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The Influence of Gamification Elements in Educational Environments

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ABSTRACT

The use of gamification might offer a partial solution to the decline in students' motivation and engagement the school system is currently facing. Specifically, this study aimed to examine whether gamification elements (perceived collaboration, perceived competition, favorable feedback, unfavorable feedback, self-expression, sense of control) contribute to intrinsic learning motivation. A survey method was used to gather the information from students, and regression analysis was used to examine these results. The results indicated that perceived collaboration, perceived competition, favorable feedback, self-expression, and sense of control are key aspects that impact students' intrinsic motivation. Overall, the findings contribute to a better understanding of learning motivation for research theories and offer concrete suggestions for using gamification to improve teaching.

KEYWORDS

Competition, Favorable Feedback, Gamification, Intrinsic Learning Motivation, Perceived Collaboration

INTRODUCTION

In higher education, gamification has become increasingly popular due to its highly interactive nature over the last couple decades (Varannai et al., 2017; Xu et al., 2021). It has been found that gamification has a positive impact on students' motivation to learn. For example, Kingsley and Grabner-Hagen (2015) and Buckley and Doyle (2016) revealed that gamification teaching can foster students' creativity, communication, critical thinking, and other literacy and learning skills. In addition, university students' performance and motivation did improve after participating in courses with gamification elements (Domínguez et al., 2013). However, prior study found that gamified learning reduced students' intrinsic learning motivation at Midwestern university, since gamification elements convert intrinsic motivation to extrinsic motivation (Hanus & Fox, 2015). In fact, because of the limited number of empirical studies on gamification, many suffer from methodological shortcomings, such as the lack of comparison groups, the short study duration, and the lack of validated tests. In spite of the popularity of gamification, the effectiveness of various elements of gamification has not been sufficiently studied.

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In education, motivation is considered a key determinant of learning. The motivation is a set of principles that explain behavior initiation, disposition, intention, and persistence (Maehr & Meyer, 1997). Intrinsic motivation refers to the feelings of pleasure, interest, and satisfaction that accompany participation in activities for their own sake (Hanus & Fox, 2015). A teacher's role is to manage student motivation, which describes how much attention and effort students put into particular learning activities (Ortiz Rojas et al., 2017; Ryan & Rigby, 2019). According to previous study, the use of gamification encourages students to view progress as an achievement instead of focusing on performance based on extrinsic metrics (Xu et al., 2021). Researchers are developing gamification systems using game elements such as competition (Toda et al., 2019), immediate feedback (Sánchez-Carmona et al., 2017; Schöbel et al., 2020), and collaboration (Putz et al., 2020). Therefore, whether the intrinsic learning motivation can be stimulated from gamified learning and gamification element remains to be explored, which is also the main motivation of this study.

The purpose of this study was to systematic review on which gamification elements improve student behavior and attitude toward learning through intrinsic motivation. As gamification encompasses so many different game mechanics and applications, it is difficult to study every aspect of it. According to previous study, this study focused specifically on six gamification elements (perceived collaboration, perceived competition, favorable feedback, unfavorable feedback, the sense of control, and self-expression) that gives students more intrinsic learning motivation. Ultimately, it is useful for understanding the factors that stimulate their intrinsic motivation, while it is also beneficial for future related teaching design or an important part of improving students' learning effectiveness.

LITERATURE REVIEW

The purpose of gamification mechanism is to apply gamification elements to non-game environment, thereby increasing individuals' motivation and immersion of participants in the environment (Hanus & Fox, 2015; Xu et al., 2021). Efficient gamification is not just layering goals and rewards on top of content. It involves more than just points and badges; it consists of challenges and feedback, as well as high levels of interaction (Bovermann & Bastiaens, 2018). Thus, people play for mastery, to overcome challenges and to socialize with others (Jahn et al., 2021). In fact, gamification reshapes learning by allowing learners to establish and understand their own goals, redefining failure, and changing feedback to be frequent, detailed, and fair (Ortiz Rojas et al., 2017; Schöbel et al., 2020). For example, providing real-time feedback allows learners to adjust their actions accordingly, enabling them to try something new and challenging without feeling intimidated (Putz et al., 2020). As well as seeing that their efforts count, learners feel competent when they see that they are making progress (Toda et al., 2019).

Consequently, the gamification of learning is to increase student engagement by incorporating game design elements into learning environments (Ryan & Deci, 2020; Wee & Choong, 2019). The current study is an attempt to explore the relationships between perceived collaboration, perceived competition, favorable feedback, unfavorable feedback, the sense of control, self-expression, and intrinsic motivation for learning.

Perceived Collaboration

Perceived collaboration involves two or more individuals working together as a team to complete tasks and win the game, such as grouping students into groups (Putz et al., 2020; So & Brush, 2008) or sharing results among team members to improve results (Müller et al., 2015). Huang et al. (2011) and Toda et al. (2019) indicated perceived collaboration is an intrinsic to the task, because it refers to students' collaboration to accomplish a common goal. For example, students interact with each other and get to know each other better when they complete tasks together. The concept of groups and social networks generated by perceived collaboration can lead to an enhancement of students needs at the level of relatedness in the classroom (Suh et al., 2018). Students can use of collaborative

mechanisms to be more active in their learning process and to share their experiences in a game. This study suggested that the collaboration elements are positively related intrinsic learning motivation in the courses.

H1: Perceived collaboration elements are positively related to the extent of intrinsic motivation to learn.

Perceived Competition

Mesquita et al. (2013) defined perceived competition as the act of two or more individuals striving towards the same goal. Lee and Yang (2011) and Toda et al. (2019) argued that perceived competition refers primarily to the fact that a student must compete against another student in order to reach a certain goal, such as scoreboards, number of medals, and level mechanisms in a game. The competitive elements in gamified teaching can meet the needs of students' relatedness. Thus, compared to traditional courses, gamification in the classroom with competitive elements make students feel like they're playing games instead of just attending classes, and make them more eager to participate in class activities (Suh et al., 2018). Therefore, this study hypothesized that perceived competition elements are positively related intrinsic learning motivation in the courses.

H2: Perceived competition elements are positively related to the extent of intrinsic motivation to learn.

Favorable Feedback

Feedback aims to provide users with information about their performance, to make them aware of their own specific activities, progress, and failures (Jahn et al., 2021; Schöbel et al., 2020). For example, exams, papers, grades and other forms of feedback at school indicate whether a student has been successful or not. In gamification, the long-term goal of success is broken down into many smaller goals, giving students immediate feedback as they complete each step.

Buckley and Doyle (2016) emphasized that in a game with feedback mechanism, students receive notifications when they complete tasks or overcome difficulties. The favorable feedback informs students that they will be expected to exhibit or meet the goal of behavior (Steelman et al., 2004). Moreover, several studies have found that favorable feedback can stimulate individuals' motivation to pursue goals more than unfavorable feedback, thereby increasing the sense of their value and meeting their competence needs (Ryan & Rigby, 2019; Sánchez-Carmona et al., 2017). This kind of favorable feedback will help players form a higher sense of competence. Therefore, this study suggested that students in a gamified learning environment can arouse more intrinsic motivation to learn through favorable feedback elements.

H3: Favorable feedback elements are positively related to the extent of intrinsic motivation to learn.

Unfavorable Feedback

Unfavorable feedback is defined as messages about a student's recent performance not meeting expectations (Jahn et al., 2021; Podsakoff & Farh, 1989). In fact, unfavorable feedback is conceptualized as the perceived frequency of negative feedback such as expressions of dissatisfaction and criticism from supervisors and/or coworkers when from the feedback recipient's view, his or her performance warrants such feedback (Steelman et al., 2004). It has been demonstrated that feedback that is unfavorable impacts students' self-esteem in a subtle way, which affects their learning effectiveness and satisfaction in the classroom (Sánchez-Carmona et al., 2017; Steelman et al., 2004). If students are informed that their performance will not be as expected in gamified classroom, their intrinsic motivation to learn can be reduced. Therefore, this study proposed the following hypothesis:

H4: Unfavorable feedback elements are negatively related to the extent of intrinsic motivation to learn.

The Sense of Control

Jackson and Eklund (2012) indicated that the sense of control includes feeling confident against failure, feeling empowered over the task, and feeling positive about the task or activity that is performed. Past studies had shown that a sense of control enhances a person's autonomy and confidence. For example, Eisingerich et al. (2019) concluded that gamification element gives participants a sense of control over their personal conditions and enables them to achieve their desired state. In fact, Noe (1986) and Ortiz Rojas et al. (2017) indicated that learning motivation is the degree to which an individual desires to participate and learn from a particular activity. The sense of control can boost participants' self-confidence, strengthened their belief that they can make themselves healthier, and increase their behavioral motivation. Thus, this study suggested that if students can gain a sense of control in gamification courses, their intrinsic motivation to learn will be enhanced.

H5: Sense of control elements are positively related to the extent of intrinsic motivation to learn.

Self-Expression

An individual's self-expression refers to how they express their individuality and autonomy, which also defines their unique personalities (Hsu et al., 2009; Suh et al., 2018). Gee (2003) and Ma and Agarwal (2007) found that helping students to construct their self-expression in virtual situations can promote students' participation. Self-expression can enhance students' autonomy need by providing them with freedom of choice without restrictions, which can enhance their autonomy needs (Suh et al., 2018). For example, gamified courses can satisfy students' autonomy needs and encourage them to participate in activities because personal profiles function like virtual characters in a video game that allow them to freely express their strengths (Standage et al., 2005; Wee & Choong, 2019). This study hypothesized that if students have more opportunities to express themselves in gamification courses, it can enhance their intrinsic motivation to learn.

H6: Self-expression elements are positively related to the extent of intrinsic motivation to learn.

METHOD

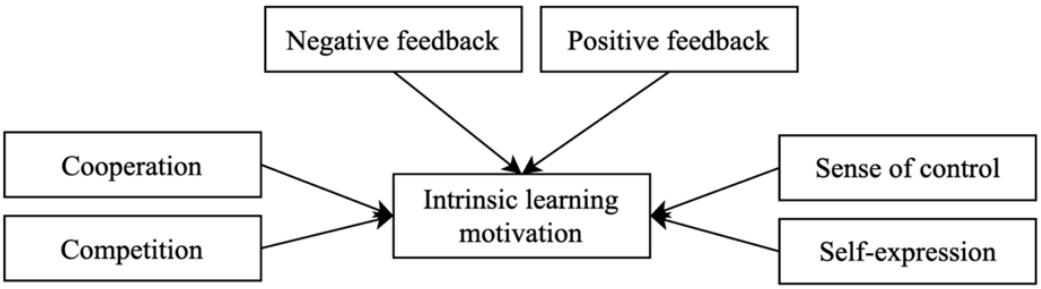
Research Model and Procedures

This study mainly explored the influence of gamification elements on students' intrinsic learning motivation. To validate the hypothesis, a survey instrument was used which consisted of 26 items that measured seven constructs in the questionnaire. To ensure content validity, items selected for the constructs were mainly adapted from prior studies. Data collection was accomplished through the use of an online questionnaire (Google forms were used in this study) designed to test the hypotheses. Participants were asked to recall a course with gamification mechanism (ex. Kahoot, Wordwall, Nearpod, and other resources that help learning in class) they have ever learned, then completed the questionnaire. The proposed research model relies on these hypotheses, as illustrated in Figure 1.

Measurements

All scales employed in this study were measured and modified from previous studies, and measured by 7-point Likert scale items with anchors ranging from strongly disagree (1) to strongly agree (7). Perceived collaboration was measured using the three-item scale established by So and Brush (2008) and Huang et al. (2011) (α=0.89). Perceived competition was mainly used the three-item established by Lee and Yang (2011) and Suh et al. (2018) (α=0.80). Favorable (α=0.85) and unfavorable (α=0.90)

Figure 1. The research model



feedback were used the seven-item established by (Steelman et al., 2004). The sense of control was adapted from Eisingerich et al. (2019) and measured by three-item (α=0.70). Self-expression was used the three-item established by Suh et al. (2018) and Ma and Agarwal (2007) (α=0.80). Moreover, this study modified the intrinsic motivation scale established by Standage et al. (2005) (α=0.89).

The survey items were pretested by a small number of teachers and experts and were modified to fit the educational context studied. This ensured all respondents understood the items and that they measured the relevant constructs. To assess the reliability of the measurement items, a test-retest reliability analysis was conducted before the formal experiment. The survey items are listed in Table 1.

Participants

This study utilizes convenience sampling to collect recent data by using online surveys, everyone who had the prior experience of gamified learning can participate in the survey. A total of 446 participants filled out the online questionnaires without compensation after one-month survey period, and excluded 12 respondents who did not complete the survey and 22 respondents who are not university students right now. Therefore, 412 questionnaires were helpful as they were filled correctly. Of the participants, 161 (39%) were male and 251 (61%) were female. They were on average 20 years old, with ages ranging from 18 to 22, and they came from different backgrounds, colleges, and ages, and were from multiple programs at different levels.

RESULTS

Convergent Validity and Reliability

The convergent validity of each item was tested by confirmatory factor analysis (CFA). The *t* values of all motive items were significant, and the average variance extracted was greater than 0.5 for every motive. The convergent validity was confirmed.

In order to assess the reliability of the questionnaire before conducting the final survey, 50 students were randomly selected from the target population. This study measured the internal reliability of constructs' items using Cronbach's alpha. Table 1 shows that all constructs' Cronbach's alpha values were greater than 0.7. Thus, all the constructs were reliable and can therefore be employed in the final study. Table 2 lists the correlations amount the study constructs, and ranged from .21 to .63.

Hypotheses Testing

A preliminary analysis showed that demographic variables were significantly correlated with the variables of interest. The effect sizes of the main effects are indicated by R^2, and the effect sizes of the interaction terms are indicated by $\triangle R^2$. These factors were considered as covariates in the following analysis. In the first regression model (M1), this study used demographic variables (sex, age and

Table 1. Measurement items and Cronbach's alpha

Construct	Code	Items	α	
Perceived Collaboration	PC1	I felt part of a learning community.	.89	(Huang, Chiu, Liu, & Chen, 2011; So & Brush, 2008)
	PC2	I was able to develop my collaboration skills.		
	PC3	I can share experiences or knowledge with my peers.		
	PC4	Overall, I am satisfied with my collaborative learning experience during the class.		
Perceived Competition	PCN1	I am facing intense competition.	.80	(Lee & Yang, 2011; Suh, Wagner, & Liu, 2018)
	PCN2	Activities of other participants are threats to my status.		
	PCN3	Competition among participants is fierce.		
Favorable Feedback	FF1	When I do a good job at school, my teacher praises my performance.	.85	(Steelman, Levy, & Snell, 2004)
	FF2	I seldom receive praise from my teacher.		
	FF3	My teacher generally lets me know when I do a good job.		
	PF4	I frequently receive positive feedback from my teacher.		
Unfavorable Feedback	UF1	When I don't meet deadlines, my teacher lets me know.	.90	(Steelman et al., 2004)
	UF2	My teacher tells me when my work performance does not meet class standards.		
	UF3	On those occasions when my work performance falls below what is expected, my teacher lets me know.		
	UF4	On those occasions when I make a mistake at school, my teacher tells me.		
Sense of Control	SC1	This class gives me a sense of control	.70	(Eisingerich, Marchand, Fritze, & Dong, 2019)
	SC2	The class makes me feel I am in charge of my own destiny		
	SC3	This class gives me the confidence that I can make a difference to my own health/dating success		
Self-expression	SE1	I express my emotions through the class.	.80	(Ma & Agarwal, 2007; Suh et al., 2018)
	SE2	I express my personality		
	SE3	I present myself in a way that I want to		
	SE4	I present myself in order to be distinguished from others		
Intrinsic Motivation	IM1	I take part in this class because the class is fun	.89	(Standage, Duda, & Ntoumanis, 2005)
	IM2	I take part in this class because I enjoy learning new skills.		
	IM3	I take part in this class because the class is exciting.		
	IM4	I take part in this class because of the enjoyment that I feel while learning new skills/techniques.		

education) as control variables to examine the relationship between control variables and intrinsic motivation to learn. The results demonstrated that control variables were no significantly related to intrinsic motivation to learn (see Table 3).

Second regression model (M2) tests the main effects of constructs. The independent variables are perceived collaboration, perceived competition, favorable feedback, unfavorable feedback, the sense of control, and self-expression. As the results showed in Table 3 (R^2 = .43, p < .01), both perceived collaboration (β= .35, p < .05) and competition (β= .15, p< .05) elements significantly affected students' intrinsic motivation, supporting H1 and H2 (see Table 3). Moreover, the results

Table 2. Correlations among the study constructs

	1	2	3	4	5	6
1. Perceived Collaboration	-					
2. Perceived Competition	.52	-				
3. Favorable Feedback	.63	.55	-			
4. Unfavorable Feedback	.35	.23	.46	-		
5. Sense of Control	.52	.45	.41	.21	-	
6. Self-expression	.34	.41	.41	.22	.56	-
7. Intrinsic Motivation	.56	.33	.24	.21	.46	.52

Table 3. The regression models

	M1	*M2*
Control step		
Sex	.05	.00
Age	.01	.00
Education	.02	.01
Main effect step		
Perceived Collaboration		.35*
Perceived Competition		.15*
Favorable Feedback		.13*
Unfavorable Feedback		-.09
Sense of Control		.22*
Self-expression		.27*
R^2	.01	.43
$\triangle R^2$	.01	.40

Note: Sex and Education are dummy variables; *denotes $p < .05$; $\triangle R^2$ indicates the effect size added.

showed that favorable feedback and intrinsic motivation were significantly correlated (β=.13, $p<$ .05), while unfavorable feedback was not significantly related to intrinsic motivation (β=.08, $p =$ 0.145). Thus, H4 was not supported. Finally, the results showed that sense of control (β=.22, $p<0.05$) and self-expression (β=.27, $p<0.05$) were all significantly correlated with intrinsic motivation. To a certain extent, when students have the opportunity to express themselves freely and choose freely, their intrinsic motivation to learn will be met. H5 and H6 were supported. (see Table 4)

CONCLUSION

Discussion

As educators, we have to capture the attention and interest of our students and engage them in a way that sustains their interest. The goal of gamification is not to create games, but rather to make learning more entertaining and engaging without undermining its credibility. Therefore, the purpose of this study was to examine whether gamification elements (perceived collaboration, perceived competition,

Table 4. All the hypotheses and the results

H1: Perceived collaboration elements are positively related to the extent of intrinsic motivation to learn.	supported
H2: Perceived competition elements are positively related to the extent of intrinsic motivation to learn.	supported
H3: Favorable feedback elements are positively related to the extent of intrinsic motivation to learn.	supported
H4: Unfavorable feedback elements are negatively related to the extent of intrinsic motivation to learn.	not supported
H5: Sense of control elements are positively related to the extent of intrinsic motivation to learn.	supported
H6: Self-expression elements are positively related to the extent of intrinsic motivation to learn.	supported

favorable feedback, unfavorable feedback, self-expression, sense of control) contributes to intrinsic learning motivation. The results of this study were described below.

First of all, gamification in the class was positively related to intrinsic learning motivation, in line with previous research (Eisingerich et al., 2019). It means that students and teachers may benefit from game-based learning conditions, as it increases interest and motivation. Through collaborative and competitive mechanisms, students are able to concentrate more in class and share their results with their peers. Once they feel part of a group during class activities, their intrinsic motivation for learning can be stimulated.

Second, the findings showed that unfavorable feedback had no significant related intrinsic learning motivation, which is different from previous research (Domínguez et al., 2013; Wee & Choong, 2019). It may be due to the fact that even students are willing to admit their faults and improve, but unfavorable feedback may cause embarrassment even in gamified classroom. On the other hand, in addition to increasing confident in students' own performances, favorable feedback can also provide more adjustment direction, thus meeting the psychological need for competence. The results clarified which gamified element is contributing to the need satisfaction, and in what way the context modifies it.

Third, Harlen and Deakin Crick (2003) and Standage et al. (2005) claimed that intrinsic motivation is a behavior motivated by a learner's desire to remember and apply what they have learned. The findings showed that gamification can satisfy intrinsic needs to a certain degree as expected. To tackle the challenge of developing learning systems that keep students highly intrinsically motivated, this study suggested combining gamification elements and classroom activities to stimulate students' motivation to learn. In sum, to effectively gamify learning to improve student engagement and motivation, educators need to understand the related aspects of games, motivational psychology, and pedagogy. The findings in this study recommends the use of these gamification strategies to guide the development and improvement of general learning systems, which will have a substantial positive impact on meeting students' intrinsic needs.

Theoretical Implications

This study has several theoretical implications. First, previous research focused mostly on curriculum design frameworks or teaching strategies (Kam & Umar, 2018), and less on exploring the influence of specific gamification elements on learning motivation. In this study, we examined the influence of six related elements on intrinsic learning motivation, and found that correlation existed. The finding can help explain the mechanisms of which gamification affects learning motivation and what kind of features are more appropriate for use. It is possible to test various gamification principles in order to develop an incremental research agenda that evaluates the effects of individual game elements on cognitive and behavioral outcomes. Second, although previous studies have examined specific gamification elements as variables, such as points, medals, rankings (Gibson et al., 2015), there are still a few studies examining the more abstract and psychologically inclined aspects of gamification as variables. This study used the elements such as perceived collaboration, perceived competition, favorable feedback, unfavorable feedback, sense of control, and self-expression as variables, and

found these elements can indeed stimulate students' intrinsic learning motivation. In conclusion, the findings in this study may contribute to applications in future studies or to extended investigation about the intrinsic learning motivation within the gamification framework.

Practical Implications

This study has several practical implications. First, it is strongly recommended that educators incorporate game elements into their teaching routines in order to enhance students' knowledge retention. For example, teachers should use performance feedback loops when teaching in gamified classroom. Because favorable feedback can be materialized and shared in class, stimulating students' competence needs and therefore enhancing learning motivation. Further, educators can use game design elements to strengthen feedback mechanisms and develop them into continuous, informative feedback by incorporating self-paced exercises, visual cues, frequent question-and-answer activities, progress bars, or carefully placed comments to learners. Second, gameful design means creating systems that are intrinsically motivating and enjoyable to use, by applying the techniques game designers use to keep players engrossed. Teachers can use gameful design to help students gain more control over their performance and progress. For example, depending on the course content, teachers can use different series of tasks, each corresponding to a different learning style, and let students choose which tasks they want to unlock. Third, as educators, we should emphasize the principle that each individual's efforts will influence another, enhancing students' sense of belonging through additional mechanisms that encourage group members to combine their ideas. We can also use Kahoot, Wordwall, Nearpod, and other network resources to help students participating in activities independently and without pressure.

Research Limitations and Suggestions

This study contains some limitations. First, the study did not describe the various gamification methods, which may cause some students with performance anxiety to feel overpressure or may benefit those with the condition from distraction. Additionally, not every teacher has the time or resources to develop gamified activities in the classroom, although gamification may be beneficial. Increasing the number of samples or analyzing different age groups can enhance the diversity of the sample and broaden the scope of the research in the future. Second, future studies should investigate what kind of game elements or features we can use in a learning activity to foster collaboration and competition. Future studies can further investigate more precisely the conditions in which gamification is effective for different types of learners. Moreover, this study focused mainly on common gamification elements at the mechanism level, but there is still a lot of other gamification elements, such as immersion and virtual characters, that would also impact students' psychological needs. Future scholars can study more about these different gamification elements as well.

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