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THE INFLUENCE OF GAME-BASED LEARNING ON LEARNERS' PERFORMANCE

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Abstract

This study determined the extent of game-based learning's influence on students' performance at one public secondary school in a medium-sized division during the School Year 2025–2026. Specifically, it examined the extent of game-based learning's influence on academic achievement, motivational engagement, and skills development; compared its influence across learners grouped by profile variables; and tested whether significant differences existed across these groups. Using a descriptive-comparative research design, the study collected data from secondary learners using a validated survey questionnaire. Results revealed that game-based learning had a strong influence on students' academic achievement, motivational engagement, and skills development. When grouped according to demographic variables, learners consistently reported a strong influence, and no significant differences were found across groups. These findings indicate that game-based learning is an effective and inclusive instructional approach that benefits diverse learners. However, the lowest-scoring indicators- retention of information, reduction of math anxiety, and multitasking ability- highlight areas needing targeted support. Based on these results, an intervention plan was formulated to strengthen reinforcement strategies, reduce math anxiety, and enhance cognitive-skill development to maximize the effectiveness of game-based learning in the school.

Keywords: *Game-based learning, academic achievement, motivational engagement, skills development*

Bio-profiles

Neleth F. Panes is teaching in one of the secondary schools in the City of Sipalay Negros Island Region. She earned her Bachelor's degree in Secondary Education with a major in Mathematics from Carlos Hilado Memorial State University.

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Introduction

Rationale

Technology has changed the way we teach and learn. Classrooms today are no longer limited to chalkboards and textbooks; lessons now often include digital tools that make learning more interactive. One of these approaches is game-based learning (GBL). In this method, teachers use games that include challenges, rewards, and problem-solving tasks to make lessons more engaging. Instead of just listening to lectures, learners get to play, explore, and practice concepts in a fun way. They make decisions, solve problems, and apply what they learn in activities that feel like games. This makes learning more active and enjoyable, while still helping learners understand important ideas (Qian, 2021).

Research highlights GBL's influence across three areas of learner performance: academic achievement, motivational engagement, and skills development. It supports understanding of concepts through interactive tasks and immediate feedback (Sánchez Gómez & García Peñalvo, 2020), sustains interest and persistence through rewards and challenges (Huang & Wu, 2022), and promotes higher-order abilities such as problem solving and strategic thinking (Korkmaz & Özdemir, 2020). However, not all skills improve equally; areas like long-term retention, math anxiety, and multitasking often require additional instructional support beyond gameplay.

In the Philippine context, studies affirm similar benefits. Cayang and Ursabia (2024) found that GBL significantly improved mathematical problem-solving among secondary learners, while Bernardo (2019) emphasized that digital games enhance logical reasoning in math classes. These local insights show that GBL can strengthen mathematics learning, but also reveal gaps in retention and confidence that need targeted support.

While international studies affirm the benefits of GBL, limited Research has examined its influence in Philippine secondary schools, particularly in addressing persistent challenges such as math anxiety, retention, and multitasking. Existing local studies focus mainly on mathematics problem-solving and logical reasoning, leaving gaps in understanding how GBL impacts broader learner performance across diverse demographic profiles. This study addresses that gap by systematically analyzing the influence of GBL on academic achievement, motivation, and skills development, while also identifying areas where learners require targeted support. The intervention plan developed from these findings contributes practical strategies for teachers, ensuring that GBL is not only engaging but also responsive to learners' specific needs.

The study promotes inclusive and equitable quality education by looking at how GBL improves academic success, motivation, and skill development. It offers research-proven methods for lowering math fear, enhancing retention, and boosting student confidence all of which are in line with SDG 4's focus on successful learning outcomes. Motivated by classroom observations, the researcher noted that while learners became more active and confident during game-like activities, some continued to struggle with math anxiety and higher-order skills. This study was conducted in the Negros Island Region (NIR) to understand how game-based learning (GBL) influences the performance of secondary learners. The findings serve as the basis for creating a learning enhancement plan that strengthens areas where learners showed lower gains, such as information retention, math anxiety, and multitasking skills.

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Game-based learning has been widely recognized for its ability to enhance engagement and achievement, yet gaps remain in understanding how it addresses persistent challenges such as retention, math anxiety, and multitasking among diverse learners. By focusing on these areas, this study contributes to both local and global literature on inclusive instructional strategies. The findings provide practical insights for teachers in the Negros Island Region and beyond, offering evidence-based guidance for designing intervention plans that reinforce strengths while addressing learner difficulties. Ultimately, the study underscores the potential of game-based learning not only as an engaging tool but as a structured approach to improving academic outcomes and learner confidence.

Literature Review

GBL, or game-based learning, is vital for maintaining students' motivation. Research indicates that intentional activities reassure confidence and persistence, whereas gamified settings increase enthusiasm and engagement (David et al., 2020; Ramos, 2023). Digital GBL provides differentiated instruction by letting students advance at their own pace (Dizon, 2021), while game-based assessments increase precision and lessen math fear (Villanueva, 2022). Garcia (2020) emphasizes GBL's importance in fostering digital literacy and critical thinking, while Almario (2020) connects it to DepEd's drive for technology-enhanced learning. According to Mendoza et al. (2021), regional perspectives also confirm that gamified tactics regularly improve independence and problem-solving abilities.

Game-based learning (GBL) has been shown in several studies to improve arithmetic ability. While Sung et al. (2016) revealed that GBL increases application and engagement but necessitates strengthening techniques for retention, Brezovszky et al. (2019) shown that digital game settings enhanced primary learners' adaptable number knowledge. Alhammad (2020) also showed that retrieval practice plus GBL improves memory. Hui and Mahmud (2023) saw notable developments in problem-solving skills, whereas Lampropoulos and Sidiropoulos (2024) observed improved test results among students exposed to gamified training.

The efficacy of game-based learning (GBL) in mathematics is confirmed by local studies. While Bernardo (2019) highlighted GBL's significance in enhancing logical thinking and cognitive processing, Cayang and Ursabia (2024) showed that it significantly improved students' problem-solving abilities. Antonio and Tamban (2021) revealed that while long-term memory problems remained, gamified approaches increased motivation and accomplishment. Students in collaborating GBL settings did better than those in regular classrooms, according to Cruz et al. (2020). According to Valderama and Oligo (2021) from STI WNU, it is still challenging to transfer math information into long-term memory in the absence of rigorous study habits, underscoring the necessity of reinforcement techniques. Together, these results demonstrate that GBL improves motivation, reasoning, and problem-solving skills, but also imposes complementing approaches to address retention.

The importance of game-based learning (GBL) in mathematics is further supported by local research. While Mosia and Egara (2024) from STI WNU verified that creative GBL techniques lower anxiety, Ramos (2023) demonstrated how systematic GBL activities foster perseverance and confidence. Reyes and Santos (2019) noted the potential of incorporating digital GBL into Philippine secondary education, while Garcia (2020) stressed that interactive, game-infused modules promote critical thinking and recall. Female students frequently show weaker self-efficacy in abstract mathematics, according to Villalon et al. (2021) from STI WNU, indicating that GBL can assist close confidence gaps.

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Game-based learning (GBL) improves academic performance, motivation, and skill development in a variety of circumstances, according to the reviewed literature. Studies conducted both domestically and internationally confirm its efficiency in enhancing comprehension, problem-solving, confidence, and engagement; but they also highlight ongoing difficulties with retention, math anxiety, and learner self-efficacy. These results support SDG 3: Good Health and Well-Being by lowering anxiety and increasing learner resilience, support SDG 4: Quality Education by encouraging inclusive and equitable learning outcomes, and support SDG 8: Decent Work and Economic Growth by enhancing teacher effectiveness and professional satisfaction. When considered collectively, this synthesis shows that GBL is an effective teaching strategy that promotes active learning and skill development while highlighting the necessity of focused interventions to deal with obstacles including retention, anxiety, and multitasking.

Theoretical Underpinnings

The learning theory foundations of Game-Based Learning identified by Wu et al. (2012) highlight that GBL influences student performance through constructivist, experiential, and situated learning processes. These theories explain how GBL improves academic achievement, increases motivational engagement, and develops essential learning skills.

Constructivist theory indicates that learners build knowledge through active exploration, which games naturally support through interactive tasks and problem-solving activities. Experiential learning further explains that students learn more efficiently when they involve in hands-on experiences, and GBL provides this through simulated environments where learners can experiment, make decisions, and receive immediate feedback. Situated learning adds that knowledge is best acquired in meaningful contexts, and games create authentic scenarios that allow students to apply concepts in practical, real-world situations. Together, these theories explain how GBL can enhance academic achievement by fostering deeper understanding, strengthening motivational engagement through interactive and rewarding experiences, and promoting skills development through strategic thinking, persistence, and independent learning.

These theories best determine the extent of game-based learning's influence on students' performance because they explain how learning occurs when students actively engage with interactive tasks, receive immediate feedback, and apply knowledge in meaningful contexts.

Objectives

The study aimed to determine the level of influence of game-based learning on learners' performance in one of the public secondary schools in a medium-sized division in Negros Island Region during the School Year 2025–2026. Specifically, it sought to determine the level of influence of game-based learning on learners' performance in terms of academic achievement, motivational engagement, and skills development, and to identify significant difference in this influence when learners are grouped and compared according to these variables.

Methodology

This chapter discusses the research design, the study locale, the respondents, the data-gathering instrument, validity and reliability, the data-gathering procedure, analytical schemes, and statistical tools.

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Research Design

This study employed a descriptive-comparative research design using a quantitative data analysis approach, which systematically collects and presents information about a specific phenomenon or population (Creswell, 2014; McMillan & Schumacher, 2010). Descriptive Research enables the researcher to address questions related to who, what, when, where, and how by gathering data from identified respondents through structured survey instruments, while the comparative aspect allows the analysis of differences across groups based on demographic variables such as age, sex, family average monthly income, parents' highest educational attainment, and grade level. Although this design does not seek to explain causal relationships or answer "why" questions, it provides a clear and systematic account of existing conditions. The quantitative data collected were analyzed using both descriptive and inferential statistical techniques to transform numerical data into meaningful insights. This design was deemed appropriate for the study, as it enabled an accurate depiction of the influence of game-based learning on learners' performance, facilitating a comprehensive understanding of its impact and serving as the basis for formulating an enhancement plan.

Locale of the Study

This study was conducted in one of the public secondary schools in a medium-sized division in Negros Island Region. The school has a total population of 29 teachers and is managed by a School Head.

The school was one of the top-performing secondary schools in a medium-sized division in Negros Island Region. It joins in high-level competition in the Provincial Sports Meet. Over the years, it has won numerous notable awards, demonstrated its quality, and engaged with the community. The Province of Negros Occidental recognized the school's dedication to environmental stewardship in 2018 by awarding it the Silver Seal of Good Environmental Governance.

Respondents of the Study

The study involved 245 secondary learners, form the total population of 670 students, with sample size determined using Cochran's formula and proportionally allocated across grade levels. Respondents were selected through stratified random sampling to ensure proportional representation across grade levels, thereby enhancing the accuracy and generalizability of the findings (Fraenkel & Wallen, 2009). Within each stratum, the lottery technique was applied to randomly select participants, ensuring fairness and unbiased representation across the sample.

Data Gathering Instrument

The researcher used a self-constructed questionnaire to collect all the required data for the study. The instrument was divided into two major parts. Part I contained questions on the respondents' profile, specifically age, sex, family average monthly income, parents' highest educational attainment, and grade level. These variables were included to determine whether the influence of game-based learning varied across different demographic groups.

Part II consisted of the questionnaire proper, which measured the level of influence of game-based learning on students' performance. This section contained thirty (30) items distributed across three areas: academic achievement, motivational engagement, and skills development, with

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10-line items per area. Respondents rated all items using a 5-point Likert scale, from 1 ("Almost never") to 5 ("Always"), enabling the researcher to quantify perceptions and determine the overall level of influence of game-based learning on learners' performance.

Instrument Validity and Reliability

The research instrument underwent validity and reliability testing to ensure its appropriateness for the study. Validity, defined by Choudhary (2020) as the degree to which a test measures what it is intended to measure, was established through expert review by three doctoral-level validators specializing in education and Research. The mean rating from the validators was 4.67, which was interpreted as excellent according to Good and Scates' (1972) criteria. This confirmed that the instrument was valid and aligned with the study's objectives. Reliability, which refers to the stability and internal consistency of a measure (Fraenkel & Wallen, 2009), was determined through a pilot test with 30 secondary learners. Using Cronbach's Alpha, the instrument yielded a reliability coefficient of 0.918, indicating excellent reliability. These results indicate that the questionnaire was both valid and reliable for measuring the influence of game-based learning on learners' performance.

Data Gathering Procedure

To guarantee the smooth conduct of the study, the researcher requested authorization from the School Heads and the Schools Division Superintendent (SDS) through the Public Schools District Supervisor (PSDS). After receiving consent from the school heads, the researcher prepared and submitted a formal letter and arranged the administration of the questionnaire at a time convenient for the respondents, the adviser, and the researcher.

The surveys were administered in person with the section adviser's assistance. Before distribution, the researcher conducted an orientation to explain the study's purpose and provide clear instructions for completing the questionnaire. The researcher ensured that all information gathered was treated with the highest level of confidentiality.

After retrieving the completed questionnaires, the researcher forwarded the data to the statistician for tabulation, application of appropriate statistical tools, and analysis. The results were organized and presented in tabular form to facilitate clarity and interpretation.

Research Ethics Protocol

The researcher strictly followed ethical standards in conducting the study. All procedures complied with the Data Privacy Act of 2012, ensuring that respondents' personal information was protected. No identifying details were collected, and all data were kept confidential and accessible only to the researcher.

Before participation, learners were provided with assent forms, while their parents or guardians were given consent forms. This ensured that both students and parents clearly understood the study's purpose and voluntarily agreed to participate. The forms explained the objectives, procedures, and participants' rights, including the right to withdraw at any time without penalty.

The researcher also emphasized that participation would not affect learners' grades or standing in school. After the study was completed, all physical materials were securely disposed of by shredding, and digital files were permanently deleted to prevent recovery.

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By securing both parental consent and student assent, the study safeguarded the welfare and rights of all participants, ensuring that their involvement was voluntary, informed, and ethically sound..

Analytical and Statistical Schemes

Objective No. 1 used a descriptive-analytical scheme to assess the level of influence of game-based learning on learners' performance in terms of academic achievement, motivational engagement, and skills development. Objective No. 2 used a comparative-analytical scheme and Mann-Whitney to determine differences in the level of influence of game-based learning across groups defined by the aforementioned variables.

Results and Discussion

This section summarizes the study's findings, which come from careful data gathering, in-depth analysis, and thoughtful interpretation. After this, meaningful conclusions were drawn from the initial phase, offering valuable insights.

Level of Influence of Game-Based Learning on Learners' Performance in the areas of Academic Achievement, Motivational Engagement, and Skills Development

Table 1
Level of Influence of Game-Based Learning on Learners' Performance in Terms of Academic Achievement

Influence of Game-based Learning		
A. Academic Achievement	**Mean**	**Interpretation**
The game-based learning…		
1. helps me understand concepts in mathematics more effectively.	3.88	High Level
2. improves my ability to solve math problems in every activity given	3.82	High Level
3. enhances my retention of information.	3.70	High Level
4. Strengthens my critical thinking skills in mathematics	3.77	High Level
5. makes learning math more engaging and enjoyable.	3.99	High Level
6. builds my confidence in answering math-related questions.	3.78	High Level
7. improves my understanding of mathematical formulas.	3.80	High Level
8. Improves my accuracy in solving math equations.	3.86	High Level
9. supports my ability to apply math in real-life situations.	4.06	High Level
10. encourages me to explore different approaches to solving math problems.	3.91	High Level
Overall Mean	**3.86**	High Level

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Table 1 presents the level of influence of game-based learning on Learners' academic achievement in mathematics. The overall mean of 3.86, interpreted as High Level, indicates that game-based learning positively influences students' academic performance.

The highest mean score was obtained by Item 9, "supports my ability to apply math in real-life situations," with a mean of 4.06, interpreted as high level.

On the other hand, the lowest mean score was recorded for Item 3, "enhances my retention of information," with a mean of 3.70, although it still falls within the high-level interpretation.

This result implies that while game-based learning is engaging and interactive, its effect on long-term retention of mathematical concepts may be less pronounced compared to its impact on engagement and application. This may be because game-based activities emphasize active participation and problem solving, which strengthen understanding in the moment but do not always provide the repeated practice needed for durable memory.

This finding is supported by the study by Sung et al. (2016), who noted that game-based learning significantly improves students' engagement and knowledge application; however, retention may require additional reinforcement strategies, such as reflection activities and follow-up assessments, to sustain learning gains.

Table 2
Level of Influence of Game-Based Learning on Learners' Performance in Terms of Motivational Engagement

Influence of Game-based Learning		
B. Motivational Engagement ***The game-based learning…***	**Mean**	**Interpretation**
1. Encourages active participation in classroom math activities.	4.02	High Level
2. boosts my interest in various subjects, especially in mathematics.	3.80	High Level
3. motivates me to explore new ideas and concepts.	3.92	High Level
4. increases my willingness to complete assignments and other tasks given.	3.92	High Level
5. enhances collaboration with classmates through interactive activities.	3.91	High Level
6. inspires me to challenge myself academically.	4.06	High Level
7. keeps me engaged and focused during lessons and performance tasks.	4.07	High Level
8. reduces anxiety when solving complex math equations.	3.70	High Level
9. makes learning math feel like an exciting and rewarding experience.	4.04	High Level
10. encourages me to explore different problem-solving strategies.	3.80	High Level
Overall Mean	**3.92**	High Level

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The table shows the influence of game-based learning on learners' motivational engagement, with an overall mean of 3.92, indicating a High Level of engagement. This suggests that game-based learning effectively motivates students and sustains their interest in mathematics lessons. The highest mean score was observed for Item 7, "keeps me engaged and focused during lessons and performance tasks," with a mean of 4.07, interpreted as a high level.

Conversely, the lowest mean score was found for Item 8, "reduces anxiety when solving complex math equations," with a mean of 3.70, interpreted as a high level.

Although still rated high, this result suggests that game-based learning may not fully address students' math anxiety, particularly when dealing with complex or challenging problems. This may be because games primarily enhance engagement and confidence during structured tasks, but they do not always target the deeper emotional factors that trigger anxiety when difficulty increases.

This result aligns with the findings of Ramirez et al. (2018), who emphasized that while interactive and game-based approaches increase motivation, math anxiety is deeply rooted and may require complementary interventions such as supportive feedback, gradual difficulty progression, and emotional support strategies.

Table 3
Level of Influence of Game-Based Learning on Learners' Performance in Terms of Skills Development

Influence of Game-based Learning		
C. Skills Development	**Mean**	**Interpretation**
The game-based learning…		
1. enhances my creative thinking and innovation skills.	4.05	High Level
2. supports independent learning and self-motivation.	4.11	High Level
3. strengthens my ability to solve problems effectively.	3.95	High Level
4. enhances my digital literacy and technological proficiency.	3.82	High Level
5. improves my teamwork and communication abilities.	4.04	High Level
6. builds adaptability when facing new challenges.	3.91	High Level
7. Develops my logical reasoning skills.	3.91	High Level
8. builds my ability to multitask effectively.	3.73	High Level
9. enhances my accuracy and speed in solving math equations.	3.81	High Level
10. improves my confidence in tackling math challenges independently.	4.00	High Level
Overall Mean	**3.93**	High Level

As shown in the table, game-based learning has a strong influence on learners' skill development, with an overall mean of 3.93.

The highest mean score was obtained by Item 2, "supports independent learning and self-motivation," with a mean of 4.11, interpreted as a high level. In contrast, the lowest mean score was recorded for Item 8, "builds my ability to multitask effectively," with a mean of 3.73, indicating a high level.

This indicates that while game-based learning improves many higher-order skills, multitasking may not be a primary outcome of such instructional strategies, as students tend to focus

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on specific tasks or objectives within the game. This may be because most game-based activities are designed around single, goal-oriented challenges that encourage concentration rather than simultaneous task management. As a result, learners strengthen skills like problem-solving and independence, but multitasking shows less development.

According to Sweller et al. (2020), learning environments that promote focused cognitive engagement are more effective than those that require multitasking, as excessive task switching can increase cognitive load and hinder deep learning. In game-based learning, students often achieve better outcomes when attention is directed toward mastering one challenge at a time rather than managing multiple tasks simultaneously.

Comparative analysis of the level of influence of game-based learning on learners' performance in the areas of Academic Achievement, Motivational Engagement, and Skills Development when grouped according to variables Age, Sex, Average Family Monthly Income, Parents' Highest Educational Attainment, and Grade level

Table 4

Difference in the level of influence of game-based learning on learners' performance in the areas of Academic Achievement when grouped and compared according to variables

Variable	Category	N	Mean Rank	Mann-Whitney U	p-value	*Sig. level*	Interpretation
Age	Younger	92	130.93	6308.500	.174		Not Significant
	Older	153	118.23				
Sex	Male	88	117.56	6429.500	.368		Not Significant
	Female	157	126.05				
Family Average Monthly Income	Low Monthly Income	165	118.39	5839.500	.143	0.05	Not Significant
	High Monthly Income	80	132.51				
Parents' Highest Educational Attainment	Low Educational Attainment	180	126.52	5216.000	.195		Not Significant
	High Educational Attainment	65	113.25				
Grade Level	Junior High	161	127.11	6099.500	.208		Not Significant
	Senior High	84	115.11				

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Table 4 presents the Mann–Whitney U test results for the significance of differences in academic achievement across groups defined by profile variables. The findings show that none of the demographic characteristics produced statistically significant differences, as all p-values were greater than 0.05.

For age, younger learners had a mean rank of 130.93, while older learners had a mean rank of 118.23; the difference was not significant (p-value = .174). For sex, males had a mean rank of 117.56, compared to 126.05 for females; using the Mann-Whitney U test, the p-value is .368, interpreted as not significant.

Learners from low-income families had a mean rank of 118.39, while those from high-income families had 132.51. It garnered a p-value of .143 interpreted as not significant. Students whose parents had low educational attainment had a mean rank of 126.52, compared to 113.25 for those with higher attainment. Using the Mann-Whitney U test, the p-value is .195, interpreted as not significant. Junior High students had a mean rank of 127.11, while Senior High students had a mean rank of 115.11, with a p-value of .208, interpreted as not significant.

These results indicate that academic achievement does not significantly differ across demographic groups, suggesting that game-based learning benefits students regardless of background. This may be because game-based activities provide equal opportunities for participation and practice, allowing learners to engage with the material at their own pace.

This aligns with Li and Tsai (2021), who found that game-based learning supports diverse learners by offering accessible, interactive tasks that promote understanding across different student groups.

Table 5

Difference in the level of influence of game-based learning on learners' performance in the areas of Motivational Engagement when grouped and compared according to variables

Variable	Category	N	Mean Rank	Mann-Whitney U	p-value	*Sig. level*	Interpretation
Age	Younger Older	92 153	129.03 119.37	6483.000	.301		Not Significant
Sex	Male Female	88 157	122.50 123.28	6864.000	.934		Not Significant
Family Average Monthly Income	Low Monthly Income High Monthly Income	165 80	117.84 133.65	5748.000	.101	0.05	Not Significant
Parents' Highest	Low Educational Attainment	180	126.75	5175.000	.168		Not Significant

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Educational Attainment	High Educational Attainment	65	112.62				
Grade Level	Junior High Senior High	161 84	123.14 122.73	6739.000	.965		Not Significant

Table 5 shows the significance of differences in students' motivational engagement across profile variables. The results reveal that age, family income, parents' educational attainment, and grade level did not produce significant differences, as all p-values exceeded the 0.05 threshold.

Younger learners had a mean rank of 129.03, compared to 119.37 for older learners. Using the Mann-Whitney U test, it obtained a p-value of .301 and interpreted it as not significant. Male students had a mean rank of 122.50, while females had a mean rank of 123.28, with a p-value of .934, indicating no significant difference despite the table's incorrect label. Learners from low-income families had a mean rank of 117.84, compared to 133.65 for high-income learners, yielding a p-value of .101 and an interpretation of not significant. Students whose parents had low educational attainment had a mean rank of 126.75, while those with higher educational attainment had a mean rank of 112.62. It has a p-value of .168 and is interpreted as not significant. Junior High students had a mean rank of 123.14, nearly identical to Senior High students' 122.73, and the difference was not significant (p-value = .965).

These results indicate that motivational engagement does not differ significantly across demographic groups, suggesting that game-based learning motivates students consistently regardless of background. This may be because game-based activities provide equal opportunities for participation, allowing learners to engage with tasks at their own pace and skill level.

This aligns with the findings of Huang and Wu (2022), who reported that game-based learning supports consistent motivation across diverse student groups by offering interactive and accessible learning experiences.

Table 6
Difference in the level of influence of game-based learning on learners' performance in the areas of Skills Development when grouped and compared according to variables

Variable	Category	N	Mean Rank	Mann-Whitney U	p-value	*Sig. level*	Interpretation
Age	Younger Older	92 153	124.54 122.07	6896.000	.791		Not Significant
Sex	Male Female	88 157	117.28 126.21	6404.500	.343	0.05	Not Significant
Family Average	Low Monthly Income	165	118.36	5835.000	.141		Not Significant

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Monthly Income	High Monthly Income	80	132.56			
Parents' Highest Educational Attainment	Low Educational Attainment	180	126.52	5217.000	.196	Not Significant
	High Educational Attainment	65	113.26			
Grade Level	Junior High	161	122.65	6705.000	.914	Not Significant
	Senior High	84	123.68			

Table 8 presents the Mann–Whitney U test results for the significance of differences in skills development across groups defined by profile variables. The findings show that none of the demographic variables produced statistically significant differences, as all p-values were above the 0.05 significance level.

Younger learners had a mean rank of 124.54, compared to 122.07 for older learners. It obtained a p-value of .791 thus interpreted as not significant. Male students had a mean rank of 117.28, while female students had a mean rank of 126.21. A p-value of .343 indicates no significant difference despite the table's incorrect label. Learners from low-income families had a mean rank of 118.36, compared to 132.56 for high-income learners, yielding a p-value of .141, which is interpreted as not significant. Students whose parents had low educational attainment had a mean rank of 126.52, while those with higher educational attainment had a mean rank of 113.26. It obtained a p-value of .196 interpreted as not significant. In terms of grade level, Junior High students had a mean rank of 122.65, while Senior High students had a mean rank of 123.68, with a p-value of .914, interpreted as not significant.

These results imply that skills development does not differ significantly across demographic groups, demonstrating that game-based learning enhances skills uniformly regardless of learners' personal or socioeconomic characteristics. This may be because game-based activities provide structured, interactive tasks that allow all students to participate and practice at their own pace, reducing gaps linked to background differences. This is supported by Sánchez-Gómez and García-Peñalvo (2020), who found that game-based learning promotes equitable skill development by offering accessible and engaging learning experiences for diverse learners.

Conclusion

The study found that game-based learning had a strong influence on academic achievement, motivation, and skills development. While retention, math anxiety, and multitasking showed lower ratings, they still fell within the high-level interpretation, confirming the overall effectiveness of GBL. All demographic groups experienced similar benefits from game-based learning. Slight variations existed, but none were strong enough to show meaningful differences. This suggests that GBL is an equitable approach that supports diverse learners. No significant differences were found across groups, confirming that the positive effects of game-based learning are consistent and

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inclusive, regardless of age, sex, income, parental education, or grade level. To optimize GBL's efficacy in these domains, specific reinforcement techniques like retrieval practice, structured reflection, and scaffolded multitasking exercises are needed, future interventions should concentrate on lowering anxiety, enhancing long-term memory, and promoting cognitive flexibility, even though GBL has been shown to be an effective tool for improving engagement and performance.

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This thesis stands as a testament not only to academic effort but also to perseverance, determination, love, and the shared journey of those who supported her.

Conflict of Interest

The author declares the absence of any conflict of interest that could have influenced the content or conclusions of this paper. She affirms that no financial, personal, or professional relationships with other individuals or organizations have compromised the objectivity, integrity, or impartiality of the research work. As a final point, no external parties influenced the study design, data collection, analysis, or interpretation.

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