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Assessing the Effects of Flow, Social Interaction, and Engagement on Students' Gamified Learning: A Mediation Analysis

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Abstract: The positive impact of gamification on student learning has been empirically asserted, and previous studies have identified engagement as crucial for the effects. However, what causal mechanisms render the gamification effects still needs further exploration. We incorporated psychological and social factors to examine how they affect students' perceived learning through engagement in a mediation model. The flow antecedents (perceived challenge of gamification and skill) and social interaction (peer interaction and social influence) were indicators of psychological and social factors, respectively. A survey was conducted to collect data from 250 college students in Taiwan. The PLC-SEM results indicate that the effects of perceived challenge and peer interaction on student learning were mediated by engagement. In addition, the impact of students' perceptions of their skills was partially mediated by engagement. Both engagement and social influence exerted a direct effect on student learning. Among the predictors, engagement was the most influential factor for students' gamified learning and had the highest performance volume. Based on the results, we suggest advancing flow antecedents and social interaction to sustain students' gamified learning.

Keywords: gamification; gamified learning; flow; engagement; social interaction

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1. Introduction

Gamification has been applied in many fields. It has gained widespread recognition [1] and remarkably increased its usage in education in the last decade [2]. Amidst the COVID-19 pandemic, online teaching has become a significant teaching method. Applying gamification in online learning enhances students' social support and learning outcomes [3,4]. However, in the educational sector, gamification is a relatively new term. It refers to an educational approach that includes game elements in a non-game context to motivate individuals and acquire desired outcomes [5–7].

Based on constructivist learning, gamification involves experiential learning, which renders that students interact with the environment and peers [8]. In recent years, a notable amount of researchers' attention has been on gamification, with education as one of the top fields [9,10]. Numerous studies have investigated the effects of gamification, revealing that the gamified settings contribute to learners' flow [2], motivation [10], engagement [11], interaction, collaboration [12], and performance [13]. Furthermore, some studies suggested a positive linkage between flow antecedents (challenge and skill) and engagement. When facing challenges, students are more engaged [14,15], and their perceptions of skill and competence determine motivation [16]. In addition, students in collaborative settings have opportunities to work as a team, feel peer support and stimulate their competence [17]; therefore, social interaction is crucial in learning outcomes [10]. Engagement in the game also positively affects learning; it is a precondition for gamification to exert its effect on learning [18]. Although a large body of literature has unfolded the gamification effects, there is scarce research to discover their associations. The pathways from one to the other await more explorations.

To unravel the causal linkages of drivers for student learning in the gamified setting, we incorporated the psychological factors (flow antecedents and engagement) and social factors (peer interaction and social influence) to assess how they predict students' perceived learning. We collected data from college students and conducted a mediation analysis to examine the direct and indirect effects. The findings of this study will be helpful for instructional designers and teachers to use game-based learning to promote students' motivation and performance.

2. Literature Review

2.1. Gamified Learning

In recent years, gamification has been widely welcomed in various fields. As Deterding et al. (2011) described, gamification is "the usage of game design principles in non-gaming contexts" (p. 10, [19]). However, other authors, such as Werbach (2014), redefined gamification as "the process of making activities more game-like" (p. 266, [20]). For years, there have been endeavors to combine the selection, use, implementation, and integration of game features to enhance the user experience and make it closer to an enjoyable and fascinating gameplay experience. For example, Chou (2019) [21] proposed the Octalysis framework. It has a shape like an octagon; each side represents a core drive. There are eight core drives in the Octalysis framework: (1) Epic Meaning & Calling, (2) Development & Accomplishment, (3) Creativity & Feedback Empowerment, (4) Ownership & Possession, (5) Social Influence & Relatedness, (6) Scarcity & Impatience, (7) Unpredictability & Curiosity, and (8) Loss & Avoidance. A number of game strategies or elements within each core correspond to each drive. For example, there are designs of points, badges, leaderboards, rewards, and progress bars for the core drive of achievement. The features are used to increase players' extrinsic motivation.

In a growing body of gamification research, the education field has become one of the central contexts for applying and investigating gamification [22]. Numerous studies have revealed that gamification positively affects learning effectiveness and motivation [10]. Also, other factors contribute to student learning. The mind flow and social interaction were positive drivers for students' engaging in gamification activities [1]. When students have a high level of participation, their learning effectiveness is enhanced [23]. Nevertheless, some findings have suggested adverse effects [24]. Since learners experience a complex learning process in the gamification environment, it needs more exploration to understand influential factors and the causal mechanism. The efforts may include the evaluation and analysis of learning processes [9], the application of theoretical frameworks for gamification design [24], and the advancement of methodological rigor [25]. In this study, we are interested in the psychological and social mechanisms for students' gamified learning.

2.2. Flow

The flow theory, first proposed by Csikszentmihalyi (1975), discusses the concept of flow experience, also known as an immersion experience and mind-flow experience [26]. Flow refers to users entering a common mode of experience when fully engaged in their activity [27]. This mode is characterized by narrowing the focus of consciousness so that irrelevant perceptual thoughts are filtered out. In a state of flow, the user is responsive only to a specific target and in control of the environment. This flow experience allows people to be completely immersed in an activity, ignoring the presence of other objects. The flow experience positively affects the users' intention to use [28] and their learning [14].

In addition to the flow state, the concept of flow also subsumes another aspect. Kiili (2006) proposed two dimensions of flow: flow antecedents and the flow state. In the gamification literature, the game's challenge and the player's skills are two frequently discussed constructs. They are the components of flow antecedents [29]. The balance of challenges and skills is a prerequisite for achieving a flow state [14,24,30]. Studies have depicted that the higher the challenges, the more anxious users will feel; the higher the skills, the more bored users will feel [30,31]. Once challenges and skills are balanced, the ego moves to a higher and more complex level and achieves self-growth [26]. In order to explore the psychological factors influencing students' gamified learning, we used perceived game challenge and skill as two indicators of flow antecedents.

2.3. Social Interaction

Social influence and peer interaction can facilitate student learning in gamified activities to enhance motivation and fun [10]. Also, abundant studies have shown that social influence and peer interaction are effective in helping students increase their engagement [32] and further improve learning outcomes [10,33]. Social influence refers to a sense of relatedness. Individuals, when experiencing relatedness, may elevate their intrinsic motivation toward engaging in activities; they are also more willing to use the system in an information technology context [34,35]. Similarly, peers play a supporting role in learning. As students have influential peers to encourage them to try, they will feel more comfortable with gamified learning, which is conducive to interacting with others, and more confident in the group [36].

2.4. Relationships among Flow, Engagement, Social Interaction, and Perceived Learning

Gamified learning effectively impacts students at any educational level. It increases students' interest and improves their perceived learning acquisition [14]. In gamification settings, the flow (challenges and skills) and social interaction (social influence and peer interaction) have a direct effect on the acquisition of knowledge [14,37]. A similar finding was also proposed. The more familiar students are, the more they can improve their learning performance [38]. Along the same line, Özhan and Kocadere (2020) [39] have unfolded a favorable link between flow and learning.

Engagement is another significant construct explored in gamified learning. It indicates the amount of time and effort students invest in educationally purposeful activities, such as connecting with their peers and instructors and participating in active and collaborative learning activities [40]. A gamification environment can encourage learning and boost engagement [41]. The effective enhancement of user engagement exists no matter in business, marketing, or education [42]. Regarding the factors affecting engagement, studies contended that flow exerts a positive effect [15,43,44], and so does social interaction [1]. In addition, students engaging in competitively challenging instructional activities that either generate pleasure or increase psychological feelings of winning would increase their engagement and enhance learning outcomes [45]. This study defined engagement as a higher-up construct of interest, enjoyment, and concentration. We used Hamari et al.'s (2016) study as a reference to develop the engagement scale [14].

Based on the review of previous literature, we found that few studies have applied structural equation models to investigate the interdependencies of psychological and social factors (i.e., flow antecedents, engagement, and social interaction) and the pathways for predicting students' perceived learning. Furthermore, most studies centered on the connection between game features and learning [9,24]. The lack of research evaluating the causal mechanism for gamified learning triggers this study. Therefore, we conducted a mediation model analysis to explore how the flow antecedents and social interaction affect students' gamified learning through engagement. Our conceptual framework for relationships among variables is shown in Figure 1. The research questions addressed are:

1. What are the associations between perceived challenge and skill?
2. What are the associations between peer interaction and social influence?
3. What are the effects of flow antecedents (perceived challenge and skill) on engagement and perceived learning?
4. What are the effects of social interaction (peer interaction and social influence) on engagement and perceived learning?

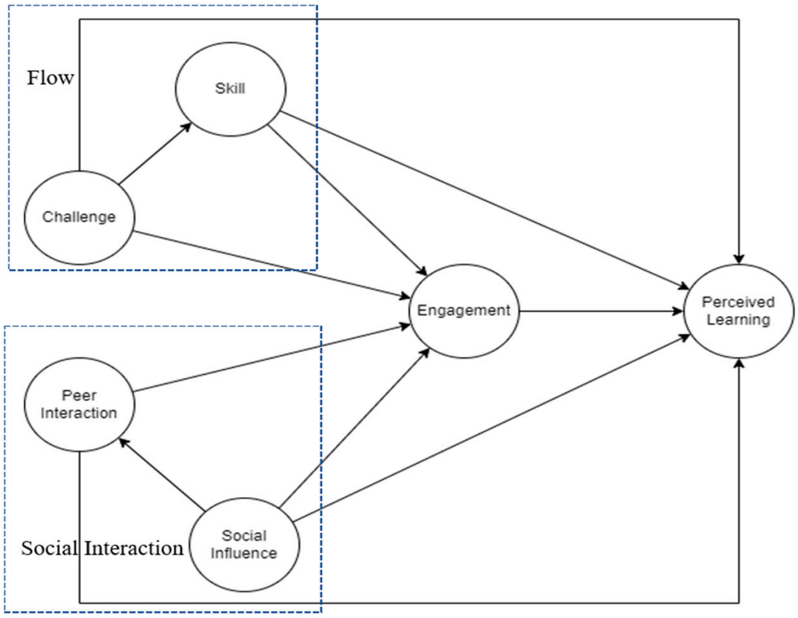

Figure 1. The conceptual framework for relationships among variables.

3. Methodology

3.1. Participants and Procedures

We conducted a survey to investigate the factors influencing students' perceived learning about gamification activities. A purposive sampling method was used to ensure that the participants in this study had been exposed to the gamified learning model. Two hundred and eighty undergraduate and graduate students in one university who took the "Human Resource Development" course were recruited. From 1 March to 30 April 2022, we sent out anonymous online questionnaires to all the participants, and 250 were returned. The 250 respondents included 75 males and 175 females; 57 first-year students, 12 sophomores, 118 juniors, 33 seniors, and 30 master students (See Table 1).

Table 1. Descriptive statistics.

Grade Level	Female	Male	Total
first-year students	36	21	57
sophomores	9	3	12
juniors	88	30	118
seniors	23	10	33
master students	19	11	30
Total	175	75	250

The participants in 2019 took the course mentioned above that contained game design elements. In the course, students learned about human resource development concepts, such as needs analysis, job competency analysis, training and development, and team leadership through online games and board games. The gamified learning activities included the game elements: points, levels, a progress bar, a leaderboard, avatars, badges, and feedback.

3.2. Instruments

Based on Hamari et al. (2016) [14] and Huang et al. (2019) [43], we designed the scales to measure participants' subjective experience of challenge, skill, engagement, social influence, peer interaction, and perceived learning. Perceived learning refers to the learning outcome in this course. There were 24 items designed with a five-point Likert scale and three questions of demographic information (i.e., college, gender, and grade).

The study invited experts to conduct a validity analysis and collected one hundred questionnaires for the pilot test from 1 October to 30 November 2021. In the exploratory factor analysis, we confirmed that the KMO and Bartlett's tests were significant, then proceeded to the factor analysis. We deleted the question items with a factor loading value less than the recommended value of 0.5. There were six factors extracted after using the maximum likelihood extraction method and oblimin rotation approach: social influence, peer interaction, skill, challenge, engagement, and perceived learning. The explanation of the total variance was 68.94%. Finally, 16 questions were retained (as shown in the Appendix A Table A1). Additionally, the overall reliability of the questionnaire is above 0.9 ($\alpha = 0.944$), which is above the suggested value of 0.7 for good reliability [46].

3.3. Analysis Strategies

This study used Smart PLS 4.0 software to perform the Partial Least Square-Structural Equation Module (PLS-SEM). Unlike the covariance-based SEM, PLS-SEM is a method based on the regression-based ordinary least square. It is used to predict or explain the target structure and is appropriate for an exploratory study with more requirements of complex model validation. Moreover, it is mainly designed to detect whether the causal relationships are significant. Adopting PLS-SEM, we analyzed the direct and indirect effects of flow antecedents (perceived challenge and skill), peer interaction (peer interaction and social influence), and engagement of college students' gamified learning.

4. Results

4.1. Measurement Model

In the confirmatory factor analysis (CFA), the composite reliability (CR) values in each scale ranged from 0.891 to 0.944. They were greater than the suggested value of 0.6 [47], indicating suitable internal consistency of the scales. In addition, the loading of each survey item exceeded the suggested value of 0.7 [48], and the average variance extracted (AVE) values ranged from 0.732 to 0.848, all above 0.5. An adequate convergence of the constructs was demonstrated [49] (See Table 2).

Table 2. Loading, composite reliability, convergent validity, and average variance extracted.

Componence	Items	Loading	Cronbach's Alpha	CR	AVE
Challenge	C1	0.871	0.760	0.891	0.804
	C2	0.922			
Skill	S1	0.886	0.870	0.920	0.793
	S2	0.897			
	S3	0.888			
Engagement	E1	0.935	0.911	0.944	0.848
	E2	0.907			
	E3	0.921			
Peer Interaction	PI1	0.925	0.816	0.916	0.844
	PI2	0.913			
Social Influence	SI1	0.880	0.820	0.891	0.732
	SI2	0.820			
	SI3	0.866			
Perceived Learning	PL1	0.921	0.904	0.940	0.840
	PL2	0.919			
	PL3	0.909			

According to the Fornell-Larcker criterion, the square root of a construct's AVE should be larger than the correlation between the construct and any other construct. Table 3 displays that the condition mentioned above is met. An additional method of the HTMT criterion was employed to assess the discriminant validity. All HTMT values were less than 0.9. The two methods have confirmed the discriminant validity of all the constructs measured in this study [49,50].

Table 3. Discriminant validity.

	Challenge	Skill	Engagement	Peer Interaction	Social Influence	Perceived Learning
Challenge	0.897					
Skill	0.601	0.890				
Engagement	0.640	0.584	0.921			
Peer Interaction	0.610	0.535	0.667	0.919		
Social Influence	0.659	0.584	0.593	0.592	0.856	
Perceived Learning	0.584	0.658	0.715	0.586	0.637	0.916

4.2. Structural Model

In the structural model, the direct path coefficients describe the relationships between the constructs. It showed an acceptable overall model fit (X^2/df = 2.146, RMSEA = 0.067, CFI = 0.965, SRMR = 0.039). A bootstrapping method by resampling the data 5000 times at a 95% confidence level was utilized to determine the importance of correlations and estimates. The findings were: (1) the students' perceived challenge accounted for 36.1% of the variance in perceived skill; (2) social influence accounted for 35.1% of the variance in peer interaction; (3) the perceived challenge, players' skills, and peer interaction accounted for 56.5% of the variance in engagement. Moreover, skill, engagement, and social influence accounted for 62.9% of the variance in perceived learning.

Figure 2 shows the path model's direct and indirect effects. Both hypotheses (H_2 and H_3) concerning the effects of the perceived challenge on skill and engagement were confirmed. The path coefficient of challenge-skill and challenge-engagement links were 0.601 *** and 0.233 **, respectively. However, the effect of challenge on perceived learning (H_1) was not supported. Regarding the impacts of skill, there were significant paths between skill and engagement (H_4: 0.182 **) as well as between skill and perceived learning (H_5: 0.279 ***). Skill was a mediator between challenge and engagement. Also, engagement acted as a mediator between skill and perceived learning. The engagement was affected by the perceived challenge of games directly and indirectly through skill.

The hypothesis (H_6) about peer interaction affecting engagement was supported. The path coefficient between peer interaction and engagement was 0.355 ***. However, the effect of peer interaction on perceived learning (H_7) was not supported. Regarding the impacts of social influence, there were significant correlations between social influence and peer interaction (H_8: 0.592 ***) as well as between social influence and perceived learning (H_{10}: 0.217 **). Nevertheless, there was no significant relationship between social influence and engagement (H9). Finally, the analysis supported the hypothesis that engagement positively affected perceived learning (H_{11}: 0.398 ***).

To examine the significance of the mediation effects, we used the bootstrapping method suggested by Hair et al. (2022) [49]. VAF is employed to assess the magnitude of the mediated effect. It is the ratio of the size of the indirect effect compared to the overall effect (indirect plus direct effect). The results are in Table 4. According to Hair et al. (2022) [49], VAF smaller than 20% means no mediation effect, between 20% and 80% for a partial mediation effect, and a full mediation effect for VAF greater than 80%. In this study, the values of VAF were 31.2% and 21.3%, indicating partial mediation effects (H_{12} and H_{15} were supported). Table 4 shows that students' control of the challenges influenced their perceived skills, then affected their engagement. In addition, the game's skill was influenced by engagement, which ultimately affected students' perceived learning. The findings suggest that taking the game's challenge and player's ability into account benefits students to effectively improve their engagement and perceived learning. Thus, instructional designers must think thoroughly about the relationship between these factors and find the best way.

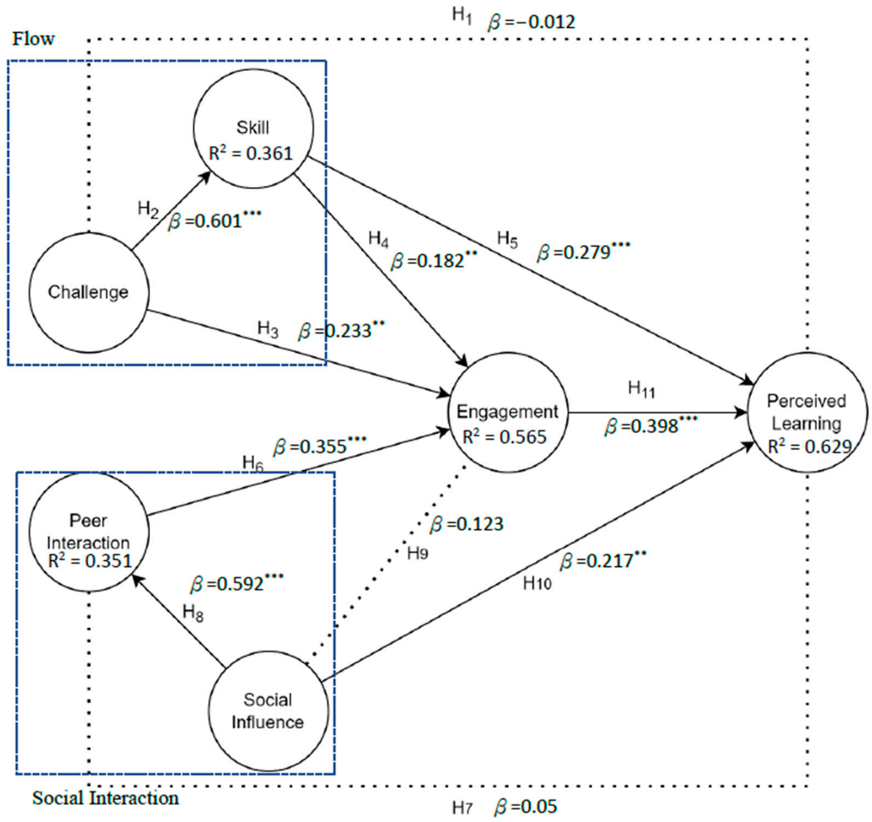

Figure 2. PLS-SEM model ** $p < 0.01$, *** $p < 0.001$.

Table 4. Mediation effect.

Independent Variables	Mediators	Dependent Variables	Direct Effect	Indirect Effect	Total Effect	VAF	Hypotheses
Challenge	Skill	Engagement	0.280	0.127	0.407	31.2%	Yes
Skill	Engagement	Perceived Learning	0.283	0.088	0.371	23.7%	Yes

4.3. Importance-Performance Map Analysis

Importance-performance map analysis (IPMA) provides additional information about PLS-SEM results. The standard PLS-SEM analyses report the relative importance of constructs determined by the total effects. IPMA considers the average values of latent variable scores to present the performance of each construct. In other words, the IPMA offers information about each predecessor constructor's total effect (importance) on the target construct. Meanwhile, it gives information on performance assessed by average latent variable scores [51]. In this study, perceived learning was our target construct. Figure 2. PLS-SEM model * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. displays the scores of importance and performance for each predecessor construct. Performance scoring is from 0 to 100: the greater the value, the better the variable's performance.

The IMPA results in Figure 3 demonstrate that students' perceived learning was most related to engagement and had the highest effect. In other words, in gamified learning, student engagement is the most critical factor to consider if the perceived learning level is to be enhanced. Social influence is the second most crucial factor. The third one is the perceived skill. Although skill was ranked third, its low performance signals that students might be unfamiliar with the game and lack the necessary playing skills. Therefore, helping students have a certain degree of familiarity with the game's operations deserves instructors' attention. The fourth most essential factor is the perceived challenge, which had the lowest performance. The challenge is hard to plan and balance, maintained by relevant studies on mind flow [31]. Finally, peer interaction is the least relevant factor, but with relatively good performance. The analysis of IPMA sketches a picture regarding the contrast between the importance and performance of each construct. In this study, we found engagement was the one with the highest importance and performance.

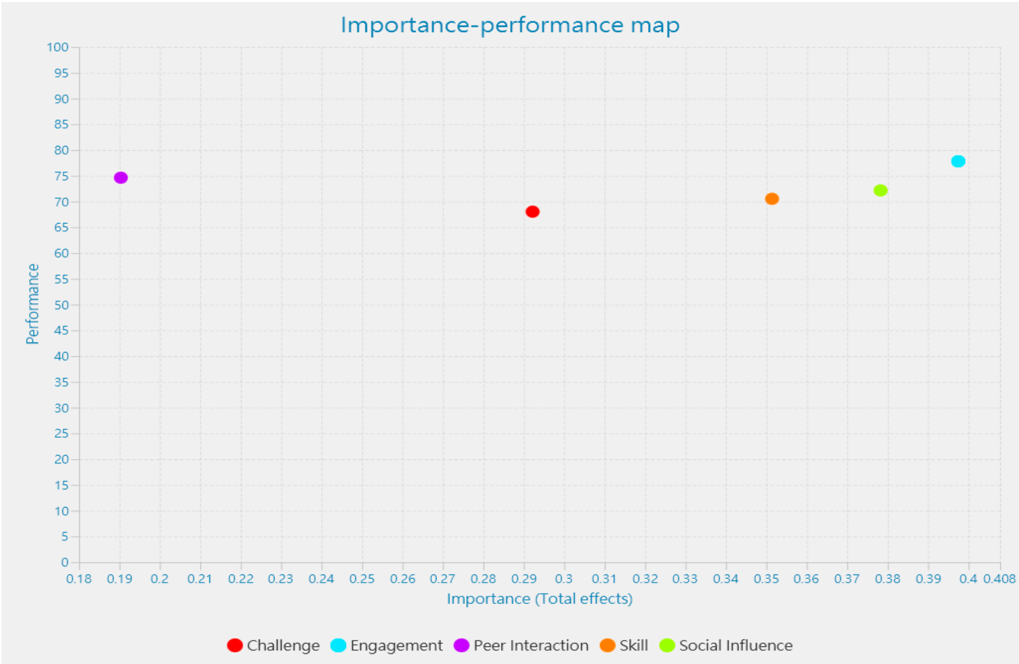

Figure 3. IMPA analysis.

5. Discussion

Previous studies contend that the flow experience, social interaction, and engagement benefit student learning in gamified settings [14,39]. However, rare research touches on the relationships among the predecessor factors. This study incorporated psychological (flow antecedents-perceived challenge and skill of gamification) and social factors (social interaction-peer interaction and social influence) to disentangle the causal linkages of the relevant predictors for students' gamified learning. A PLS-SEM was conducted, using engagement as a mediator. Several noteworthy findings are discussed as follows.

First, regarding the flow antecedents, the perceived game's challenge enacted its impact on students' gamified learning through engagement, while players' perceptions of their skills had both direct and indirect effects. In other words, the game's challenge could not directly influence players' gamified learning. Its effect, instead, must be through engagement. As the literature asserts, challenging tasks arouse students' motivation to conquer problems, which is conducive to their concentration on learning [15,43]. However, the challenge does not always result in positive learning outcomes. When players face a highly challenging game that requires abilities beyond what they can afford, frustrations or the intention to give up will occur. In contrast, when players can control the game, their engagement will be boosted, and their performance will also be improved. Balancing challenge and skill have been discussed extensively in the literature; it is crucial to creating the flow state [2,14,24]. A state of flow refers to students focusing on intrinsically interesting activities and having elevated enjoyment [14,24,27,30]. Achieving the state of flow could not merely count on the challenging gamified activities. Our study particularly proposes that the perceived challenge of games does not alone bring about desirable cognitive outcomes. Nevertheless, skill plays a direct influential role.

Second, for the factors of social interaction, we found that peer interaction only exerted an indirect effect on perceived learning, unlike social influence with a direct impact. In the game settings, students have chances to discuss with peers and work collaboratively [10,36].

Through peer support, students enhanced their engagement. However, the interactions were not intellectually sufficient to stimulate their learning. Although prior studies argued that collaborations advance competence [17], our study reveals that the quality of peer interaction might determine its strength of influence. Moreover, as a sense of relatedness, social influence was found to benefit people's willingness to use gamification services [34]. Connecting with others is a psychological need. By relating to others, users in the information technology context reinforce their willingness to use the system [35]. This study further suggests that the participants, influenced by peers, teachers, or knowledgeable others to engage in gamification, enhance their learning performance.

Third, there were three predictors significantly associated with engagement: perceived challenge, skill, and group interaction. Players' perceptions of challenges do not necessarily bring about positive learning outcomes but elevate one's concentration. Prior literature contended that players' self-perceived skills [15,43] and group interaction [32] contribute to engagement, and this study provides additional confirmation. Among the three factors, peer interaction had the highest effect on engagement.

Finally, based on the IMPA results, engagement had the greatest importance for students' perceived learning, followed by social influence, skill, challenge, and peer interaction. Several studies argued that engagement is the most critical factor in gamification [1,52]. Social influence in this study, reflecting people's relatedness, also had a high degree of contribution. Moreover, engagement owned the highest magnitude of performance among the predecessor factors. It was the most notable driver for student learning outcomes. Other factors ranked by the performance volume were peer interaction, social influence, skill, and challenge. In sum, engagement and social influence both had a greater extent of importance and performance, whereas a relatively moderate extent for skill and challenge. Unlike the four variables mentioned above, peer interaction had high performance but low importance. Although Thiebes et al. (2014) [36] argued that peer-to-peer interactions are beneficial to participants' immersion in the activity, the quality of interactions influences its strength of effect on cognitive learning. It explains why students in our study did not significantly improve their learning outcomes even though they had frequent peer interactions.

6. Conclusions and Implications

Research on how gamification can be used to promote perceived learning is still in its initial stage. This study developed a gamified learning model to explore relevant psychological (flow antecedents-perceived challenge and skill) and social factors (social interaction-peer interaction and social influence) affecting perceived learning in higher education settings. By assessing the causal mechanism, this study found that the effects of perceived challenge and peer interaction on perceived learning outcomes were mediated by engagement. In addition, the impact of students' perceptions of their skills was partially mediated by engagement. Both engagement and social influence had a direct effect on student learning outcomes. Among the predictors, engagement was the most influential factor for students' gamified learning and had the highest performance volume.

There are two aspects of contributions that this study has made. First, from a theoretical perspective, the model presented in this study can help researchers and practitioners gain a preliminary understanding of the driving mechanism underlying cognitive learning strategies that connect learners' flow, social interactions, and gamified learning. It differs from past research, which merely focused on how mind flow or community interactions affect gamified cognitive learning. Incorporating psychological and social factors into account, we have proposed a more comprehensive model of gamified learning to identify the associations between the factors and the pathways of the connections. Second, from a pedagogical point of view, this study provides hints for implementing gamification activities. The instruction or training program can increase the challenge level of games to advance players' skill level but must attend to the balance of challenge and skill to maximize learners' engagement. Therefore, it is essential to consider students' game skills, the difficulty degree of games, and the interactivity of games in groups when planning game-based learning activities.

Despite our contributions, this study has its limitations, including only conducting the study in one university and centering on one flow aspect for inquiry. Acknowledging the limitations and based on the findings, we propose several suggestions for gamification teaching and future studies. First, the gamified learning design must be developmentally appropriate. It means that the challenge of games needs to match or appropriately above users' skill level. Too complex games would prohibit students' achievement of the flow state. Second, when students play gamification activities, some challenges might cause them to give up. The instructor can form several heterogeneous groups to facilitate student learning. By giving prompts and helping the groups to discuss with peers, the instructor can decrease students' frustrating experiences. Third, the instructor must communicate with each group to know their learning progress. Although gamification involves self-regulated learning, the instructor needs to guide the students to continue participating in the activities. Fourth, having students reflect on what was experienced and learned from the activities benefits their deepening learning. A peer-review process can also help students focus on the learning course content. Finally, there are some suggestions for future studies. Researchers may extend the gamification approach by integrating project-based learning into the course design. The approach can be applied in different courses to understand if differential effects exist, and a hierarchical modeling analysis might help illuminate the variations. Besides, since teaching is a context-based cultural activity, it is worth investigating gamification in different cultural contexts.

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Appendix A

Table A1. Questionnaire.

Factors	Item	Questions
Challenge	C1	Engaging in gamified learning is not a challenge for me
	C2	Gamified learning has not pushed my abilities to the limit
Skill	S1	I am familiar with the mechanisms of using gamified learning in the class
	S2	I am familiar with the procedures of using gamified learning in the class
	S3	Learning to use gamified learning is easy for me
Engagement	E1	I actively participate in gamified learning courses
	E2	I am willing to participate in teaching activities related to gamified learning
	E3	I enjoyed my participation in gamified learning
Peer interaction	PI1	Using gamified learning increases my interaction with my classmates
	PI2	When I use gamified learning, I actively build a network of classmates
Social influence	SI1	I am encouraged to participate in gamified learning by my teacher, peers, or classmates
	SI2	My teacher, peer, or classmate helps me engage in the gamified learning
	SI3	Some influential persons, such as the teacher or classmates, suggested I engage in gamified learning activities
Perceived learning	PL1	Gamified learning has helped me in my studies
	PL2	Using gamified learning allows me to learn the course content efficiently
	PL3	Using gamified learning improves my learning performance

The items were designed with a five-point Likert scale.

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