 values satisfy the requirement for the 0.19 cut off. The value of Q^2 for SS was 0.301 far greater than zero which refers to predictive relevance of the model, the model exhibits an acceptable fit and high predictive relevance. While the VIF values were 1.612, 1.856, and 1, which were less than 5 as suggested by Hair (2014). Further in the prediction SS, the p-values of G, SENG were 0.000, 0.000 respectively, also in predicting SENG, the p-value of G was 0.000. This indicates that the likelihoods of achieving through absolute p-value are 0.01 and 0.05, suggesting a support for H1, H2, and H3.

4.3 Indirect effect

The result of indirect relationship among the research variables is shown in Table 4

Table 4
Results Mediation Effect

Path	St. β	St. d	T values	2.50%	97.50%	p-values
G→ SENG→ SS	0.230	0.115	3.621	0.043	0.423	0.020

As demonstrated in Table 4 above, the result of Bootstrapping revealed that the indirect path G on SS through SENG was positive and significant at a statistical significance level of 0.05 level: β = 0.230, T-value = 3.621, P-value = 0.020. The indirect effect of Boot Bias was Correct, where it did not straddle a 0 in between, suggesting a mediating role of SENG on the relationship between G and SS. (Preacher and Hayes, 2008); LL = 0.423, UL = 0.423. The results indicated that the mediation effect was statistically significant, thus, hypothesis H4 was supported.

5. Discussion, Conclusion, and Implications

The purpose of this study was to examine the impact of game-based e-learning on satisfaction with the e-learning experience among private universities' students in Jordan, while considering the mediating effect of their level of engagement. Research hypotheses were tested using AMOS 23. The findings showed support for all hypotheses. Regarding the first hypothesis (H1) which examined how the e-learning gamification dimensions (game mechanics, game dynamics and aesthetics) may affect students' e-learning satisfaction, the direct path hypothesis testing results showed that the e-learning gamification dimensions had a positive influence on students' e-learning satisfaction. This is in line with other empirical studies' findings, which demonstrated that e-learning gamification such as game mechanics (Robson et al., 2015; Hew, et al., (2016) and game dynamics (Robson et al., 2015; Suh et al., 2018; Alabbasi, 2018) and aesthetics (Robson et al., 2015; Kamunya et al., 2019) were all significant in predicting student satisfaction. The findings reported here also revealed a support for the gamification-student engagement relationship. This came consistent with the findings of Denny (2013) and Denny et al., (2018), who pointed out that e-learning gamification had positive influence on student behavioral engagement, emotional engagement, and cognitive engagement. Moreover, several research studies revealed consistent evidence where e-learning gamification was found to raise the level of students' engagement (Gray & DiLoreto, 2016; Garcia-Cabot et al., 2020; Hammouri et al., 2020; Hew et al., 2016; Kamunya et al., 2019; Rahman et al., 2018; Isaías et al., 2020; Suh, et al., 2018).

Additionally, the findings point to a notable positive influence for students' e-learning engagement on student satisfaction and as a mediating variable linking gamification to satisfaction as tested in H3 and H4 respectively. This provides support for the findings of Suh et al. (2018) who showed that students' e-learning engagement is positively linked to students' e-learning satisfaction. Finally, the mediating impact for students' e-learning engagement on the relationship between gamification and student satisfaction was also verified, lending support for the fourth hypothesis (H4).

In conclusion, the findings shown in this study highlight the significance of gamification in predicting students' satisfaction in Jordanian private universities, and the study also discovered that the students' e-learning engagement played a mediating role on the relationship between gamification and students' e-learning satisfaction. The implications of this research are significant and insightful to educational institutions, particularly those adopting e-learning techniques. Gamification appears to be an effective strategy for increasing student engagement and satisfaction, which can ultimately result in better learning outcomes. By leveraging the motivational aspects of games, educators can potentially create more enjoyable and interactive e-learning environments that foster students' interest and active participation in their studies. Accordingly, higher educational institutions must place more emphasis on integrating e-learning gamification as a mechanism to enrich student experience, while reducing student dropout rates in e-learning classes. Gamification can be absolutely of the options universities may have in their toolbox to survive and to thrive in the fiercely competitive sector, especially in the digital era and considering the significant changes brought about by the COVID-19 pandemic.

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