Incorporating tangible rewards into gamification increases students' identified regulation in fully online learning

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Abstract: Intangible rewards (such as virtual points and virtual badges) have often been used in gamified learning contexts to motivate learners. However, such intangible rewards are not stimulating to all learners. Studies have reported that learners express their desire to redeem intangible rewards for some utilitarian resources or benefits. Considering that empirical evidence regarding how tangible rewards impact students' motivation is still lacking, the present study applied a randomized controlled trial approach to explore the effects of tangible rewards on students' identified regulation (a type of autonomous motivation) and external regulation (a type of controlled motivation). The study was conducted in a fully online gamified flipped class. Individual students were randomly assigned either to the tangible rewards group (EG = 28) or the intangible rewards group (CG = 29). Students in EG reported significantly higher identified regulation than those in CG while no significant difference was found in terms of external regulation. The results theoretically supported the standpoint that tangible rewards can help promote autonomous/self-determined motivation and gave practical guidance for educators who are interested in using tangible rewards in online gamified courses.

Keywords: Gamification, redeem, tangible rewards, motivation

1. Introduction

Gamification has been used to enhance greater student engagement, especially in the online learning environment (Zainuddin et al., 2022). Gamification rewards (Nicholson, 2015), usually take two forms — intangible and tangible. Intangible rewards refer to virtual badges/points and verbal praise that do not contain any utilitarian benefits to recipients (Meder et al., 2018). Tangible rewards refer to those that involve material goods (e.g., money) or some utilitarian benefits, (e.g., opportunities to participate in preferred activities) (Cameron et al., 2001; Kappen & Orji, 2017).

In most previous gamified learning studies, intangible rewards are more commonly used (Bai et al., 2021; Meder et al., 2018). Although non-utilitarian rewards can bring about enjoyable experiences in the gamified learning setting (Landers et al., 2015), not all learners favor these intangible factors in the long run. Instead, they tend to value the option of exchanging such rewards for more utilitarian or material resources (e.g., Huang & Hew, 2018).

2. Related Literature

2.1 Theoretical Controversy

The use of tangible rewards in education has been controversial and remains up for debate (Kappen & Orji, 2017). The controversy mainly revolves around how tangible rewards impact students' autonomous motivations.

The self-determination theory makes a distinction between autonomous and controlled motivations based on their underlying regulatory processes and their associated

levels of self-determination. Autonomous motivation is a type of motivation in which individuals engage in a behavior because they find it inherently interesting, enjoyable, or meaningful. Controlled motivation, on the contrary, involves feeling pressured or coerced to engage in a behavior or activity due to external factors. Identified regulation, is a type of autonomous motivation that involves people identifying with the personal value and importance of the behavior for themselves and thus accepting it as their own. External regulation is a type of controlled motivation that involves people engaging in a behavior or activity solely to obtain a specific external outcome or reward (Ryan & Deci, 2000).

Specifically, some theorists criticize the detrimental effect of tangible rewards because tangible rewards tend to be perceived as controlling (i.e., being forced to complete designated tasks because of the reward). The perceived locus of causality changes from oneself to external rewards (Deci et al., 1975). They may begin to view the engagement in the designated tasks as a means to an end rather than as an inherently meaningful pursuit. Namely, they tend to feel that their efforts are only worthwhile if they are rewarded, rather than because they are improving their abilities. In this case, giving tangible rewards can lead to a decrease in identified regulation and an increase in external regulation.

However, other theorists argue that tangible rewards can be helpful if used appropriately. According to the social learning theory, when the rewards are tied to specific levels of performance (e.g., exceeding a certain score or surpassing other people's scores), an individual's perceived competence or self-efficacy will be enhanced (Bandura, 1986). The tangible rewards act as a social validation of one's competence, whereby a person's talents and abilities (internal factors) are perceived as the reasons for the rewards, rather than the rewards being perceived as the reasons for high-level performance (Cameron & Pierce, 2002). As a result, individuals' identification with the learning activity is strengthened instead of being harmed.

2.2 Previous Studies

Only a limited number of studies that have directly compared the use of tangible and intangible rewards in gamified educational contexts. For example, Ortega-Arranz et al. (2019) conducted a study that compared the behavioral engagement of students in a Massive Open Online Courses (MOOC) course among three groups: a "gamified group" (awarded with virtual badges only), a "tangible reward gamified group" (awarded with virtual badges redeemable for certain learning benefits), and a control group (without rewards). No significant difference was found between the two gamified groups although both of them outperformed the control group.

More recently, Bai et al. (2021) explored the effects of tangible rewards on students' behavioral engagement and learning performance in a fully online university course, comparing students who were given virtual points to students who were given virtual points redeemable for high-quality learning materials. While tangible rewards encouraged students to create and reply to more posts, no significant difference was observed in their learning performance.

In general, there is still a lack of research that directly compares the effect of tangible and intangible rewards in fully online learning setting. In addition, the current empirical studies on gamification have not explored the effects of tangible rewards on students' motivation.

3. Research Questions

The present study aims to fill the research gap by examining two research questions:

RQ1: What is the effect of tangible rewards on students' identified regulation in online learning?

RQ2: What is the effect of tangible rewards on students' external regulation in online learning?

4. Methodology

4.1 Context and Participants

The present study was conducted in the higher education context, in a fully online International Business course. The course comprised of eight sessions, each lasting 3.5 hours, and was aimed at preparing undergraduate students for a postgraduate entrance examination. Students who planned to take the examination and enter an international business master's degree program voluntarily signed up for the course.

Altogether 57 participants with an average age of 21 were enrolled in this course. The participants were individually randomly assigned to either the control group (CG) or the experimental group (EG). The only difference between the two groups was that the EG students could redeem exclusive learning materials with their virtual points while the CG students could not. All the redeemable rewards were later given to the CG students after the experiment to avoid ethical issues.

4.2 Gamified Flipped Class Design and Redemption Scheme

In a typical flipped classroom, students engage in (1) pre-class computer-based learning (such as video lectures) and (2) in-class interactive learning. Students are expected to familiarize themselves with pre-class learning materials and focus on higher-level cognitive activities, such as peer learning, and problem-solving (Bishop & Verleger, 2013; Sointu et al., 2023).

To increase student engagement in the pre-and in-class learning activities, points, badges, and leaderboards (known as the PBL triad) were used for both CG and EG. The PBL triad is one of the most commonly used gamification elements (Leitão et al., 2022). Please see Table 1 for a detailed gamification design.

Table 1. *Gamification design in the flipped class*

Points	***Description***
5	5 points for downloading pre-class learning materials (only the first download will be counted)
10	10 points for answering each pre-class MCQ question correctly (5 MCQ questions in total)
5	5 points for completing all pre-class learning activities, including downloading the pre-class learning activities and fulfilling pre-class tests
10	10 points for answering each in-class MCQ question correctly (10 MCQ questions in total)
10	10 points for voluntarily answering or posing questions in class (only the first three attempts will be counted)
Badges	***Description***
Fully Prepared	This badge rewards students whose accuracy rates in the pre-class quizzes are greater than or equal to 80%
Task Completion	This badge rewards students who complete all pre-class learning activities, including downloading the pre-class learning activities and fulfilling pre-class tests
Task Master	This badge rewards students who complete the ten items in the in-class quizzes

Quiz Whiz	This badge rewards students whose accuracy rates in the in-class quizzes are greater than or equal to 80%
Leaderboards	***Description***
Leaderboard by session	This leaderboard announces students' rankings and accumulated points by each weekly session.
Overall Leaderboard	This leaderboard announces students' overall rankings and accumulated points throughout the whole course
Tangible rewards	***Description***
Exclusive learning materials	(EG only) The rewards could be redeemed weekly for students who accumulated 160 virtual points or above that week.

In this study, the course was conducted through a synchronous videoconferencing tool. All the pre- and in-class learning activities were conducted using a self-designed gamified learning platform.

4.3 Data Collection and Analysis

Students identified regulation and external regulation was measured by scales adapted from the Situational Motivation Scale (SIMS, Guay et al, 2000). The Shapiro–Wilk statistics showed a non-normal distribution of student responses in the CG (W = 0.924, p = .038) and the EG (W = .846, p = .001) in terms of identified regulation. Similarly, in terms of external regulation, student responses in the CG (W = .917, p = .025) and EG (W = .915, p = .026) were also non-normally distributed. In this case, students' responses to these two scales were examined using the Mann–Whitney U test.

5. Results

5.1 Effects on Students' Identified Regulation

The questionnaire results indicated good reliability (Cronbach's alpha = 0.947). As shown in Table 3, the students in the EG (Mdn = 6.167, SD = 1.044) reported a significantly higher level of identified regulation than those in the CG (Mdn = 4.667, SD = 1.107; U = 630.000, p < .05, r = 0.478).

5.2 Effects on Students' External Regulation

The questionnaire results indicated relatively acceptable reliability (Cronbach's alpha = 0.617) (Hajjar, 2018; Wim et al., 2008). The students in the EG (Mdn = 3.333, SD = 1.373) reported no significant difference in terms of external regulation with those in the CG (Mdn = 4.000, SD = 1.119; U = 330.000, p = .222) (see Table 3).

Table 3. *Effects of tangible rewards on students identified regulation and external regulation*

Measures	Comparison group	*Mdn (SD)*	*p-value (effect size)*
Identified regulation	EG	6.167 (1.044)	p = .000*, r = 0.478
	CG	4.667 (1.107)	
External regulation	EG	3.333 (1.373)	p = .222
	CG	4.000 (1.119)	

Note. * significant using p < .05

6. Discussions and Conclusions

This study applied a randomized controlled trial approach to examine the effects of tangible rewards redeemed through intangible rewards on students' identified regulation and external regulation in a fully online gamified flipped class. The results showed that the use of tangible rewards significantly increased students' identified regulation while indicating no significant influence on students' external regulation.

6.1 Implications

The findings shed more light on the theoretical controversy over the effects of tangible rewards. Specifically, the increase in identified regulation indicates that tangible rewards facilitate the internalization of motivation — the process by which an individual adopts and integrates an external regulation or value into their sense of self (Deci & Ryan, 2015). Both the reward scheme and the reward type are crucial to the effectiveness of tangible rewards in promoting internalization.

In this study, the redemption of tangible rewards is associated with a performance standard (i.e., earning over 160 virtual points, which is roughly 80% of the full virtual points for a week). This criterion provides valuable information that can positively reinforce students' competence (Bandura, 1986), thereby mitigating the potential negative effects of the reward being a controlling factor (Ryan & Deci, 2000). Additionally, according to the extended attribution theory, tangible rewards tied to performance levels enhance perceived competence and encourage individuals to attribute their success to their own abilities (Lepper et al., 1996).

The type of tangible rewards used in this study is compatible with learning purposes, i.e., exclusive learning materials that may boost students' scores in the postgraduate entrance examination. In other words, the redeemed tangible rewards are personally meaningful/relevant to students as they are closely related to their valued future goals. Such personal relevance is crucial to identified regulation (Vansteenkiste et al., 2018). That explains why in the redeeming procedure, students tend to identify learning activities with personal meaning, endorsing that learning is good for themselves.

To summarize, theoretically, this study provides evidence supporting the theoretical standpoint that tangible rewards can be helpful in promoting autonomous/self-determined motivation if used appropriately. Practically, this study provides two important implications for applying tangible rewards in the gamified learning context, (1) linking tangible rewards to a standard of performance; (2) linking tangible rewards to students' valued learning goals.

6.2 Limitations

Three primary limitations need to be acknowledged in this study. Firstly, the research focused solely on a fully online class that utilized synchronous videoconferencing technology. Therefore, the outcomes of this investigation may not be applicable to other learning contexts, such as asynchronous learning in MOOCs or face-to-face learning. Secondly, the tangible rewards implemented in this study may only be effective for students who are preparing for the entrance examination. The use of this kind of reward may not be generalizable to other situations, highlighting the importance of providing rewards that match the specific needs of the target population. To address this issue, future research could include a pre-survey to gather information about students' requirements and preferences. Thirdly, the relatively small ample size may limit the generalizability of the findings.

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