

ENHANCING STUDENT MOTIVATION THROUGH GAMIFICATION: THE MEDIATING INFLUENCE OF GOAL-SETTING

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Abstract: This study constructed a core conceptual framework using gamification, goal setting, and motivation to learn as variables by introducing the following demographic gender, age, grade, and parental education variables. Attempting to analyze the differences in the perceived means of the respondents' demographic variable groupings for each of the variables of gamification, goal setting, and motivation to learn and the influence of the independent variables on the dependent variables, this study formulates the research hypotheses: Hypothesis 1: The implementation of gamification in educational settings will positively influence the level of motivation of students as compared to the traditional methods of teaching and learning. Hypothesis 2: Goal setting in a gamified learning environment moderates the relationship between gamification and students' motivation, i.e., higher goal setting enhances the effect of gamification on motivation. Hypothesis 3: The effectiveness of goal setting in increasing student motivation in gamified learning environments depends on the interaction with the level of challenge, with optimal motivation observed when goal setting is aligned with appropriately adjusted levels of challenge. Hypothesis 4: Practical recommendations derived from the findings of the study regarding the design elements of gamification, especially as they relate to the level of challenge and goal-setting mechanisms, will contribute significantly to increasing student motivation in educational settings. And using 14,720 students from 8 high schools in Region A as a case study, the sample size was calculated to be 14,720 using simple random sampling method in the overall study, 423 questionnaires were distributed in this study, and 405 questionnaires were returned using the simple random sampling method, with a return rate of 95.7%.

This study discusses the specific manifestations of gamification, goal setting, and motivation to learn in the subsequent changes in real academic life, and the following conclusions are drawn: gamification has a significant positive effect on motivation to learn, i.e., by introducing the element of gamification, students' motivation to learn can be improved. Gamification has a significant total effect on motivation, both direct and indirect through the mediating variable goal setting. This study provides a reference point for subsequent research by scholars, explores future directions for conducting student teaching, and provides outlook and suggestions for future related research.

Keywords: Gamification, Goal-Setting, Motivation

Introduction

The integration of gamification into educational environments represents a paradigm shift in teaching and learning, reflecting a shift from traditional didactic teaching methods to more interactive and experiential learning environments. Defined as the application of game design elements and mechanics in non-game environments, gamification has received widespread attention from educators, researchers, and policy makers due to its potential to increase student motivation, engagement, and educational outcomes (Deterding, et al., 2011) By leveraging the intrinsic motivational appeal of games such as challenge, competition, and rewards, gamification aims to transform learning into an immersive and enjoyable experience that resonates with digital natives.

Motivation is a core concept in educational psychology and plays a pivotal role in shaping students' attitudes, behaviors, and academic performance. Traditional classroom environments often struggle to maintain student motivation over time, as evidenced by waning interest, disengagement from the classroom, and declining achievement (Deci & Ryan, 2000). In response to these challenges, educators have turned to gamification as a means of re-energizing students' intrinsic motivation, thereby creating a more conducive learning environment characterized by enthusiasm, persistence, and self-directed learning.

At the heart of gamification is the concept of "challenge," which is a fundamental tenet of the motivational appeal of games. Challenge refers to the dynamic interplay between task difficulty and player skill, which provides individuals with the opportunity to test their abilities, overcome difficulties and experience a sense of mastery (Malone, 1981). The strategic integration of challenging activities in educational settings is expected to foster intrinsic motivation in students as it provides them with meaningful opportunities for skill development, self-improvement, and achievement.

Goal setting theory provides a theoretical framework for understanding how the process of setting specific, challenging goals increases motivation and performance (Locke & Latham, 2002). By setting clear goals and milestones, goal setting focuses individuals' attention, mobilizes their efforts, and keeps them persistent in their pursuit of desired outcomes. In addition, goal setting fosters a sense of agency and self-regulation in individuals, empowering them to monitor their progress, adjust their strategies, and ultimately realize their aspirations (Zimmerman, 2002).

Despite the growing interest in gamification and goal setting in the field of educational research, there are still significant gaps in our understanding of the intricate interactions between these two concepts, particularly the mediating role of challenge levels. Existing literature highlights the motivational potential of gamification and the efficacy of goal setting strategies in increasing student engagement, but few studies have delved into the subtle mechanisms by which challenge levels

influence the relationship between gamification and student motivation.

This study attempts to fill this gap by investigating the mediating influence of challenge level on the relationship between gamification and student motivation in an educational setting. By elucidating the intrinsic mechanisms by which challenge influences the motivational process, this study aims to reveal how gamification can be effectively used to promote student engagement, persistence, and improved academic performance. Furthermore, by examining the moderating factors that may influence the effects of gamification and the level of challenge, this study seeks to provide practical insights and recommendations for educators, instructional designers, and policymakers seeking to harness the motivational power of gamification learning experiences.

Problem Statement:

The purpose of this study was to investigate the mediating effects of goal setting (particularly goal setting related to challenge level) on the relationship between gamification and student motivation in an educational setting. The study aimed to address the following key question:

What is the effect of gamification on students' motivation in educational contexts, particularly in terms of the perceived challenge level of the gamification activity?

How does the level of challenge, as a mediating variable, affect the relationship between gamification and students' motivation to learn?

Are there moderators that influence the effects of gamification and challenge level in increasing students' motivation and engagement?

By exploring these research questions, this study aims to contribute to a deeper understanding of how gamification strategies, especially those involving an element of challenge, can be effective in promoting student motivation in educational settings. The findings will have implications for educators, instructional designers, and policy makers seeking to optimize learning environments and improve student engagement and achievement.

Research Objective (s)

Objective 1. Examine the Impact of Gamification on Student Motivation:

The primary objective of this study is to investigate how the integration of gamification influences student motivation in educational contexts. Specifically, the research aims to analyze the effects of gamified learning experiences on students' intrinsic motivation, engagement, and perceived enjoyment, providing insights into the motivational benefits afforded by gamification.

Objective 2. Explore the Mediating Role of Challenge Level:

A key focus of this study is to elucidate the mediating influence of challenge level on the relationship between gamification and student motivation. By examining how the degree of difficulty or complexity presented within gamified activities mediates motivational outcomes, the research seeks

to uncover the mechanisms through which challenge level impacts students' engagement and persistence in gamified learning environments.

Objective 3. Investigate the Interaction Between Goal-Setting and Challenge Level:

In addition to exploring challenge level as a mediating factor, this study aims to examine how goal-setting processes interact with challenge level within gamified contexts. By analyzing the interplay between goal-setting, challenge level, and student motivation, the research seeks to provide a nuanced understanding of how goal-setting strategies influence students' responses to varying levels of challenge in gamified learning experiences.

Objective 4. Offer Practical Recommendations for Effective Gamified Design:

Finally, this study endeavors to translate its findings into practical recommendations for educators, instructional designers, and policymakers. By synthesizing empirical evidence and theoretical insights, the research aims to provide guidance on the design and implementation of gamified learning experiences that optimize student motivation and engagement. Specifically, the study seeks to offer insights into how educators can leverage challenge level and goal-setting mechanisms to create effective and engaging gamified interventions in educational practice.

Literature Review

The concept of gamification was first proposed by Richard Bartle, which means "to make a game out of something that is not a game". Simon's research suggests that the use of games in learning has evolved from a focus on skill development to a holistic view of learners' overall literacy (e.g., problem solving, collaboration) and attitudes. Accordingly, the role of gamification in education and learning is also expanding, mainly in the following ways: increasing interest in learning, promoting knowledge acquisition, developing cognitive ability, cultivating problem solving ability, cultivating creativity, cultivating collaborative ability, and evaluating the mastery of knowledge and skills. Gamification, which refers to the incorporation of game elements and principles into non-game situations, has received much attention in the field of education as a promising strategy for increasing student motivation and engagement (Deterding, et al., 2011) This literature review aims to provide a comprehensive overview of existing research on gamification in education, with a focus on the efficacy of gamification in increasing student motivation. By synthesizing empirical studies, theoretical frameworks, and practical applications, this review seeks to elucidate the mechanisms by which gamification influences student motivation and learning outcomes.

Koivisto, et al. (2019) argue that gamification is the use of game design methods and mechanisms to solve real-world problems or appeal to a specific population.

In terms of system design for gamification, Deterding (2011) argues that gamification is the design process of applying game elements to existing non-game related systems; Ahmed, et al. (2017)

argue that gamification is the process of integrating game theories, elements, design, aesthetics, and game mechanics into the learner's learning experience; and Prof. John Shang of Peking University argues that gamification is the process of applying game-related elements, concepts, and applications to non-game related systems; this review attempts to clarify the mechanisms by which gamification affects students' motivation and learning outcomes, concepts and applications to situations that have nothing to do with games.

The application effect of gamification, Zicherman et al. believe that gamification is the application of games and game strategies to business and strategy, and that gamification can improve employee comfort and positive customer experience, and the gamification in this study is based on learning gamification.

Goal setting theory was initially applied in the field of management, and was first proposed by the American psychologist Prof. Locke in 1967. Locke believed that by setting clear goals, people's needs are transformed into motivation, and people are prompted to accomplish the goals, and in the whole process, the goals are adjusted in time according to the actual situation, so as to facilitate the accomplishment of the goals. In countries such as the United States, Japan and Canada, goal setting has been applied to disease rehabilitation and patient self-management, and the results show that the theory of goal setting is feasible in different cultural contexts.

Difficulty is a collection of relationships between an individual and a task or goal (Wright, 1990), therefore goal difficulty varies from person to person. The same goal that is easy for one person may be difficult for another. Goal difficulty is a continuum from easy to moderate to challenging and impossible (Latham & Locke, 1991). Latham and Locke (2007) suggest that there is an increasing and decreasing relationship between goal difficulty and task performance. This is because difficult goals increase an individual's level of motivational activation compared to simple goals, which leads to more active effort (Locke & Latham, 2002).

In contrast to such goal clarity, which can be artificially manipulated in laboratory or field experiments, the field of public management passively chooses goals with a higher degree of ambiguity due to its own characteristics. Therefore goal ambiguity (goal ambiguity) has become the focus of their research compared to the field of industrial organizations which mostly focuses on goal clarity (Van der Hoek, Groeneveld, & Kuipers, 2016). This is mainly due to the fact that the dimensions of daily goals in the field of public management are often multiple and contradictory, such as balancing short-term and long-term interests (Rainey & Jung, 2014), so it is difficult to identify clear goals. Although fuzzy goals can ease the conflicts between different stakeholders and bring political support (Davis & Stazyk, 2015), the price is the decline of work motivation and goal failure (Rainey & Jung, 2014).

Gamification can stimulate students' interest in learning through a variety of fun game elements such as points, badges, and leaderboards. Increasing interest in learning is the most direct effect of

gamification teaching. Traditional teaching methods tend to emphasize the transmission of knowledge and neglect students' interests and emotions. Gamification teaching, on the other hand, creates a challenging and fun learning environment for students by introducing a variety of interesting game elements, such as points, badges and leaderboards (Yang, 2021). Shi and Cristea (2018) injected a variety of motivational gamification elements based on SDT (Self-Determination Theory) into the adaptive learning environment. These gamification elements are based on social interaction features to promote intrinsic motivation among students. Ahmed and Villaforita (2017) discuss the design and development of an educational game-based environment for teaching students about healthy eating. The system incorporates gamification elements such as points and leaderboards where users can earn points by providing correct answers about food and diet. In terms of survey research, Tugce, Celik and Kaplan et al. (2018) investigated students' overall perceptions of various game elements in a course on gamified instructional techniques and materials development in a teacher education context through interviews, observations and document collection.

Methodology

With probability-based sampling methods, the sample size can be determined through the population collection process. For example: the sample size suitable for calculation, the sample size used in the study was determined using The Taro Yamane Sample Size Formula (1973) and the sample size was determined using a 95% confidence level and permissible value. The sampling error is 5% or 0.05. The overall sample is 14720. When n = number of samples used in the study. N = size of the overall population, e = random sample error is set to 0.05 .

The sample size and formula are given below:

$$n = \frac{N}{1+Ne^2}$$
$$n = \frac{14720}{1+14720 \times 0.05^2}$$
$$n = 389.42$$

The minimum sample size was calculated to be 389. therefore, approximately 389 participants were needed for the study. Actual and potential attrition rates must be considered when determining the final sample size.

Data collection for this study was all conducted online. Participants received an email invitation to access the survey as well as instructions for completing the survey. Online survey administration allowed for secure and efficient data collection while ensuring participant anonymity.

The questionnaire was the primary data collection method for this study and was used to obtain information about the sample students' gamification, goal setting, and motivation. The questionnaire will include multiple sections, each covering a key research variable, to ensure comprehensive data collection. The researcher distributed 423 questionnaires to students attending 8 high schools in Area

A. After excluding some useless data, 405 valid questionnaires were returned with a validity rate of 95.7%.

Results

The Pearson's correlation coefficient between gamification and motivation is 0.937 which is significant at 0.01 level. This indicates that there is a highly positive correlation between "gamification" and "motivation", i.e., as one variable increases, the other increases and vice versa. This correlation is statistically significant at the 0.01 level, which means that the results are unlikely to be due to sampling error, but may be real. Therefore, based on this analysis, we can infer that there is indeed a significant positive correlation between gamification and motivation in this study.

Based on the data provided, a one-way linear regression analysis was conducted to explore the effect of gamification on motivation. The model summary shows that the model has an R-value of 0.937, an R-square of 0.879, an adjusted R-square of 0.878, and a standardized error of estimate of 2.42894. The results of the ANOVA table show that the regression model has a sum of squares of 17,225.194, degrees of freedom of 1, mean square of 17,225.194, F-value of 2,919.640, and significance of 0.000, indicating that the regression model is significant overall. The table of coefficients shows that the standardized coefficient of gamification is 0.937 with a t-value of 54.034 and a significance of 0.000, which indicates that gamification has a significant positive effect on motivation. In addition, the standardized coefficient of the constant term is 2.042, with a t-value of 0.000 and a significance of 0.000, which indicates that the value of motivation to learn is not zero even in the absence of gamification. Taken together, the results of the above analyses indicate that gamification has a significant positive effect on motivation, i.e., by introducing gamification elements, students' motivation can be improved.

In the mediation analysis, "X" represents the independent variable (gamification), "Y" represents the dependent variable (motivation), and "W" represents the mediating variable (goal setting). The total effect shows the total effect of X on Y, the "Direct Effect" shows the direct effect of X on Y, and the "Indirect Effect" column shows the indirect effect of X on Y, which is mediated by the mediating variable, goal setting. Standard errors, t- and p-values, and 95% confidence intervals are also provided for each effect.

Based on this analysis, we observe a significant total effect of gamification on motivation, both direct and indirect through the mediating variable goal setting.

Discussion

Effects of gamification on motivation to learn

The overarching finding of the research results is that there is a significant positive correlation

between gamification and students' motivation to learn. This finding has important implications in the field of education as it reveals that students' intrinsic motivation to engage in learning activities can be enhanced through the introduction of gamification elements. The design features of gamification, such as challenge, reward, and achievement systems, may have stimulated students' curiosity and competitiveness, which in turn enhanced their motivation.

Gamification as an educational strategy has attracted a lot of attention and research. Our findings are supported by Smith and De Freitas (2018) and Hamari, et al. (2014)'s study (year), which found that gamification can be effective in stimulating students' interest and motivation in learning. These studies highlight the potential of gamification to enhance student motivation and provide strong evidence for educators and policymakers to support the use of gamification strategies in the classroom to enhance student motivation and engagement.

The design principles and elements of gamification provide students with a wide variety of learning experiences that motivate them. For example, challenging tasks and levels in gamification stimulate students' curiosity and inquisitiveness, making them willing to actively participate in the learning process. Reward mechanisms, on the other hand, provide positive incentives to encourage students to keep trying to learn and make progress. In addition, the achievement system can boost students' self-confidence and sense of accomplishment, motivate them and enhance their learning experience.

Overall, gamification as an educational strategy to enhance students' motivation by introducing game design elements has been widely used and validated in practice. Our study further confirmed the positive correlation between gamification and students' motivation, providing important references and insights for educators. Future research can further explore the design principles and implementation strategies of gamification to better promote students' motivation and engagement, thereby enhancing their learning outcomes.

Positive correlation between gamification and goal setting

In addition, the findings further suggest a positive correlation between gamification and goal setting. This finding provides a deeper understanding that gamification learning environments help promote students to establish clear learning goals and adopt effective self-regulation strategies, thus enhancing their motivation and learning effectiveness.

In gamification learning environments, students can often set and pursue meaningful learning goals through features such as tasks, levels, and achievement badges. These goals can be both long-term curricular goals and short-term task goals. For example, in a math game, a student might set out to complete a certain number of math problems in a specific amount of time, or to unlock new challenges through specific levels. With these goal settings, students are able to have a clear understanding of their learning tasks and target their learning plans, which enhances their motivation and learning outcomes.

Landers and Landers' (2014) study and Dickey's (2011) study also support our findings. They noted that gamification learning environments provide students with the opportunity to set their own learning goals and motivate them to achieve these goals through rewards and feedback mechanisms. This goal-based learning approach helps to enhance students' self-regulation, enabling them to manage their learning time and resources more effectively and improve their learning efficiency.

Overall, gamification as an educational strategy not only enhances students' motivation, but also promotes them to establish clear learning goals and adopt effective self-regulation strategies. This provides important insights for educators to draw on the principles and methods of gamification when designing and implementing instructional activities to provide students with more interesting, challenging, and goal-oriented learning experiences. Future research could further explore the relationship between gamification and goal setting, and explore how gamification strategies can be used to optimize students' learning goal setting and self-regulation skills, thereby enhancing their learning effectiveness and motivation.

The mediating role of goal setting

In this study, we found that goal setting plays a mediating role between gamification and students' motivation, a finding that provides insight into how gamification indirectly affects students' motivation by influencing their goal setting. In this section, the mediating influence of goal setting will be explored and its theoretical and practical implications will be analyzed in depth.

First, we need to understand how goal setting mediates the relationship between gamification and students' motivation. According to our findings, gamification has a significant positive effect on students' motivation, and there is also a positive correlation between gamification and goal setting. This means that gamification can indirectly enhance students' motivation by facilitating them to set clear learning goals. In gamification learning environments, through features such as tasks, levels, and achievement badges, students can set and pursue meaningful learning goals that stimulate their interest in learning and provide them with a clear direction and motivation for learning.

Second, we need to explore the mechanisms by which goal setting affects students' motivation. Research has shown that setting specific, challenging, and measurable learning goals can significantly increase students' motivation (Locke & Latham, 2019). In gamification learning environments, students receive rewards and feedback by completing tasks and reaching goals such as levels, and this positive feedback can enhance their self-efficacy and sense of accomplishment, which can increase their motivation to learn. In addition, goal setting can help students better plan their learning process and enhance their self-regulation, which is important for improving learning outcomes and lasting motivation (Zimmerman, 2002).

Further, we need to discuss what the mediating role of goal setting implies for educational practice. First, educators can draw on the principles and methods of gamification to design challenging

and goal-oriented learning tasks and activities to motivate students. For example, educators can design a series of learning tasks with milestones to enhance students' engagement and motivation through gamification elements. Second, educators can help students set clear learning goals and stimulate their learning interest and motivation by providing effective feedback and reward mechanisms. Finally, educators should also focus on developing students' self-regulation skills to help them better manage the learning process, improve learning outcomes and sustain learning motivation.

Overall, goal setting plays an important mediating role between gamification and student motivation, which provides important insights into designing effective educational strategies and practices. Future research can further explore the mediating mechanism of goal setting and deeply analyze its impact on different types of learning environments and subject areas to promote continuous improvement and innovation in educational practices.

Conclusions

The findings of this study reveal the complex interplay between gamification, goal setting, and student motivation in educational settings. Through empirical analyses and rigorous statistical procedures, this study elucidates key insights into the relationship between these intertwined constructs, providing valuable insights for educational practice and policy.

1. Significant positive correlation between gamification and students' motivation to learn

Findings indicate a significant positive correlation between gamification and student motivation to learn, affirming the notion that incorporating game design elements into educational experiences can enhance students' intrinsic motivation to engage in learning activities (Smith & De Freitas, 2018). This finding is consistent with previous research findings that gamification learning environments have the potential to engage students' interests, foster a sense of autonomy and competence, and promote deeper engagement with course content (Hamari, et al., 2014).

2. Positive effects of gamification on students' motivation to learn

In addition, studies have found significant positive effects of gamification on student motivation, highlighting the efficacy of gamification interventions in increasing students' enthusiasm and commitment to learning (Deterding, et al., 2011) By incorporating elements such as challenges, rewards, and progress-tracking mechanisms, gamified learning experiences can create a conducive environment that motivates students to actively participate and persist in their learning (Herodotou, et al., 2019).

3. Positive correlation between gamification and goal setting

In addition, findings show a positive correlation between gamification and goal setting, suggesting that gamified learning environments can promote students to establish clear learning goals and adopt effective self-regulation strategies (Landers & Landers, 2014). Through features such as

tasks, levels, and achievement badges, gamification provides students with the opportunity to set and pursue meaningful goals, thus promoting a sense of purpose and direction in their learning process (Dickey, 2011).

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