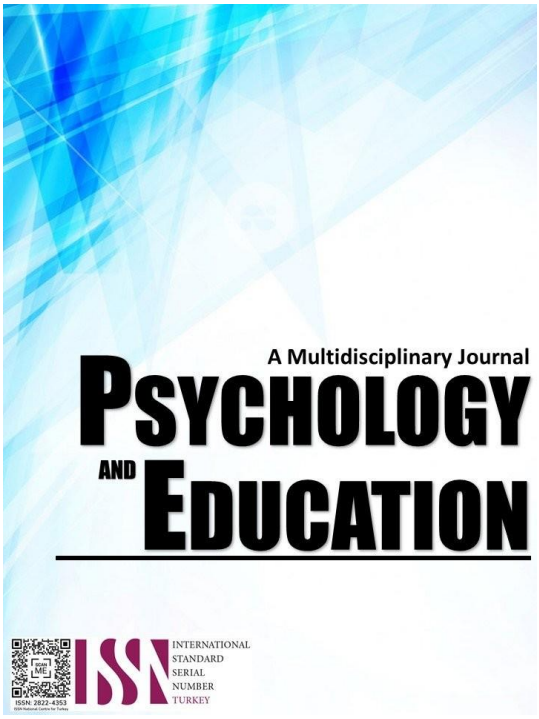
MATH VENTURE: A GAMIFIED REMEDIAL INTERVENTION MATERIAL FOR MATHEMATICS 7



PSYCHOLOGY AND EDUCATION: A MULTIDISCIPLINARY JOURNAL

Volume: 37
Issue 9
Pages: 944-956
Document ID: 2025PEMJ3620
DOI: 10.70838/pemj.370904
Manuscript Accepted: 04-11-2025

Psych Educ, 2025, **37**(9): 944-956, Document ID:2025PEMJ3620, doi:10.70838/pemj.370904, ISSN 2822-4353

Research Article

Math Venture: A Gamified Remedial Intervention Material for Mathematics 7

Jofer B. Guzman*
For affiliations and correspondence, see the last page.

Abstract

This study focused on the development and evaluation of the Math Venture, a gamified remedial intervention material for Mathematics 7 at Muntindilaw National High School, Schools Division Office of Antipolo, during the academic year 2023–2024. The survey questionnaire served as a data collection tool for the descriptive study design. Twenty-one (21) experts and eighteen (18) high school math teachers. Mathematics teachers and experts on the developed Math Venture Game for Mathematics 7 in terms of: fun, continued user Intention, visual attractiveness, challenge, balance, immersion, perceived ease of use, and perceived usefulness is inferred to have Very High Acceptability with a grand weighted mean of 4.92 and 4.79, respectively. The suggestions made by the respondents informed the researcher on how to further improve the material. The respondents suggest: resolve minimal errors, rephrase the directions into simpler one; hint is not necessary; allow users to save their game data in the cloud using their email; make the interface or theme interconnected, apply different sounds, make it more colorful, make questions presented randomly and set time limit not only in one map, but per level based on difficulties.

Keywords: *mathematics, gamified, remedial intervention*

Introduction

In both local and worldwide schooling, mathematics is always struggling with poor exam scores. The Organization for Economic Co-operation and Development (OECD) evaluated the academic achievement of 15-year-old students in 81 nations in the subjects of reading, science, and mathematics as part of the Program for International Students Assessment (PISA) 2022. The Philippines came in third place in science and sixth place in reading and math on these examinations. The average score in every category rose by only a single digit, indicating that although this is an improvement over the 2018 cycle, when Filipino pupils performed the worst in reading comprehension and the second- worst in both science and math, the Philippines' performance was not much affected. Just 16% of Filipino pupils achieved at least the most basic level of mathematical competency, known as "level 2 proficiency," which is defined as the ability to independently identify and analyze simple mathematical representations, according to the PISA findings. This indicates that 84% of Filipino test-takers are not proficient in mathematics (Manila Times, 2023).

In the international context, UNESCO (2022) reported various challenges in the Philippines' numeracy performance, including limited access to quality education resources across many regions. The lack of well-trained teachers and insufficient funding for educational initiatives has further led to wide gaps in numeracy proficiency among students. On the other hand, some countries have excelled in numeracy education through strong education systems, investments in teacher training, and effective curriculum design. Such nations place emphasis on numeracy as a core skill, making sure that students are adequately prepared in mathematics from an early age.

A comparative analysis of numeracy performance between the Philippines and other countries provides valuable insights into both the challenges and solutions related to numeracy education. This educational revolution is anchored on cutting-edge technology that transforms the way teaching is done, bringing with it innovative methods that capture the interest of learners. In this regard, mathematically gamified applications are considered highly promising tools (Lampropoulos et al., 2022). These apps subtly integrate entertaining features with informative content to present to learners and create interactive experiences, thereby making learning interesting while educating them (Blašković et al., 2023).

This theory of gamification has initiated an exciting period of optimism for the teachers with enthusiasm (Kentnor, 2019). It is a paradigm shift, where learning is reframed as an engaging and participatory activity rather than passive reception of information. Utilizing the power of gamification, educational technology designers tapped into a fundamental aspect of human psychology: the innate desire to play, compete, and achieve (Fulton, 2019). The result has been the development of mathematical gamified apps that are meant to make learning both entertaining and effective.

Gamified learning, which incorporates game aspects like competition, prizes, and interactive challenges into the learning environment, has gained a lot of popularity recently. It's a novel method to teaching as it encourages students to actively engage in the learning process and makes learning fun (Saleem et al., 2022). The concepts of active learning, which highlight student involvement and engagement as crucial factors in information retention and comprehension, are in line with the usage of gamified applications in the classroom (Smiderle et al., 2020).

For Grade 7 students, it means exposure to new curriculums, teaching methods, and higher academic expectations, especially for mathematics, where the challenge is a greater level of responsibility in learning (Bringula et al., 2021). The difficulty in mastering foundational skills in the country has led to the necessity of intervention materials for students who struggle with mathematics. While many still resort to traditional worksheets, printed exercises, and teacher-led explanation for remedial classes, Taukeni (2019) stated

that these have their limitations in engaging the students. Standard materials may only provide structured practice but lack interactivity and immediate feedback that can promote the retention and interest of the students, especially in complex subjects such as algebra and linear equations, Lassoued et al., (2020).

Studies show a great lack of appropriate learning materials for remedial mathematics education, especially in formats that can engage students and further improve their learning outcomes. For example, Aguhayon et al. (2023) indicated that the traditional remedial materials cannot meet the varied learning needs of students, particularly those with weak foundational mathematical concepts. This gap calls for innovation in terms of new approaches such as gamified learning tools that have proven promising to motivate students and keep them active in learning academic content (Slamet et al., 2024).

In fact, junior high school students' greater use of technology, especially mobile devices, creates a new opportunity for learning (AlGerafi et al., 2023). These digital devices avail access to information and educational resources for immediate consumption, thereby promoting independent learning among students (Stracke et al., 2022).

Learning is changed through educational applications, games, and multimedia resources. Through this, elements of interactivity are included in the learning process, enabling learners to solve complex issues through game experience. Such resources boost problem-solving skills and continue sustaining high engagement levels in math (Adipa et al., 2021) which taps on the need for more innovative materials that would sustain the attention of students as well as foster interactive learning experiences.

Gamified math applications, that utilize game elements to create a fun experience, have shown positive results in the context of mathematical engagement and enhancement of students' math skills (Cahya & Indriana, 2023). These apps provide an active learning environment where students solve problems and get instant feedback. Incorporating competitive and achievement elements in the app encourages students to solve more problems, hence they end up gaining deeper insight into mathematical concepts (Wichadee, 2020).

Consequently, this study draws from the Mean Percentage Score (MPS) from the Quarterly Examination in Mathematics 7 for the School Year 2023-2024 as a quantitative measure of students' performance. By analyzing MPS data, the study aims to assess whether students struggle with mathematical concepts. To address the ongoing challenges in numeracy and maximize learning outcomes, the development of intervention materials that are technology-based has become crucial.

The implementation of gamified applications aligns with modern instructional strategies and DepEd's policies for student-centered education, offering promising ways to complement existing remedial efforts. By utilizing game elements, these new materials provide students with active, engaging learning experiences that go beyond the capabilities of traditional worksheets and textbooks.

Essentially, the goal of this study is to investigate how gamified applications of mathematics might revolutionize the field of education. Starting with the fundamentals, the following section, which is the use of the gamified mobile applications in the classroom, may be unlocked by analyzing the grade seven mathematics gamified apps that have been created. The goal of this study is to fully use technology to enhance education and prepare students for the possibilities and challenges of the future, not only to gain more knowledge.

Research Questions

This study focused on the development and evaluation of the Math Venture, a Gamified Remedial Intervention Material for Mathematics 7 at Muntindilaw National High School, Schools Division Office of Antipolo, during the Academic Year 2023–2024. Specifically, it sought to answer the following questions:

1. Which quarter has the least mean percentage score (MPS) in Mathematics7 based on the quarterly exam result of Muntindilaw National High School, District I-C, Division of Antipolo City for the School Year 2023-2024 as basis for the development of gamified application for Mathematics 7?
2. What is the evaluation of the high school math teachers and experts on the developed gamified application for Mathematics 7 learners in terms of:
    2.1. fun;
    2.2. continued user intention;
    2.3. visual attractiveness;
    2.4. challenge;
    2.5. balance;
    2.6. immersion;
    2.7. perceived ease of use; and
    2.8. perceived usefulness?
3. Is there a significant difference between the evaluation of the high school math teachers and experts on the gamified application in terms of the aforementioned variables?
4. What are the comments and suggestions given by the two groups of respondents in the improvement of the developed gamified app in Mathematics 7?

Literature Review

Numeracy stands as a foundational skill crucial for the academic and personal development of Grade 7 students (Jain, 2019). It serves as the cornerstone of success in complex subjects, including mathematics and science. As students' progress through their education, the importance of numeracy becomes increasingly evident. Proficiency in numeracy not only contributes to academic achievements but also proves indispensable for effective problem-solving, informed decision-making, and navigating the challenges of daily life.

In addition to academic benefits, numeracy is the linchpin of problem- solving abilities, as emphasized by Myers (2023). Students with strong numeracy skills possess the capacity to approach and solve real-world problems with logic and analytical thinking. These skills are not confined to mathematical equations; they extend to critical thinking and decision-making in various aspects of life. As Grade 7 students transition into adolescence, they encounter a host of challenges that require the ability to analyze situations, make informed choices, and formulate solutions (Uka & Uka, 2019).

Despite the undeniable importance of numeracy, poor performance in this area remains a concern in many educational systems. Several factors contribute to subpar numeracy performance among Grade 7 students, including inadequate foundational skills in earlier grades, limited resources, and outdated pedagogical approaches. Many students find basic arithmetic, fractions, or decimals too difficult, and this can make more advanced concepts appear to be complex (Mabena et al., 2021). Further, Guhl (2019) noted that resource constraints may limit access to quality numeracy education in disadvantaged economic settings. School resources such as textbooks, technology, and well-trained teachers may be lacking, and this may limit the access of students to effective numeracy instruction.

Old and ineffective teaching methods can also hinder the understanding of the students on numeracy concepts. Li & Schoenfeld (2019) revealed that teachers who are not trained may not effectively engage students in learning, which is an obstacle for students to master numeracy skills. Also, mathematics is viewed as boring and abstract by most students, and this affects their interest and motivation in learning mathematics (Aguilar, 2021). Traditional "drill-and-practice" methods often emphasize rote memorization over conceptual understanding, making mathematics feel monotonous and disconnected from real life (Li & Schoenfeld, 2019; Wijaya & Vidianti, 2020).

Along with these unique education challenges is the emerging demand to work out remedial programs, in some form of learning gaps bridging, to assist the challenged learners in the country.

According to Capuyan et al. (2023), remedial instruction is needed for students who have different intellectual abilities, and they suggest that personalized instruction can be used to support learners who may need additional help to get on par with their peers. Their research showed that a significant percentage of elementary students had low numeracy skills and obtained borderline or failing grades in mathematics from 2016 to 2019, which indicated a persistent need for additional interventions.

Furthermore, mathematical gamified applications are gaining popularity in terms of revolutionizing education. These apps provide interactive learning experiences to bridge the gap between abstract concepts and real-world applications (Nurnberger-Haag et al., 2023).

In the Philippines, gamified mathematical apps are slowly being adopted as educationists and policymakers realize the impact, they can have on changing mathematics education. Examples of such initiatives include the Department of Education's "DepEd Commons" platform, which is a digital repository of educational resources for students and teachers. In this platform, there is an emerging collection of digital resources meant to complement traditional classroom instruction and engage students in new ways (Domingo, 2019).

Integrating gamified applications to the curriculum in the Philippines resolves the following unique challenges: One good example is how the digitization of tools levels playing fields in terms of access, especially in far-off islands or underserved communities, given that resources are mostly minimal. High-quality and rich interactive resources are then afforded by gamified apps which reduce educational disparities and therefore enable a more equal experience during the learning process (Francisco & Yazon, 2019).

Methodology

Research Design

In this investigation, the descriptive approach was used. The descriptive approach seeks to characterize a phenomenon according to its characteristics. What, when, where, and how that phenomenon occurred are the questions it seeks to address. Although the data in this kind of study may be gathered subjectively, it is often subjected to quantitative analysis in order to identify correlations utilizing statistical analyses such as averages, percentages, and frequencies (Humble, 2020). Since the goal of this research is to assess the created Math Venture game as a remedial intervention resource for Mathematics 7, this approach is comparatively relevant. Analysis of the assessment conducted by the instructors and knowledgeable respondents was done using this.

Respondents

The main source of data were the eighteen (18) math teachers and twenty- one (21) experts from various schools within the Division Office of Antipolo City. Purposive sampling was used in this research in order to identify the respondents. Purposive sampling,

according to Mweshi and Sakyi (2020), is the process by which a researcher deliberately chooses participants and locations in order to discover or comprehend the key phenomena.

Instrument

The data gathering instrument used in this study is a survey questionnaire. Part I collected the profile of the Math teachers and experts' respondent in terms of sex, position, number of years of service, and designation. Part II is a questionnaire adapted and revised from the framework proposed by Swacha et al. (2023) this was used to determine the evaluation on the developed Math Venture Game for Mathematics 7 according to the following: (1) fun, (2) continued user attention, (3) visual attractiveness, (4) challenge, (5) balance, (6) Immersion, (7) perceived ease of use, and (8) perceived usefulness.

The modified questionnaire was made by the researcher with the assistance of the adviser. After the draft was created, it was sent to five experts for evaluation in terms of appropriateness, relevance and suitability to the research problems. Feedback and ideas. The researcher modified the content of the questionnaire based on the suggestions of the validators.

Procedure

The researcher secured the consent to conduct the study and the research services agreement from the Research and Development Office of Marikina Polytechnic College. Also, permission to conduct the study was secured from the schools Division Superintendent of Antipolo to allow the researcher to administer the questionnaires to the teachers and experts.

The researcher administered the survey questionnaire to the different schools of Antipolo by asking the permission of the school principal. Then, after the approval, the researcher demonstrated the developed gamified app which is the Math Venture Game to the math teachers and experts. The math venture gamified app was installed in their mobile phones and they used it before they answered the survey questionnaire. After the evaluation, the results were retrieved and tallied for the statistical treatment of data gathered.

Results and Discussion

This portion presents the results and discussion based on the gathered data.

Table 1. *The Quarter with the Least Mean Percentage score (MPS) in Mathematics 7 Based on The Quarterly Exam Result of Muntindilaw National High School During the School Year 2023–2024 that Served as the Basis for the Development of Math Venture Game*

Competency Code	*Least Mastered Competencies*	*MPS*	*Rank*
	Second Quarter		
M7AL-IIc-4	Evaluates algebraic expressions for given values of the variables.	31.40	1
M7AL-IId-2	Adds and subtracts polynomials.	32.27	2
M7AL-IIg-2	Solves problems involving algebraic expression.	33.06	4
M7AL-IId-2	Derives the laws of exponents	37.73	8
M7AL-IIe-2	Multiplies and divides polynomials.	42.96	10
	Average Mean Percentage Score (MPS)	35.48	
	Fourth Quarter		
M7SP-IVh-1	Illustrates the measures of variability (range, average deviation, Variance, standard deviation) of statistical data.	32.79	3
M7SP-IVj-1	Uses appropriate statistical measures in analyzing and interpreting statistical data.	33.40	5
M7SP-IVj-2	Draw conclusions from graphic and tabular data and measures of central tendency and variability.	34.51	6
M7SP-IVd-e-1	Uses appropriate graphs to represent organized data: pie chart, bar graph, line graph, histogram and ogive.	36.27	7
M7SP-IVb-1	Gathers statistical data.	38.87	9
	Average Mean Percentage Score (MPS)	35.17	

As presented in the table, the quarters with the lowest mean percentage score (MPS) in mathematics 7 are quarters two and four, with average MPSs of 35.17 and 35.48 respectively according to the results of the quarterly test. Consequently, the development of the Math Venture game for Mathematics 7 is based on the second and fourth quarters.

It encompasses the following skills: (1) evaluating algebraic expressions for given values of the variables with a computed mean of 31.40; (2) adding and subtracting polynomials with a computed mean of 32.27; (3) illustrating statistical data variability measures (range, average deviation, variance, and standard deviation) with a computed mean of 32.79; (4) solving algebraic expression problems with a computed mean of 33.06; and (5) applying the proper statistical measures when analyzing and interpreting statistical data with a computed mean of 33.40.

This implies that most of the students find the topics difficult, especially in understanding the concepts that are covered in the top five

least mastered competencies. It shows that Grade 7 students have poor academic performance on the said least mastered competencies. Some factors are to be considered such as the low comprehension of the students, lack of mathematical skills of students, suspension of classes due to unfavorable weather conditions, teachers' difficulty in teaching the lesson, and lack of resources used in teaching.

Table 2. *Respondents' Evaluations on the Developed Math Venture Game for Mathematics 7 in Terms of Fun*

	Teachers		*Experts*	
Utilizing the Math venture Game…	*WM*	*VI*	*WM*	*VI*
1. allows the users to follow their own course of action.	4.94	VHA	4.95	VHA
2. makes users feel good at it.	4.94	VHA	4.90	VHA
3. allows the users to experience something new.	4.94	VHA	4.81	VHA
4. makes users to continue to feel curious while playing; and	5.00	VHA	4.81	VHA
5. allows users to enjoy themselves while playing Math Venture.	4.89	VHA	4.76	VHA
Overall Weighted Mean	4.94	VHA	4.85	VHA
Standard Deviation	0.24		0.32	

The developed Math Venture game for Mathematics 7 received Very High Acceptability ratings from math teachers and experts for fun, with weighted means of 4.94 and 4.85 overall and standard deviations of 0.24 and 0.32, respectively.

This means that the developed Math Venture Game for Mathematics 7 in terms of fun allows the users to follow their own course, makes them feel good, allows them to experience something new, makes them curious while playing, and they will be more likely to stay engaged and continue learning effectively.

This further supports the research of Brown and Clarke (2022), who stated that gamified learning environments increase engagement and motivation in learning over a period of time, because they are personalized and interactive in nature.

Table 3. *Respondents' Evaluations on the Developed Math Venture Game for Mathematics 7 in Terms of Continued User Intention*

	Teachers		*Experts*	
Continued User Intention	*WM*	*VI*	*WM*	*VI*
1. Users will have the interest to continue using Math Venture Game rather than discontinue its use.	4.83	VHA	4.86	VHA
2. I would suggest the use of Math Venture Game rather than use any alternative means.	4.83	VHA	4.76	VHA
Overall Weighted Mean	4.83	VHA	4.81	VHA
Standard Deviation	0.42		0.43	

Both groups evaluated the gamified application developed for Mathematics 7 in terms of continued user intention with Very High Acceptability weighted means of 4.83 and 4.81 and standard deviations of 0.42 and 0.43, respectively.

Given that both groups feel that the Math venture game's continued user intention is very highly acceptable, then engaging design and interactive elements are going to maintain the user's interest and commitment, hence making it a preference tool for learning math over alternative methods. According to Bandy (2022), gamified mobile apps support an interactive and immersive learning environment through the use of points and rewards, thereby promoting user engagement and sustained participation.

Table 4. *Respondents' Evaluations on the Developed Math Venture Game for Mathematics 7 in Terms of Visual Attractiveness*

	Teachers		*Experts*	
Visual Attractiveness	*WM*	*VI*	*WM*	*VI*
1. The layout of the user interface of Math Venture Game is attractive.	5.00	VHA	4.90	VHA
2. The colors used on the user interface of Math Venture Game are attractive.	5.00	VHA	4.90	VHA
3. The user interface design of Math Venture Game caught my attention to explore it.	4.94	VHA	4.86	VHA
4. Overall, I think the user interface of Math Venture Game looks good.	5.00	VHA	4.86	VHA
Overall Weighted Mean	4.99	VHA	4.88	VHA
Standard Deviation	0.47		0.32	

The teachers and the experts graded the developed gamified application of Mathematics 7 in visual attractiveness with Very High Acceptability with a weighted mean rating of 4.99 and 4.88 and standard deviation rating of 0.47 and 0.32 respectively.

An attractive layout and color scheme are crucial in capturing and maintaining users' interest, which can lead to a more immersive and enjoyable learning experience. Attention to visual design in educational tools would, therefore, be important in increasing user interaction and satisfaction, which would make the tools effective and preferable for learners. Well-designed gamified apps, Hassan says (2023), must include provisions that meet learners with a variety of disabilities, including adjustments to the size of font used, captions or subtitles in the case of multimedia, contrast changes in colors, and very clear instructions to accommodate cognitive challenges in the process. These aspects increase beauty while catering for a different aspect of need for learners.

Table 5. *Respondents' Evaluations on the Developed Math Venture Game for Mathematics 7 in Terms of Challenge*

	Teachers		*Experts*	
Challenge	*WM*	*VI*	*WM*	*VI*
1.Using Math Venture Game prompts the users to push their limits.	4.89	VHA	4.81	VHA
2. Using Math Venture Game drives the users in a good way to the brink of wanting to give up.	4.94	VHA	4.52	VHA
3. Using Math Venture Game pressures, the users in a positive way by its high demands.	4.89	VHA	4.57	VHA
4. Math Venture Game challenges the users.	4.94	VHA	4.90	VHA
5. Using Math Venture Game calls for a lot of effort for the users to be successful.	4.89	VHA	4.52	VHA
6. Using Math Venture Game causes the users to feel like the continuous need to improve to do well.	4.94	VHA	4.76	VHA
7. Using Math Venture Game causes the users to work at a level close to what they are capable of.	4.89	VHA	4.71	VHA
Overall Weighted Mean	4.91	VHA	4.69	VHA
Standard Deviation	0.16		0.37	

Both groups scored the developed gamified application for Mathematics 7 in terms of challenge as Very High Acceptability, with the overall weighted mean of 4.91 and 4.69 and standard deviations of 0.16 and 0.37, respectively.

It implies that the math venture game effectively employs challenging and stimulating gameplay to push users to their limits and foster personal growth. By creating a positive pressure environment and requiring significant effort, the game motivates users to continuously improve and engage deeply with the material. This validates the work of Corpuz-Sanchez and Pasia (2023), who reported that appropriate challenge learning environments are significant factors in student motivation and performance.

Table 6. *Respondents' Evaluations on the Developed Math Venture Game for Mathematics 7 in Terms of Balance*

	Teachers		*Experts*	
Balance	*WM*	*VI*	*WM*	*VI*
1. In Math Venture Game lots of meaningful choices are presented to the users.	4.89	VHA	4.71	VHA
2. In Math Venture Game sufficient contexts are provided to allow each choice (that a user makes in the system) to have balanced advantages and limitations.	4.94	VHA	4.62	VHA
3. In Math Venture Game, users with equal skills have a roughly same chance to succeed although they might start with different choices (e.g., options, characters, resources, etc).	4.89	VHA	4.90	VHA
Overall Weighted Mean	4.91	VHA	4.75	VHA
Standard Deviation	0.19		0.32	

Both groups scored the developed gamified application for Mathematics 7 in terms of balance as Very High Acceptability, with the overall weighted means of 4.91 and 4.75 and standard deviations of 0.19 and 0.32, respectively.

The findings confirmed to be very high acceptability imply that Math Venture game is designed to offer a balanced and equitable gaming experience through meaningful contextually rich choices. By providing users with a variety of options that come with both advantages and limitations, the game ensures that success is achievable regardless of initial choices or starting points. This supports the study conducted by Serin (2023), who emphasized how well-balanced gamified applications are effective in education because they will let the user explore various avenues to success. According to Serin, the giving of choice among the learners such as choosing different strategies and resources is a more personalized approach to learning.

Table 7. *Respondents' Evaluations on the Developed Math Venture Game for Mathematics 7 in Terms of Immersion*

	Teachers		*Experts*	
Immersion	*WM*	*VI*	*WM*	*VI*
1. Using the Math Venture Game provides the users with the feeling that time passes quickly.	4.94	VHA	4.81	VHA
2. The Math Venture Game grabs all of users' attention.	4.83	VHA	4.76	VHA
3. Using the Math Venture Game causes actions to seem to come automatically.	4.94	VHA	4.76	VHA
4. Using the Math Venture Game causes the users to stop noticing when they become tired.	4.78	VHA	4.81	VHA
5. Using the Math Venture Game causes users to ignore everything around them.	4.83	VHA	4.67	VHA
6. Using the Math Venture Game causes the users to become fully emotionally involved.	4.89	VHA	4.71	VHA
Overall Weighted Mean	4.87	VHA	4.75	VHA
Standard Deviation	0.30		0.34	

The created gamified application for Mathematics 7 on immersion received Very High Acceptability ratings from both groups, with weighted means of 4.87 and 4.75 and standard deviations of 0.30 and 0.34, respectively.

It indicates that the developed Math Venture Game is very much immersive and engages the full focus of users by creating an alluring, engaging experience.

This design supports the claims of Pescarin and Pandiani (2022), which are that in some immersive game environments, an absorption state may occur where, in deep concentration, gamers become so focused that time even becomes irrelevant.

Table 8. *Respondents' Evaluations on the Developed Math Venture Game for Mathematics 7 in Terms of Perceived Ease of Use*

	Teachers		*Experts*	
Perceived Ease of Use	*WM*	*VI*	*WM*	*VI*
1. Learning to operate Math Venture Game would be easy for the users.	5.00	VHA	4.81	VHA
2. Users would find it easy to cause Math Venture Game to do what they want to do.	4.94	VHA	4.52	VHA
3. Users would find Math Venture Game clear and understandable.	5.00	VHA	4.86	VHA
4. It would be easy for the users to become skillful at Math Venture Game.	4.89	VHA	4.90	VHA
5. Users would find Math Venture Game easy to use.	5.00	VHA	4.95	VHA
Overall Weighted Mean	4.97	VHA	4.81	VHA
Standard Deviation	0.14		0.23	

With a general weighted mean of 4.97 and 4.81 and standard deviations of 0.14 and 0.23, respectively, both groups gave the created gamified application for Mathematics 7 a Very High Acceptability rating for perceived ease of use.

This finding suggests that Math Venture game is user friendly and accessible. Its straightforward mechanics and intuitive interface make users learn to operate the game easily and effectively achieve what they set out to within the game and become confident in their use of the game.

This corresponds with the results of Zainuddin (2023), who underlined that simplicity in use is an important driver in educational technology adoption and subsequent continuous usage.

Table 9. *Respondents' Evaluations on the Developed Math Venture Game for Mathematics 7 in Terms of Perceived Usefulness*

	Teachers		*Experts*	
Perceived Usefulness	*WM*	*VI*	*WM*	*VI*
1. Using Math Venture Game would enable the users to more quickly accomplish tasks.	4.94	VHA	4.67	VHA
2. Using Math Venture Game would improve the performance of the users.	5.00	VHA	4.81	VHA
3. Using Math Venture Game would increase the users' productivity.	5.00	VHA	4.76	VHA
4. Users would find Math Venture Game useful.	4.94	VHA	4.90	VHA
Overall Weighted Mean	4.97	VHA	4.79	VHA
Standard Deviation	0.15		0.23	

The weighted mean of the developed gamified application of Mathematics 7 on perceived usefulness scored Very High Acceptability by both groups. They yielded an overall weighted mean of 4.97 and 4.79 and standard deviations of 0.15 and 0.23, respectively.

The findings imply that the game, Math Venture, has been developed to enhance the efficiency and effectiveness of its users. By allowing them to perform their tasks faster, it increases the productivity of its users, hence supporting an increase in productivity.

According to Sanchez et al. (2020), educational games enhance student performance more effectively compared to non-game-based instruction due to the provision of an interactive and engaging learning environment in which users can complete tasks faster and more efficiently.

Table 10. *Test of Significant Difference in the Two Groups of Respondents' Evaluation in Terms of Fun on the Developed Math Venture Game for Mathematics 7*

Respondents	*n*	*OWM*	*SD*	*Computed t Value*	*p-Value*	*Decision*	*Interpretation*
Teachers	18	4.94	0.24			Fails to reject the H_0	Not Significant
Experts	21	4.85	0.32	1.08	0.29		

The calculated t-value is 1.08 and the critical t-value with 37 degrees of freedom is 2.03. Because the p-value of 0.29 is higher than the.05 threshold of significance, the statistical judgment fails to reject the null hypothesis. As a result, there is no significant difference between the experts' and math teachers' evaluation of how much fun the developed Math Venture Game for Mathematics 7

This implies that both Mathematics teachers and experts agreed that in terms of fun the developed Math Venture Game for Mathematics 7 is very highly acceptable as a learning tool.

Conversely, Brown and Clarke (2022) noted that while gamification is generally well-received, some educational experts' express concerns that the "fun" elements might distract from deeper learning or mastery of complex concepts.

Table 11. *Test of Significant Difference in the Two Groups of Respondents' Evaluation in Terms of Continued User Intention on the Developed Math Venture Game for Mathematics 7*

Respondents	*n*	*OWM*	*SD*	*Computed t Value*	*p-Value*	*Decision*	*Interpretation*
Teachers	18	4.83	0.42			Fails to reject	Not Significant
Experts	21	4.81	0.43	0.17	0.86	the H_0	

The calculated t-value is 0.17 and the critical t-value with 37 degrees of freedom is 2.03. Because the p-value of 0.86 is higher than the 0.05 threshold of significance, the statistical judgment fails to reject the null hypothesis. As a result, there is no significant difference between the experts' and math teachers' evaluations of how much fun the developed Math Venture Game for Mathematics 7.\

This implies that both Mathematics teachers and experts totally agreed that in terms of continued user intention the developed Math Venture Game for Mathematics 7 is very highly acceptable as learning tool.

Zhao et al. (2021) highlighted the importance of user satisfaction and intention to continue using gamified learning tools. Their study found that when such tools are perceived as engaging and effective, both educators and experts tend to support their continued use, as seen in the Math Venture Game.

Table 12. *Test of Significant Difference in the Two Groups of Respondents' Evaluation in Terms of Visual Attractiveness on the Developed Math Venture Game for Mathematics 7*

Respondents	*n*	*OWM*	*SD*	*Computed t Value*	*p-Value*	*Decision*	*Interpretation*
Teachers	18	4.88	0.47			Fails to reject	Not Significant
Experts	21	4.88	0.32	-0.04	0.96	the H_0	

The calculated t-value is -0.04, and the critical t- value with 37 degrees of freedom is 2.03. Because the p-value of 0.96 is higher than the.05 threshold of significance, the statistical judgment fails to reject the null hypothesis. As a result, there is no significant difference between the experts' and math teachers' evaluation of the visual attractiveness of the developed Math Venture Game for Mathematics 7.

This indicates that both Mathematics teachers and experts totally agreed that in terms of visual attractiveness the developed Math Venture Game for Mathematics 7 is very highly acceptable as a learning tool.

Jafarkhani et al. (2024) emphasized that visually appealing learning tools can significantly impact user engagement, particularly in educational games. Their study found that users were more likely to remain engaged when the interface was visually stimulating and easy to navigate.

Table 13. *Test of Significant Difference in the Two Groups of Respondents' Evaluation in Terms of Challenge on the Developed Math Venture Game for Mathematics 7*

Respondents	*n*	*OWM*	*SD*	*Computed t Value*	*p-Value*	*Decision*	*Interpretation*
Teachers	18	4.91	0.16			Reject the H_0	Significant
Experts	21	4.69	0.37	2.51	0.02		

The calculated t-value is 2.51 and the crucial t- value with 37 degrees of freedom is 2.03. Given that the p-value of 0.02 is less than the.05 threshold of significance, the null hypothesis is statistically rejected. This indicates that, at the 5% level of significance, there is substantial evidence to support the claim that the two groups of respondents' evaluations of the challenge were different from one another.

This indicates that there is a significant difference between the experts' and teachers' evaluations of the difficulty of the developed Math Venture Game for Mathematics 7.

This approach is supported by Cheung and Ng (2021), who found that educational games with an optimal level of challenge can boost student engagement and learning outcomes.

Table 14. *Test of Significant Difference in the Two Groups of Respondents' Evaluation in Terms of Balance on the Developed Math Venture Game for Mathematics*

Respondents	*n*	*OWM*	*SD*	*Computed t Value*	*p-Value*	*Decision*	*Interpretation*
Teachers	18	4.91	0.19			Fails to reject	Not Significant
Experts	21	4.75	0.32	1.92	0.06	the H_0	

The calculated t-value is 1.92 and the critical t-value with 37 degrees of freedom is 2.03. The null hypothesis fails to be rejected

statistically since the p-value of.06 is higher than the significance threshold of 0.05. As a result, there is no significant difference between the experts' and teachers' evaluation of the developed Math Venture Game for Mathematics 7 in terms of balance.

Consequently, mathematics teachers and experts suggest that in terms of balance the developed Math Venture Game for Mathematics 7 is very highly acceptable as learning tool as it offers a balanced and reasonable gaming experience through meaningful decisions with extensive context.

Becker and Görlich (2020) maintained that balance in educational games is important to ensure learners' engagement. They had shown that a balanced game allows learners to make meaningful decisions while being fully engaged in the game context since a well-balanced game present neither too easy nor too difficult challenges.

Table 15. *Test of Significant Difference in the Two Groups of Respondents' Evaluation in Terms of Immersion on the Developed Math Venture Game for Mathematics 7*

Respondents	*n*	*OWM*	*SD*	*Computed t Value*	*p-Value*	*Decision*	*Interpretation*
Teachers	18	4.87	0.30			Fails to reject the H_0	Not Significant
Experts	21	4.75	0.34	1.15	0.26		

The calculated t-value is 1.15 and the critical t-value with 37 degrees of freedom is 2.03. The null hypothesis fails to be rejected statistically since the p-value of 0.26 is higher than the significance threshold of

0.05. In light of this, there is no significant difference between the experts' and teachers' evaluation of the immersion of the developed Math Venture Game for Mathematics 7.

This implies that both mathematics teachers and experts agreed that in terms of immersion the developed Math Venture Game for Mathematics 7 is highly immersive. It can capture the user's full attention and create a compelling, engaging experience.

L. Zhang et al. (2023) discuss the importance of immersion in gamified learning environments. They noted that deeply immersive experiences can sustain user engagement and suggest retention of information.

Table 16. *Test of Significant Difference in the Two Groups of Respondents' Evaluation in Terms of Perceived Ease of Use on the Developed Math Venture Game for Mathematics 7*

Respondents	*n*	*OWM*	*SD*	*Computed t Value*	*p-Value*	*Decision*	*Interpretation*
Teachers	18	4.97	0.14			Reject the H_0	Significant
Experts	21	4.81	0.23	2.59	0.01		

The calculated t-value of 2.59 and the crucial t-value with 37 degrees of freedom of 2.03 are shown in Table 18. Since the p-value of 0.01 is less than the.05 threshold of significance, the null hypothesis is statistically rejected. This indicates that, at the 5% level of significance, there is substantial evidence to support the claim that the two groups of respondents' evaluations of perceived ease of use differed from one another. As a result, there is a significant difference between the experts' and teachers' evaluation of the developed Math Venture Game for Mathematics 7.

As a result, math teachers and experts believe that the developed Math Venture Game for Mathematics 7 is a very good learning tool in terms of difficulty. The findings demonstrated that the Math Venture game was designed with usability and accessibility in mind.

Al-Qaysi et al. (2020) quote Davis (1989), who identified perceived ease of use as one of the critical criteria in deciding whether consumers would embrace and continue to use technology in the Technology Acceptance Model (TAM).

Table 17. *Test of Significant Difference in the Two Groups of Respondents' Evaluation in Terms of Perceived Usefulness on the Developed Math Venture Game for Mathematics 7*

Respondents	*n*	*OWM*	*SD*	*Computed t Value*	*p-Value*	*Decision*	*Interpretation*
Teachers	18	4.96	0.15			Reject the H_0	Significant
Experts	21	4.80	0.23	2.61	0.01		

The calculated t-value of 2.61 and the crucial t-value with 37 degrees of freedom of 2.03 are shown in Table 19. Since the p-value of 0.01 is less than the 0.05 threshold of significance, the null hypothesis is statistically rejected. This indicates that, at the 5% level of significance, there is substantial evidence to support the claim that the two groups of respondents' evaluations of perceived usefulness differed from one another. As a result, there is a significant difference between the experts' and teachers' evaluation of the developed Math Venture Game for Mathematics 7.

As a result, mathematics teachers and experts suggest that in terms of perceived usefulness the developed Math Venture Game for Mathematics 7 is very highly acceptable as a learning tool. Thus, the results confirmed that the Math Venture game was designed to enhance user efficiency and effectiveness.

Akram et al. (2022) further support this, with evidence that teachers' perception of the usefulness of educational tools strongly correlates with their intention to use the technology.

Comments

Overall, the comments imply that the Math Venture Game is a valuable educational tool that successfully blends entertainment with learning. Its engaging interface, ease of use, educational value, and potential for use in both regular and remedial settings make it an effective resource for enhancing the mathematical skills of Grade 7 students. By making learning fun and accessible, the game has the potential to significantly impact student outcomes in mathematics, fostering both engagement and mastery of the subject.

Suggestions

The suggestion "resolve minimal errors and lagging sometimes" refers to technical problems that are encountered in the smooth usage of the game. It would appear that even though effective, the game is prone to glitches or occasional delays that may annoy learners and take them away from their focus.

Another suggestion, "rephrase directions into simpler directions," provides clarity of direction. Consequently, this would mean some users did not do well in trying to understand what the directions were giving. It may have compromised their effective interplay with the game.

From a technical feasibility perspective, the recommendation "to enable users to save their gameplay in the cloud" and sync to another device for easy access shows one of the rising expectations for flexible, mobile learning.

It would be better to see more color added, possibly even adding user accounts in the future. More color and user accounts would be synonymous with further customization and personalization of the game. This means that a more colorful and personalized interface would indeed make the game more interesting for students.

Conclusions

Based on the findings of this study, the following are the conclusions drawn from the results of the study. The developed Math Venture Game was recognized as a potential learning aid in Mathematics 7 by both math teachers and experts in the following areas: fun, continued user intention, visual attractiveness, balance, and immersion. However, the evaluation of math teachers and experts differs in terms of challenge, perceived ease of use, and perceived usefulness.

References

Adipa, S., Laksana, K., Busayanon, K., Asawasowan, A., & Adipat, B. (2021). Engaging Students in the Learning Process with Game-Based Learning: The Fundamental Concepts. International Journal of Technology in Education (IJTE), 4(3), 542-552. https://files.eric.ed.gov/fulltext/EJ1311472.pdf.

Aguhayon, H., Tingson, R., Pentang, J. (2023). Addressing Students Learning Gaps in Mathematics through Differentiated Instruction. International Journal of Educational Management and Development Studies, 4(1), 69-87. https://doi.org/10.53378/352967.

Aguilar, J. J. (2021). High School Students' Reasons for disliking Mathematics: The Intersection Between Teacher's Role and Student's Emotions, Belief and Self-efficacy. International Electronic Journal of Mathematics Education. https://files.eric.ed.gov/fulltext/EJ1327942.pdf.

Akram, H., Abdelrady, A. H., Al-Adwan, A. S., & Ramzan, M. (2022). Teachers' Perceptions of Technology Integration in Teaching-Learning Practices: A Systematic review. Frontiers in Psychology, 13. https://doi.org/10.3389/fpsyg.2022.920317.

Al-Qaysi, N., Mohamad-Nordin, N., & Al-Emran, M. (2020). Employing the technology acceptance model in social media: A systematic review. Education and Information Technologies, 25(6), 4961–5002. https://doi.org/10.1007/s10639-020-10197-1.

AlGerafi, M. a. M., Zhou, Y., Oubibi, M., & Wijaya, T. T. (2023). Unlocking the potential: A comprehensive evaluation of augmented reality and virtual reality in education. Electronics, 12(18), 3953. https://doi.org/10.3390/electronics12183953.

Bandy, J. (2022). Learning to apply knowledge and skills to benefit others or serve the public good. Retrieved from Idea Education: https://www.ideaedu.org/idea-notes-on-learning/learning-to-apply knowledge-and-skills-to-benefit-others-or-serve-the-public-good/.

Bringula, R., Reguyal, J. J., Tan, D. D., & Ulfa, S. (2021). Mathematics self-concept and challenges of learners in an online learning environment during COVID- 19 pandemic. Springer Open, 7-11.

Brown, S. E., & Clark, L. M. (2022). Fostering engagement in Grade 7 mathematics: The role of interactivity in gamified mobile

apps. Educational Psychology Review, 45(3), 237-254. https://doi.org/10.1007/s10648-021-09637-4.

Cahya, A., & Indriana, D. (2023). Transforming Middle School Mathematics Education: The Impact of Gamification on Student Interest and Engagement. L'Geneus: The Journal Language Generations of Intellectual Society, 12(2), 65-73.

Capuyan, D., Etcuban, J. O., Manguilimotan, R., Padillo, G., Raynera, W., & Onrejas, E. (2019). Mathematics remedial program for elementary learners in Cebu City, Philippines. American Research Journal of Humanities Social Sciences, 2(5), 16-23.

Cheung, S. Y., & Ng, K. Y. (2021). Application of the educational game to enhance student learning. Frontiers in Education,6. https://doi.org/10.3389/feduc.2021.623793.

Corpuz-anchez, J., & Pasia, A. (2023). Gamified learning environment in improving the engagement and Mathematical Problem-Solving ability of Grade 7 students. International Journal of Open-Access, Interdisciplinary & New Educational Discoveries of ETCOR Educational Research Center, 2(3), 588–603. https://etcor.org/storage/iJOINED/Vol.%20II(3),%20588- 603.pdf.

Francisco, M. V., & Yazon, M. M. (2019). An exploratory study on the use of gamification in mathematics instruction in the Philippines. International Journal of Information and Education Technology, 9(11), 838-843.

Fulton, J. N. (2019). Theory of Gamification - Motivation. Retrieved from Eric.Gov: https://files.eric.ed.gov/fulltext/ED607091.pdf.

Guhl, P. (2019). The Impact of Early Math and Numeracy Skills on Academic Achievement in Elementary School. Northwestern College, Iowa NW Commons. https://nwcommons.nwciowa.edu/cgi/viewcontent.cgi?article=1145&contex t=education masters.

Hassan, L. (2023). Accessibility of games and game-based applications: A systematic literature review and mapping of future directions. New Media & Society, 26(4), 2336–2384. https://doi.org/10.1177/14614448231204020.

Humble, S. (2020). Quantitative analysis of questionnaires: Techniques to explore structures and relationships. Routledge.

Jafarkhani, F., Barani, F., Nawaser, K., Rashidi, H., & Gharleghi, B. (2024). Factors affecting the aesthetic experiences in educational games: A qualitative investigation. Journal of Economy and Technology, 2, 200–207. https://doi.org/10.1016/j.ject.2024.07.002.

Jain, P., & Rogers, M. (2019). Numeracy as critical thinking. Adults Learning Mathematics: An International Journal, 14(1), 2333. https://files.eric.ed.gov/fulltext/EJ1232382.pdf.

Kentnor, H. (2019). Distance Education and the Evolution of Online Learning in the. Retrieved from University of Denver Digital Commons: https://digitalcommons.du.edu/cgi/viewcontent.cgi?article=1026&context=lawfacpub.

Lampropoulos, G., Keramopoulos, E., Diamantaras, K., & Evangelidis, G. (2022). Augmented Reality and Gamification in Education: A systematic literature review of research, applications, and empirical studies. Applied Sciences, 12(13), 6809. https://doi.org/10.3390/app12136809

Lassoued, Z., Alhendawi, M., & Bashitialshaaer, R. (2020). An exploratory study of the obstacles for achieving quality in distance learning during the COVID-19 pandemic. Education sciences, 10(9), 232. https://doi.org/10.3390/educsci10090232.

Mweshi, G. K., & Sakyi, K. (2020). Application of sampling methods for the research design. Archives of Business Review–Vol, 8(11).

Myers, M. (2023). Strong numeracy skills are essential for success in mathematics in later school years. Retrieved from Myers Learning Portal: https://mrsmyersr.com/1news/importance-developing-strong-numeracy-skills-children.

Nurnberger-Haag, J., Wernet, J. L., & Benjamin, J. I. (2023). Gameplay in Perspective: Applications of a Conceptual Framework to Analyze Features of Mathematics Classroom Games in Consideration of Students' Experiences. International Journal of Education in Mathematics, Science and Technology, 11(1), 267-303.

Pescarin, S., & Pandiani, D. S. M. (2022). The impact of story structure, meaningfulness, and concentration in serious games. Information, 13(12), 567. https://doi.org/10.3390/info13120567.

Saleem, A. N., Noori, N. M., & Ozdamli, F. (2021). Gamification Applications in e- learning: A Literature review. Technology Knowledge and Learning, 27(1), 139–159. https://doi.org/10.1007/s10758-020-09487-.

Sanchez, D. R., Langer, M., & Kaur, R. (2020). Gamification in the classroom: Examining the impact of gamified quizzes on student learning. Computers & Education, 144, 103666. https://doi.org/10.1016/j.compedu.2019.103666.

Serin, H. (2023). The Role of Technology in Mathematics Education: Promoting Student Achievement. International Journal of Social Sciences & Educational Studies, 10(2).

Slamet, J., Basthomi, Y., Ivone, F. M., & Eliyanah, E. (2024). Unlocking the potential in a gamification-based MOOC: Assessing autonomous learning and self-directed learning behaviors. Teaching and Learning Inquiry, 12, 1-20. https://doi.org/10.20343/teachlearninqu.12.19.

Stracke, C., Burgos, D., Santos-Hermosa, G., Bozkurt, A., Sharma, R., Swiatek Cassafieres, C., ... & Truong, V. (2022). Responding to the initial challenge of the COVID-19 pandemic: Analysis of international responses and impact in school and higher education. Sustainability, 14(3), 1876.

Swacha, J., Queirós, R., & Paiva, J. C. (2023). GATUGU: Six Perspectives of Evaluation of Gamified Systems. Information, 14(2), 136. https://doi.org/10.3390/info14020136.

Taukeni, S.G., 2019, 'Providing remedial support to primary school learners within their zone of proximal development'. South African Journal of Childhood Education, 9(1), a654. https://doi.org/10.4102/sajce.v9i1.654.

Uka, A., & Uka, A. (2019). The Effect of Students' Experience with the Transition from Primary to Secondary School on Self-Regulated Learning and Motivation. Sustainability, 12(20), 8519. https://doi.org/10.3390/su12208519.

Wichadee, S. (2020). Enhancement of Performance and Motivation through Application of Digital Games. Teaching English with Technology, 18(1), 77-92. https://files.eric.ed.gov/fulltext/EJ1170635.pdf.

Zainuddin, Z., et al. (2020). The impact of gamification on learning. Educational Research Review, 30, 100326. https://doi.org/10.1016/j.edurev.2020.100326.

Zhao, J., Hwang, G. J., Chang, S. C., Yang, Q. F., & Nokkaew, A. (2021). Effects of gamified interactive e-books on students' flipped learning performance, motivation, and meta-cognition tendency in a mathematics course. Educational Technology Research and Development, 69, 3255-3280.

Affiliations and Corresponding Information

Jofer B. Guzman
Muntindilaw National High School
Department of Education – Philippines