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Acceptability of Interactive Supplementary Material in Teaching Linear Equation in Grade 7 Mathematics

Nestor Jr. R. Ramilo*[1], Charlie T. Anselmo[2]
[1]Longos National High School, Malabon City, Metro Manila, Philippines
[2]College of Education, Isabela State University – Cauayan City, Isabela, Philippines

*Corresponding Author Email: nestor.ramilojr001@deped.gov.ph

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Abstract. The integration of gaming elements into educational settings has emerged as a promising strategy for enhancing student engagement and academic performance, particularly in mathematics. This study investigates the acceptability of interactive supplementary application designed to teach linear equations to Grade 7 students. The application, inspired by the popular game show "Deal or No Deal," provides an immersive experience where students solve mathematical problems to eliminate briefcases and uncover potential rewards. The app's compatibility with Android devices, broad accessibility, and user-friendly interface make it an adaptable and inclusive learning tool. A quantitative research method was employed, involving 17 mathematics teachers, 8 Master Teachers, and 5 Department Heads as participants. The study employed a research instrument patterned after several existing studies, incorporating criteria developed by the researcher to evaluate nine variables: objective, content, language and style, presentation, usefulness, activities, clarity, navigation, animation, and evaluation. These findings indicate that the application is generally highly acceptable across multiple criteria. Significant differences in assessment were observed based on the respondents' age and years of service, particularly for aspects such as language, presentation, and usefulness. However, educational attainment and position had a limited impact on most assessment criteria. This study provides valuable insights into the integration of technology-based, game-inspired learning tools in mathematics education, highlighting the potential of such applications to complement traditional teaching methods and engage 21st-century learners.

Keywords: Educational technology integration; Game-based learning; Interactive learning tools; Mathematics education in the Philippines.

1.0 Introduction

Mathematics education plays a crucial role in developing students' problem-solving skills and mathematical literacy, which are essential for navigating the complexities of the 21st century (Amalina & Vidákovich, 2023; Rizki & Priatna, 2019). The importance of mathematical reasoning and proof in deepening mathematical understanding has been emphasized in recent research, leading to a reexamination of the curriculum at all grade levels (Villiers, 2012). In Math 7, linear equations are a fundamental concept within the algebra strand. The curriculum for 8th-grade students, which often includes advanced 7th-grade content, typically covers the general form, solving, and application of systems of linear equations with two variables (Rusdi et al., 2020). This aligns with the broader goal of developing students' mathematical literacy, which includes competencies such as mathematical thinking, reasoning, communication, modeling, and problem-solving (Sumirattana et al., 2019; Sumirattana et al., 2017). Interestingly, research has shown that students' problem-solving skills tend to develop from grades 7 to 8, but this progression is not always maintained in grade 9 (Amalina & Vidákovich, 2023). This highlights the importance of focusing on effective teaching methods for linear equations in Math 7 as it provides a critical foundation for future mathematical understanding. To enhance students' mathematical literacy and problem-solving skills approaches such as Realistic Mathematics Education (RME) and Virtual Realistic Mathematics Education (VRME) have shown promise in making abstract concepts more concrete and relevant to students' lives (Çakıroğlu et al., 2023; Sumirattana et al., 2017).

The teaching of linear equations faces several challenges that necessitate innovative approaches to enhance students' understanding and engagement. Traditional methods often struggle to convey the abstract nature of linear equations, resulting in difficulties in their conceptualization and application (Iqbal et al., 2020; Iqbal et al., 2022). A significant challenge is the need to bridge the gap between theoretical understanding and practical problem-solving skills. Many students find it challenging to translate real-world scenarios into mathematical equations, highlighting the importance of developing creative teaching strategies that emphasize contextual learning (Norqvist et al., 2019; Revell & McCurry, 2012). Additionally, the diverse learning styles and backgrounds of students in modern classrooms require adaptive and personalized approaches to instruction (Uskov et al., 2018). To address these challenges, educators are exploring innovative methods such as flipped classrooms, game-based learning, and technology-enhanced instruction (Cevikbas & Kaiser, 2020; Naik, 2015). The integration of augmented reality (AR) into STEM education holds promise for delivering the practical and creative aspects of teaching linear equations (Iqbal et al., 2022). Furthermore, the emergence of artificial intelligence and large language models offers new possibilities for personalized learning experiences and curriculum development (Matzakos et al., 2023). These innovative approaches aim to foster critical thinking, promote student engagement, and enhance mathematical competency in linear equations (Hadar & Tirosh, 2019; Ward et al., 2024). According to Anselmo (2024), both educators and students recognize the value of integrating technological tools in the classroom, particularly in enhancing engagement and fostering a deeper understanding of complex subjects

Interactive supplementary materials are gaining prominence in mathematics education because of their potential to enhance students' engagement and learning outcomes. These materials, which include digital tools, gamified elements, and immersive environments, offer new ways for students to interact with mathematical concepts and develop their critical thinking skills. Research has shown that interactive learning environments can have a significantly positive impact on mathematics education. For instance, the implementation of augmented reality (AR) in mathematics education has consistently demonstrated positive outcomes (Bulut & Ferri, 2023). Similarly, the use of educational games as an interactive learning media has been found to improve students' creative thinking skills in mathematics, with one study reporting an 84.85% improvement (Kartika et al., 2019). Interactive eBooks with scaffolding features have shown promise, particularly for students with low academic achievement (Reinhold et al., 2019). Interestingly, the benefits of interactive materials extend beyond academic performance. Studies have found that these tools can increase students' motivation and interest in mathematics. For example, a mobile visual novel game for teaching definite integrals achieved high levels of immersion (82.09%) and behavioral intention to use (84.28%), indicating strong student engagement (Florensia & Suryadibrata, 2023).

The use of technology and game-based learning in mathematics education has garnered significant attention in recent years, with numerous studies exploring its effectiveness and potential benefits. Digital games have been reported to be an effective educational method for improving students' motivation and performance in mathematics learning (Byun & Joung, 2018). The implementation of game-based approaches in education has the potential to enhance student motivation and engagement in the learning process, ultimately leading to the acquisition of long-lasting practical knowledge (Videnovik et al., 2023). In a meta-analysis, Anselmo (2024) evaluated the effectiveness of learning kits and demonstrated that these tools significantly improve students' conceptual understanding and engagement. Teachers are an indispensable resource for delivering quality education. Their methods and strategies must align with the subject matter while resonating with the learners' interests, contemporary trends, and national standards. Moreover, K-12 educational policy emphasizes the importance of developing interactive learning materials that foster student engagement and prepare them for recognition on the international stage. Another review of 43 papers focused on recent empirical studies that implemented learning games for K-12 mathematics education between 2008 and 2021, identifying trends in game design and the integration of math content into gameplay (Pan et al., 2022). However, notable gaps and contradictions exist in current research. While some studies report positive outcomes in student learning, particularly in affective or psychological states and language acquisition (Hung et al., 2018), others emphasize the need for further research to investigate the design and implementation of learning games for math education in K-12 settings (Pan et al., 2022).

Interactive supplementary materials in-game applications can effectively address challenges in student engagement and learning outcomes by leveraging the benefits of gamification while mitigating its potential drawbacks. These materials can enhance students' motivation and engagement by creating a more interactive and enjoyable learning environment (Wulan et al. 2024). By incorporating game-design elements such as experience points, levels, badges, challenges, and leaderboards, courses can significantly improve students' attention to reference materials, online participation, and proactivity (Barata et al., 2013). The use of virtual reality technology in educational games can further improve learners' sense of presence and interaction, stimulate their interest, and enhance their engagement (Gao et al., 2018). However, it is important to note that gamification is not universally effective. Some studies have found that average student engagement levels can be lower during simulation game classes than during traditional case study classes (Rogmans & Abaza, 2019). Similarly, Chao and Chang (2018) describe a study that applied the Augmented Reality (AR) technique to develop a math learning app for schoolchildren. The results indicated that the students found the AR Math learning app acceptable and increased their interest in learning. The study showed a significant improvement in learning effects after using the app (Chao & Chang, 2018). In addition, Outhwaite et al. (2019) reported a randomized control trial of interactive math apps for the early years of education. The study found that using math apps led to significantly greater math learning gains than standard math practice. Interactive apps, which combined aspects of direct instruction with play, were effective in raising achievement in early math (Outhwaite et al., 2019). These studies suggest that interactive and game-based approaches to mathematics teaching can be acceptable and effective for students.

This study addresses the need for effective supplementary materials for teaching Linear Equations in Math 7, focusing on the development and evaluation of an interactive game application. It aims to assess the acceptability of this proposed Interactive Supplementary Material among educators in the City School Division of Manila. This research examines various aspects of the material, including its features, objectives, content, language, presentation, usefulness, activities, clarity, navigation, and evaluation methods. Additionally, the study examines whether demographic factors, such as age, length of service, educational attainment, and teaching position, influence respondents' assessments of the material. The findings will inform potential modifications to enhance the effectiveness of the proposed supplementary material in teaching Linear Equations to Grade 7 students.

2.0 Methodology

2.1 Research Design

This study employed a quantitative research method, utilizing statistical tools to analyze the numerical data collected from participants. This approach is efficient for data collection and analysis, enabling researchers to process large datasets quickly and accurately (Bryman, 2021). The structured data analysis method aligns well with the research objective. Statistical software, such as SPSS, facilitates the application of advanced statistical techniques, including descriptive and inferential statistics, as well as data visualization, thereby enhancing the rigor and reliability of the study. This method enables the generalization of findings beyond a specific sample, allowing conclusions to be applied to broader populations or educational contexts (Cohen et al., 2011). Thus, the quantitative approach provides a systematic and rigorous means of investigating educational phenomena and generating relevant insights.

2.2 Research Participants

This study was conducted within the fourth district of Manila City, focusing on Grade 7 mathematics teachers, Master Teachers, and Department Heads of Mathematics as the target population. Non-probability sampling, specifically purposive sampling, was employed to collect the data. Purposive sampling, as defined by Campbell et al. (2020), involves the deliberate selection of respondents based on particular demographics or characteristics of interest. This approach allowed the researcher to strategically choose participants who possessed valuable insights and experience relevant to the study's objectives. The respondents in the study consisted of seventeen Mathematics teachers, eight Master Teachers, and five Department Heads in mathematics from the Fourth District of the Manila Division office.

2.3 Research Instrument

This study's research tool was modeled after several previous studies, with some criteria and indicators developed by the researcher. The instrument's reliability was assessed using Cronbach's alpha, yielding a score of 0.930, based on 40 items and 17 responses from mathematics teachers. The instrument is divided into two main sections. The initial section focused on the respondents' profiles, detailing their personal and professional backgrounds. The second section comprised 45 statements, with five statements assessing each of the nine variables identified for the study: objective, content, language and style, presentation, usefulness, activities, clarity, navigation and animation, and evaluation. The respondents rated each statement using a Likert scale.

2.4 Data Gathering Procedures

The following data collection procedure was performed in this study: (a) Permission to conduct the study was obtained from the Manila Division Office of District IV Schools, (b) Wrote a letter of permission to the head of the school's Math Department, (c) A research instrument was formulated and validated, (d) The research instrument was administered to the respondents in this study, (e) Raw quantitative data were retrieved, collated, and analyzed using SPSS software, (f) Summarize and formulate conclusions based on statistical results and recommendations for further studies.

2.5 Ethical Considerations

Prior to participation, informed consent was obtained from all respondents, including the educators and students. Participants were thoroughly informed about the purpose, scope, and objectives of the study. They were provided with detailed information about their participation, including the nature of the data to be collected, the methods of data collection, and how their data would be used. The consent forms were designed to be clear and comprehensible, ensuring that participants understood their rights, including the right to withdraw from the study at any point without any negative consequences.

3.0 Results and Discussion

3.1 Profile of the Participants

Table 1 presents the distribution of respondents by age, including the age distribution of the respondents and the frequency and percentage for each age group. Among the 30 respondents, the largest group was aged 26–30 years, with 11 individuals (36.70%). The 31–35 year group had six respondents (20.00%), similar to the 21–25 year group. The 41–45 years group included four respondents (13.30%), and the smallest group, 36–40 years, had three respondents (10.00%). This distribution highlights the age diversity of the respondents, with the majority aged 26–30 years offering valuable demographic insights into their perspectives on technology-based applications for teaching mathematics. Additionally, it displays the respondents' years of service, along with the frequencies and percentages for each range. Among the 30 respondents, 20 (66.70%) had 1 to 5 years of service, seven (23.30%) had 6 to 10 years, and three (10.00%) had 11 to 15 years. This distribution reveals that most respondents had fewer years of service, predominantly within the five-year range, offering insights into their experience levels in assessing technology-based applications in teaching mathematics.

Further, it shows the distribution of respondents according to their educational attainment; among the 30 respondents, the majority (63.30%) held a bachelor's degree. Eight respondents (26.70%) completed master's degrees, while the smallest group, three (10.00%), had a master's degree. This distribution highlights that most respondents had a Baccalaureate Degree, few had completed master's units, and the fewest possessed a master's degree. These data offer insights into the respondents' educational backgrounds, which are crucial for evaluating their qualifications and expertise in assessing technology-based applications in teaching mathematics. Finally, Table 1 shows the distribution of respondents according to their positions, including the frequency and percentage. Among the 30 respondents, the largest group comprises Math 7 Teachers (17 individuals, 56.70%). Eight respondents (26.70%) were masters teachers. The smallest group consisted of Mathematics Head Teachers with five individuals (16.60%). This distribution reveals that most respondents are math seven teachers, followed by a smaller percentage of Master Teachers, and an even smaller percentage of Math Head Teachers. These data provided insights into their qualifications and expertise in assessing technology-based applications in mathematics teaching.

Table 1. *Profile of the participants*

Age	Frequency	Percentage
41 – 45	4	13.30
36 – 40	3	10.00
31 – 35	6	20.00
26 – 30	11	36.70
21 – 25	6	20.00
Years in Service		
11 – 15	3	10.00
6 – 10	7	23.30
1 – 5	20	66.70
Educational Attainment		
With master's degree	3	10.00
With a master's unit	8	26.70
Baccalaureate Degree	19	63.30
Position		
Math 7 Teachers	17	56.70
Master Teacher	8	26.70
Head Teacher Math	5	16.60

3.2 Level of Acceptability of the Proposed Interactive Supplementary Material

The following tables summarize the assessment of the respondents (math teachers, master teachers, and Department Heads) using the nine sub-criteria.

Objectives

Table 2 demonstrates that the Teaching Mathematics 7 instructional materials, when supplemented interactively, are highly acceptable. The objectives were clearly stated, SMART, and aligned with the learning competencies, resulting in a weighted mean score of 4.6 or higher, indicating high acceptability. This clarity and alignment likely enhance instructional effectiveness by providing clear guidance for teachers and students. With an overall weighted mean of 4.71, the assessment underscores the importance of well-defined objectives in technology-based education, emphasizing their role in effective teaching and learning practices. Clearly stated objectives in the instructional content ensure that learners focus on their goals throughout the educational process. This evaluation indicates that the instructional materials were effectively integrated to guide students' learning experiences through well-defined objectives.

Table 2. *Level of acceptability of the proposed interactive supplementary material in terms of objectives*

Indicator	Mean	Interpretation
1. Objectives are clearly stated in the instructional material	4.77	Highly Acceptable
2. Objectives are SMART (Specific, Measurable, Attainable, Realistic and Time-bound)	4.70	Highly Acceptable
3. Objectives are aligned with the learning competencies	4.67	Highly Acceptable
4. Objectives instruct and translate learning competencies	4.77	Highly Acceptable
5. Objectives are indicated in the content area of instructions.	4.67	Highly Acceptable
Overall Result	**4.71**	**Highly Acceptable**

In a study conducted by Anselmo (2024), the level of acceptability of a module was evaluated based on various criteria, including clarity of objectives, content relevance, and instructional design. The findings indicated that clearly defined and well-structured objectives significantly contributed to the overall acceptability and effectiveness of the educational material among students and educators.

Content

Table 3 lists the acceptability levels of the content. The relevance of the content received a high weighted mean score of 4.73, indicating strong alignment with the intended learning outcomes. This relevance enhances instructional effectiveness by closely matching students' educational goals. The clarity of the content presentation was rated at 4.80, reflecting a highly acceptable level that likely aids student comprehension and understanding. The content's alignment with students' interests was 4.73, which boosted their engagement and motivation. Additionally, the practical relevance of the content, with a score of 4.80, ensured that the students saw real-world applications of the concepts. Overall, a general weighted mean of 4.68 underscores the importance of instructional content being relevant, clear, engaging, and providing opportunities for skill development. These findings underscore the significance of well-designed instructional materials for effective Mathematics 7 teaching and learning experiences.

Table 3. *Level of acceptability of the proposed interactive supplementary material in terms of content*

Indicator	Mean	Interpretation
1. Contents are relevant to the objectives	4.73	Highly Acceptable
2. Contents are clearly presented	4.80	Highly Acceptable
3. Contents are in the level of interest of the students	4.73	Highly Acceptable
4. Contents provide relevance to the topic	4.80	Highly Acceptable
5. Contents provide sufficient activities to enhance the skills of the students	4.33	Acceptable
Overall Result	**4.68**	**Highly Acceptable**

Duncan's (2018) study on game-based learning in mathematics emphasized the importance of content relevance, clarity, and alignment with students' interests in fostering meaningful learning. Duncan also emphasized the importance of providing sufficient activities to enhance students' skills, aligning with Indicator 5 in Table 6. The acceptable rating for this indicator suggests that while the content generally meets expectations, there is potential for improvement in offering a broader range of activities to enhance student learning outcomes.

Language and Style

Table 4 The level of acceptability of language and styles evaluates the respondents' views on the language and style of interactive supplementary materials in Teaching Mathematics 7. The terms of the instructional materials generally matched the learners' comprehension level, with a weighted mean of 4.40, which was deemed acceptable. Nonetheless, improvements can further enhance term comprehension. Conversely, the terms effectively communicated the topic content, earning a highly acceptable score of 4.53, which indicates that the language conveyed key concepts effectively, despite some complexity. The clarity of basic concepts and principles also scored 4.40, an acceptable level, suggesting effective communication of some fundamentals but room for further clarification. The simplicity and clarity of the terms scored a highly acceptable value of 4.63, indicating that the language was accessible to the learners. However, the structure and style received a moderately acceptable score of 3.41, indicating a need for design improvements to enhance clarity and effectiveness. Overall, the general weighted mean for language and style is 4.27, reflecting an acceptable level of effectiveness. While strengths include term clarity, refining structure, and style can enhance understanding and engagement.

Table 4. *Level of acceptability of the proposed interactive supplementary material in terms of language and style*

Indicator	Mean	Interpretation
1. Terms used suits the learner's level of comprehension	4.40	Acceptable
2. Terms used conveys the message of the topic/subject contents	4.53	Highly Acceptable
3. Provides clear understanding of basic concepts and principles	4.40	Acceptable
4. Terms used are simple and clear	4.63	Highly Acceptable
5. The structure and styles used are appropriately designed	3.41	Moderately Acceptable
Overall Result	**4.27**	**Acceptable**

These results mirror those of Smith et al. (2018), who emphasized the importance of using terms that match learners' comprehension levels. They argued that materials tailored to learners' cognitive abilities enhance their understanding and engagement. This aligns with the finding that instructional materials should be tailored to learners' comprehension levels. Johnson and Williams (2019) stress the importance of clear communication in educational materials, suggesting that clarity enhances learning outcomes. This supports the finding that the terms used effectively conveyed key messages to the subject. Brown and Jones (2020) emphasize the importance of providing clear explanations of fundamental concepts and principles, arguing that ambiguity hinders learning progress. This finding corresponds with the finding that instructional materials clearly explain fundamental concepts and principles.

Presentation

Table 5: Level of acceptability in terms of presentation shows that the topics were presented in a logical sequence, achieving a high weighted mean score of 4.60, indicating well-structured material that facilitates effective learning. The instructional materials included technology-based activities with a weighted mean score of 4.67, suggesting that these activities are engaging and relevant. The Font in the application scored 4.18, which is acceptable but potentially improvable for better visibility. The application stimulated creativity, earning a high score of 4.60, and lesson clarity received a score of 4.63, indicating effective communication of key concepts. The assessment of the

presentations yielded a general weighted mean of 4.54, indicating that the respondents well received the Interactive Supplementary Material for Teaching Mathematics 7. Strengths include logical sequencing, integration of activities with technology, and the clarity of lesson delivery. However, improvements in font visibility are required to enhance the overall presentation effectiveness.

Table 5. *Level of acceptability of the proposed interactive supplementary material in terms of presentation*

Indicator	Mean	Interpretation
1. Topics are presented in logical and orderly sequences	4.60	Highly Acceptable
2. Presents activities that seek to relate the use of the technology-based application	4.67	Highly Acceptable
3. The fonts used in technology-based applications are big enough to be seen by the students	4.18	Acceptable
4. The technology-based application presented effectively stimulates students' creativity	4.60	Highly Acceptable
5. The lesson presented clearly	4.63	Highly Acceptable
Overall Result	**4.54**	**Highly Acceptable**

Usefulness

Table 6 assesses respondents' views on the usefulness of interactive supplementary materials in Teaching Mathematics 7. The technology-based application was rated highly relevant to learners' needs, with a weighted mean score of 4.83, indicating high acceptability. This suggests that it effectively addresses the specific learning requirements and challenges. The application also enhanced students' mathematical skills with a weighted mean score of 4.53, indicating its effectiveness through interactive exercises, visualizations, and other engaging features. Furthermore, it significantly increased the students' motivation to learn, achieving a weighted mean score of 4.90, which was classified as highly acceptable. This indicates that the technology-based approach fosters enthusiasm and engagement, thereby making learning more enjoyable. Additionally, the application served as a supplementary strategy for linear equations and Inequalities, earning a highly acceptable weighted mean score of 4.80, thereby effectively complementing traditional teaching methods. The overall weighted mean for the usefulness assessment was 4.50, indicating a highly acceptable level of effectiveness. This evaluation underscores the significant benefits of integrating technology into mathematics education, including improved relevance to learners' needs, enhanced skills, increased motivation, and adequate supplementation of traditional methods.

Table 6. *Level of acceptability of the proposed interactive supplementary material in terms of usefulness*

Indicator	Mean	Interpretation
1. The technology-based application is relevant to the needs of the learner	4.83	Highly Acceptable
2. It enhances their mathematical skills	4.53	Highly Acceptable
3. It increases the motivation of the students to learn	4.90	Highly Acceptable
4. It serves as a supplement strategy in Linear Equations and Inequalities	4.80	Highly Acceptable
5. It motivates the students to be a critical thinker and a problem solver	3.45	Moderately Acceptable
Overall Result	**4.50**	**Highly Acceptable**

Smith and Johnson (2018) provided compelling evidence supporting the notion that well-structured instructional material, integrated activities, and straightforward presentation techniques are essential elements of effective teaching and learning practices. Their insights offer valuable guidance for educators and instructional designers seeking to optimize learning outcomes in technology-based educational contexts.

Activities

Table 7 shows the level of acceptability in terms of Activities; the Interactive Supplementary Material is highly relevant to learners' needs, with a weighted mean score of 4.80, classified as highly acceptable. This indicates that the application's activities were well-designed to meet specific student learning requirements and enhance their educational experience. The application also significantly boosted the students' motivation to learn, achieving a weighted mean score of 4.87. This suggests that the activities effectively engage and inspire students. Additionally, as a supplementary strategy for teaching linear equations and Inequalities, the application received a highly acceptable score of 4.67, indicating that it complements traditional teaching methods. It also promotes critical thinking and problem-solving, with a highly acceptable score of 4.87, encouraging students to think analytically and creatively. The overall weighted mean score for the activities was 4.66, indicating a high level of effectiveness. This evaluation highlights the material's benefits, including relevance to learners' needs, enhancement of mathematical skills, motivation, and promotion of critical thinking. These findings align with Brown and Jones's (2020) research, which emphasizes the importance of technology in meeting individual learning needs, boosting motivation, and developing critical thinking, thereby promoting better learning outcomes.

Table 7. *Level of acceptability of the proposed interactive supplementary material in terms of activities*

Indicator	Mean	Interpretation
1. The technology-based application is relevant to the needs of the learner	4.80	Highly Acceptable
2. It enhances their mathematical skills	4.11	Acceptable
3. It increases the motivation of the students to learn	4.87	Highly Acceptable
4. It serves as a supplement strategy in Linear Equations and Inequalities	4.67	Highly Acceptable
5. It motivates the students to be a critical thinker and a problem solver	4.87	Highly Acceptable
Overall Result	**4.66**	**Highly Acceptable**

Clarity

Table 8 presents the level of acceptability in terms of clarity, where the application effectively identified instructional focus standards within a unit of study (weighted mean score: 4.50) and articulated the importance of learning intentions for both students and teachers (weighted mean score: 4.57). It details what students will do to achieve their learning intentions (weighted mean score: 4.53) and breaks down learning intentions into progressions (weighted mean score: 4.70). The overall weighted mean for clarity assessment was 4.32, indicating a high acceptability of offering clear instructional guidance, articulating learning objectives, and supporting students' understanding of their learning progression. These findings align with those of Smith and Johnson (2019), emphasizing the importance of clarity in instructional materials for enhancing student understanding, engagement, and learning outcomes.

Table 8. *Level of acceptability of the proposed interactive supplementary material in terms of clarity*

Indicator	Mean	Interpretation
1. Identify one standard that serves as the instructional focus within a unit of study.	4.50	Highly Acceptable
2. Restate the standard in student-friendly language without compromising rigor. This is called the learning intention-the "what" that students are learning.	3.28	Moderately Acceptable
3. Decide why the learning intention is important for students and teachers.	4.57	Highly Acceptable
4. Write the details of what students will do to achieve the learning intention. These are the success criteria-the "how".	4.53	Highly Acceptable
5. Break the learning intention into learning progressions-the skills and concepts that lead to the learning intentions.	4.70	Highly Acceptable
Overall Result	**4.32**	**Highly Acceptable**

Navigation and Animation

Table 9 presents the level of acceptability of navigation and animation, assessing respondents' perceptions of the navigation and animation in Interactive Supplementary Material for Teaching Mathematics 7. The functionality of click buttons was high (weighted mean = 4.87), indicating well-designed and responsive interactive elements. The game's reward system received moderate acceptability (weighted mean = 3.43), suggesting room for improvement. The login and registration buttons were highly acceptable (weighted mean = 4.80), indicating user-friendliness. The graphic design was also highly acceptable (weighted mean = 4.73), thereby enhancing the user experience. The overall weighted mean for navigation and animation assessments was 4.53, indicating high effectiveness. These findings align with Duncan's (2018) emphasis on the importance of effective navigation and animation in educational games for enhancing user engagement and learning outcomes.

Table 9. *Level of acceptability of the proposed interactive supplementary material in terms of navigation and animation*

Indicator	Mean	Interpretation
1. The click buttons work accordingly.	4.87	Highly Acceptable
2. A reward system appropriate for the given games.	3.43	Moderately Acceptable
3. The login button offers a convenient way for players to access the game.	4.80	Highly Acceptable
4. The game offers an easy login and registration system.	4.80	Highly Acceptable
5. Graphic design is appropriate to the game theme.	4.73	Highly Acceptable
Overall Result	**4.53**	**Highly Acceptable**

Evaluation

Table 10 presents the acceptability level in terms of the evaluation. The respondents rated the adequacy of the items for different learning objectives, with a weighted mean score of 4.70, indicating high acceptability. This suggests that the assessment items within the application sufficiently addressed the various learning objectives and comprehensively covered the curriculum. Assessments for each lesson were deemed adequate to determine topic mastery, with a highly acceptable weighted mean score of 4.57. This indicates that the assessment activities effectively gauge students' comprehension and proficiency in each lesson, thus providing valuable insight into their mastery. Additionally, the assessments comprehensively covered the content, earning a highly acceptable weighted mean score of 4.70, ensuring alignment with the learning objectives and curriculum standards. The general weighted mean for the evaluation assessment is 4.56, indicating a highly acceptable level of effectiveness. This underscores the application's success in providing adequate assessment items, assessing students' learning pace, and determining topic mastery while comprehensively covering the content. The findings in Table 10 are corroborated by Johnson and Williams (2019), who emphasize the importance of well-designed assessments in educational materials. They asserted that assessments should align with learning objectives, adequately cover content, and offer opportunities for skill development, contributing to the effectiveness of the evaluation process in gauging student progress and mastery.

Table 10. *Level of acceptability of the proposed interactive supplementary material in terms of evaluation*

Indicator	Mean	Interpretation
1. The number of items is enough for different learning objectives	4.70	Highly Acceptable
2. Ensures the development of the skills of the students in Linear Equations and Inequalities	4.40	Acceptable
3. Assessments are designed to evaluate the pace of the learner	4.43	Acceptable
4. Assessment for every lesson is adequate in determining the mastery of the topic	4.57	Highly Acceptable
5. Assessment covers the content of the topic.	4.70	Highly Acceptable
Overall Result	**4.56**	**Highly Acceptable**

Summary

Table 11 presents the summary assessment evaluations from math teachers, master teachers, and Department Heads, indicating that the Interactive Supplementary Material achieved a general weighted mean score of 4.53, which is deemed "Highly Acceptable." Overall, the Interactive Supplementary Material for Teaching Mathematics (7) received high ratings across all indicators, supporting its potential to enhance mathematics instruction. Arli and Zulyusri (2020) supported these findings. They investigated the development and validation of an interactive flash-based multimedia game for middle school students, utilizing the "guess the picture" format. Using the Plomp development model, they assessed the game construction, content, graphics, and language. Their study concluded that multimedia games met valid criteria and could enhance student learning in terms of knowledge, behavior, and skills. Sabirova et al. (2019) evaluated the interactive educational platform UCHI.ru for teaching mathematics. The methods included testing, observation, and analysis to assess the platform's impact on the student's mathematical skill development, motivation, and knowledge gaps.

Table 11. *Level of acceptability of the proposed interactive supplementary material*

Indicator	Mean	Interpretation
Objectives	4.71	Highly Acceptable
Content	4.68	Highly Acceptable
Language and Style	4.27	Acceptable
Presentation	4.54	Highly Acceptable
Usefulness	4.50	Highly Acceptable
Activities	4.66	Highly Acceptable
Clarity	4.32	Acceptable
Navigation and Animation	4.53	Highly Acceptable
Evaluation	4.56	Highly Acceptable
Overall Result	**4.53**	**Highly Acceptable**

3.3 Difference in the Assessments of the Respondents when Grouped According to their Demographic Profile

Table 12 reveals significant differences in objectives, content, clarity, and evaluation between respondents aged 21-25 and 26-30, as shown by the rejection of the null hypothesis (HO) and post-hoc analysis. This indicates notable variations in the perception of the effectiveness of interactive supplementary materials among these age groups. Additionally, significant differences in language and style were found between respondents aged 26-30 and 36-40, suggesting differing perceptions among these groups. In contrast, no significant differences were observed in presentation, usefulness, activities, navigation, or animation across age groups, as the null hypothesis was not rejected, indicating that age did not affect the respondents' assessments of these variables. These findings emphasize the need to consider age-related differences when evaluating Interactive Supplementary Materials in mathematics teaching. While perceptions of objectives, content, clarity, and evaluation vary with age, other aspects do not. These results align with those of Smith et al. (2018), who found distinct preferences among younger and older learners regarding objectives, content, clarity, and evaluation, supporting the observed significant differences between respondents aged 21-25 and 26-30. The lack of significant differences in presentation, usefulness, activities, navigation, and animation aligns with the notion that certain aspects are not affected by age. This study highlights the importance of accounting for age-related differences in the development and evaluation of interactive supplementary material to address diverse user needs.

Table 12. *Difference in the assessments of the respondents when grouped according to their age*

Variables	Test Statistic F	p −value	Decision	Interpretation
Objectives	2.79	0.048	Reject H_O	Significant
Content	3.09	0.034	Reject H_O	Significant
Language and Style	12.6	0.000	Reject H_O	Significant
Presentation	2.05	0.117	Fail to Reject H_O	No Significant
Usefulness	2.54	0.065	Fail to Reject H_O	No Significant
Activities	2.35	0.081	Fail to Reject H_O	No Significant
Clarity	11.7	0.000	Reject H_O	Significant
Navigation and Animation	0.76	0.561	Fail to Reject H_O	No Significant
Evaluation	20.4	0.000	Reject H_O	Significant

If p value < 0.05, Reject H_O

Table 13 reveals significant differences in assessments of language and style, presentation, usefulness, activities, and clarity between respondents with 1-5 years of service and those with 16-20 years for Interactive Supplementary Material in Teaching Mathematics 7, as evidenced by the rejection of the null hypothesis and post-hoc analysis. However, no significant differences were found for objectives, content, navigation, animation, or evaluation, suggesting that service length did not significantly influence perceptions of these variables. These findings underscore the importance of considering service length when assessing the effectiveness of Interactive Supplementary Materials in mathematics education and developing targeted professional development strategies. These results align with previous research by Johnson and Williams (2019), who noted that educators with different service lengths may perceive educational materials differently, emphasizing the need to consider educators' service length when evaluating and designing instructional materials to meet diverse needs and preferences effectively.

Table 13. *Difference in the assessments of the respondents when grouped according to their length of service*

Variables	Test Statistic F	p −value	Decision	Interpretation
Objectives	0.241	0.867	Fail to Reject H_O	Significant
Content	1.183	0.335	Fail to Reject H_O	Significant
Language and Style	3.271	0.037	Reject H_O	Significant
Presentation	8.395	0.000	Reject H_O	No Significant
Usefulness	8.991	0.000	Reject H_O	No Significant
Activities	4.715	0.009	Reject H_O	No Significant
Clarity	1.252	0.311	Fail to Reject H_O	Significant
Navigation and Animation	2.138	0.120	Fail to Reject H_O	No Significant
Evaluation	1.511	0.235	Fail to Reject H_O	Significant

If p-value < 0.05, Reject H_O

Table 14 shows the test of differences in the assessment in terms of the highest educational attainment. The analysis revealed no significant differences in indicators, including objectives, content, language, style, presentation, activities, clarity, navigation, animation, and evaluation, based on the respondents' highest educational attainment. The null hypothesis is not rejected, implying that educational attainment does not significantly influence the assessment of these variables. However, significant differences in usefulness were found between respondents with a bachelor's degree and those with a master's degree, as indicated by the post-hoc analyses. This suggests that educational attainment may affect perceptions of the usefulness of interactive supplementary material. Although it does not significantly impact views on most aspects of the Interactive Supplementary Material, it may influence opinions on its usefulness. These insights are crucial for understanding educators' perspectives and for tailoring their support and training accordingly.

These findings are consistent with those of Smith et al. (2018), who examined the impact of educational attainment on the assessment of instructional materials. They noted that educators with varying levels of educational attainment might view the usefulness of educational materials differently. This finding supports the current study's observation of significant differences in the perceptions of usefulness between educators with bachelor's and master's degrees. The absence of significant differences in other variables, such as objectives, content, language, style, presentation, activities, clarity, navigation, animation, and evaluation, across educational attainment levels also aligns with the findings of Smith et al. Hence, this study highlights the importance of considering educators' highest level of educational attainment when evaluating and designing instructional materials to effectively meet their diverse needs and preferences.

Table 14. *Difference in the assessments of the respondents when grouped according to their educational attainment*

Variables	Test Statistic F	p −value	Decision	Interpretation
Objectives	0.494	0.616	Fail to Reject H_O	No Significant
Content	2.125	0.139	Fail to Reject H_O	No Significant
Language and Style	1.577	0.225	Fail to Reject H_O	No Significant
Presentation	1.451	0.252	Fail to Reject H_O	No Significant
Usefulness	8.164	0.002	Reject H_O	Significant
Activities	0.730	0.491	Fail to Reject H_O	No Significant
Clarity	0.107	0.899	Fail to Reject H_O	No Significant
Navigation and Animation	0.248	0.782	Fail to Reject H_O	No Significant
Evaluation	2.447	0.106	Fail to Reject H_O	No Significant

If p-value < 0.05, Reject H_O

Table 15 shows a test of the differences in the assessment in terms of position. The study revealed no notable disparities among respondents in various positions concerning objectives, language and style, usefulness, clarity, navigation, or animation, thus upholding the null hypothesis. However, substantial differences in content, presentation, activities, and evaluation led to the rejection of the null hypothesis for these variables. Further analysis uncovered distinctions specifically between Teacher I and Master Teacher I, as well as between Teacher II and Master Teacher I, suggesting varied perceptions of interactive supplementary materials based on position and a need for customized materials.

Table 15. *Difference in the assessments of the respondents when grouped according to their position*

Variables	Test Statistic F	p −value	Decision	Interpretation
Objectives	2.148	0.635	Fail to Reject H_O	No Significant
Content	12.654	0.023	Reject H_O	Significant
Language and Style	1.657	0.149	Fail to Reject H_O	No Significant
Presentation	18.496	0.042	Reject H_O	Significant
Usefulness	3.654	0.589	Fail to Reject H_O	No Significant
Activities	22.648	0.014	Reject H_O	Significant
Clarity	8.658	0.741	Fail to Reject H_O	No Significant
Navigation and Animation	5.649	0.481	Fail to Reject H_O	No Significant
Evaluation	13.164	0.027	Reject H_O	Significant

If p-value < 0.05, Reject H_O

In a related study, Biber et al. (2022) examined the effectiveness of technology-enhanced interactive activities in mathematics education and the attitudes of educators toward them. They created 50 interactive exercises focusing on exponential and square root numbers and conducted a case study involving 25 teachers. The research found that educators generally favored interactive activities and technology integration despite encountering implementation challenges. This study recommends further improvements to technology use in mathematics instruction. Copia and Cuizon (2022) examined mobile game engagement in 100 participants. Their findings indicated that younger individuals and those with higher educational levels demonstrated significantly greater engagement levels. Bien (2023) assessed a research-designed mobile game application for ninth-grade Biology students. The study found that both experts and teachers concurred with its efficacy in enhancing learning and potential as an assessment instrument. Lopez (2022) assessed a numeracy mobile game designed to enhance junior high school student's performance in integer operations. Both teachers and experts gave positive ratings for the game, with no significant differences in their evaluations of the game mechanics, design, narratives, incentives, music, and content.

4.0 Conclusion

This study investigated the acceptability of "Math Deal or No Deal," an interactive supplementary material for teaching linear equations to Grade 7 students in Manila. This research aimed to address gaps in understanding the effectiveness of game-based learning tools in mathematics education. Using a quantitative methodology, the study surveyed mathematics teachers, master's teachers, and department heads. The results indicated high overall acceptability of the application across multiple criteria, including objectives, content, activities, and evaluation. The game-based approach was found to be engaging and effective in enhancing students' mathematical skills and motivation. Significant differences in assessment were observed based on respondents' age and years of service, while educational attainment and position had a limited impact. This study highlighted the potential of game-inspired learning tools to complement traditional teaching methods and engage 21st-century learners. However, perceptions varied based on educators' demographics and experience levels, emphasizing the importance of considering diverse perspectives in educational technology development. The application's offline accessibility, broad compatibility, and user-friendly interface were strengths, whereas font visibility and the game reward system were identified as areas for improvement. The study concludes that while interactive materials, such as "Math Deal or No Deal," are broadly effective for teaching linear equations, their implementation should consider the diverse needs and perspectives of educators. Further research is recommended on the long-term impact of such tools on student performance, as well as ways to customize applications for different user groups.

Schools and software developers should consider incorporating interactive learning tools, such as "Math Deal or No Deal," to enhance traditional teaching approaches for Grade 7 linear equations. However, the implementation should be flexible enough to address various educational perspectives and requirements. Future versions of the app should address identified areas for improvement, such as enhancing font legibility and refining the reward mechanism. Moreover, it is suggested that we investigate the long-term impact of these interactive tools on students' academic performance and explore methods to tailor applications for different user groups. Teachers should receive proper training and assistance to effectively integrate these tools into their curriculum, considering factors such as age and experience, which may affect their attitudes towards and use of educational technologies.

5.0 Contributions of Authors

In this study, the author conceptualized and designed the research, including formulating the research questions and hypotheses, contributing significantly to data collection and analysis, and ensuring the accuracy and consistency of the data gathered. played a key role in reviewing the literature and drafting the introduction, providing insights into relevant theories and prior research findings, instrumental in interpreting the results, assisting with statistical analyses, bringing clarity to the findings, focusing on the discussion and implications, linking the findings to practical applications, and suggesting avenues for future research. All authors contributed to the final manuscript by reviewing and refining it for coherence, accuracy, and clarity, and approved the final version for submission. They also oversaw the entire project.

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7.0 Conflict of Interests

No Conflict of Interest

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