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# Enhancing Trigonometry Learning Through Active Play: The Trigon-hexa Magic Journey Board Game

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**ABSTRACT**

Mathematics education plays a vital role in shaping effective learning experiences. This study explores how integrating active learning strategies with the Trigon-hexa Magic Journey (ThMJ) board game can enhance students' engagement with trigonometry. Active learning, which shifts students from passive recipients to active participants, serves as the foundation for this approach. The ThMJ board game combines mathematics with adventure, offering an interactive and immersive way to understand trigonometric concepts through hands-on engagement and strategic play. Developed with attention to board layout, materials, and problem-solving tasks, the game aims to make trigonometry both accessible and enjoyable. Rooted in real-world applications, ThMJ challenges students to apply trigonometric functions in creative ways, helping them connect theory to practice. The game not only improves problem-solving skills but also fosters teamwork, builds confidence, and makes learning fun. By moving away from traditional instruction, this study demonstrates how game-based active learning can transform the classroom experience. ThMJ encourages collaboration and curiosity, promoting deeper understanding and retention of mathematical concepts. Ultimately, ThMJ is more than a game. It represents a new direction for math education, one that motivates learners and cultivates a lasting interest in mathematics through play and exploration.

## 1. Introduction

In the ever-evolving landscape of education, fostering effective learning experiences is paramount. As educators seek innovative methods to engage students and ignite their passion for learning, the concept of active learning emerges as a beacon of promise. By encouraging students to actively participate in their own learning process, active learning approaches empower them to become proactive seekers of knowledge [1,2], rather than passive recipients. Amidst this backdrop, the realm of mathematics education stands as a particularly fertile ground for exploration. For many

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students, mathematics has been perceived as a daunting subject [3,4], often met with trepidation and disinterest. Yet, the allure of mathematics lies not only in its inherent beauty and complexity but also in its potential to unlock a world of possibilities.

Trigonometry, with its intricate web of angles, ratios, and functions [5], has long been regarded as a formidable subject for many students. Yet, within its complexity lies a world of discovery and fascination waiting to be unlocked. Enter the ThMJ board game, a captivating fusion of mathematics and adventure that promises to revolutionize the way students engage with trigonometry and its related concepts. These board games offer a tangible and immersive experience, drawing students into a world where mathematical concepts come to life through tactile interaction and strategic gameplay. But what sets mathematics board games apart goes beyond mere entertainment. They serve as powerful tools for active learning [6,7], enticing students to delve into mathematical concepts with enthusiasm and curiosity [8]. By engaging in gameplay that requires problem-solving, critical thinking, and collaboration, students develop a deeper understanding of mathematical principles and sharpen their mathematical skills in a dynamic and engaging manner.

Moreover, mathematics board games offer a compelling alternative to on-screen games [9], providing a much-needed respite from digital distractions and screen time. As students shift their focus from digital screens to physical game boards, they engage more fully with the material at hand [10], fostering deeper connections and promoting sustained interest in mathematics. In this exploration of mathematics board games, we delve into the myriad benefits they offer for education and learning. From fostering active engagement and problem-solving skills to reigniting students' interest in mathematics, these games hold the potential to transform the educational landscape and inspire a new generation of mathematical thinkers. This paper embarks on a journey to discover the transformative power of mathematics board games, ThMJ and the objectives of the study are primarily reflective of the following: to explore the real-world applications of trigonometric functions such as sine, cosine, and tangent; to evaluate students' ability to apply these functions through game-based problem-solving scenarios; and to assess how gameplay facilitates higher-order thinking skills, as demonstrated by their success in solving tasks, strategic decision-making, and in-game achievements. The study evaluates these through pre/post engagement surveys and observational rubrics measuring task completion and problem-solving efficacy during gameplay.

This study's remaining sections are organised as follows. The theoretical context is given in Section 2. The development of ThMJ framework is shown in Section 3. Section 4 provides the methodology of this study. The key findings from feedback are highlighted in Section 5. Section 6 describes the benefits of practical implementation of ThMJ, and Section 7 presents the paper's final conclusions.

## 2. Theoretical Context - Literature Study on Active Learning

Active learning is a pedagogical approach by applying various activities for students to take part actively in the learning process. The theory of active learning states that learners acquire knowledge more effectively when they actively engage with the learning process rather than passively receiving information [11]. It emphasizes student participation [12], communication [13], and involvement [14] in learning activities. Active learning encourages students to think critically, solve problems, discuss ideas, and apply concepts in practical contexts, promoting deeper understanding and long-term knowledge retention. This theory suggests that learning is a dynamic process that involves the learner's active construction of meaning through exploration, experimentation, and reflection. Instead of merely listening to lectures or reading texts, students are encouraged to engage in activities such as group discussions, hands-on experiments, simulations, case studies, and problem-

solving tasks. The theory of active learning has roots in constructivist and social constructivist educational theories [15], which emphasize the role of learners as active constructors of knowledge. However, the specific term "active learning" gained prominence in the 1970s and 1990s through the work of educational theorists and researchers [16],[17] and [18]. The study was conducted [19] by incorporating the Mathematics Achievement Test, the attitudes test, the motivation survey, and finally a more statistically reliable MANOVA test to find out the effect of active learning in classrooms. The study concluded that active learning classrooms were more academically productive than traditional classrooms making students improve their grades and their passion in education.

Integrating a mathematics board game like ThMJ with the theory of active learning can enhance the educational experience in several ways. Several theories and strategies can be used to improve the learning process when applying active learning principles in mathematics board games. By immersing players in a challenging and interactive game environment, ThMJ captures their interest and motivates them to actively participate in solving trigonometry problems. Active learning encourages hands-on experiences where students manipulate materials and engage with concepts directly. In the case of ThMJ, players physically interact with the game board, dice, and other components, actively applying trigonometric principles to progress through the game. Players can actively construct their understanding and knowledge while playing this board game since they need to engage with the game rules, mechanics and strategies. Active learning promotes the development of problem-solving skills by presenting students with challenging tasks. In ThMJ, players must solve trigonometry problems and puzzles to navigate through the jungle and uncover hidden treasures, fostering critical thinking and analytical abilities.

Active learning frequently involves collaboration and communication among students [21]. In multiplayer mode, ThMJ fosters teamwork by encouraging players to collaborate, strategize, and share ideas to overcome challenges and achieve shared objectives, thereby enhancing interpersonal skills. Additionally, active learning promotes reflection and feedback as essential components for growth. Within ThMJ, players are encouraged to evaluate their problem-solving approaches and decisions, supporting self-assessment and learning from mistakes. Furthermore, active learning emphasizes the application of knowledge in real-world contexts [22]. By integrating realistic scenarios and challenges, ThMJ helps learners grasp the practical relevance of trigonometry concepts and apply them effectively in novel situations.

The core elements of active learning within ThMJ include:

**Hands-on engagement**: Students physically move game pieces, roll specially designed dice featuring trigonometric functions (sin, cos, tan, cot, sec, csc), and solve context-driven trigonometric problems.

**Problem-solving tasks**: Challenges involve real-world inspired trigonometric applications, such as estimating heights, calculating distances, and applying trigonometric identities to advance through the game.

**Critical thinking and decision-making:** Players must select pathways, manage limited resources (time constraints), and strategize movement based on their understanding of trigonometric principles.

**Collaboration and communication**: Multiplayer modes encourage teamwork, fostering communication, negotiation, and cooperative learning

**Real-world relevance**: The game's thematic challenges mirror authentic scenarios requiring trigonometric reasoning, helping students appreciate the practicality of mathematics beyond textbooks

Research supports that integrating active learning approaches with mathematical board games improves students' academic performance, motivation, and persistence [8,22,9]. By embedding mathematical rigor within an adventurous and interactive gameplay experience, ThMJ transforms traditionally intimidating content into a dynamic journey of exploration and mastery.

## 3. Development of ThMJ

The methodology of the ThMJ study comprises four main areas: research design, respondents, instruments, and data analysis. These elements collectively support the evaluation of the board game's effectiveness in enhancing trigonometric understanding through active learning.

ThMJ presents players with a jungle adventure where they must navigate through various trigonometric challenges to reach an ancient cave containing valuable treasures. Through a hexagonal game board representing different trigonometric functions and clues incorporating trigonometric principles, players engage in problem-solving tasks that reinforce their understanding of trigonometry. The game accommodates both single-player and multiplayer modes, encouraging collaboration and teamwork among players. There are six entrances (see Fig. 1) leading to the treasure location, and the player must use a six-sided dice, each face representing one of the six basic trigonometric functions. Here are the details for each entrance:

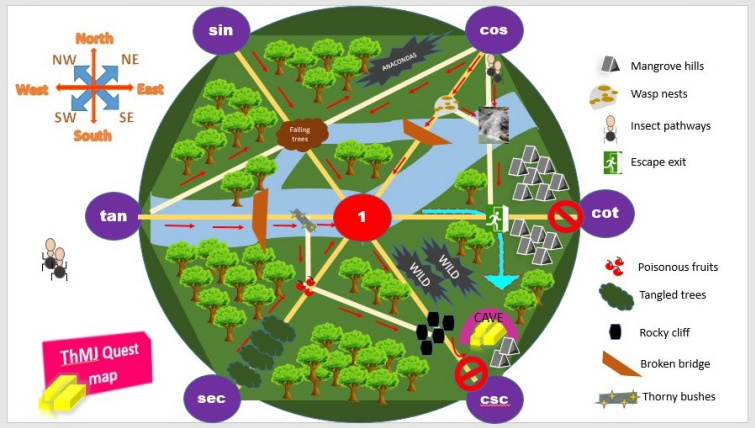


**Fig. 1.** ThMJ Quest Map

i. **Tangent Entrance**: This entrance has two possible exits. The first exit involves crossing a broken bridge, while the second exit leads through a path obstructed by falling trees at the intersection.
ii. **Sine Entrance**: To progress through this entrance, the trekker must navigate through an area filled with falling trees, ultimately reaching the centre of the jungle.
iii. **Cosine Entrance**: The Cosine Entrance also offers three exits. The first exit involves passing by an area inhabited by snakes while the second exit leads to an area filled with wasp nests that are arranged in a pattern reminiscent of trigonometry shapes. Meanwhile, the third exit entails following paths created by insects.
iv. **Cotangent and Cosecant Entrances**: These entrances present a unique challenge. Instead of using these functions directly, the player must find their co-functions to enter the jungle successfully.
v. **Secant Function Entrance**: To access this entrance, the trekker must follow a tangled path, making it challenging to find the way. However, someone with a solid understanding of basic trigonometry might identify the tree pattern that follows the path of trigonometric identities, making it easier to navigate through the thicket.

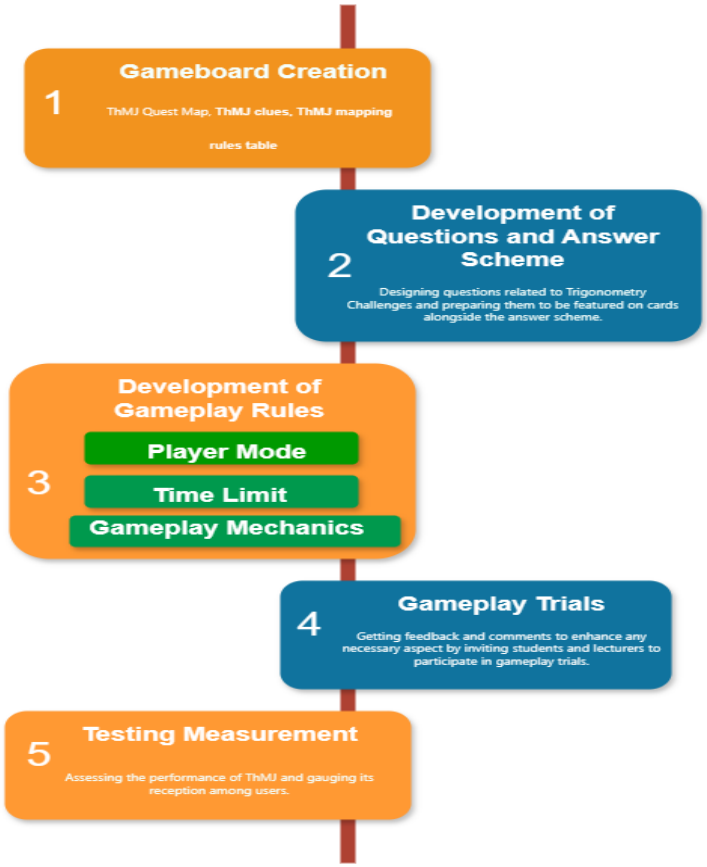


**Fig. 2.** Framework of ThMJ

Fig. 2 represents a framework involved in developing ThMJ gameplay. It starts with game board creation. At this stage, the game board layout is designed to convey the immersive experience of navigating through a dense jungle, featuring a variety of locations, checkpoints, and interconnected paths that symbolize various trigonometry challenges and clues. The game board includes six entrances, each representing different trigonometric functions (e.g., sine, cosine, tangent, cosecant, secant, cotangent). The resulting game board layout is presented to players as the ThMJ Quest Map (Fig. 1), accompanied by essential components including ThMJ hunt clues (Fig. 3), a ThMJ mapping rules table (Fig. 4), and the trigonometry challenge cards (Fig. 5). ThMJ clues serve to guide players in navigating trigonometry problems by incorporating fundamental principles and identities, while the ThMJ mapping rules table aids players throughout their journey.

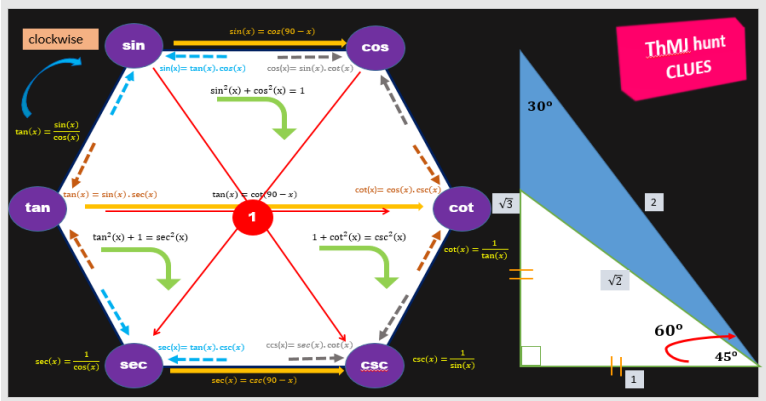


**Fig. 3.** ThMJ Hunt Clues

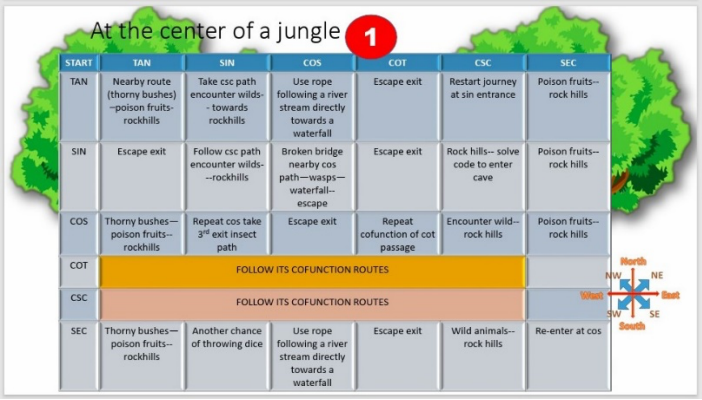


**Fig. 4.** ThMJ Rulemap


**Fig. 5.** Challenge Card

All trigonometry challenge questions are then being featured on cards. The development of questions together with the answer scheme is the next stage of ThMJ framework. Careful attention is then devoted to designing gameplay rules, particularly regarding mechanics, duration, and the optimal number of players. Upon finalizing stages 1 through 3, the ThMJ game board undergoes testing by both lecturers and students, with all feedback and comments meticulously recorded for assessment during the testing measurement phase. The purpose of testing is to evaluate the performance of ThMJ and gauging its reception among users.

### *3.1 Components of the ThMJ Framework*

The essential components of the ThMJ framework include game board, player materials, trigonometry challenge card, time limit, and the players.

#### *3.1.1 Game Board (ThMJ Quest Map)*

The layout of the hexagonal game board depicting the dense jungle and various trigonometric challenges. The game board depicting the dense jungle, with six entrances representing different trigonometric functions (e.g., sine, cosine, tangent, cosecant, secant, cotangent). The game board features a map with various locations, checkpoints, and paths representing different trigonometry challenges and clues. Each location on the board is associated with a trigonometric problem or puzzle. Each player receives a ThMJ quest map, ThMJ clues, and ThMJ mapping rules table to guide them through the journey. In addition, player(s) will be equipped with writing materials, calculators (if allowed), and any other necessary tools for solving trigonometric problems.

### *3.1.2 Player Materials*

The materials provided to players, such as ThMJ quest maps (Fig. 1), ThMJ hunt clues (Fig. 3), ThMJ rule map (Fig. 4), dice (Fig. 6), and writing materials.

*i. ThMJ Hunt Clues*

The ThMJ hunt clues as depicted in Fig. 3 provides guidance for solving problems as players navigate through the jungle using the ThMJ quest map. Some clues are given directly, while others are hidden. These clues incorporate trigonometric principles and identities, which are represented in a magical hexagon and triangles that utilize the Pythagorean theorem and special angles. In the magical hexagon, each vertex represents a trigonometric function such as tangent, sine, cosine, secant, cosecant, and cotangent, serving as the entrance for players. As players traverse each path, they encounter trigonometric ratios and identity clues along neighbouring routes. For instance, moving clockwise or counterclockwise reveals the ratios of trigonometric functions. Starting with tangent and moving clockwise, the next entrance represents sine, followed by cosine. This relationship is akin to the product identities observed in triangles, where sine equals the product of tangent and cosine.
Similarly, exploring clockwise from other vertices yields further clues. The connections between lines in the hexagon, represented by the number 1, provide additional insights. For example, the opposite side of a function represents the reciprocal function; for instance, sine is the reciprocal of cosecant and cotangent is the reciprocal of tangent in trigonometry. Moreover, players can deduce basic trigonometric identities by examining the upper triangle. The relationship between sine, cosine, and the number 1 indicates that $sin^2\theta + cos^2\theta = 1$. The two lower triangles reveal additional identities: for instance, $tan^2\theta + 1 = sec^2\theta$ and $1 + cot^2\theta = csc^2\theta$.

*ii. ThMJ Rule map*

ThMJ mapping rules table (see Fig. 4) guides players on movement and challenge completion. The types and difficulty levels of challenges players will encounter vary depending on the randomly selected card by the players. These challenges include solving trigonometric problems and puzzles. Once player reach at the centre of the jungle, then need to follow this mapping rules table. For instance, if the player reaches at the centre (1) (see Fig. 1) from cosine entrance, then the player needs to throw a dice again. If the player gets cos, then it will be an easier path since the player can have an escape exit. If the player gets sin, then the player needs to repeat cos path takes third exit insect path.

*iii. Dice*

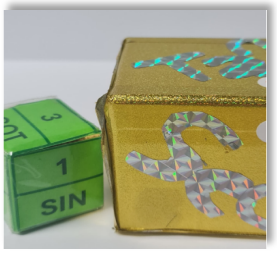


**Fig. 6.** Dice

The dice in ThMJ plays a crucial role in determining player movement, decision-making, and challenge engagement. Unlike regular dice, the ThMJ dice is specially designed to incorporate trigonometric functions, making the game both educational and strategic. The dice have six faces, each representing a different trigonometric function: e.g. sin (sine), cos (cosine), tan (tangent), cot (cotangent), sec (secant), and csc (cosecant).

Rolling a specific function determines which path the player takes through the jungle., the type of trigonometry challenge they must solve, and special in-game effects (e.g., bonus rewards, movement boosts).

### *3.1.3 Trigonometry Challenges Player Materials*

The types and difficulty levels of challenges players will encounter vary depending on the randomly selected card by the player. These challenges include solving trigonometric problems and puzzles. At the cosine entrance checkpoint, players come across an area inhabited by anacondas, obstructing their path through the jungle. To advance on the game board, players must solve trigonometric problems associated with cosine functions, showcasing their comprehension of cosine ratios and angles (See Table 1).

**Table 1**
Encounter with Anacondas at the Cosine Entrance

| Checkpoint (Code) | Challenge | Answer |
|---|---|---|
| C1 (a) | In a jungle clearing, there are three anacondas basking in the sun. They position themselves in such a way that they form an equilateral triangle with each other. Player needs to find the angle at one vertex. | 60 degrees |

### *3.1.4 Time Limit*

The time limit for completing the game is 30 minutes for single-player mode and 20 minutes for multiplayer mode.

### *3.1.5 Multiplayer Mode*

The game accommodates both single-player and multiplayer modes, promoting collaboration and competition among players. ThMJ were designed to accommodate both single and multiple players (3 persons). The player embarks on a solo adventure through the game board, aiming to solve trigonometric challenges and reach the final destination. For Multiple Player Mode, maximum of three players compete against each other to be the first to reach the final destination. Players take turns rolling dice to move across the board, encountering trigonometry challenges along the way.

In this jungle adventure, a grasp of trigonometric principles is not only valuable but also essential for safely reaching the ancient cave and its treasures.

### *3.2 Gameplay Mechanics of ThMJ*

Players roll the dice to determine which entrance they take to proceed into the jungle. Follow the route indicated at each entrance, encountering challenges such as falling trees, broken bridges, or wild encounters. At each checkpoint, players must solve basic trigonometric functions to proceed. If a player's route leads them towards the jungle's centre, they roll the dice again and follow the ThMJ mapping rules provided. Players must reach the ancient cave within the allotted time to win the game.

### *3.2.1 Special Rules*

Individual players completing the game within 15 minutes receive bonus coins in addition to collecting valuable items in the ancient cave. For multiplayer games with three players, the first player to reach the ancient cave wins the game. Players can work together in teams of three to strategize and overcome challenges faster.

### *3.2.2 Game End*

The game ends when the timer runs out or when a player/team successfully reaches the ancient cave. Players tally their scores based on completion time, bonus coins earned, and valuable items collected.

## 4. Methodology

The methodology of the ThMJ study comprises four main areas: research design, respondents, instruments, and data analysis. These elements collectively support the evaluation of the board game’s effectiveness in enhancing trigonometric understanding through active learning.

### *4.1 Research Design*

This study employed a quasi-experimental design with a single group pretest-post-test format to investigate the impact of the ThMJ board game on trigonometry learning.

### *4.2 Participants*

The participants consisted of 39 pre-university students enrolled in a mathematics foundation course at Universiti Pertahanan Nasional Malaysia (UPNM).

### *4.3 Instruments*

The study employed four key instruments to assess the effectiveness of the ThMJ board game. A Likert-scale engagement survey was administered before and after gameplay to measure students' motivation and interest in trigonometry. An observation checklist, completed by facilitators during gameplay, captured indicators of critical thinking, collaboration, and task performance. Challenge card performance served as embedded formative assessments, where students solved contextual trigonometric tasks, such as estimating heights, applying sine, cosine, and tangent ratios, and using trigonometric identities to navigate in-game scenarios—providing direct evidence of concept application. Finally, a feedback form was distributed post-gameplay, allowing students to reflect on the game's usability, difficulty, enjoyment, and perceived learning outcomes, offering qualitative insights into its instructional impact.

### *4.4 Data Collection and Analysis*

Quantitative data from the pre/post surveys were analyzed using descriptive statistics (mean and percentage change). Observational data were coded and interpreted thematically to assess behavioral engagement, strategy use, and collaborative interaction during gameplay.

## 5. Feedback Analysis

Based on the feedback provided from players of the ThMJ board game, here are the key points of feedback and potential recommendations for improvement:

i. Difficulty Level:
   - Feedback: Several players mentioned that the questions were too hard or unclear, with some noting the level of English and trigonometry as too advanced for moderate students.
   - Recommendation: Consider revising the questions to make them more accessible, potentially by simplifying the language and providing more clear examples or explanations.

ii. Game Instructions and Briefing:
   - Feedback: Players suggested the briefing should be clearer before starting the game, and some rules were found to be unclear.
   - Recommendation: Provide a concise and comprehensive guide or tutorial at the beginning of the game, including clear explanations of the rules and objectives.

iii. Game Components:

- Feedback: Feedback on game components includes the map being roughly designed, cards too big, and a suggestion to change the markers to smaller ones.
- Recommendation: Consider redesigning the map and adjusting the size of the cards and markers for better usability and visual appeal.

iv. Game Design and Experience:
- Feedback: Positive comments on the game's innovative approach to making math fun and the clear and detailed clues, but some players mentioned the game felt initially confusing.
- Recommendation: Streamline the game design for easier understanding at the start and consider adding more intuitive and clear instructions.

v. Scenarios and Themes:
- Feedback: Some players suggested changing the scenario, such as the market, and improving the clarity of labels for the road.
- Recommendation: Review and refine scenarios and themes for more engagement and realism, and ensure labels and instructions are clear.

vi. Enhancing Engagement:
- Feedback: Suggestions were made to add background music for a better experience and to include better illustrations.
- Recommendation: Consider incorporating background music and high-quality visuals to enhance the overall gaming experience.

vii. Overall Experience:
- Feedback: Most players had a positive overall experience, finding the game exciting and an excellent way to explore trigonometry concepts.
- Recommendation: Build on the positive aspects and continue to refine the game based on other feedback.

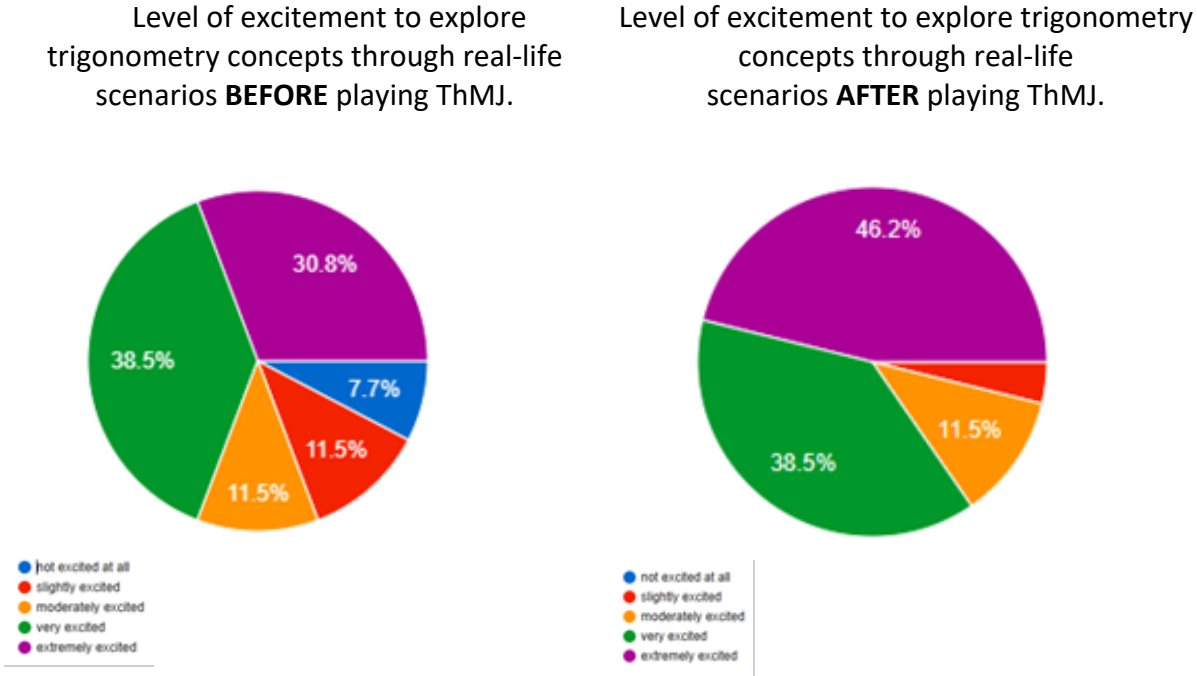


**Fig. 7.** Level of Excitement to Explore Trigonometry Concepts

Fig. 7 exhibits the increase in the level of excitement among players before and after playing the ThMJ board game. It indicates a positive impact on engagement and interest in exploring trigonometry concepts through real-life scenarios. Before playing the game, **30.8%** of players were excited to explore trigonometry concepts. After playing the game, **46.2%** of players reported being extremely excited to explore trigonometry concepts through real-life scenarios. This shows a significant increase in excitement levels, with the percentage more than doubling from before to after playing the game.

It seems like there was a positive change in players' understanding of trigonometry concepts after playing the ThMJ board game. Fig. 8 shows before playing the game, **46.2%** of players reported having a **FAIR** understanding of trigonometry concepts. After playing the game, **46.2%** of players reported having a **VERY GOOD** understanding of trigonometry concepts. This suggests a significant improvement in players' comprehension of trigonometry concepts as a result of playing the ThMJ board game. In this case, the entire group that initially reported fair understanding seems to have improved to very good understanding.

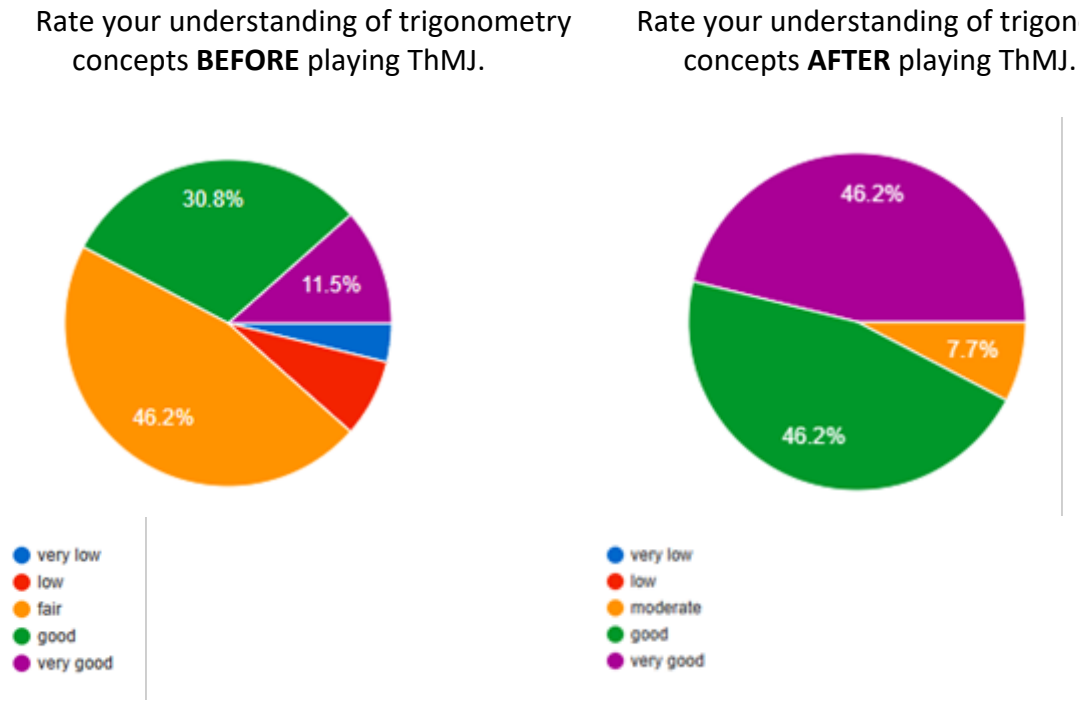


**Fig. 8.** Rate the Understanding of Trigonometry Concepts

## 6. Benefits of Practical Implementation of ThMJ

The practical implementation of the ThMJ board game presents a dynamic and effective approach to trigonometry learning through the integration of active learning principles and game-based pedagogy. The structured gameplay provides students with a platform to actively explore mathematical concepts in an engaging, collaborative, and contextually meaningful environment.

ThMJ transforms traditional classroom instruction into an interactive experience, significantly increasing student motivation and interest in learning trigonometry. The game mechanics such as time-based progression, exploration, and treasure-seeking enhance immersion and curiosity. Recent

studies such as Hui and Mahmud [24] and Donkin and Kynn [22] have emphasized that game-based learning can increase intrinsic motivation and support learner engagement over time. As players progress through the game, they must solve diverse trigonometric problems, analyse clues, and make strategic decisions. This promotes critical thinking and sharpens problem-solving abilities. Moreover, recent findings by Al-Khayat et al. [25] highlight the importance of adaptive challenges in fostering cognitive engagement. They proved that mathematics games contribute to support the development of analytical thinking among students, especially when designed with adaptive challenges.

The game places mathematical problems in a real-world-inspired jungle setting, helping learners contextualize abstract trigonometric functions. Players apply their mathematical knowledge to overcome obstacles and navigate paths. This approach has been shown to reinforce conceptual understanding and encourage learners to see the practical value of mathematics in real-life scenarios [23]. Feedback from ThMJ implementation revealed notable improvements in both understanding and interest in trigonometry. Prior to gameplay, only 30.8% of students were eager to explore trigonometric concepts; after gameplay, this number increased to 46.2%. Moreover, students' reported understanding levels improved from fair to very good. These findings are supported by [24], who highlighted that active and gamified learning strategies significantly enhance learning outcomes and knowledge retention.

In multiplayer mode, ThMJ encourages peer interaction, collective decision-making, and strategic cooperation. These social interactions mirror collaborative learning environments and align with modern pedagogical frameworks that emphasize communication and teamwork as core 21st-century competencies [26]. Completing tasks successfully and progressing through the game promotes positive reinforcement, which has a direct impact on students' confidence in their mathematical abilities. According to recent research, game-based environments reduce performance pressure and support emotional engagement, leading to lower math anxiety and improved self-efficacy [23].

ThMJ accommodates various learning preferences by offering a mix of visual (maps and clues), kinaesthetic (movement and dice interaction), and logical (problem-solving cards) elements. This multimodal design aligns with Universal Design for Learning (UDL) principles, promoting inclusivity and accessibility for students with diverse learning needs [26]. ThMJ is adaptable to classroom settings as a revision tool, formative assessment activity, or collaborative group exercise. With clear alignment to curriculum aims, it supports flexible implementation across various instructional contexts. As game-based strategies continue to gain traction in educational institutions, scalable tools like ThMJ can complement traditional teaching methods while enhancing learner engagement and achievement.

## 7. Conclusion

While foundational studies from the 2000s laid the groundwork for active learning in mathematics education, more recent research reinforces these findings and highlights new trends. For instance, a 2023 meta-analysis of active learning in undergraduate STEM settings [27] found significant effect sizes across multiple learning outcomes. Comparative research [28] indicates that board-game-based interventions may produce comparable gains in problem-solving skills as digital apps, particularly in primary mathematics. A systematic review by Patel & Smith [29] further affirms that collaborative and tactile game-based strategies continue to thrive, especially in elementary classrooms. The integration of ThMJ into mathematics education offers a promising approach to enhancing trigonometry learning through active engagement. By providing an interactive and immersive learning experience, ThMJ empowers students to explore trigonometric concepts in a

dynamic and enjoyable manner, ultimately fostering deeper understanding and appreciation for mathematics.

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