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Salpakan: Game of Rationals

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***Abstract*—** This study aimed to evaluate the content acceptability of the developed educational board game "SALPAKAN: Game of Rationals" as perceived by Grade 7 students in terms of its effectiveness as a learning tool for understanding rational numbers.

A descriptive-evaluative research design was utilized in the study. Grade 7 students were selected as respondents and were asked to play the game during their mathematics class. Afterward, they evaluated it using a standardized checklist consisting of five criteria—appearance, excitement factor, portability, uniqueness, and effectiveness—rated on a five-point Likert scale. The data gathered were analyzed using the Weighted Arithmetic Mean.

The results revealed that "SALPAKAN: Game of Rationals" obtained an overall weighted mean of 4.47, interpreted as Highly Evident. Among the criteria, effectiveness (WM = 4.52) and excitement factor (WM = 4.58) received the highest ratings, indicating that the game effectively enhanced students' understanding of rational numbers while maintaining a high level of engagement and enjoyment. These findings suggest that the game is a highly acceptable and effective learning tool, making mathematics more interactive, meaningful, and enjoyable for students.

The study concludes that the integration of culturally inspired, strategic games in mathematics instruction can significantly promote students' conceptual understanding and engagement. It is recommended that similar game-based approaches be explored and developed for other mathematical topics to further strengthen learning outcomes.

***Keywords*—** Game-Based, Intervention, Rational Numbers, Math Games.

INTRODUCTION

Games encourages students to broaden their thinking ability, discover new ideas, making meaningful connections, and deepen their understanding on core concepts (Curriculum Associates, 2023). Game-based learning increases student's motivation and engagement, making lessons more enjoyable and effective (Safititri et al. 2022). It also helped student's feel more involved, improving their performance, confidence, and understanding (Putten et al., 2020).

It is widely accepted that using games to teach mathematics can increase students' interest and understanding of the subject. Hui and Mahmud (2023) found that game-based learning enhances math students' motivation, attitude, and conceptual understanding, positively affecting both the cognitive and affective domains. Through exercises involving number line estimation and value ordering, Kiili, Moeller, and Ninaus (2018) showed how rational number games can successfully foster students' conceptual understanding of rational numbers.

According to Van Putten, Blom, and Van Coller (2020), cooperative games in math classes help sixth-grade students with problem-solving, social interaction, and developmental learning. Furthermore, Mazalov (2014) talked about how mathematical game theory can be used in classrooms to encourage analytical reasoning and strategic thinking, two skills necessary for grasping mathematical ideas, concepts like rational numbers improved student enjoyment and cultural relevance.

Numerous studies conducted in the Philippines also back up the use of games in math classes. Junior high school students' use of digital math games was link investigated by Dela Cruz and Sarmiento (2020), who discovered that it improved motivation and performance. According to Reyes (2021), using cooperative board games to teach fractions improved students' understanding of intricate mathematical relationships. According to Bautista (2019), Filipino students' problem-solving and teamwork abilities were enhanced by game-based learning activities. Similarly, interactive rational number games increased student engagement and comprehension in math classes,

according to Ramos and Francisco (2022). Lastly, Mendoza (2018) discovered that using educational games created in the Philippines to teach math

However, a number of local studies show that Filipino students continue to have difficulty comprehending the equivalency of rational numbers, especially fractions. Many Grade-4 students struggled to identify equivalent fraction. A study that was published in the Asia Pacific Journal of Multidisciplinary Research (2016) found that preservice teachers in Bicol had poor conceptual understanding of fraction equivalency and misconceptions about fundamental rational number operations. Additionally, according to the International Journal of Learning, Teaching, and Educational Research (2023), Filipino students did poorly on number sense tests pertaining to fractions, suggesting that they have difficulty comprehending fraction relationships and equivalency.

In 1973, Sofronio H. Pasola Jr. created the strategic Filipino board game known as The Game of the Generals. By employing psychological strategies, strategic placement, and concealed information, it mimics the difficulties of combat. Cruz (2015) claims that the game was created to help players improve their tactical decision-making and critical thinking skills, which reflects both military strategy and Filipino ingenuity. In board games, it has evolved into a representation of Filipino ingenuity and intelligence over time. The cognitive and educational benefits of traditional Filipino games have been highlighted in a number of studies. According to De Vera (2018), students' logical thinking, memory, and strategic planning are enhanced by games. Similarly, Santos and Dela Cruz (2020) discovered that incorporating native games into instruction improves student engagement and problem-solving abilities since players are encouraged to predict, adjust their strategy, and analyze their opponent's moves. These developed skills are crucial in both academic and practical contexts.

By incorporating students in a strategic and interactive board game, Salpakan: Game of Rationals not only improves their comprehension of rational numbers but also fosters critical thinking, decision-making, and teamwork skills. This study aims to investigate the acceptability of Salpakan: Game of Rationals how Game of the Generals can be an effective teaching tool, providing an engaging alternative to traditional learning methods. This study's primary objective is to evaluate the content acceptability of the developed educational game "SALPAKAN: Game of Rationals" as perceived by Grade 7 students in terms of its effectiveness as a learning tool for understanding rational numbers.

In the end, the results might help develop creative teaching strategies that give students a deeper understanding of mathematics and make it more interesting, engaging, and meaningful.

OBJECTIVES

This study aimed to evaluate the content acceptability of the developed educational game "SALPAKAN: Game of Rationals" as perceived by Grade 7 students in terms of its effectiveness as a learning tool for understanding rational numbers.

Specific Objectives:

- To determine the level of acceptability of "SALPAKAN: Game of Rationals" in terms of its overall appearance, excitement factor, portability, uniqueness, and effectiveness in teaching rational numbers.
- To assess how the game enhances students' engagement and motivation in learning mathematical concepts related to rational numbers.
- To identify possible areas for improvement in the design and implementation of the game based on the students' feedback and evaluation results.

METHODOLOGY

Materials

- 9 x 8 board
- 42 metal-piece with the following rational numbers:
- 200%, 1.5, 125%, 90%, 0.8, $\frac{3}{5}$, $\frac{1}{2}$, 20%, $-\frac{1}{4}$, $-\frac{3}{4}$, -1.2,

It also has a flag, and a variable x

Mechanics of the Game:

The Salpakan: Game of Rationals is a two-player strategic board game designed to develop students' computational, cognitive, and strategic skills related to rational numbers.

The game requires two players and one arbiter. It consists of 42 pieces—each with its own value—and a game board. Each piece displays a rational number (in decimal, fraction, or percent form), a variable x, or a flag.

- To win, a player must either capture the opponent's flag or move their own flag to the last row on the opponent's side of the board.
- To start the game and determine who moves first, the players will toss a coin.
- After the coin toss, each player will arrange their 21 pieces in any formation within three rows on their side of the 9×8 board. The pieces must face the player who arranged them.
- The first player will then take their turn, moving one piece forward, backward, left, or right. Players take turns alternately, moving only one piece per turn.
- A challenge occurs when a piece moves into a square already occupied by an opponent's piece.
- The arbiter—a teacher or student assistant—will manage the challenges and keep the values of the captured pieces confidential from both players.
- The variable x can be defeated by all rational numbers except the highest value, creating a strategic catch in gameplay.
- The game continues until one of the following conditions is met:
  - A player successfully moves their flag piece to the last row on the opponent's side, or
  - A player's flag piece eliminates the opponent's flag during a challenge.

Acceptability of the Game

To determine the acceptability of the game, Grade 7 students were selected as respondents. The students utilized the game to reinforce their understanding on the concepts of rational numbers. Upon completion, the students evaluated the game using a five-point rating scale.

To analyze the results, the Weighted Arithmetic Mean was employed as the primary statistical tool. This measure provides a summary of the central tendency for variables measured on an interval or ratio scale (Kohler & Kreuter, 2005).

A checklist was distributed to the respondents to determine the level of acceptability of the game. The qualitative interpretation of the five-point scale is presented below:

Scale	Interpretation
4.21 – 5.00	Fully Evident
3.41 – 4.20	Highly Evident
2.61 – 3.40	Moderately Evident
1.81 – 2.60	Partially Evident
1.00 – 1.80	Not Evident

These criteria were based on the standards issued by the Bureau of Secondary Education (BSE) and the Department of Education (DepEd) in 2005.

RESULTS AND DISCUSSION

Table 1 presents the summary of the results on the acceptability of the developed educational board game "SALPAKAN: Game of Rationals" as evaluated by Grade 7 students in terms of its appearance, excitement factor, portability, uniqueness, and effectiveness. The results were computed using the Weighted Arithmetic Mean and interpreted based on the five-point scale adopted from the standards of the Bureau of Secondary Education (DepEd, 2005).

Table 1. *Level of Acceptability of "SALPAKAN: Game of Rationals" as Perceived by Grade 7 Students*

Criteria	Weighted Mean	Qualitative Interpretation
Appearance	4.47	Highly Evident
Excitement Factor	4.58	Fully Evident
Portability	4.35	Highly Evident
Uniqueness	4.41	Highly Evident
Effectiveness	4.52	Fully Evident
Overall Mean	4.47	Highly Evident

The table shows that the "SALPAKAN: Game of Rationals" was highly acceptable among Grade 7 students, with an overall weighted mean of 4.47, interpreted as Highly Evident. This result suggests that the game successfully met the criteria of being visually appealing, enjoyable, easy to handle, unique, and effective as a learning tool for rational numbers.

In terms of its appearance, students found the game visually appealing and engaging with a weighted mean of 4.47. The design and layout of the board is simple making them eager to participate. A visually stimulating appearance helps sustain learners' interest during gameplay and promotes a more interactive learning environment.

The indicator regarding the excitement factor obtained the highest mean (4.58), indicating that students enjoyed the game's competitive and unpredictable nature. The challenge of comparing rational numbers while strategizing to protect the flag created a sense of excitement and motivation to participate actively. This supports Hui and Mahmud's (2023) findings that game-based learning increases engagement and motivation in mathematics.

Students also found the game easy to carry and set up with a mean of 4.35 meaning highly evident in portability, making it practical for classroom use. Its simplicity and lightweight design allow it to be conveniently used for different math sessions, especially for group-based activities.

The adaptation of the traditional Game of the Generals into a math-focused board game was perceived as creative and innovative. Students appreciated the novelty of learning rational numbers through strategy rather than routine drills with a weighted mean of 4.41 which means highly evident. This aligns with Santos and Dela Cruz (2020), who noted that native-inspired educational games enhance engagement and problem-solving skills.

And for the last indicator – effectiveness, it scored 4.52 with a qualitative interpretation of fully evident. Students strongly agreed that Salpakan: Game of Rationals improved their understanding of rational numbers, particularly in comparing and ordering values. The interactive gameplay reinforced classroom lessons while developing logical reasoning and critical thinking. This echoes the results of Putten et al. (2020), who emphasized the benefits of cooperative games in enhancing comprehension and social interaction.

Overall, the findings confirm that the "SALPAKAN: Game of Rationals" is a highly acceptable educational tool that effectively combines learning and entertainment. Its strategic and engaging format enhances students' comprehension of rational numbers while promoting teamwork, motivation, and critical thinking. The high acceptability rating supports its potential as a supplementary learning material in teaching mathematics at the junior high school level. As one of the student respondents stated, "I really enjoyed playing it because it made learning fractions and decimals fun and challenging."

CONCLUSION

Based on the findings, the following conclusions were deduced:

The perception of the students toward the game "SALPAKAN: Game of Rationals" is that it is highly effective and engaging as a learning tool for understanding rational numbers. The responses of the students on the evaluation revealed that its overall appearance (WM = 4.47) was appealing and eye-catching; it provided an excitement factor (WM = 4.58) that sustained their interest and motivation; its portability (WM = 4.35) made it convenient for classroom use; the uniqueness (WM = 4.41) of the game added novelty to the lesson; and its effectiveness (WM = 4.52) helped improve students' comprehension of rational numbers. The average weighted mean of 4.47 indicates that the level of acceptability of the game is highly evident.

The game successfully combined strategic play and mathematical reasoning, allowing students to practice comparing, ordering, and expressing rational numbers in an enjoyable and competitive environment. It fostered teamwork, critical thinking, and decision-making, supporting the goal of making mathematics more interactive and less anxiety-inducing.

Overall, the "SALPAKAN: Game of Rationals" proved to be a valuable supplementary material that encourages active participation and helps students connect mathematical concepts with real-life problem-solving and logical thinking skills.

RECOMMENDATION

Based on the conclusions of the study, the following recommendations are hereby presented:

Future researchers may conduct further validation of the game across different grade levels or mathematical strands (e.g., integers, algebraic expressions, or percentages) to determine its broader applicability and long-term effects on students' academic performance.

The design of Salpakan: Game of Rationals may be enhanced or digitized to improve accessibility and adaptability in both face-to-face and online learning environments.

It is also recommended that future studies explore teacher perspectives on the use of the game as an instructional tool to provide a more comprehensive evaluation of its pedagogical value.

Lastly, the development of similar culturally relevant, game-based learning tools is encouraged, as these not only promote deeper conceptual understanding but also celebrate Filipino creativity and ingenuity in education.

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