DEVELOPMENT AND IMPACT OF GAME-BASED LEARNING MATERIALS FOR GRADE 7 USING GOOGLE FORMS

Angel Ann N. Banaguas[1], Diana M. Castillo[2], Melody A. Mendoza[3], Melodie B. Villalobos[4], Mary Ann N. Cahayon[5]

[12345]Immaculate Conception College of Balayan, Inc., Plaza Mabini, 4213, Balayan, Batangas, Philippines

Corresponding Email: laurencebugtong3@gmail.com

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Abstract

Game-based learning in education incorporates elements of games into instructional activities, fostering competition and interaction among students through entertainment as a learning tool. This study aimed to develop game-based learning materials for the Grade 7 mathematics classroom using Google Forms to create an interactive and engaging learning experience. The materials were designed to increase student motivation and participation while reinforcing key mathematical concepts through interactive activities. The study employed an experimental research design with a pre-test and post-test approach. A total of 33 Grade 7 students participated and were divided into two groups: an experimental group that used game-based learning and a control group that followed traditional teaching methods. The results showed that the experimental group demonstrated a significant improvement in their post-test scores compared to their pre-test scores. In contrast, students in the control group showed minimal or no improvement, indicating the positive impact of game-based learning. These findings suggest that using digital tools like Google Forms for game-based activities can result in more consistent and meaningful learning outcomes in mathematics. The game-based approach proved effective in enhancing understanding and engagement, showing its potential to support better academic performance. In conclusion, this research provides evidence that game-based learning can be an effective tool in mathematics instruction. Future studies could explore its long-term effects and effectiveness in more challenging educational environments. Overall, integrating game-based materials in teaching represents a promising strategy for improving student learning experiences and outcomes in mathematics education.

Keywords: *Game-Based, Google Forms, and Learning Materials*

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INTRODUCTION

Game-based learning, or educational gaming, is defined as the integration of digital or analog games into learning processes to enhance educational outcomes. This method capitalizes on the motivational elements inherent in games, fostering student engagement and active participation in knowledge acquisition. A significant challenge in this field is creating games that effectively balance entertainment with educational value, ensuring they capture students' attention while meeting educational standards and learning objectives. Additionally, assessing student learning outcomes within game-based environments presents a complex difficulty. Traditional assessment tools often fall short in measuring the unique learning experiences facilitated by game-based learning. Consequently, the development of specialized assessment methods to accurately evaluate knowledge and skills gained through gameplay remains a critical concern for researchers in this domain.

The origins of game-based learning can be traced back to the 1970s with early educational video games like The Oregon Trail, which aimed to create interactive learning experiences in classrooms. However, it wasn't until the 2000s, with advancements in technology and the emergence of more sophisticated digital games, that the concept began to gain widespread recognition. Contemporary educational game developers have increasingly created games tailored to educational needs, merging engaging gameplay with instructional content.

The implementation of game-based learning has been shown to enhance student motivation, engagement, and knowledge retention across various subjects and educational levels, from math and science to language arts and history. By leveraging the immersive nature of games, educators can foster critical thinking and problem-solving skills, ultimately enriching the learning process. In the context of game-based learning, one niche or blind spot that researchers identified was the need for more comprehensive studies exploring the long-term effects and sustainability of game-based learning interventions. While there was a growing body of research highlighting the effectiveness of game-based learning in improving students' engagement and motivation, there was limited understanding of how these benefits translated into long-term learning outcomes. Additionally, the literature in this field tended to focus primarily on the use of digital games, with fewer studies exploring the potential of non-digital or analog game-based learning approaches. This gap in the literature presented an opportunity for researchers to investigate the efficacy of non-digital games in promoting student learning and engagement.

Game-based learning continued to evolve with the integration of virtual reality (VR), augmented reality (AR), and other emerging technologies. It held great potential to transform education by providing innovative and engaging learning experiences for students. One of the teaching materials used by teachers to encourage engaging and active participation among students in classrooms was game-based material. According to Grace (2019), game-based learning was a method of obtaining new concepts and skills through the use of digital and non-digital games. The application of games in education fostered notable improvements in both learning and educational outcomes (Kula & Syafii, 2021).

It was noted that teachers paid close attention to how games affected their students' interactions, emotionality, and cognitive activity—three critical aspects of the educational process. However, the acceptance and engagement of gamification in pedagogy remained challenging (Ding et al., 2018). Researchers explored how individual differences in cognitive abilities, motivation, and gaming experience influenced learning outcomes in game-based learning environments. They examined the effectiveness of adaptive and personalized game-based learning approaches in catering to diverse learner needs and preferences (Sailer et al., 2017). Developing and validating innovative assessment methods for measuring learning outcomes and assessing the effectiveness of game-based learning interventions was critical. Gris & Bengtson (2021) highlighted a prevalence of learning assessments over engagement and usability assessments. They also identified and refined design principles for creating effective educational games that balanced entertainment with educational goals (Plass et al., 2015). Exploring the role of teacher training and support in facilitating the successful implementation of game-based learning in educational settings (Becker, 2017) informed the development of strategic intervention materials. Investigating the effectiveness of game-based learning materials developed through Google Forms was essential in this study.

These provided avenues for further research to advance understanding of how to harness the potential of game-based learning for educational purposes. Game-Based Learning (GBL) required further research and development. While numerous studies highlighted the benefits of GBL, such as enhancing student engagement, motivation, and academic performance, critical gaps remained. Additionally, the effectiveness of adaptive and personalized GBL approaches that catered to diverse learner needs had not been sufficiently investigated. There was also a lack of validated assessment methods to measure the success and long-term impact of GBL interventions on knowledge retention and transferability.

The study aimed to explore the impact of game-based learning on diverse learners, including those with special educational needs. Researchers used Google Forms to integrate game-based learning materials in mathematics classrooms for Grade 7 students. The goal was to enhance engagement, deepen understanding of mathematical concepts, and evaluate the effectiveness of this innovative approach. The study combined technology, gamification, and education, resulting in interactive and enjoyable learning experiences. The researchers' findings contributed to a broader understanding of game-based learning and its potential impact on educational outcomes. This research contributed valuable insights to educational strategies and technology integration in the classroom.

Philosophical Foundations

The principles that guide this research stem from constructivism, experiential learning, and pragmatism. Constructivist theorists such as Jean Piaget and Lev Vygotsky, who assert that knowledge is constructed by learners through experiences and interactions (Piaget, 1952; Vygotsky, 1978). An excellent example is Game-based Learning (GBL), which motivates and enables students to engage in exploration, collaboration, and problem-solving. Within games, students engage actively, transforming information into knowledge, as Vygotsky's social constructivism suggests, reciprocally learning with peers and benefitting from scaffolding.

Furthermore, Kolb's Experiential Learning Theory (1984) reinforces the game-based approach with the idea that learning is a process rooted in experience. His cyclical model begins with concrete experience, then through reflective observation, abstract conceptualization, and culminates in active experimentation. This cycle is particularly evident in GBL, as students interact with tasks, reflect on outcomes, draw mathematical insights, and apply them in new game-based tasks, especially in digital formats like Google Forms.

The philosophy of John Dewey (1938) also defends the incorporation of games within the classroom. Dewey was an advocate for education that was based in active learning and authentic experiences. He took a pragmatic approach focused on ‘learning by doing’ within meaningful contexts that mirror real-world challenges. Criteria for effective game-based learning materials are interactive, purpose-driven activities that cultivate not only knowledge content but also critical thinking and problem-solving skills.

With this in mind, the engagement and immersion fostered by the game-based learning materials in the mathematics classroom embody these teaching philosophies, addressing autonomy, hands-on experience, collaboration, and overall, a heightened academic achievement alongside understanding.

Objectives

This study aims to aims to evaluate the effectiveness of game- based learning instructions in enriching mathematical achievement of the students. Specifically, it aims to answer the following questions:

1. What is the mathematical performance of the controlled and experimental group in terms of:
    a. pretest
    b. post test
2. How effective is the game-based learning material at enhancing students' participation?
3. Is there a significant difference between mathematical performance based on:
    a. pre-test and post-test of controlled group
    b. pre-test and post-test of experimental group
    c. pre-test of controlled group and experimental group
    d. post-test of controlled group and experimental group.
4. Based on the findings of the study, how will the game-based learning materials be enhanced?

Methodology and Design

To attain its objective, the researchers utilized experimental techniques under the purview of quantitative research to achieve their goal. Experimental research was a type of comparative analysis in which participants were observed while being subjected to one or more conditions, and two or more variables were studied. This type of research was used to compare the pre-test and post-test results of the experiment to determine the effectiveness of the game-based learning materials.

Population and Sampling

The researchers utilized purposive sampling, a form of non-probability sampling, to select respondents based on specific characteristics required for the sample. Respondents were identified through the judgmental and referral method, another non-probability technique, where sample members were selected solely based on the researcher’s knowledge and judgment and were referred by the teacher. This method offered advantages, as the researcher’s expertise played a crucial role in creating a highly accurate sample with minimal margin of error. Furthermore, it enabled the researchers to directly approach their target population. The respondents consisted of one selected Grade 7 section from Immaculate Conception College of Balayan, Inc., comprising both male and female students. Criteria for selecting respondents included being enrolled as Grade 7 students at Immaculate Conception College of

Balayan, Inc. for the academic year 2024-2025, currently taking Mathematics courses with the same teacher, and being referred by the mathematics teacher.

Instrumentations

The study utilized four-point Likert scale survey questionnaires, pre-tests, and post-tests to assess students' primary knowledge of mathematics in Grade 7. The pre-test assessed students' understanding of key mathematical concepts, such as geometry, percentage, and rate. The experimental group was given game-based learning materials through Google Forms, while the control group continued with their regular curriculum. A post-test was conducted to assess the effectiveness of the learning materials. The post-test mirrored the pre-test in structure and content, allowing for a direct comparison of students' learning gains. The survey questionnaire assessed students' attitudes towards mathematics and engagement with the game-based learning materials. The four-point Likert scale provided insights into students' perceptions of the learning experience and its effectiveness. The post-test topics and difficulty levels were similar to the pre-test, indicating that any observed differences in performance could be attributed to the impact of the game-based learning materials. The researchers aimed to gain a comprehensive understanding of the effectiveness of game-based learning in enhancing students' mathematical knowledge and engagement.

Data Collection

The researchers implemented a systematic approach to gather data for their study, which included reviewing existing literature and identifying the research problem. They developed game-based learning materials, which required participants to answer questions correctly before progressing to higher levels. A purposive sampling technique was used to select a section of Grade 7 students, divided into a control group and an experimental group. Following a pre-test to assess their initial understanding, the experimental group engaged with the game-based materials over ten sessions, while the control group adhered to traditional teaching methods. A post-test was conducted to evaluate learning outcomes, accompanied by the distribution and collection of questionnaires for further validation of the data. The gathered information was then organized, analyzed, and interpreted using appropriate statistical techniques, leading to formulated conclusions and a comprehensive presentation of the findings. The interpretation of responses the researchers gathered in their survey questionnaire. If the computed weighted mean was equivalent to 3.26 – 4.00, it was labeled as strongly agree or always in frequency. Agree and frequently ranged from 2.51 – 3.25, while disagree and seldom were computed with a mean of 1.76 – 2.50. On the other hand, a weighted mean of 1.0 – 1.75 was categorized as strongly disagree and never in frequency.

Data Analysis

The researchers utilized several statistical methods to analyze their data: the pre-test and post-test results were presented to assess the students' mathematical performance and identify differences between the two. A weighted mean was calculated, adjusting for the relative importance of individual values to compare factors influencing the materials' effectiveness. A T-Test was employed to compare the means of the control and experimental groups, with a paired T-test applied to gauge significant differences in pre-test and post-test results between these groups, and an independent T-test used to evaluate differences in both pre-test and post-test scores across the two groups.

Ethical Considerations

The participation of the target participants was entirely voluntary. The researchers received complete consent from the students and staff of Immaculate Conception College of Balayan, Incorporated. The researchers also managed to keep the respondents' identities, information, and responses private. They ensured that the respondents benefited and were not harmed. In all instances, ethical considerations came first. The study also prioritized honest and truthful discussions when gathering findings, avoiding any misunderstandings or exaggerations. Through these ethical considerations, the researchers not only proposed a developed game-based learning material but also ensured and valued all respondents who participated in the study.

RESULTS and DISCUSSION

Table 1
Pre-test Result of the Controlled Group

Scores	Frequency	Percentage	Rank
0-5	0	0%	7.5
6-10	2	12%	4.5
11-15	1	6%	6
16-20	3	18%	3
21-25	5	29 %	1
26-30	4	24%	2
31-35	2	12%	4.5
36-40	0	0%	7.5
TOTAL	**17**	**101%**	

Table 1 presents the results of the pre-test of the respondents in the controlled group. It shows that five (5) respondents, or twenty-nine percent (29%), earned scores between 21 and 25, while four (4) respondents, or twenty-four percent (24%), scored between 26 and 30. Moreover, three (3) respondents, or eighteen percent (18%), received scores within the range of 16 to 20. On the other hand, two (2) respondents, or twelve percent (12%), scored between 6 and 10, and between 31 and 35. Additionally, one (1) respondent, or six percent (6%), earned a score between 11 and 15. Lastly, no respondents scored between 0 and 5 or between 36 and 40. This suggests that the majority of respondents scored between 21 and 25. This result is supported by the study of Kilgo et al. (2015), which emphasized the variability of pre-test and post-test scores in differentiating students' performance levels. The study revealed that lower-performing students exhibit reduced correlation coefficients, which could diminish the statistical power of educational evaluations.

Table 2
Pre-test Result of the Experimental Group

Scores	Frequency	Percentage	Rank
0-5	0	0.0%	7
6-10	1	6.3%	4.5
11-15	1	6.3%	4.5
16-20	6	37.5%	1
21-25	4	25.0%	2
26-30	3	18.8%	3
31-35	0	0.0%	7
36-40	0	0.0%	7
TOTAL	16	100.0%	

Table 2 presents the results of the pre-test of the respondents in the experimental group. It shows that six (6) respondents, or thirty-seven point five percent (37.5%), earned scores between 16 and 20, while four (4) respondents, or twenty-five percent (25%), scored between 21 and 25. Moreover, three (3) respondents, or eighteen point eight percent (18.8%), received scores within the range of 26 to 30. On the other hand, two (2) respondents, or six point three percent (6.3%), scored between 6 and 10, and between 11 and 15. Lastly, no respondents scored between 0 and 5, 31 and 35, or 36 and 40. This suggests that the majority of respondents scored between 16 and 20. Similarly, the study by Kim and Ke (2017) investigated the effects of game-based learning in a virtual reality environment on elementary students' mathematical achievement, employing a pre-test-post-test design. The study found significant improvements in mathematical performance, showcasing the potential of engaging learning environments to foster mathematical skills. This research emphasized the relevance of innovative and interactive educational methods in assessing pre-test-post-test effects.

Table 3
Post- test result of the Controlled Group

Scores	Frequency	Percentage	Rank
0-5	0	0.0%	7
6-10	0	0.0%	7
11-15	3	17.7%	3.5
16-20	3	17.7%	3.5
21-25	5	29.4%	1
26-30	3	17.7%	3.5
31-35	3	17.7%	3.5
36-40	0	0.0%	7
TOTAL	**17**	**100.2%**	

Table 3 presents the results of the post-test for the respondents in the controlled group. The data reveals that five (5) respondents, or twenty-nine point four percent (29.4%), earned scores between 21 and 25. Three (3) respondents, or seventeen point seven percent (17.7%), scored within each of the following ranges: 11 to 15, 16 to 20, 26 to 30, and 31 to 35. Notably, no respondents scored in the ranges of 0 to 5, 6 to 10, or 36 to 40. This suggests that the majority of respondents scored between 21 and 25. These findings align with Kilgo et al. (2015), who highlighted the variability in pre-test and post-test results as a method for differentiating students' performance levels. According to their study, examining such differences is essential in assessing the impact of educational interventions on student outcomes.

Table 4
Post- Test Result of the Experimental Group

Scores	Frequency	Percentage	Rank
0-5	0	0.0%	7
6-10	0	0.0%	7

11-15	1	6.3%	4.5
16-20	3	18.8%	3
21-25	6	37.5%	1
26-30	5	31.2%	2
31-35	1	6.3%	4.5
36-40	0	0.0%	7
TOTAL	**16**	**100.1%**	

Table 4 presents the results of the post-test for the respondents in the experimental group. The data reveals that six (6) respondents, or thirty-seven point five percent (37.5%), scored between 21 and 25. Five (5) respondents, or thirty-one point two percent (31.2%), scored within the range of 26 to 30. Additionally, three (3) respondents, or eighteen point three percent (18.3%), earned scores between 16 and 20. One (1) respondent, or six point three percent (6.3%), scored within the ranges of 11 to 15 and 31 to 35. Notably, no respondents scored in the ranges of 0 to 5, 6 to 10, or 36 to 40. This suggests that the majority of respondents scored between 21 and 25. These findings are consistent with Schalich (2015), who emphasized that pre-test and post-test assessments are valuable tools for determining differences in students' mathematical performance. Schalich (2015) argued that such assessments are instrumental in evaluating improvements in student outcomes following educational interventions.

Table 5
Survey on the Challenges of Grade 8 Shin Saimdang in Korean Language Learning

Indicators	WM	VI	R
1. I find game-based material attractive.	3.50	Strongly Agree	2
2. I cooperate more in class when using game-based learning materials	3.50	Strongly Agree	2
3. I appreciate mathematical idea better by way of game-based learning.	3.31	Strongly Agree	7
4. I enjoy mathematics when using the game-based learning materials.	3.75	Strongly Agree	1
5. I feel motivated when using the game-based learning materials.	3.44	Strongly Agree	4
6. I would rather choose the game-based learning more than traditional learning methods.	3.06	Agree	13
7. I am more assured in using game-based materials in mathematics.	3.13	Agree	11
8. I notice that game-based learning materials help me maintain information better.	3.44	Strongly Agree	4
9. I am more probably to complete assignments imply game-based learning.	3.13	Agree	11
10. I believe game-based learning materials impressive teaching instrument in mathematics.	3.06	Agree	13
11. I remain attentive during lessons.	3.19	Agree	9
12. I find that game-based learning materials attracts me to contributes more during class discussions.	3.19	Agree	9
13. I believe my mathematical performance improved due to the teaching methods used.	3.31	Strongly Agree	7

14. I observed a development in my mathematical performance from the pre-test to post-test after using a game-based learning materials as a method of activity.	3.38	Strongly Agree	6
15. . I learn a lot in mathematics unlike before	3.06	Agree	13
General Weighted Mean	3.10	Agree	

Legend: 3.25-4.00 Strongly Agree; 2.50-3.24 Agree; 1.75-2.49 Disagree; 1.00-1.74 Strongly Disagree

Table 5 highlights the positive perceptions of game-based learning materials in mathematics, reflecting their effectiveness in creating an engaging and enjoyable learning environment. The respondents strongly agreed that game-based tools made mathematics more enjoyable, with the highest-ranked statement being "I enjoy mathematics when using game-based learning materials," which had a weighted mean of 3.75. While respondents appreciated the advantages of game-based methods, their preference for these over traditional learning approaches was reflected in the mean of 3.06. Similar findings were reported by Leaning (2015), who conducted a study on the use of games and gamification to enhance student engagement and achievement. Her findings indicated that games and gamification positively impacted student engagement, experience, and achievement, suggesting that the integration of game-based learning materials in mathematics education could enhance student engagement and motivation. Overall, half of the respondents strongly agreed, and the other half agreed, that game-based learning materials were effective in enhancing students' mathematical performance, with a weighted mean of 3.10, interpreted as agreement. This effectiveness was attributed to the challenging topics in Grade 7, which contributed to the respondents' improved academic performance.

Table 6
The Significance of the Difference between the Pre-Test and Post-Test Scores of the Respondents in the Controlled Group

Test	Mean	SD	Level of Significance	Test Statistics	Remarks
Pre-Test	22.35	6.53	0.05	0.15	Fail to Reject
Post-Test	23.53	6.13			

Table 6 presents the significant difference between the pre-test and post-test scores of the respondents in the controlled group. The pre-test mean of the controlled group was 22.35, with a standard deviation of 6.53. In contrast, the post-test mean increased to 23.53, with a standard deviation of 6.13. The table also shows that the test statistic was 0.15, which is higher than the significance level of 0.05, indicating that the null hypothesis could not be rejected.

In support of these findings, Yu et al. (2018) demonstrated that the use of game-based learning materials positively influenced students' learning outcomes, including their motivation, engagement, and satisfaction. The absence of game-based materials in the controlled group, as observed in this study, suggests that there was no significant improvement in the students' mathematical achievements. These results indicate that the traditional approach to teaching, without the incorporation of game-based learning, did not lead to significant changes in the controlled group's pre-test and post-test scores.

Table 7
The Significance of the Difference between the Pre-Test and Post-Test Scores of the Respondents in the Experimental Group

Test	Mean	SD	Level of Significance	Test Statistics	Remarks
Pre-Test	20.56	5.49	0.05	0.0005	Reject
Post-Test	23.19	5.13			

Table 7 presents the significance of the difference between the pre-test and post-test scores of the respondents in the experimental group. The pre-test mean for the experimental group was 20.56, with a standard deviation of 5.49. In contrast, the post-test mean was 23.19, with a standard deviation of 5.13. The test statistic result of 0.0005 was lower than the significance level of 0.05, leading to the rejection of the null hypothesis. This result aligns with the study of Sapin and Orbon (2022), which demonstrated that adopting game-based learning in mathematics instruction enabled students to achieve their learning objectives more quickly and effectively. Their findings indicated that game-based learning materials can significantly enhance students' mathematical problem-solving skills. These results suggest that the pre-test and post-test scores of the experimental group improved following the implementation of the developed game-based learning materials.

Table 8
The Significance of the Difference between the Pre-Test Scores of the Respondents in the Controlled and Experimental Groups on their Pre-Test

Group	Mean	SD	Level of Significance	Test Statistics	Remarks
Controlled	20.56	5.49	0.05	0.42	Fail to Reject
Experimental	22.35	6.53			

Table 8 presents the significance of the difference between the pre-test scores of the respondents in the controlled and experimental groups. The pre-test mean for the controlled group was 20.56, with a standard deviation of 5.49, while the experimental group had a pre-test mean of 22.35 and a standard deviation of 6.53. The test statistic result of 0.42 was higher than the significance level of 0.05, meaning that the null hypothesis failed to be rejected. This finding is supported by the study of pre-test assessments, which provided critical data on psychological capital and work engagement, enabling researchers to effectively evaluate the impact of the intervention. The results suggest that there was no significant difference between the pre-test scores of the respondents in the controlled and experimental groups.

Table 9
The Significance of the Difference between the Post-Test Scores of the Respondents in the Controlled and Experimental Groups on their Post-Test

Group	Mean	SD	Level of Significance	Test Statistics	Remarks
Controlled	23.19	5.13	0.05	0.87	Fail to Reject

Table 9 presents the significant difference between the post-test scores of the respondents in the controlled and experimental groups. The controlled group had a post-test mean of 23.19 with a standard deviation of 5.13, while the experimental group had a post-test mean of 23.53 with a standard deviation of 6.13. The test statistic result of 0.87 was higher than the significance level of 0.05, indicating that the null hypothesis failed to be rejected. This finding aligns with the research of Arcagok (2021), which demonstrated that game-based teaching contributed to increased academic achievement. The study highlighted that game-based practices significantly enhanced student achievement when compared to traditional methods. Therefore, this suggests that the post-test scores of both the controlled and experimental groups did not show significant improvement.

Enhancing game-based learning material

As the result of the interview on enhancing game-based learning materials, the key factors that the researchers considered were as follows: First the material should use a real-world scenario so that the students can relate to exposition, in addition to that, the materials should regularly add new context and features. Moreover, the researchers should consider the user experienced testing, ensuring that the materials are engaging and interactive design. Lastly, the game-based learning material should be reviewed by experts, and consulted with the subject matter specialists. The enhanced game-based learning tools for Grade 7 Mathematics were designed by integrating theoretical concepts with real-world applications. These materials, developed using Google Forms, included interactive components such as real-life situations and problem-solving tasks based on everyday scenarios. For instance, instead of simply asking students to solve equations, the games presented scenarios like calculating the time required to drive between two locations. Each task was created to engage students by offering challenges they could relate to, while also encouraging critical thinking and practical problem-solving skills. The learning materials were responsive to students' answers: if a student provided an incorrect response, they were directed back to the question and prompted to try again until they answered correctly. This approach aligns with Mastery Coding (2024), which states that game-based learning enhances student engagement by balancing challenges, rewards, and creativity, making learning both interactive and rewarding. By immersing students in imaginative worlds and encouraging curiosity through progressive tasks, this method fosters active participation and skill-building. This strategy ensured that students fully understood the concepts before advancing to the next level of the game. It emphasized perseverance and comprehension, motivating students to reflect on and learn from their mistakes. Successful completion of tasks allowed students to remain motivated and engaged throughout the learning process. Moreover, these enhancements encouraged student collaboration. The real-life applications helped students recognize the relevance of mathematics in their daily lives, making the learning experience both engaging and enjoyable. The enhanced game-based learning materials not only improved students' mathematical skills but also deepened their appreciation for the practical value of what they learned in the classroom.

CONCLUSION

Based on the findings, the pre-test and post-test results of both the controlled and experimental groups showed the mathematical performance of each student. However, the experimental group achieved a higher percentage of students scoring in the higher range compared to the controlled group. The use of game-based learning materials was effective in enhancing Grade 7 students' participation in mathematics.

No significant difference was observed in the pre-test and post-test performances of the controlled group, indicating that students did not learn actively without the developed game-based learning materials. In contrast, the experimental group demonstrated a significant improvement, showing that the developed game-based learning material was more effective and beneficial. Additionally, no significant difference was found between the pre-test results of the controlled and experimental groups, suggesting that both groups had similar scores before the intervention. The lack of a significant difference in the post-test results suggests that both groups had comparable knowledge, regardless of the use of game-based learning materials.

The pre-test and post-test results of the experimental group should be compared to determine whether the results demonstrate the effectiveness of the game-based learning materials on the mathematical performance of the students. Similarly, the pre-test and post-test results of the controlled group should be compared to assess any improvement in their mathematical performance without the use of game-based learning materials.

The pre-test results of the experimental group and controlled group should be compared to show the level of performance of each group before the intervention. The post-test results of both groups should then be compared to understand the relationship between the two groups after the intervention.

To enhance game-based learning materials, the content should incorporate real-life situations to make the learning experience more relatable. Additionally, continuous updates and expert reviews of the materials should be conducted to ensure their relevance and effectiveness.

RECOMMENDATIONS

This research suggests a method for creating game-based learning materials for Grade 7 mathematics, which can enhance students' engagement and understanding of mathematical concepts. The materials should be continuously updated to reflect changing educational standards, technological advancements, and students' interests. Regular user experience assessments can identify areas for improvement and guide the development process. Expert consultation from educational specialists, curriculum developers, and game designers can enhance the instructional quality and entertainment value of the materials. Professional development for teachers can enhance instructional delivery and foster student engagement. Further research is needed to explore the long-term effects of game-based learning on student performance and the scalability of these materials for broader educational settings. Diverse learning styles should be considered, including visual, auditory, and kinesthetic preferences. Advanced technologies like augmented reality, virtual reality, and artificial intelligence can be used to create immersive and adaptive game-based learning experiences. Community and parental involvement can be fostered by providing access to the game-based learning materials at home. Finally, integrating game-based learning materials into blended learning models can provide flexibility and enhance the overall learning experience.

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