

Acceptability of the Game SpinGebra for Mastering Fundamental Operations on Algebraic Expressions in One Variable

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ABSTRACT

The main thrust of this study was to determine the acceptability level of the game SpinGebra as a drill in mastering the fundamental operations on monomial algebraic expressions in one variable of the Grade 8 students of Dr. Cecilio Putong National High School for the School Year 2023 – 2024. This study used a one-shot case study pre-experimental design. The questionnaire had undergone pilot testing and item analysis. The gathered data were analyzed and interpreted using the weighted mean formula and Kruskal Wallis test. The result of the study implies that the SpinGebra game is highly acceptable by the students in mastering fundamental operations on monomial algebraic expressions in one variable. It was found that the game has a lower acceptability level in procedures than Learning areas considering that it was a newly introduced game to the players. The researchers concluded that SpinGebra is a highly acceptable game for students to master the concept of the fundamental operations of monomial algebraic expression. Being newly exposed to the game is an opportunity to familiarize the procedures to master the concepts behind the game. Based on the conclusion of the study, the researchers recommend that students may be exposed to playing SpinGebra in any of their vacant time to fully familiarize the procedures of the game and at the same time master the fundamental operations of monomial algebraic expression. Also, teachers teaching operations in algebraic expressions may utilize this game after the discussion to further enhance mastery of the lessons.

Keywords: SpinGebra, Monomial algebraic expression, One variable, Acceptability, Experimental

INTRODUCTION

The main thrust of this study was to determine the acceptability level of the game SpinGebra as a drill in mastering the fundamental operations on monomial algebraic expressions in one variable of the Grade 8 students of one of the National High School in Tagbilaran City for the School Year 2023 – 2024. This study used a one-shot case study pre-experimental design. The questionnaire had undergone pilot testing and item analysis with reliability level above .80. The gathered data were analyzed and interpreted using the weighted mean formula and Kruskal Wallis test.

The result of the study implies that Mathematics encompasses numbers, letters, and equations, ranging from simple to complex skills, challenging individuals' minds (Sapit, 2016). However, Gafoor, A. and Kurukkan N. (2015). found that among 51 students surveyed, 82% disliked mathematics, with 75% finding it difficult. Reasons included challenges in understanding the subject, inadequate instruction, and the need for more time to grasp concepts.

Also, Larino (2018) noted that teachers face a significant challenge in guiding students to understand and solve basic linear equations involving one variable. Students generally perceive algebra as challenging, encountering difficulties with algebraic expressions (Marpa, 2019). Despite this recognition, there is a lack of understanding regarding the specific nature of these challenges and their contributing factors. When teaching equations, it is essential to emphasize the idea of relationships between quantities rather than simply carrying out operations on terms.

Helping students see the meaning behind equations allows them to grasp how numbers and variables connect in problem situations. At the same time, teachers should cultivate a positive learning atmosphere that motivates participation, reduces anxiety, and strengthens students' belief in their ability to reason through algebraic problems (Hoon, et. al, 2024).

The use of rotary wheel in teaching can be concluded that the mathematical rotary wheel media for teaching flat shapes is valid and suitable for classroom use (Hidayata, R., & Ritonga, R., 2023). Although it is presented as a media tool, it also has the potential to function effectively as a hands-on learning aid through the use of physical spin wheels. This game can be a fun alternative to the traditional approach used by teachers typically in solving mathematics.

In addition, Machdarini, M., & Hidayat, L. (2024) explains that the spin wheel is a circular game tool equipped with a pointer and divided into several segments that can be customized based on the lesson content. It works by spinning the wheel around its axis until the pointer stops on a particular section. This interactive learning medium is designed to assist learners with intellectual disabilities in developing their understanding of basic arithmetic operations.

Since coordinate plane concepts are applied in the game, Anabousy, A., Daher, W., & Bassan-Cincinatus, R. (2023) identified a coordinate system as a fundamental mathematical concept often applied in geometry to specify the exact location of a point or object using numbers, directions, or angles. It helps identify positions in both two-dimensional (plane) and three-dimensional spaces. Mastery of this concept is essential for students to accurately interpret and represent geometric relationships.

Additionally, it is noted that coordinate systems serve as a method for specifying the position of points on the Earth. Dilao (2013) explains that most coordinate systems utilize two numbers, known as coordinates, to locate a point, where each number represents the distance between the point and a fixed reference point called the origin. Rene Descartes, a 17th-century French mathematician and philosopher, introduced the Cartesian coordinate system, dividing a plane into four quadrants using perpendicular horizontal and vertical lines.

Quadrants are labeled I to IV in a counterclockwise direction, starting from the upper right. The x-axis (horizontal) and y-axis (vertical) are the two number lines, and their intersection forms the origin (0). Quadrant I has positive values for both axes, while Quadrant II has a negative x-axis and a positive y-axis. Quadrant III has negative values for both axes and Quadrant IV has a positive x-axis and a negative y-axis. This system forms the coordinate plane.

Research of Jupri, A., & Drijvers, P. H. M. (2016) explained that students lack of ability in horizontal mathematization, and understanding problems and formulating mathematical models in

particular. These lessons are related to the concepts of cartesian plane. On the other hand, Sugiarti and Retnawati (2019) discovered that students struggle with solving algebraic problems involving concepts and principles. Challenges include difficulty in identifying variables and constants, applying division in algebra, understanding definitions of variables and constants, and applying principles like addition, reduction, multiplication, factoring, and solving algebraic word problems.

By gamification, Zambrano, C. B. (2025) highlighted that educational gamification combines elements of games with learning activities, encouraging students to learn through play. It serves as an effective tool to make classroom experiences more engaging, enabling active participation in interactive tasks that enhance the teaching and learning process. When applied properly, gamification becomes a powerful approach for boosting students' motivation and academic achievement.

The game SpinGebra was developed by the researchers based on the concept of monomial algebraic expressions in one variable. The name SpinGebra combines "spin" and "algebra," reflecting its purpose. The study aimed to master fundamental operations related to monomial algebraic expressions and observed the integration of the Cartesian coordinate system in assigning signs to terms based on quadrants. A game SpinGebra is created using Spin of wheels integrated in the lesson of Cartesian plane for signs of the algebraic expressions to be simplified.

In order for this game to determine its acceptability, the assessment tools are crafted based on the concepts of Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015) which highlights game mechanics that refer to the core activities or actions that players repeatedly engage in during gameplay. These actions can serve primarily educational purposes (learning mechanics) or be used to measure understanding and progress (assessment mechanics). Another, visual aesthetic design covers the overall appearance and atmosphere of the game, including visual elements, characters, and how important information is displayed. It also involves the game's narrative, which unfolds through features like cutscenes, in-game events, dialogues, and voice-overs.

Additionally, the content and skills component focus on the specific subject matter and competencies that the game aims to develop. Finally, with incentive system, players are often motivated through various incentives such as points, stars, badges, trophies, power-ups, or other types of rewards that reinforce learning engagement. These incentives serve to sustain engagement, encourage progress, and make the learning experience more enjoyable and goal-oriented. These rewards may be built directly into the gameplay, such as power-ups that grant players special abilities, or they may exist outside the main game mechanics, like stars or points that don't affect gameplay directly.

It is then the main thrust of this study to determine the acceptability level of the game SpinGebra as a drill in mastering the fundamental operations on monomial algebraic expressions in one variable of the Grade 8 students. The overall acceptability of the game was determined when all aspects were assessed to be statistically acceptable by comparing two aspects at a time.

METHODOLOGY

This study used a shot case study pre-experimental design in which after introducing the game to the students, the researchers asked the students to play the SpinGebra game based on the procedures, rules, and mechanics of the game. After playing, the students were asked about its acceptability using a 5-point Likert scale questionnaire having four important areas such as procedures, learning content, experience, and learning outcome. After being granted to pursue the study, the study was conducted at Dr. Cecilio Putong National High School in Tagbilaran City, the study involved ninety (90) Grade eight (8) students. Respondents were paired based on pretest results to ensure equal levels of mathematical skills. The researchers utilized **SpinGebra**, which proved effective in enhancing students' performance in solving algebraic expressions (Lorejo, R. M., Cosain, N. M., & Dahan, M. O., 2024).

RESULTS

After collecting, data banking, and analyzing the data on the acceptability of the SpinGebra game, it was presented and interpreted accordingly.

Table 1. Level of Acceptance of the Students Towards the SpinGebra Drill (N= 45)

Areas	Weighted Mean	Description
A Mechanics, Design, and Rules		
1. Clarity of the mechanics and rules as stated.	4.40	Highly Acceptable
2. Easiness of the mechanics and rules to follow.	4.04	Acceptable
3. Organization of the mechanics and rules.	4.24	Highly Acceptable
4. Presentation and attractiveness of the Design.	3.93	Acceptable
5. Easiness of the game to play.	4.36	Highly Acceptable
Average	4.20	Highly Acceptable
B Learning Content		
1. Easiness of the content.	4.58	Highly Acceptable
2. The content gives knowledge on fundamental operations on Monomial Algebraic Expressions.	4.42	Highly Acceptable
3. The game develops mastery on fundamental operations on Monomial Algebraic Expressions.	4.20	Highly Acceptable
4. The game is suitable for acquiring knowledge on fundamental operations on Monomial Algebraic Expressions.	4.38	Highly Acceptable
5. The game requires higher order thinking skills.	4.73	Highly Acceptable
Average	4.46	Highly Acceptable
C Experience from the Game		
1. The game is interesting, challenging and fun to play.	4.36	Highly Acceptable
2. The game enhances competence in mastering fundamental operations on Monomial Algebraic Expressions.	4.27	Acceptable
3. The game develops competence.	4.29	Acceptable
4. The game is helpful in enhancing the skill in mastering fundamental operations on Monomial Algebraic Expressions.	4.13	Acceptable
5. The game lessens boredom.	4.20	Highly Acceptable

Average		4.25	Highly Acceptable
D Learning Outcome			
1. It develops mastery on fundamental operations on Monomial Algebraic Expressions.		4.27	Highly Acceptable
2. It develops my potential in mastering fundamental operations on Monomial Algebraic Expressions.		4.36	Highly Acceptable
3. It helps me recall my past lesson about fundamental operations on Monomial Algebraic Expressions.		4.36	Highly Acceptable
4. It causes me to appreciate Mathematics.		3.91	Acceptable
5. It enhances my skills in mastering fundamental operations on Monomial Algebraic Expressions.		4.40	Highly Acceptable
Average		4.26	Highly Acceptable
Overall Average		4.29	Extremely Effective
Scale	Range	Description	Interpretation
5	4.20 – 5.00	Highly Acceptable	Extremely Effective
4	3.40 – 4.19	Acceptable	Highly Effective
3	2.60 – 3.39	Neutral	Moderately Effective
2	1.80 – 2.59	Less Acceptable	Slightly Effective
1	1.00 – 1.79	Not Acceptable	Least Effective

Table 1 shows the students' level of acceptance towards SpinGebra as a drill for mastering the fundamental operations of monomial algebraic expression in one variable. As shown, the overall composite mean is 4.29 described as "Highly Acceptable". The findings suggest that SpinGebra is highly acceptable to the students as they play the game.

The mechanics, designs, and rules are highly acceptable at a 4.20 weighted mean. This means that the game has clear, easy, and organized mechanics and rules to follow which are observed even the first time in playing. Its design is presented attractively. In terms of learning content, students considered the game as highly acceptable as indicated by the composite mean of 4.46. This shows that playing SpinGebra involves mental activities such as calculations and estimations yet easy for them to perform. Also, the game gives the knowledge and develops mastery of fundamental operations on Monomial Algebraic Expressions as it requires higher-order thinking skills.

When it comes to the experience of playing the game, students rated the game as highly acceptable (4.25) being interesting, challenging, and fun to play which lessens their boredom. The game enhances and develops competence in the skill of mastering fundamental operations on Monomial Algebraic Expressions. The learning outcome component of the game is highly acceptable based on the composite mean of 4.26 which shows that students recalled the past lesson which helps them develop and enhance their skills in performing fundamental operations on Monomial algebraic expressions.

The SpinGebra game aligns with the findings of Poncy and Duhon (2017) as it can enhance students' skills in identifying numbers and solving simple math problems. Also, the acceptability of the game aligns with **Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015)** that rewards may be built directly into the gameplay, such as power-ups that grant players special abilities, or they may exist outside the main game mechanics, like stars or points that don't affect gameplay directly.

Table 2. Difference of Acceptability Level of SpinGebra Games among Aspects

Group	N	Mean Rank	Chi-Square	df	Asymp. Sig.
1.00=Procedures	45	77.27	10.687	3	.014
2.00= Learning	45	111.08			
3.00=Design of the Game	45	85.00			
4.00=Experience of the Game	45	88.66			
Total	180				

To determine if the areas considered for acceptability of the game have the statistical same level as rated by the students, the Kruskal Wallis test was utilized since the parametric assumptions are not met. The result shows that there is a significant difference in any of the areas when compared to each other in terms of level of acceptability in the game ($\chi^2=10.687$, $df=2$, $p\text{-value}=0.14$). This means that any pairs may have statistically different acceptability level when compared two at a time thus a need to proceed to a post hoc test using pairwise comparison.

Table 3. Pairwise Analysis of Acceptability level of SpinGebra Game between Aspects

Sample1-Sample2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj.Sig.
1.000-3.000	-7.733	10.877	-.711	.477	1.000
1.000-4.000	-11.389	10.877	-1.047	.295	1.000
1.000-2.000	-33.811	10.877	-3.108	.002	.011
3.000-4.000	-3.656	10.877	-.336	.737	1.000
3.000-2.000	26.078	10.877	2.397	.017	.099
4.000-2.000	22.422	10.877	2.061	.039	.236

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

Legend: 1.00=Procedures; 2.00= Learning ; 3.00=Design of the Game ; 4.00=Experience of the Game

Table 3 shows a significant difference in the acceptability of the game between Procedures and Learning. This means that the acceptability level of 4.20 for Procedures is significantly lower than the acceptability level of Learning at 4.46. The game is new to the students yet the concepts in the game were taught in lower grades so the game is easier to be acceptable in terms of its learning than the procedures which need more practice and exposure to the game to eventually master the rules, procedures, and mechanics. All other areas when compared to each other yield no significant difference as indicated in their p-value that is more than 0.05 alpha level.

CONCLUSION

Based on the findings of the study, the researchers concluded that SpinGebra is a highly acceptable game for students to master the concept of the fundamental operations of monomial algebraic expression. Being newly exposed to the game is an opportunity to familiarize the procedures to master the concepts behind the game. This suggests that while students easily accepted the learning component—likely because the mathematical concepts were already familiar from earlier lessons—they found the procedural aspects more challenging, requiring additional practice and familiarity to master the game’s rules and mechanics.

RECOMMENDATIONS

Based on the conclusion of the study, the researchers recommend that students may be exposed to playing SpinGebra in any of their vacant time to fully familiarize the procedures of the game and at the same time master the fundamental operations of monomial algebraic expression. Also, teachers teaching operations in algebraic expressions may utilize this game after the discussion to further enhance mastery of the lessons.

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