Psychological Need Satisfaction and Student Performance in Gamified Learning: The Mediating Role of Motivation Based on Self-Determination Theory

Maryam Jameelah Mohd Hashim

Faculty Business and Management, UiTM Puncak Alam, Selangor

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ABSTRACT

In higher education, gamified learning has attracted greater attention as a cutting-edge pedagogical strategy to enhance student engagement and academic achievement. However, little is known about the psychological processes underlying how gamified learning affects student outcomes. This study investigates the effects of autonomy, competence, and relatedness on student performance in a gamified learning environment, using Self-Determination Theory (SDT) and motivation as a mediating variable. Data from 201 undergraduate students who participated in gamified learning activities in a university course were collected using a quantitative research approach. To test the suggested correlations between the constructs, the data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings show that in gamified learning environments, student motivation is greatly influenced by autonomy, competence, and relatedness. Additionally, it was discovered that student performance was positively and significantly impacted by motivation. Additionally, the results show that motivation mediates the relationship between psychological need satisfaction and student performance. This suggests that students who feel more competent, related, and autonomous in gamified learning environments are more likely to become more motivated, which in turn improves their academic performance. By offering empirical support for the use of Self-Determination Theory in higher education, this study adds to the expanding body of research on gamified learning and student motivation. The results emphasize the importance of creating gamified learning environments that meet students' psychological needs to increase motivation and boost academic achievement. For educators and instructional designers seeking to develop more engaging and effective learning opportunities in higher education, the study offers valuable insights.

Keywords: Gamified learning; Self-Determination Theory; Autonomy; Competence; Relatedness; Student motivation; Student performance; PLS-SEM.

INTRODUCTION

In the last several years, colleges and universities have increasingly adopted new teaching methods to help students be more involved, motivated, and successful in school. One option is gamified learning. It adds game-like features to classrooms, such as points, badges, leaderboards, and challenges, to get students more interested and make learning more fun. Gamification has become more popular because it can turn standard classrooms into fun, interactive places that make students more interested in learning and help them stick with it (Férriz-Valero et al., 2020; David & Weinstein, 2023).

Even as more people use it, gamified learning's efficiency primarily hinges on how well it meets students' psychological needs and boosts their motivation. Self-Determination Theory (SDT) is one of the most well-known theories for understanding why students are driven to learn. According to Self-Determination Theory, people are motivated by the satisfaction of three basic psychological needs: autonomy, competence, and relatedness (Ryan & Deci, 2020). Autonomy is how much people think they can make their own choices and do what they want. Competence is how much people think they can do their tasks well. Relatedness is how well they feel they fit in and connect with others in a group.

It is vital to meet these psychological demands to build intrinsic motivation, which is doing things for their own reasons rather than for benefits from others (Bureau et al., 2021). Students are more likely to take ownership of their own learning and be more interested in it when they have control over their own education. Students are more likely to work hard in school when they think they can finish their learning tasks (Raven & Pels, 2021). Also, relatedness is vital for creating a place where kids can learn and feel connected to their teachers and classmates. This makes them more interested and motivated to learn at school (White et al., 2020).

Recent studies indicate that educational environments fostering autonomy, competence, and relatedness markedly improve student motivation and academic achievement (Hao & Lan, 2023; Basileo et al., 2024). Gamified learning systems effectively satisfy these psychological needs by offering students opportunities to make choices, obtain performance feedback, and engage in collaborative learning with peers. Gamified learning may create an engaging and inspiring educational environment that enhances children's academic performance through many means.

Motivation is a major part of how students learn and handle schoolwork. Students with a high level of motivation tend to show greater tenacity, engagement, and academic achievement than their less motivated peers (Urhahne & Wijnia, 2023). Self-Determination Theory posits that fulfilling psychological needs cultivates autonomous motivation, hence increasing students' propensity to participate in learning activities and attain their academic objectives (Ryan & Deci, 2020).

Consequently, comprehending the impact of autonomy, competence, and relatedness on student performance in gamified learning settings is crucial for enhancing instructional practices in higher education. Using motivation as a mediator, this study examines how autonomy, competence, and relatedness affect students' performance in a gamified learning environment.

One of the most important factors that affects how well students do in college is motivation. Many schools and universities are still having problems keeping students interested and motivated in traditional classrooms, though. Traditional teaching methods generally put the teacher in charge, which may make it harder for pupils to participate in the learning process and to learn to be independent. As a result, students may not be as motivated, engaged, or successful in school.

To address these problems, teachers have increasingly used gamification to engage students and motivate them. Gamified learning environments use elements like games in school to make learning more engaging and interesting. Previous research indicates that effective gamification can enhance student motivation, engagement, and learning outcomes (Férriz-Valero et al., 2020).

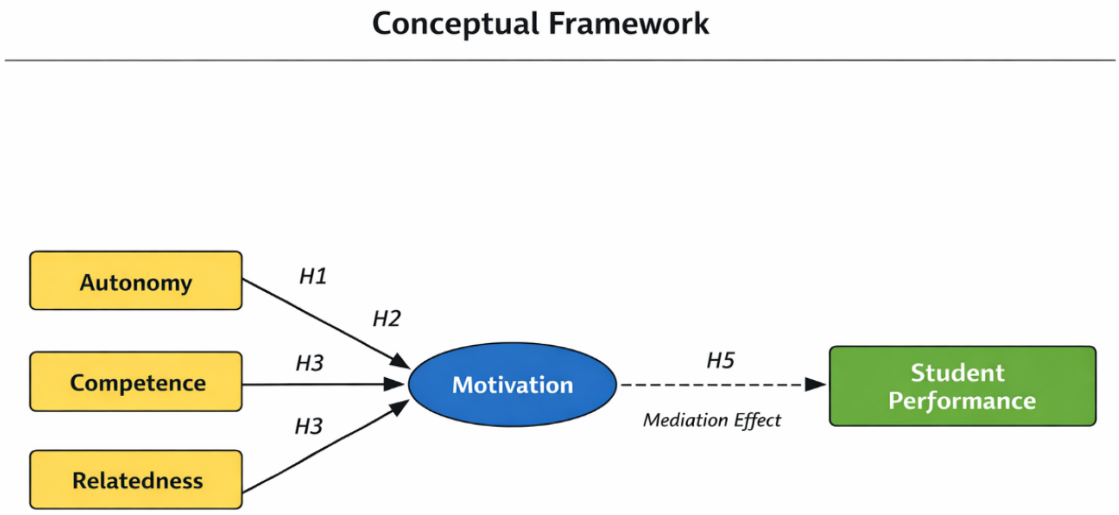
Gamified learning offers significant advantages; however, the mechanisms by which gamification affects student motivation and academic achievement are not yet fully understood. There is a lack of empirical research investigating how gamified learning environments fulfill students' psychological needs—namely, autonomy, competence, and relatedness—and how these needs influence their motivation and academic performance.

Self-Determination Theory posits that fulfilling these psychological needs is crucial for fostering intrinsic motivation and optimal learning (Ryan & Deci, 2020). However, numerous recent studies have focused on the direct relationship between gamification and learning outcomes, neglecting the mediating role of motivation in the relationship between psychological factors and student performance.

Recent research indicates that motivation may function as a pivotal mechanism elucidating the impact of psychological need satisfaction on students' learning behaviors and academic performance (Hao & Lan, 2023; McAnally & Hagger, 2024). Nevertheless, empirical evidence investigating this mediating link in gamified learning contexts is scarce.

Consequently, additional study is required to investigate the impact of autonomy, competence, and relatedness on student performance in gamified learning environments and to determine if motivation functions as a mediating variable in these dynamics. Comprehending these relationships can furnish educators and

policymakers with essential insights for crafting learning settings that significantly bolster student motivation and academic achievement.



Research Model Explanation

The suggested research framework is grounded in Self-Determination Theory (SDT), which elucidates how fulfilling fundamental psychological needs influences individuals' motivation and behavior (Ryan & Deci, 2020). Self-Determination Theory asserts that the psychological needs for autonomy, competence, and relatedness are fundamental in fostering intrinsic motivation, engagement, and performance. When these needs are satisfied, individuals are more inclined to self-motivate and engage in learning activities.

LITERATURE REVIEW

This study examines the interconnections among autonomy, competence, relatedness, motivation, and student performance within a gamified learning environment. In this scenario, autonomy, competence, and relatedness are treated as independent variables, motivation as a mediating variable, and student performance as the dependent variable. Autonomy refers to the extent to which students perceive they have control over their decisions and actions in the learning process. Gamified learning environments provide students greater autonomy by enabling them to select their own tasks, progress at their own speed, and pursue individualized learning trajectories. Students exhibit greater intrinsic motivation and engage more actively in learning tasks when they perceive themselves as the architects of their own education (Cullen & Oppenheimer, 2024).

Competence refers to students' perception of their ability to excel in academic tasks and achieve their educational objectives. Gamified learning environments can enhance students' confidence by providing explicit objectives, prompt feedback, and commendation for their achievements. These elements assist students in monitoring their advancement and fostering a positive self-assessment of their abilities, so enhancing their motivation to continue learning (Raven & Pels, 2021).

Relatedness refers to the extent to which students perceive a sense of belonging and connection with others in the educational environment. In educational institutions, collaboration, peer connections, and supportive teacher relationships can foster a sense of belonging among students. Gamified educational settings typically incorporate social elements such as collaboration, collective tasks, and ranking systems. These attributes facilitate student connections and foster a sense of belonging within the learning community (White et al., 2020).

Motivation is crucial for engaging students and facilitating their academic success. Self-Determination Theory posits that when students' psychological needs for autonomy, competence, and relatedness are fulfilled, they are more inclined to develop autonomous motivation. This enhances their interest and persistence in learning activities (Ryan & Deci, 2020). Motivated students are more inclined to invest the requisite time and effort to maintain concentration on their academic responsibilities and achieve superior performance in school (Urhahne & Wijnia, 2023).

This study posits that motivation serves as a mediating variable illustrating the impact of autonomy, competence, and relatedness on student performance. In gamified learning environments, increased autonomy, competency, and social connectivity among students should enhance their motivation to learn. This elevated motivation results in improved academic performance.

The proposed study's outcome variable is student performance. It illustrates students' perceptions of their academic performance, their actual achievements, and their comprehension of the course content. Prior research consistently demonstrates that driven youngsters exhibit greater engagement, persistence, and academic success compared to their unmotivated peers (Bureau et al., 2021).

The proposed study paradigm posits that autonomy, competence, and relatedness enhance student motivation, subsequently leading to improved academic performance. The paradigm posits that motivation serves as an intermediary between the fulfilment of psychological needs and students' performance in gamified learning settings.

METHODOLOGY

Research Design

This study used a quantitative approach to investigate the relationships among autonomy, competence, relatedness, motivation, and student performance in a gamified learning environment. Quantitative approaches are frequently employed in educational research to evaluate theoretical models and analyze correlations among variables through statistical techniques (Sekaran & Bougie, 2016)).

The research is based on Self-Determination Theory (SDT), which posits that fulfilling the psychological demands for autonomy, competence, and relatedness enhances motivation and elevates educational achievements (Ryan & Deci, 2020). This study regarded autonomy, competence, and relatedness as independent variables, investigated motivation as a mediating variable, and evaluated student performance as the dependent variable.

We utilized Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess the proposed correlations. PLS-SEM is an efficient technique for examining intricate relationships among several factors. This is often used in research on education and behavior (Hair et al., 2022).

Population and Sample

The subjects of this study were undergraduate students enrolled in a gamified learning course at a tertiary institution. The participants were students who participated in gamified learning activities integrated into their curriculum during the semester.

There were 201 students in this study. The sample size is adequate for PLS-SEM analysis, as previous studies suggest that at least 100–200 respondents are required to obtain dependable results (Hair et al., 2022).

We used a convenience sample to collect data from students who chose to take the survey after the gamified learning sessions ended. This is a common way for education researchers to choose participants based on how easy it is to reach them and how willing they are to take part.

Data Collection Methods

A structured questionnaire was employed to collect data via an online survey platform. Upon completion of the semester's gamified learning activities, the students were administered the questionnaire.

Participants in the poll voluntarily engaged and were informed that their responses would remain confidential and would be utilized solely for research purposes. Throughout the data collection procedure, ethical principles such as privacy and informed consent were maintained. A five-point Likert scale was employed to assess all items. Likert scales are frequently utilized in behavioral and educational research to evaluate respondents' opinions and attitudes on specific topics (Hair et al., 2022).

Measurement of Variables

The measurement items used in this study were adapted from established instruments previously used in research on **Self-Determination Theory and student motivation**.

Construct	Number of Items	Source
Autonomy	5	Ryan & Deci (2020)
Competence	5	Raven & Pels (2021)
Relatedness	5	White et al. (2020)
Motivation	4	Bureau et al. (2021)
Student Performance	5	Férriz-Valero et al. (2020)

These items were slightly modified to fit the context of **gamified learning environments in higher education**.

Data Analysis Technique

The data collected were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM), a variance-based structural equation modelling technique suitable for examining complex relationships among latent constructs, particularly in predictive and exploratory research contexts (Hair et al., 2022). The analysis was conducted using SmartPLS software, which enables the simultaneous assessment of measurement and structural models.

The data analysis procedure was performed in two stages. First, the measurement model was evaluated to establish the reliability and validity of the constructs. Second, the structural model was assessed to examine the hypothesised relationships among the constructs.

Measurement Model Assessment

The measurement model was assessed for internal consistency reliability, convergent validity, and discriminant validity. Internal consistency reliability was evaluated using Cronbach's alpha (α) and composite reliability (CR). Values above 0.70 were considered indicative of acceptable reliability (Hair et al., 2022).

Convergent validity was assessed using the Average Variance Extracted (AVE). An AVE value of 0.50 or higher indicates that the construct explains at least 50% of the variance in its indicators, thereby demonstrating adequate convergent validity (Ramayah, Cheah, Chuah, Ting, & Memon, 2018).

Discriminant validity was evaluated using the Fornell–Larcker criterion and the Heterotrait–Monotrait ratio (HTMT). HTMT values below 0.90 were used as the threshold to confirm that the constructs are empirically distinct (Hair et al., 2022).

Structural Model Assessment

After establishing the adequacy of the measurement model, the structural model was evaluated to test the proposed hypotheses. The assessment involved examining path coefficients, the coefficient of determination (R^2), effect size (f^2), and predictive relevance (Q^2).

Path coefficients were analysed to determine the strength and direction of relationships between constructs. The coefficient of determination (R^2) was used to assess the explanatory power of the endogenous constructs. Effect size (f^2) was calculated to evaluate the contribution of each exogenous construct to the endogenous construct.

Predictive relevance (Q^2) was assessed using the blindfolding procedure to determine the model's predictive capability. In addition, bootstrapping with 5,000 resamples was conducted to evaluate the statistical significance of the path coefficients and to test the hypothesized relationships.

Mediation Analysis

A mediation analysis was conducted to examine the mediating role of motivation in the relationships among autonomy, competence, relatedness, and student performance. The analysis was performed using the bootstrapping procedure in PLS-SEM. The significance of indirect effects was assessed to determine whether motivation mediates the relationships between the independent variables and student performance. Mediation is established when the indirect effect is statistically significant (Hair et al., 2022).

RESULTS AND DISCUSSION

Descriptive Statistics

A total of 201 student responses were analysed to examine the relationships among autonomy, competence, relatedness, motivation, and student performance. Descriptive statistics were computed to assess the central tendency and variability of each construct.

Table 1: Descriptive Statistics of Study Constructs (N = 201)

Construct	Mean	Standard Deviation
Autonomy	4.50	0.54
Competence	4.50	0.54
Relatedness	4.57	0.55
Motivation	4.58	0.54
Student Performance	4.54	0.55

All constructs recorded high mean values above 4.50, indicating that students perceived the learning environment as highly supportive of their psychological needs. Motivation reported the highest mean score (M = 4.58, SD = 0.54), followed by relatedness (M = 4.57, SD = 0.55) and student performance (M = 4.54, SD = 0.55). These findings are consistent with Self-Determination Theory (Ryan & Deci, 2000, 2020).

Measurement Model Result

The measuring model was evaluated for internal consistency reliability, convergent validity, and discriminant validity. Internal consistency reliability was assessed with Cronbach's alpha (α) and composite reliability (CR). Values exceeding 0.70 were deemed suggestive of satisfactory reliability (Hair et al., 2022).

Convergent validity was evaluated by the Average Variance Extracted (AVE). An AVE score of 0.50 or higher indicates that the concept accounts for at least 50% of the variance in its indicators, thereby demonstrating sufficient convergent validity.

Discriminant validity was assessed utilizing the Fornell–Larcker criterion and the Heterotrait–Monotrait ratio (HTMT). HTMT values below 0.90 served as the criterion for establishing the empirical distinctiveness of the constructs (Hair et al., 2022).

Structural Model Results

The structural model was evaluated using bootstrapping with 5,000 resamples. The results indicated that autonomy ($\beta = 0.21$, $t = 3.12$, $p < .01$), competence ($\beta = 0.29$, $t = 4.05$, $p < .001$), and relatedness ($\beta = 0.34$, $t =$

4.78, $p < .001$) had significant positive effects on motivation. Among these, relatedness emerged as the strongest predictor.

Motivation had a significant positive effect on student performance ($\beta = 0.62$, $t = 9.15$, $p < .001$), confirming its role as a key determinant of academic outcomes. The model explained 58% of the variance in motivation ($R^2 = 0.58$) and 38% of the variance in student performance ($R^2 = 0.38$), indicating moderate to substantial explanatory power (Hair et al., 2022).

Mediation Analysis

A mediation analysis was conducted to examine whether motivation mediates the relationships among autonomy, competence, relatedness, and student performance. The indirect effects were tested using bootstrapping procedures.

The results showed that the indirect effect of autonomy on student performance through motivation was significant ($\beta = 0.13$, $t = 2.98$, $p < .01$). Similarly, competence demonstrated a significant indirect effect on student performance via motivation ($\beta = 0.18$, $t = 3.87$, $p < .001$), while relatedness also showed a significant indirect effect ($\beta = 0.21$, $t = 4.42$, $p < .001$).

To assess mediation strength, the Variance Accounted For (VAF) was calculated. The VAF values were 61% for autonomy, 69% for competence, and 74% for relatedness. According to established guidelines, VAF values between 20% and 80% indicate partial mediation, whereas values above 80% indicate full mediation (Hair et al., 2022).

Based on these results, motivation partially mediates the relationships between autonomy, competence, relatedness, and student performance. This suggests that while psychological needs directly influence student outcomes, a substantial portion of their effects operates through motivation.

DISCUSSION

The findings of this study provide strong empirical support for Self-Determination Theory by demonstrating that autonomy, competence, and relatedness significantly influence student motivation, which in turn enhances academic performance.

Autonomy was found to positively influence motivation ($\beta = 0.21$, $p < .01$), indicating that students who experience greater control over their learning are more motivated. Competence also showed a significant effect ($\beta = 0.29$, $p < .001$), suggesting that confidence in one's abilities enhances engagement and persistence. Relatedness emerged as the strongest predictor ($\beta = 0.34$, $p < .001$), highlighting the importance of social connections in fostering motivation.

Motivation demonstrated a strong positive effect on student performance ($\beta = 0.62$, $p < .001$), confirming its central role in driving academic success. The mediation analysis further revealed that motivation serves as a key mechanism through which psychological needs influence performance. The partial mediation results indicate that both direct and indirect pathways are important in explaining student outcomes.

The relatively high VAF values, particularly for relatedness (74%), suggest that social interaction and a sense of belonging play a critical role in enhancing motivation, which subsequently improves performance. These findings are consistent with prior research emphasising the importance of supportive learning environments in promoting motivation and academic achievement (Deci et al., 2017; Bureau et al., 2021).

Overall, the results highlight that while autonomy, competence, and relatedness directly contribute to student performance, their effects are significantly strengthened through motivation. This underscores the importance of designing learning environments that not only support psychological needs but also actively foster student motivation.

Student Feedback on Gamified Learning

Analysis of students' qualitative feedback revealed several recurring themes regarding their experiences with the gamified learning system. Overall, students expressed positive perceptions of gamified learning, particularly regarding enhanced engagement, motivation, collaboration, and academic performance. These findings are consistent with prior studies demonstrating that gamified learning environments can significantly improve students' motivation, engagement, and learning outcomes (Férriz-Valero et al., 2020; Lampropoulos et al., 2024).

Autonomy in Learning

A prominent theme emerging from the data was students' perceived autonomy in the learning process. Many students reported that the gamified system enabled them to take greater control of their learning through features such as task selection, level progression, and flexible participation. These elements allowed students to engage with course materials at their own pace and according to their individual preferences.

Furthermore, students highlighted that the system facilitated self-directed learning by allowing them to monitor their progress and select tasks aligned with their abilities. This flexibility fostered a sense of responsibility for their learning outcomes and increased their willingness to participate in academic activities. These findings align with self-determination theory, which posits that autonomy-supportive environments enhance intrinsic motivation and engagement (Ryan & Deci, 2020; Cullen & Oppenheimer, 2024).

Feedback and Competence Development

Another key theme identified was the role of feedback in supporting competence development. Students frequently emphasized the importance of the gamified system's immediate feedback, which enabled them to identify and correct errors promptly. This timely feedback enhanced their understanding of course concepts and facilitated continuous improvement.

Additionally, performance indicators, such as scores, progress tracking, and achievement metrics, enabled students to monitor their development over time. As a result, many students reported increased confidence and a stronger sense of achievement. This perceived competence further motivated them to engage more actively in learning tasks and to undertake more challenging activities. These findings corroborate previous research indicating that feedback and perceived competence are critical determinants of student motivation and engagement (Raven & Pels, 2021; Bureau et al., 2021).

Collaboration and Social Interaction

Collaboration and peer interaction also emerged as significant components of the gamified learning experience. Students reported that group-based activities, discussions, and collaborative challenges enhanced their sense of connectedness with peers. Such interactions facilitated knowledge sharing, idea exchange, and collective problem-solving.

Moreover, collaborative activities fostered a supportive learning environment in which students could assist one another in understanding complex concepts. Many participants noted that teamwork not only improved their learning outcomes but also made the learning experience more enjoyable and socially enriching. These findings are consistent with existing literature highlighting the importance of social interaction and peer support in enhancing student engagement and motivation (White et al., 2020; Yang et al., 2025).

Motivation and Engagement

Gamification elements, including points, badges, and leaderboards, were identified as key drivers of student motivation and engagement. Students reported that these features made learning activities more interactive and enjoyable, thereby increasing their participation in class.

In particular, competitive elements such as leaderboards fostered a sense of friendly competition, motivating students to improve their performance and complete tasks more efficiently. This competitive dynamic encouraged sustained engagement and heightened interest in the subject matter. These findings align with prior research indicating that gamification can enhance motivation, engagement, and overall learning experiences (Sailer et al., 2021; Lampropoulos et al., 2024).

Improvements in Academic Performance

Students also reported perceived improvements in their academic performance following their engagement with gamified learning activities. Many participants indicated that the system enhanced their understanding of course content and enabled them to apply knowledge more effectively.

Specifically, students noted improvements in several key areas, including problem-solving, critical thinking, understanding of course materials, and time management. Additionally, the gamified environment encouraged consistent study habits and sustained focus on learning objectives. These findings support existing evidence that gamified learning can positively influence academic performance and learning effectiveness (Lampropoulos et al., 2024).

Contribution And Limitation

This study contributes to the existing literature in several important ways. First, it extends the application of Self-Determination Theory (SDT) to gamified learning environments in higher education. While previous studies have examined the impact of gamification on student engagement and motivation, relatively few have investigated how the psychological needs for autonomy, competence, and relatedness influence student performance in gamified learning settings.

Second, the study contributes to the literature by examining the mediating role of motivation in the relationship between psychological need satisfaction and student performance. By integrating motivation as a mediating variable, this study provides deeper insights into the mechanisms through which gamified learning environments influence academic outcomes.

Third, this study provides empirical evidence using Partial Least Squares Structural Equation Modelling (PLS-SEM) to test the relationships among autonomy, competence, relatedness, motivation, and student performance. The findings strengthen the theoretical understanding of how psychological needs influence learning behaviour and outcomes in digital learning environments.

Finally, the study contributes to the growing body of research on gamification in higher education, particularly in understanding how gamified learning strategies can be designed to support students' psychological needs and enhance learning outcomes. The results highlight the importance of incorporating motivational theories into the design of gamified educational environments.

Despite its contributions, this study has several limitations that should be considered when interpreting the findings.

First, the study used a cross-sectional research design, which limits the ability to establish causal relationships between the variables. Although the results suggest significant relationships among the constructs, longitudinal studies would provide stronger evidence regarding the causal effects of psychological need satisfaction on motivation and student performance.

Second, the data were collected from students enrolled in a single course using gamified learning activities, which may limit the generalizability of the findings to other educational contexts. Students from different academic disciplines, institutions, or learning environments may experience gamified learning differently.

Third, the study relied on self-reported data collected through questionnaires, which may introduce response bias. Students may have responded based on their perceptions rather than their actual behaviour or academic performance.

Fourth, the study focused only on three psychological needs derived from Self-Determination Theory. Although autonomy, competence, and relatedness are central components of SDT, other factors such as self-efficacy, learning engagement, and technological acceptance may also influence student motivation and performance in gamified learning environments.

RECOMMENDATION AND CONCLUSION

Future research could address several limitations of the present study and further extend the understanding of gamified learning and student motivation.

First, future studies could adopt longitudinal research designs to examine how psychological need satisfaction and motivation evolve over time in gamified learning environments. Longitudinal studies would provide deeper insights into the long-term impact of gamified learning on student motivation and academic performance.

Second, future research could examine the proposed model in different educational contexts, such as online learning environments, blended learning settings, or other academic disciplines. This would help determine whether the relationships observed in this study are consistent across various learning environments.

Third, future studies could explore additional psychological and behavioural variables that may influence student performance in gamified learning environments. Variables such as learning engagement, self-efficacy, technology acceptance, and learning satisfaction may provide a more comprehensive understanding of students' learning experiences.

Fourth, researchers could investigate the gamification design features that most effectively support psychological need satisfaction. For example, future studies could examine how specific gamification elements, such as leaderboards, badges, or collaborative challenges, influence students' autonomy, competence, and relatedness.

Finally, future research could employ mixed-methods approaches, combining quantitative data with qualitative interviews or focus groups. This would allow researchers to gain deeper insights into students' experiences and perceptions of gamified learning environments.

This study investigated the influence of autonomy, competence, and relatedness on student performance within a gamified learning context, with motivation acting as a mediating variable. Based on Self-Determination Theory (SDT), the study examined how fulfilling students' psychological needs affects their motivation and academic performance in a gamified educational environment.

The study's findings demonstrate that autonomy, competence, and relatedness substantially affect student motivation in gamified learning contexts. Students who perceive greater control over their learning activities, feel competent in academic tasks, and establish significant social relationships with peers and instructors are more inclined to cultivate a heightened desire to learn. These findings corroborate the core tenets of Self-Determination Theory, indicating that fulfilling psychological needs is essential for cultivating intrinsic motivation and engagement.

Furthermore, the findings indicate that motivation substantially affects student performance, suggesting that motivated students are more likely to participate actively in learning and achieve superior academic results. The research further validates the mediating role of motivation in the relationship between psychological need fulfillment and student achievement. This indicates that autonomy, competence, and relatedness indirectly affect student performance by enhancing students' motivation for learning.

The findings underscore the need to create gamified learning environments that address students' psychological needs. Educational settings that offer autonomy, bolster students' perception of competence, and encourage social interaction can markedly improve students' motivation and academic achievement.

This study extends the existing literature on gamified learning and student motivation in higher education by providing empirical evidence for the use of Self-Determination Theory in digital learning contexts. The results provide significant insights for educators and instructional designers seeking to develop engaging, successful gamified learning experiences that enhance student motivation and academic performance.

In summary, integrating gamification with motivational theories such as Self-Determination Theory can create a robust framework for improving student engagement and academic achievement in higher education. Subsequent research should continue to investigate novel pedagogical approaches that address students' psychological needs and promote meaningful learning experiences in more digital educational settings.

REFERENCES

1. Basileo, L. D., Otto, B., Lyons, M. E., Vannini, N., & Toth, M. D. (2024). The role of self-efficacy, motivation, and perceived support of students' basic psychological needs in academic achievement. *Frontiers in Education, 9*. https://doi.org/10.3389/feduc.2024.1385442
2. Bureau, J. S., Howard, J. L., Chong, J., & Guay, F. (2021). Pathways to student motivation: A meta-analysis of antecedents of autonomous and controlled motivations. *Review of Educational Research, 92*(1), 46–72.
3. Cullen, S., & Oppenheimer, D. M. (2024). Choosing to learn: The importance of student autonomy in higher education. *Science Advances, 10*(29).
4. David, L., & Weinstein, N. (2023). A gamified experiential learning intervention for engaging students through satisfying needs. *Journal of Educational Technology Systems, 52*(1), 52–73. https://doi.org/10.1177/00472395231174614
5. Férriz-Valero, A., Østerlie, O., Martínez, S. G., & García-Jaén, M. (2020). Gamification in physical education: Evaluation of impact on motivation and academic performance within higher education. *International Journal of Environmental Research and Public Health, 17*(12), 4465.
6. Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Sage Publications.
7. Hao, Y., & Lan, Y. (2023). Research and practice of flipped classroom based on mobile applications in local universities from the perspective of self-determination theory. *Frontiers in Psychology, 13*. https://doi.org/10.3389/fpsyg.2022.963226
8. Lampropoulos, G., Keramopoulos, E., & Diamantaras, K. (2024). Gamification in education: A systematic review of the literature. *Education Sciences, 14*(2), 102.
9. McAnally, K., & Hagger, M. S. (2024). Self-determination theory and workplace outcomes: A conceptual review and future research directions. *Behavioral Sciences*, 14(6), 428.
10. Ramayah, T. J. F. H., Cheah, J., Chuah, F., Ting, H., & Memon, M. A. (2018). Partial least squares structural equation modeling (PLS-SEM) using smartPLS 3.0. An updated guide and practical guide to statistical analysis, 978-967.
11. Raven, H., & Pels, F. (2021). Why feeling competent matters. *German Journal of Exercise and Sport Research, 51*(3), 371–378.
12. Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology, 61*, 101860. https://doi.org/10.1016/j.cedpsych.2020.101860
13. Sailer, M., Hense, J., Mayr, S., & Mandl, H. (2021). How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. *Computers in Human Behavior, 69*, 371–380.
14. Sekaran, U. & Bougie, R. (2016) Research Methods for Business: A Skill-Building Approach. 7th Edition, Wiley & Sons, West Sussex.
15. Urhahne, D., & Wijnia, L. (2023). Theories of motivation in education: An integrative framework. *Educational Psychology Review, 35*(2). https://doi.org/10.1007/s10648-023-09767-9
16. White, R. L., Bennie, A., Vasconcellos, D., Cinelli, R., Hilland, T., Owen, K., & Lonsdale, C. (2020). Self-determination theory in education: A systematic review. *Teaching and Teacher Education, 99*, 103247.
17. Yang, Y., Zhang, X., & Li, Q. (2025). Student engagement and motivation in digital learning environments: A self-determination theory perspective. *Frontiers in Psychology, 16*.