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Impact of Game-Based Student Response Systems on Academic Performance

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ABSTRACT

This study examines the relationship between game-based student response systems (GSRS) and college student academic performance. GSRS, such as Kahoot!, are emerging in classrooms as a "fun" way to review course material and test student understanding. Its increasing usage begs the question of its effectiveness for students. Therefore, this research tests the impact, using achievement goal theory and engagement theory as the foundation. The research model behind this study outlines the relationship between GSRS and academic performance with learning goal-orientation, performance goal-orientation, and engagement acting as mediators. We collected 157 completed survey responses and utilized Partial Least Squares (PLS) structural equation modeling. The findings highlight the significance of integrating GSRS in educational settings to enhance student engagement and foster a deeper understanding of course material.

Keywords: *Game-based student response systems; Academic performance; Student engagement; Educational technology*

INTRODUCTION

Game-based student response systems (GSRS) are emerging in classrooms as a "fun" way to review course material and test student understanding. For instance, as of 2023, one popular GSRS, Kahoot!, reported over 1.37 million paid subscriptions and over 9 billion participations since launch (Kahoot!, 2023). These systems typically involve students using a mobile device to complete a multiple-choice, competitive formative assessment with quick feedback. Educators employ GSRS to engage students during lectures, assess student knowledge, and motivate learning of course information.

The increasing use of GSRS raises questions about their academic effectiveness for students. Although previous studies have demonstrated increased engagement in classrooms (Dellos, 2015; Fotaris et al., 2015; Miller & Zhao, 2022; Wang, 2015; Yoo & Lee, 2023; Zarzycka-Piskorz, 2016), research on the impact of GSRS on academic performance is limited. Andrés, Sanchis, & Poler (2015) noted the scarcity of research on this topic, with an average of four publications per year since 2001. Therefore, this paper addresses the following research question: How does the use of GSRS impact academic performance?

To investigate this question, we first identified five variables: GSRS, learning goal orientation, performance goal orientation, engagement, and academic performance. We posited that the two goal orientations and engagement would mediate the relationship between GSRS use and academic performance. We developed a questionnaire and conducted a pilot study to assess the reliability and validity of our measures. Partial least squares (PLS) structural equation modeling was employed to analyze the questionnaire data.

This paper is organized as follows: We begin with a review of the literature on the variables of this study. Next, we present our hypotheses. This is followed by a description of the methodology employed in the study. We then discuss the results of our analyses. Finally, we conclude by summarizing our findings and discussing their implications.

LITERATURE REVIEW

Game-Based Student Response Systems

Gamification is defined as the use of game elements in non-game contexts (Barata et al., 2013; Cavus et al., 2023; Fotaris et al., 2015; Hansen, & Anderson, 2023; Miller & Zhao, 2022; Yoo & Lee, 2023; Zarzycka-Piskorz, 2016). Gamification in higher education can also positively impact students. Kang &Lee (2023) examined the effect of Kahoot! in a university education setting and found that Kahoot! increased student engagement during classes. Moreover, the research demonstrated that Kahoot! improves students' learning outcomes by creating a dynamic and engaging educational environment. Barata et al. (2013) described a 5-year study on gamification in an Instituto Superior Técnico course. The research found that students feel more motivated and interested in gamified courses, as shown by their higher participation (66% increase in average online posts), and scores were slightly higher than those in the non-gamified course (mean of 17.21 versus 15.90-16.90, out of 20). Another gamified course at the University of West London (Fotaris et al., 2015) had higher average attendance (12% difference) and higher average final grades (8% difference).

In recent research, meta-analyses have provided data on the effects of gamification on educational outcomes. Núñez et al. (2021) evaluated the effects of gamification on student engagement and learning outcomes by analyzing 31 studies related to gamification in higher education. Huang et al. (2020) also conducted a meta-analysis to assess the impact of the game-based learning in higher education. The result of the study confirmed that game-based learning improves student motivation and academic achievement. Both meta-analyses found that gamification improves student engagement and learning outcomes by incorporating game-based features, such as scoring, ranking, and quests, that increase motivation and interactive participation in educational activities.

Audience response systems are devices used for answering questions, surveys, or votes (Caldwell, 2007). Thus, we can define student response systems (SRS) as the same devices used in educational contexts. SRS can positively impact students in higher education. Caldwell (2007) reported that West Virginia University courses using SRS saw lower attrition rates (4-8%), more A grades (4.7%), and fewer Ds, Fs, or withdrawals (3.8%).

Combining gamification with SRS results in game-based student response systems (GSRS). In 2008, researchers at the Norwegian University of Science and Technology developed a GSRS prototype called Lecture Quiz, and students reported they learned more using it than traditional lectures (Wang et al., 2008). Since then, many web-based GSRS have been published. Andrés et al. (2015) analyzed six free GSRS: Infuse Learning, QuizSocket, Kahoot!, Verso, Socrative, and Poll Everywhere. Findings showed they all function similarly but also have some differences that may affect which is used. Li & Wong (2022) examined GSRS advancements by evaluating their impact on classroom engagement. By examining both established and new GSRS platforms, their research offers insights into how gamification and student engagement interact to improve learning in the digital era.

One popular GSRS option is Kahoot!, which is the result of the Lecture Quiz project (Li & Wong, 2022). The instructor creates a quiz, discussion, or survey, and starts the game on a projected computer. Students join the game via computer, phone, or tablet, and they see questions and answer options on the projection. Students answer the questions on their device, and those who

answer correctly and faster earn more points. Research suggests that Kahoot! positively impacts students. One study (Zarzycka-Piskorz, 2016) found that 53% of students were motivated to master the content, and 48% were “very motivated” to win the game. Wang (2015) compared motivation, engagement, and perceived learning between a first-time, single usage of Kahoot! and a semester-long usage. Results found no major differences between the two groups. The semester-long usage group had changes in motivation and engagement but no changes in perceived learning. Zeng & Sun's (2023) meta-analysis examined 50 studies from 2008 to 2023 to evaluate the impact of gamification on students' academic performance. The findings indicated that gamification significantly enhanced student engagement and motivation, leading to improved academic outcomes, particularly in STEM subjects. Li, Ma, & Shi (2023) also examined a meta-analysis on gamification’s effectiveness in education. They found that gamification significantly improved student engagement, motivation, and academic performance, especially in interactive, competitive settings.

Net Generation

Millennials, also referred to as Digital Natives and the Net Generation, are those born from 1982 to 2002 (Barnes et al., 2007; Elam et al., 2007). Among them, the Net Generation specifically refers to individuals born from the late 1990s to the early 2000s, who have grown up with extensive exposure to digital technology and the Internet (Bennett et al., 2008, Tapscott, 2009). Over the past decade, researchers have studied Net Generation students, their educational technology uses, and classroom environments and explained that they enjoy or prefer using technology over traditional teaching methods (Suša, 2014, Giurgiulescu et al., 2015), and technology enhances their learning (Suša, 2014; Giurgiulescu et al., 2015). Some suggest this research focus needs to change because of a lack of proper evidence (Bennett & Maton, 2010) or difference between Net Generation and non-Net Generation educational technology usage (Romero et al., 2013). Despite the controversy, the Net Generation remains a relevant topic for research.

The Net Generation has many characteristics that may influence their usage of educational technology (Barnes et al., 2007; Elam et al., 2007; Evans & Forbes, 2012). They are:

1) sheltered,
2) team-achievement, and goal-oriented,
3) confident,
4) multitaskers,
5) technologically savvy,
6) structured,
7) generous, and
8) independent learners.

Studies have shown that due to these characteristics, educators should adjust their approaches to these students (Barnes et al., 2007; Elam et al., 2007; Evans & Forbes, 2012).

Goal-Orientation

Goal-orientation, also known as achievement-orientation, is one of the characteristics of the Net Generation. According to the achievement goal theory, individuals pursue different types of goals, either focusing on mastering skills and increasing competence or on demonstrating their ability relative to others. This theory is based on the idea that how individuals perceive their own competence and define success significantly influences their motivational processes (Dweck, 1986). Dweck (1986) defined two categories of goal-orientation: learning goal and performance goal. Learning goal-orientation focuses on increasing competence and mastering information, which is generally associated with intrinsic motivation. Individuals pursuing learning goals are

driven by a genuine interest in the subject and personal growth, rather than external rewards (Dweck, 1986; Ryan & Deci, 2000). Intrinsic motivation leads to engagement in activities that are intrinsically satisfying (Elliot & McGregor, 1999). Performance goal-orientation, is about focus on others, positively recognizing one's competence or avoiding appearing incompetent. Performance goal-orientation is related to extrinsic motivation because individuals are motivated by validation from others and external outcomes, such as grades or accolades, rather than personal satisfaction (Elliot & Church, 1997; Schunk, 2001). Performance goals can be further divided into proving goals, which focus on showing superior ability, and avoiding goals, which aim to avoid appearing incompetent (VandeWalle et al., 2001). Jaramillo-Mediavilla et al. (2024) found that gamification has a positive impact on students' intrinsic motivation. Game elements such as points, rewards, and leveling up encouraged students' goal orientation and self-directed learning. The study showed that students experienced increased engagement and interest in learning, especially when tackling challenging tasks. Additionally, the immediate feedback and sense of achievement provided by gamification enhanced their motivation to learn.

Different goal-orientations can lead to different behavioral patterns. Learning goal-orientation can lead to mastery orientation -challenge-seeking and persistent (Dweck 1986, Ames, 1992), while performance goal-orientation can lead to helplessness -challenge-avoiding and low persistence (Dweck 1986).

Achievement goal theory suggests that goal-orientation relates to self-regulation and academic performance. Bouffard et al. (1995) found that overall, learning goal is more related to self-regulation than performance goal. However, students with both high learning goal and performance goal show higher self-regulatory strategies and higher academic performance. VandeWalle et al. (2001) also found a constant positive relationship between learning goal and academic performance.

Engagement

Engagement Theory suggests that student involvement in learning is fundamental for effective education. It focuses on the importance of cognitive processes, intrinsic motivation, collaboration, and project-oriented learning to enhance students' active participation and learning outcomes. Kearsley & Schneiderman (1998) defined engaged learning as student involvement in cognitive processes, combined with intrinsic motivation. Intrinsic motivation is important in the learning process because it is driven by an internal desire for personal growth and competence (Dweck, 1986). The internal desire fosters deeper engagement, sustained effort, and a more meaningful learning experience, as individuals are motivated by their own curiosity and personal goals rather than external incentives.

Engagement theory is further defined as having three components: collaboration, project-oriented learning, and authentic, non-academic focus (also referred to as "Relate-Create-Donate"). According to Kassab et al. (2023), engagement is not only related to cognition but also behaviour and emotion. Cognitive engagement involves mental effort and interest in learning, behavioral engagement refers to participation in academic tasks and activities, and emotional engagement relates to students' feelings about their learning experience.

Ahlfeldt et al. (2005) analyzed data of an adapted National Survey of Student Engagement (NSSE) and found that smaller classes, higher-level classes, and classes with problem-based learning tend to have higher levels of engagement. Also, arts, humanities, and social science courses had higher engagement than natural science and mathematics courses. Given the social nature of these courses, the results are not surprising. Fernandez & Nguyen (2023) investigated the impact of digital platforms on enhancing student engagement in university settings. The study explains how technology not only complements traditional teaching methods but also introduces a new

dimension of interactivity and personalization that significantly boosts student involvement and learning outcomes. Carini et al. (2006) also gathered data from the original NSSE and found that active student engagement, such as student-faculty interaction and collaborative learning, can increase student learning as measured by GPA and GRE scores. With these benefits in mind, educators should encourage their students to become engaged learners. Zepke & Leach (2010) provided a list of ways to improve student engagement, such as creating enriching educational experiences and enabling students to work independently.

Technology usage can fit into and increase student engagement. Various communication and data technologies (such as,. conferencing, email, wikis) can fit into all three components of engagement theory (Kearsley & Schneiderman, 1998). Laird & Kuh (2004) examined 2003 NSSE data and found positive relationships between student engagement and IT usage. Thus, student technology usage can increase engaged learning, which can lead to increased student learning.

Academic Performance

Academic performance includes class exam grades and school GPA. Research suggests that various factors can affect academic performance. Achievement goal theory emphasizes the role of goal orientation in academic performance. Self-efficacy, which is a key factor in this theory, relates to an individual's belief in their ability to achieve academic goals. In addition, based on engagement theory, a student's motivation is important for their engagement in learning. When students believe in their abilities, they are more motivated to engage with their learning. This improves their academic performance. (Pintrich & DeGroot, 1990, Huang, 2003). For instance, studies show that self-efficacy positively relates to and predicts academic performance (Honicke & Broadbent, 2016; Huang, 2003). Duckworth & Seligman (2005) found that self-discipline better predicts academic performance gains than IQ scores. Thus, students who strive to meet scholarly performance goals are more likely to attain them. Other factors affecting academic performance include time management and test anxiety. Macan et al. (1990) found that students' perceived control of time strongly correlated with academic performance and stress. Those who felt a stronger control of time reported higher work/life satisfaction and less role overload. Chapell et al. (2005) found slightly higher academic performance in those with low test anxiety (B+ compared to B grades).

Certain factors within the classroom can also affect academic performance. Teachers with professional development in higher-order thinking skills, classes demonstrating higher-order thinking skills, and hands-on learning are positively associated with student performance, according to Wenglinsky (2002). Meece et al. (2006) found that classrooms with performance goal environments sometimes increased academic performance, while mastery goal environments may have a significant impact only when encouraged by teaching practices. In students, emotions such as hope and pride can mediate the relationship between goal-orientations and performance (Pekrun et al., 2006).

Technology can affect academic performance as well. Debevec et al. (2006) found that students who heavily relied on either technology-based learning methods or traditional learning methods have higher performance than those who reported low or high use of both methods combined. Scida & Saury (2006) compared a traditional course to a hybrid traditional-online course at the University of Virginia and found higher satisfaction (94%), more A grades (58% versus 32%), and more B grades or above (84% versus 73%) in the hybrid course. These studies suggest that the use of technology in education can increase academic performance.

RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

Research Model

The research model examines the relationship between Game-Based Student Response Systems (GSRS) and academic performance through learning goal-orientation, performance goal-orientation, and engagement. According to Achievement Goal Theory (Dweck, 1986), learning goal-orientation emphasizes mastering content and self-improvement, while performance goal-orientation is oriented to achieving recognition and outperforming peers. Engagement theory suggests that higher levels of engagement lead to better academic performance (Kearsley & Schneiderman, 1998). These theories propose that goal orientations and student engagement serve as mediators in the relationship between GSRS and academic performance, and based on this, the research model (Figure 1) was developed.

By examining goal orientations and student engagement as mediators, we seek to discover the underlying mechanisms through which GSRS influences academic performance. This aligns with achievement goal theory and engagement theory. Achievement goal theory proposes that goal orientations affect academic success, and engagement implies that higher engagement improves academic outcomes. We believe that the mediators in our research model provide a better understanding of how GSRS impacts student academic performance.

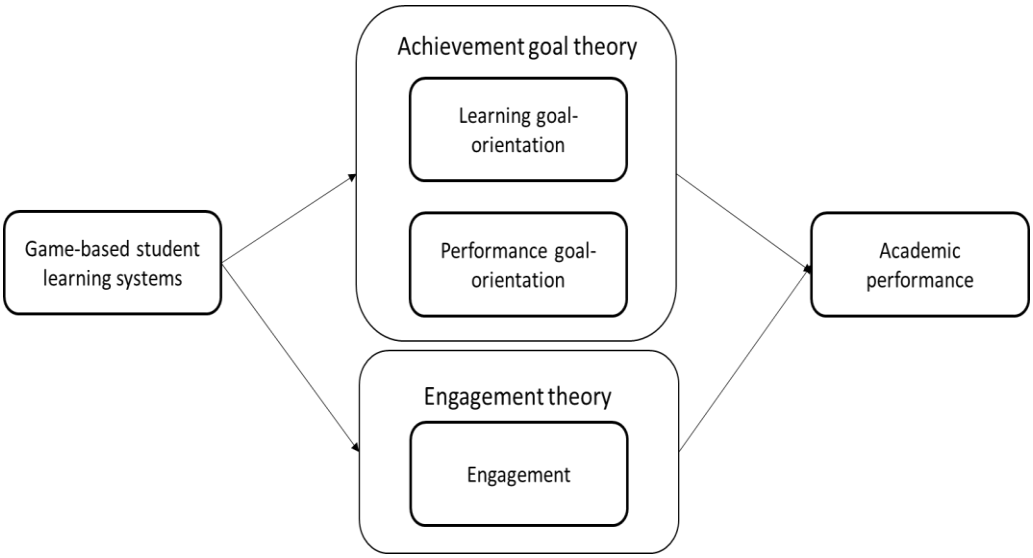


Figure 1: Research Model

Hypotheses Development

One major aspect of GSRS is that it is a system used to test knowledge by quizzing. This aspect can relate to learning goal-orientation. Students with a learning goal-orientation desire to master course content (Dweck, 1986). So, students participating in GSRS may decide to master their course information to perform well in the GSRS and self-reaffirm their competence. As mentioned earlier, Zarzycka-Piskorz (2016) found that over half of students (53%) using Kahoot! were motivated to master course content. Therefore, GSRS relates to learning goal-orientation. In

addition, the Net Generation is characterized as being goal-oriented. Thus, we hypothesize that GSRS positively relates to learning goal-orientation in Net Generation students.

Hypothesis 1: *GSRS is positively associated to learning goal-orientation in Net Generation students.*

Another major aspect of GSRS is that it has game elements, such as competition. This aspect can relate to performance goal-orientation. Students with a performance goal-orientation desire recognition of their competence (Dweck 1986). So, students participating in GSRS may compete with their peers, try to win, and aim to appear competent of the content. As mentioned earlier, Zarzycka-Piskorz (2016) found that almost half of students (48%) using Kahoot! were "very motivated" to win. Therefore, GSRS relates to performance goal-orientation. In addition, the Net Generation is characterized as being technologically savvy. Thus, the current study hypothesizes that GSRS positively relates to performance goal orientation in Net Generation students.

Hypothesis 2: *GSRS is positively associated to performance goal-orientation in Net Generation students.*

GSRS is for a group of students to use in the classroom. Whether competing individually or as teams, GSRS usage promotes collaboration between students and the instructor during and after answering questions. Collaboration is one of the main components of student engagement (Kearsley & Schneiderman 1998). Depending on the questions given, GSRS can create problem-based learning, which can offer higher levels of engagement (Ahlfeldt et al., 2005). Also, Laird & Kuh (2004) found positive relationships between technology usage and student engagement, which can support the relationship between GSRS and engagement. Thus, we hypothesize that GSRS positively relates to engagement in Net Generation students.

Hypothesis 3: *GSRS positively relates to engagement in Net Generation students.*

As noted in the Literature Review, previous studies show a positive relationship between learning goal-orientation and academic performance (Bouffard et al., 1995; VandeWalle et al., 2001). We believe these findings will be reconfirmed in this research paper. Thus, we hypothesize that learning goal-orientation in Net Generation students positively relates to academic performance.

Hypothesis 4: *Learning goal-orientation in Net Generation students positively relates to academic performance.*

As stated earlier, one study (Meece et al., 2006) found a positive relationship between performance goal-orientation and academic performance. Both learning and performance goal-orientation also positively relate to academic performance (Bouffard et al., 1995). Thus, we hypothesize that performance goal-orientation in Net Generation students positively relates to academic performance.

Hypothesis 5: *Performance goal-orientation in Net Generation students positively relates to academic performance.*

As mentioned in the Literature Review, one study (Carini et al., 2006) saw active engagement lead to an increase student learning, measured by GPA and GRE scores. This finding suggests the more engaged a student is, the higher their academic performance will be. Thus, we hypothesize that engagement positively relates to academic performance.

Hypothesis 6: *Engagement in Net Generation students positively relates to academic performance.*

RESEARCH DESIGN AND METHODOLOGY

Data Collection

Data were collected from university students across three sections of a Management Information Systems (MIS) course. The first exam of the course was used for data collection. The exam consisted of 14 Kahoot! questions and 21 traditional multiple-choice questions. After the exam, a survey was administered to measure learning goal-orientation, performance goal-orientation, and engagement.

Measurement

Game-Based Student Response Systems (GSRS)

The Game-Based Student Response Systems (GSRS) performance was assessed using the Kahoot! quiz. Each student's performance was measured through the following: accuracy, and time taken to complete the quiz (Table 1).

Table 1: *GSRS Measurement*

Measures	Accuracy Points	Time Points
7	13-14 correct answers	Top 14.3% (fastest times)
6	11-12 correct answers	Top 14.4-28.6%
5	9-10 correct answers	Top 28.5-42.9%
4	7-8 correct answers	Top 42.9-57.2%
3	5-6 correct answers	Top 57.1-71.5%
2	3-4 correct answers	Top 71.4-85.8%
1	0-2 correct answers	Bottom 14.2% (slowest times)

Academic Performance

Academic performance was assessed using the results from the remaining 21 questions on the exam and, the final average grades for the course (Table 2).

Table 2: *Academic Performance Measurement*

Measures	Accuracy Points	Final Average Grade
7	20-21 correct answers	85.8-100
6	17-19 correct answers	71.4-85.8
5	14-16 correct answers	57.1-71.5
4	11-13 correct answers	42.9-57.2
3	8-10 correct answers	28.5-42.9
2	5-7 correct answers	14.4-28.6
1	0-4correct answers	0-14.3

Mediators

Learning goal-orientation, performance goal-orientation, and engagement were assessed using a questionnaire developed from previously validated instruments, with modifications to fit into the

current research context. The question items for measuring these mediator variables are listed in Appendix A and are based on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Measurement Reliability and Validity Test

For reliability testing, Cronbach's alpha was used for determining the reliability of a measure, as described in Table 3. Most Cronbach's alpha values were .70 or greater, thus indicating that those measures were reliable. However, Cronbach's alpha value for engagement was less than .70 (.6123). The factor loadings in all cases except two scales were greater than .65. The two engagement scales with low factor loadings were removed. In addition to Cronbach's alpha, Table 4 presents the descriptive statistics for the measures, the internal consistency reliabilities (ICR), the average variance extracted (AVE), and the correlation matrix for all constructs in the study. They supported reliability for the constructs. Then, the factor loadings were greater than .65. The square root of AVEs for each construct were greater than the inter-construct correlations. This pattern supported convergent and discriminant validity (Komiak & Benbasat, 2006).

Table 3: *Composite Reliability and Cronbach's Alpha*

	Number of items	**Composite reliability**	**Cronbach's alpha**
GSRS	2	0.87	0.81
ENG	3	0.67	0.61
LGO	4	0.85	0.83
PER	2	0.96	0.92
PGO	9	0.81	0.77

GSRS: game-based student response systems; ENG: Engagement; LGO: Learning goal-orientation; PER: Academic performance; PGO: Performance goal-orientation.

Table 4: *Descriptive Statistics, Correlations, and Reliabilities*

	ENG	**LGO**	**PER**	**PGO**	**GSRS**
ENG	0.6601				
LGO	0.4389***	0.7721			
PER	0.4574***	0.6615***	0.9629		
PGO	0.7296***	0.6262***	0.7434***	0.5857	
GSRS	0.3136***	0.5558***	0.9367***	0.5860***	0.9764

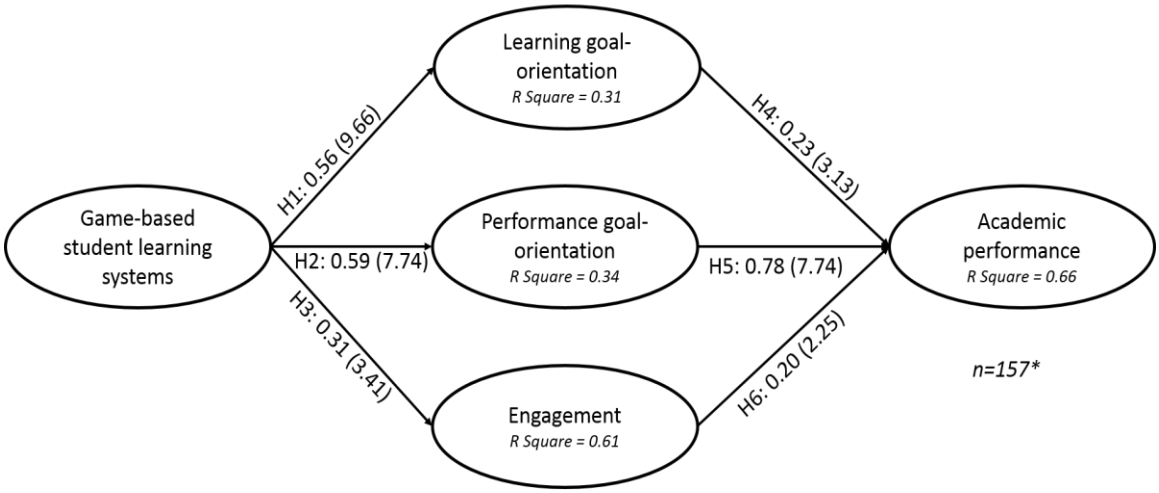
1. *GSRS: game-based student response systems; ENG: Engagement; LGO: Learning goal-orientation; PER: Academic performance; PGO: Performance goal-orientation.*
2. ****p < 0.001*
3. *Diagonal elements are the square root of the shared average variance extracted (AVE) between the construct measures and their measures; off-diagonal elements are correlations between constructs.*

DATA ANALYSIS AND RESULTS

PLS (partial least squares, SmartPLS V3) was used for the data analysis. Structural equation modelling (SEM) analysis was chosen over regression analysis, because SEM can analyse all of

the paths in a model in one analysis. Within SEM, PLS was chosen over LISREL because this study aims at theory development instead of theory testing - whereas LISREL requires a sound theory base, PLS supports exploratory research.

We employed a bootstrapping method (200 times) that used randomly selected subsamples to test the PLS model. Figure 2 shows the results of the PLS analysis. As hypothesized, game-based student learning systems (GSRS) usage was positively and significantly related to learning goal-orientation ($\beta = 0.56$, $p < 0.001$, $R^2 = 0.31$), performance goal-orientation ($\beta = 0.59$, $p < 0.001$, $R^2 = 0.34$), and engagement ($\beta = 0.31$, $p < 0.005$, $R^2 = 0.61$). In addition, learning goal-orientation ($\beta = 0.23$, $p < 0.05$), performance goal-orientation ($\beta = 0.78$, $p < 0.001$), and engagement ($\beta = 0.20$, $p < 0.01$) were positively and significantly related to academic performance ($R^2 = 0.66$). In PLS-SEM, with the beta coefficients (β) indicating the strength and direction of the relationships between the predictor variables and dependent variables. The p-values for these relationships were all less than 0.005, which indicate that the relationships are statistically significant and it is very unlikely that the observed effects occurred by random chance. R-squared values represent the proportion of variance explained by the predictor variables and provide a measure of the model's predictive power (Hair et al., 2022).



1. *Path coefficient (t-statistics)*
2. ****p < 0.001*
3. ** sample size*

Figure 2: Results of PLS-SEM Analysis

DISCUSSION

The findings offer significant theoretical and practical implications, enriching our understanding of the nexus between goal orientations and academic performance, as well as offering insights into the potential of GSRS in educational settings. The research findings indicate that Game-Based Student Learning Systems (GSRS) help students in mastering course content. This aligns with learning goal-orientation, which suggests that students are motivated to understand and master the material, rather than just focusing on performance (Dweck, 1986). The findings confirm the relationship between GSRS and performance goal-orientation. GSRS motivates students to demonstrate their competence relative to their peers. Furthermore, the competitive elements in GSRS, such as scoring and rankings, are associated with performance goal-orientation (Zarzycka-

Piskorz, 2016). The results indicate a positive relationship between GSRS and engagement. This result underscores that GSRS promotes active student participation. The results of this study are consistent with prior research that demonstrate a strong relationship between engagement and interactive learning experiences (Kearsley & Schneiderman, 1998) and between the problem-based learning components in GSRS and student engagement. (Ahlfeldt et al., 2005). The positive relationship between learning goal-orientation and academic performance is confirmed. This finding suggests that students who focus on mastering content achieve higher academic performance. Previous research supports this finding by providing evidence that learning goal-orientation improves academic performance through intrinsic motivation, which encourages students to put more effort into their studies (Bouffard et al., 1995; VandeWalle et al., 2001). The results of the current study also support the relationship between performance goal-orientation and academic performance. This aligns with prior research that suggests students who are motivated to demonstrate their abilities are more likely to put additional effort into mastering the material. This results in higher academic performance. (Meece et al., 2006; Bouffard et al., 1995). Finally, the relationship between engagement and academic performance is confirmed. High levels of engagement enhance participation and involvement in learning activities, which improves academic performance (Carini et al., 2006)

Theoretical Implications

Our research underscores the importance of understanding the differential impact of learning and performance goal orientations on academic performance. This distinction is crucial as it highlights that the drive behind a student's pursuit of academic excellence - whether for the sake of learning or the desire to outperform peers - can significantly influence their grades. This insight opens avenues for future research to delve deeper into how these orientations interact with various educational technologies, like GSRS, to affect student outcomes. It also prompts a re-evaluation of how goal orientations are incorporated into theoretical models of student performance.

Practical Implications

From a practical standpoint, the positive validation of GSRS as a tool to enhance academic performance has immediate ramifications for educational practice. Given the digital nativity of the current generation of college students, there is a clear opportunity for educators to leverage technologically advanced tools to meet students where they are. Our findings suggest that educators might be more inclined to integrate GSRS into their teaching strategies, potentially leading to improved course grades and, by extension, academic success. Moreover, the insights gained from the relationship between goal orientations and the effectiveness of GSRS can guide the development of tailored interventions that cater to different student motivations, thereby enhancing the educational experience.

Based on the findings of this study, educators can develop practical strategies to integrate GSRS into their educational environment. This includes incorporating gamified elements such as scoring, rankings, and quests to enhance motivation and engagement. As educators develop their strategies, they should ensure that game mechanics align with educational objectives. For example, while GSRS can boost engagement, its effectiveness depends on thoughtful design and implementation to prevent potential issues like distraction or unequal access among students (Dichev & Dicheva, 2017; Huang et al. 2020).

Limitations

While our study provides valuable insights, it has several limitations. Firstly, the sample size and its generalizability are notable constraints. The research was conducted with students from a single educational institution. This may limit the applicability of the findings to other educational settings

or broader populations. Future research should aim to include a more diverse and representative sample to enhance the external validity of the results.

Furthermore, the reliance on self-reported data for measuring engagement and goal orientations introduces potential bias. Participants might overestimate or underestimate their own engagement levels and performance. This could affect the accuracy of the findings. To address this issue, future studies could benefit from incorporating objective measures or triangulating self-reported data with other sources. This approach could provide a more accurate assessment of the constructs being studied.

CONCLUSION

In summary, this paper has explored the impact of GSRS on academic performance, situating learning goal-orientation, performance goal-orientation, and engagement as mediators within our research model. While our findings validate the majority of our variables, the journey to fully understanding the dynamics at play is ongoing. We call for further research to build upon our findings, refine theoretical models, and ultimately, enhance educational practices through informed, evidence-based strategies.

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Appendix A

Items Used In Questionnaire

Learning Goal-Orientation (VandeWalle, Cron, & Slocum 2001)

1. I prefer challenging and difficult classes so that I'll learn a great deal.
2. I truly enjoy learning for the sake of learning.
3. I like classes that really force me to think hard.
4. I'm willing to enroll in a difficult course if I can learn a lot by taking it.

Performance Goal-Orientation (VandeWalle, Cron, & Slocum 2001)

1. It's important that others know that I am a good student.
2. I think that it's important to get good grades to show how intelligent you are.
3. It's important for me to prove that I am better than others in the class.
4. To be honest, I really like to prove my ability to others.
5. I would rather drop a difficult class than earn a low grade.
6. I would rather write a report on a familiar topic so that I can avoid doing poorly.
7. I am more concerned about avoiding a low grade than I am about learning.
8. I prefer to avoid situations in classes where I could risk performing poorly.
9. I enroll in courses in which I feel that I will probably do well.

Engagement (Items 1-3 adapted from Shernoff, Schneider, & Shernoff 2003)

1. I was concentrating well on the Kahoot!.
2. I found the activity interesting.
3. I enjoyed what I was doing.
4. After participating in my class's Kahoot(s)! my grade has been approved.
5. Kahoot! helped me on assignments (e.g. quizzes, tests) that included the same course materials from the Kahoot!.