The Tower of Differentiation: Development and Preliminary User Evaluation of an Educational Game for Learning Derivatives in Pre-University Mathematics

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DOI: https://doi.org/10.47772/IJRISS.2026.100900369

Received: 19 August 2026; Accepted: 24 August 2026; Published: 12 October 2026

ABSTRACT

This project presents the development and preliminary user evaluation of “Tower of Differentiation," a Roblox-based educational game to help pre-university students understand the mathematical concept of differentiation in calculus. The aims of this project are (1) to enhance understanding of differentiation concepts through an interactive, engaging mathematics game on Roblox, (2) to enhance problem-solving skills related to differentiation concepts through a game-based method, and (3) to foster critical thinking and strategic planning by analysing the game's questions to support good decision-making under time pressure. The game integrates differentiation questions with an obstacle-course format, scaffolded across five stages from foundational to more advanced differentiation rules. The prototype was then used to test game mechanics, designs, and difficulty levels to ensure the game was both educational and fun. Playtesting in the early stages improved the structure, content, and user experience of the game. A preliminary evaluation was conducted with 70 students who played the game and completed a post-game feedback survey. The survey examined students’ perceptions of engagement, clarity of mathematical questions, perceived understanding, motivation, adequacy of time, and their perceived ability to apply differentiation concepts. The survey results show a significant positive trend in student interest in mathematics. Still, they should not be interpreted as evidence of actual learning gains because the study did not include a pre-test, post-test, control group, or inferential statistical analysis. The study is therefore positioned as a development and preliminary evaluation report. The educational game can be further refined based on students’ feedback and integrated as a supplementary learning activity to encourage greater interest, motivation, and active participation in mathematics learning.

Keywords: calculus, computerised game, derivatives, game-based learning, educational game, differentiation

INTRODUCTION

In recent years, the notion of digital game-based learning, sometimes abbreviated as GBL, has been promoted for the instruction of calculus in educational settings. A growing number of studies have explored and examined the effectiveness of game-based learning (GBL) in educational settings through the application of theoretical frameworks and empirical case studies (Hanafi et al., 2025; Ortiz-Rojas et al., 2025; Thomas et al., 2025). By employing creative methods, it motivates students to learn calculus through games. Research indicates that game-based learning in calculus can help students overcome their apprehension toward abstract concepts and theorems, stimulate their curiosity, address real-world problems, convert passive learning to active engagement, and transition from fragmented knowledge to a comprehensive understanding. This enables students to prepare more effectively for their forthcoming primary topics.

Advanced mathematics in disciplines like physics and engineering is based on calculus. Calculus is not only essential for mastering more challenging academic courses but also a reliable indicator of an individual's future earnings outside of the classroom (Lee et al., 2016). However, some studies have discovered a discrepancy between what students learn in the classroom and their ability to apply mathematical concepts to other domains and use calculus outside the classroom (Lesh & Zawojewski, 2007). Students frequently struggle to apply their calculus knowledge in real-world situations because they lack hands-on experience. Additionally, students' lack of comprehension of calculus's practical applications may cause them to lose motivation to learn (Kasmin et al., 2025). Game-based learning may address part of this challenge by combining repeated practice, immediate task demands, feedback, and an engaging environment. At the same time, game-based activities can introduce additional cognitive demands if navigation, competition, or visual elements distract learners from the mathematical task. Therefore, educational game design should balance challenge, engagement, and cognitive demands rather than treating entertainment as a sufficient indicator of effectiveness.

This project proposed a computerised game, entitled "Tower of Differentiation", which is specifically designed around the concept of differentiation in solving mathematical problems. It is based on Roblox's Obby game (NoypiGeeks, 2023), where players need to avoid obstacles and solve five mathematics problems to reach the checkpoint level, which may become more challenging as they progress through each level. The strategy of this game allows students to evaluate their own learning and encourages critical thinking when solving differentiation-based challenges (Cody et al., 2015). The game concept was designed as an engaging, interactive experience that makes learning differentiation rules more accessible and enjoyable for students. The prototype enabled testing of different game mechanics, designs, and difficulty levels to ensure the game was both educational and entertaining. Feedback from early playtesting sessions was used to refine the game's structure, content, and overall user experience. The objectives of this project are to enhance understanding of differentiation concepts through an engaging and interactive mathematics game developed on the Roblox platform, to enhance problem-solving skills in differentiation concepts through a game-based method and to encourage critical thinking and strategic planning by analysing differentiation concepts presented in the game's questions for effective decision-making under time constraints. Overall, the study contributes in two major outcomes. First, it documents the design and development decisions used to integrate differentiation content into a multiplayer game. Second, it provides a preliminary evaluation of students' perceptions after gameplay. Importantly, the present study does not claim underlying evidence that the game improves mathematical achievement because no pre-test, post-test, comparison group, or inferential analysis was conducted. Instead, it examines whether the developed prototype was perceived as engaging, understandable, motivating, and supportive of students' perceived learning experience.

METHODOLOGY

Two components comprised this project's methodology: (i) the initialisation of the game concept and the development process and (ii) a preliminary user evaluation. The initialisation and development component covered game concept formation, gameplay mechanics, mathematical content, coding, testing, and refinement. Meanwhile, the evaluation component used a post-game descriptive survey to document participants' perceptions of the learning experience. Since the presented evaluation data were collected after gameplay and were retained in collective form, the study is treated as a preliminary user-perception evaluation rather than a controlled effectiveness study.

Theoretical Framework

Self-Determination Theory (SDT), Cognitive Load Theory, and Flow Theory are primary pillars of motivation for the game design. According to flow theory, learners are more engaged when they have clear objectives, a suitable challenge, feedback, and a balance between the demands of the activity and their perceived abilities (Hamari et al., 2016; Kiili et al., 2012). The game incorporates these ideas by using time limitations, obstacles, differentiated questions at checkpoints, phased progression, and instant advancement following correct answers. Instead of providing all differentiation rules at the same level of complexity, the five-stage structure aims to give increasing challenge.

An additional explanation for the game's motivational elements is given by SDT. According to Ryan and Deci

(2000), autonomy, competence, and relatedness are fundamental psychological demands linked to self-determined motivation. Opportunities to select movement methods, conquer increasingly challenging obstacles, earn rewards, and compete or cooperate in a multiplayer setting may promote perceived competence, autonomy, and social interaction in the current game. Although these characteristics offer a theoretical justification for analysing students' stated motivation and interest, no direct assertion on the satisfaction of particular psychological needs is made because the current survey did not employ a validated SDT instrument.

Additionally, Cognitive Load Theory offers a crucial design factor. Sweller (1988), notes that excessive cognitive processing can compete with the processing needed for learning, making instructional tasks less effective. In order to minimise preventable misunderstanding while maintaining the difficulty of the mathematical work, visual stage differentiation, superscript mathematical notation, arrows, checkpoints, and escalating difficulty were used. Because interface concerns may add unnecessary demands unrelated to differential learning, the technological challenges found during development, such as question-display and input issues, are pertinent to this consideration.

Research Design and Participants

The preliminary evaluation used a descriptive, post-game survey design. Seventy students were involved through sampling and accessed the game through a Roblox link. All participants played the game before completing the survey.

Data Collection and Survey Instrument

The questionnaire was conducted post-gameplay and focused on students' perceptions regarding the game and educational experience. The aspects discussed comprised the overall gaming experience, the clarity of mathematical directions, the impact of the obby format on the appeal of mathematics, the perceived comprehension of differentiation, motivation for studying, sufficiency of the time limit, the ability to tackle differentiation-related challenges, and the difficulty of the levels. The questionnaire was created specifically for the study and the dependability coefficients like Cronbach’s alpha were absent from the current dataset. This constraint is clearly recognised, and subsequent assessments need to employ verified metrics of motivation, engagement, and perceived learning where suitable.

Data Analysis

The accessible survey data were examined utilising descriptive statistics, particularly frequencies and percentages. No t-test, ANOVA, correlation, effect-size analysis, or any other inferential method was performed due to the absence of pre-test/post-test scores, a comparative group, or individual-level data appropriate for such evaluations. The percentages are thus seen as reflections of students' perceptions rather than empirical proof of learning efficacy.

Game Concept

Tower of differentiation is a digital game inspired by the original Roblox game Tower of Hell. In this game, players advance to the next stage by correctly answering a mathematical question at each checkpoint in a tower. The first player to successfully complete all stages is declared the winner and is awarded new superpowers and decorations before beginning a new game session upon reaching the top of the tower. Figure 1 shows the flowchart of the gameplay.

1. Computerised Game Design:

Each player is provided with an avatar that represents their in-game identity. The game is designed to be played exclusively from a third-person perspective. One gameplay mode is available: multiplayer gameplay. In multiplayer gameplay mode, all players could race with their friends. Avatar movement is controlled using the WASD keys on a personal computer or laptop, or via a thumbstick on a handheld device such as a tablet or smartphone. All players get 30 minutes to finish the round. The maximum number of players on a server is 10.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue IX September 2026

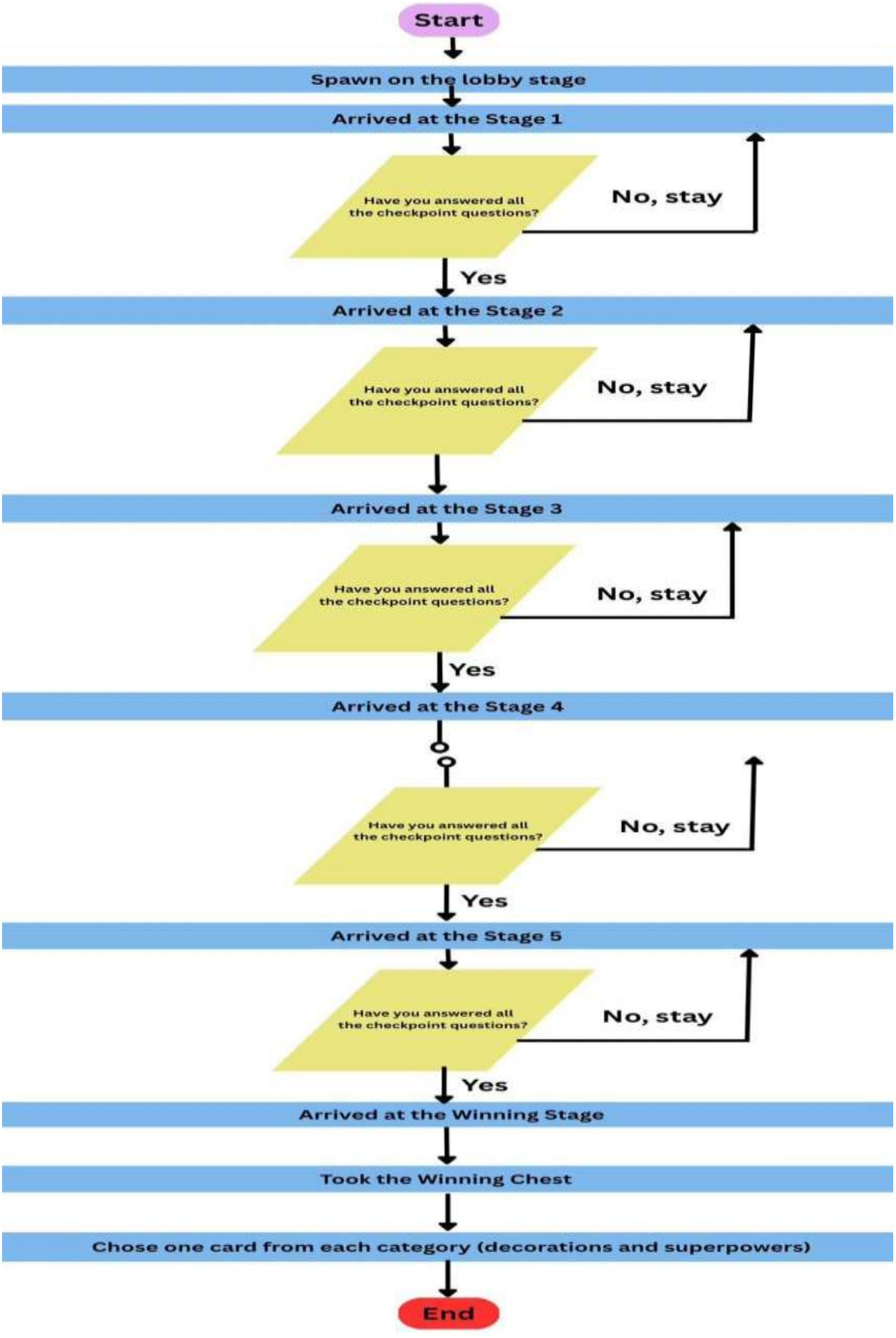


Figure 1: Flow Chart of Gameplay

2. Gameplay Mechanics:

The game incorporates a variety of obstacles in each stage. These obstacles include, but are not limited to, stairs, laser beams, ladders, and other interactive elements. Players are required to navigate these obstacles through actions such as walking, running, sliding, and jumping. To reach the finish line, players must complete 5 stages. At each stage, a mathematics question is presented. Each stage has 5 questions. The higher the stage count, the more difficult it will be to win. There will be a few hints around the last stage that players must find to make their gameplay easier. The players are required to select or type an answer before proceeding. Correct responses allow players to complete the stage and advance further in the game.

3. Avatar Special Abilities:

The avatar is equipped with unique superpowers that enable players to knock down or temporarily disable other players during gameplay. These abilities may be strategically employed to gain a competitive advantage, overcome obstacles, or defend against opposing players. Each superpower may be subject to a cooldown period or require the collection of specific in-game resources prior to activation. This mechanism introduces an additional layer of strategic decision-making into the game.

4. Winning:

The main objective of Tower of Differentiation is to race and be the first player to complete all the mathematical questions and stages. The first player to reach the finish line will be declared the winner of the round. After winning, the winner will arrive in a playground room and get a chest. The chest contains decoration and superpower cards. The winner needs to choose one card from each category and can save it for later use. For example, low gravity power and colourful halos. If the players did not finish the round, their game will be reset to the new round.

Development Process

In the Tower of Differentiation, the game is structured as a “obby tower race” where players must solve differentiation problems to ascend levels. The first player to reach the winning stage wins the game immediately. For the gameplay, all players begin at the “Lobby stage” of the tower. Each player is provided with several checkpoints when they arrive at any stage. Problems are divided into 5 stages; the higher the stage count, the more difficult it is to win. If a player answers a question correctly, they will move to the next checkpoint. However, if they answer incorrectly, the player remains at the current level. At the winning stage, a chest is provided containing superpowers and avatar decoration. The winner is allowed to choose one item from each category. For example, a player may select increased walking speed (superpower) and a shiny halo (avatar decoration). The development process of the game begins with creating a floor as the foundation. Next, walls and a roof are constructed to form a tower using different colours to distinguish each stage clearly. Then, a lobby stage is designed to serve as the spawning point for players at the start of the game. Next, obstacles (obbies) and checkpoints are built on each stage to structure gameplay progression. Following this, a winning stage is created for players who successfully complete all stages, along with a reward system in the form of a chest containing decorations and superpowers. The entire stage is then decorated to make the game more visually appealing and engaging for players. After that, questions with varying levels of difficulty are generated for each stage. Finally, all coding data are inserted including integrating the questions into each checkpoint to ensure proper functionality, marking the completion of the game development process.

Nevertheless, several refinement processes occurred in the game. Firstly, the game’s theme was changed from a pink colour only to a variety of pastel colours to make it more visually appealing and to better differentiate each stage. In addition, there was an issue with the coding where the questions at each checkpoint did not appear on the screen. Therefore, the code was updated to ensure that questions would pop up correctly. Furthermore, some stages could not be completed by players due to an ‘invisible lava block’ that was incorrectly positioned, causing players to die randomly upon contact. To resolve this issue, the block was repositioned further away from the player’s path. Moreover, a bridge with fences along its sides as well as arrows at each checkpoint from the starting game to the end was added to guide players along the correct path.

Other than that, the duration of the game was extended to 90 minutes, instead of the initially proposed 30 minutes. This adjustment was made to provide sufficient time for players to answer the questions and complete all stages. Figure 2 shows the development process.

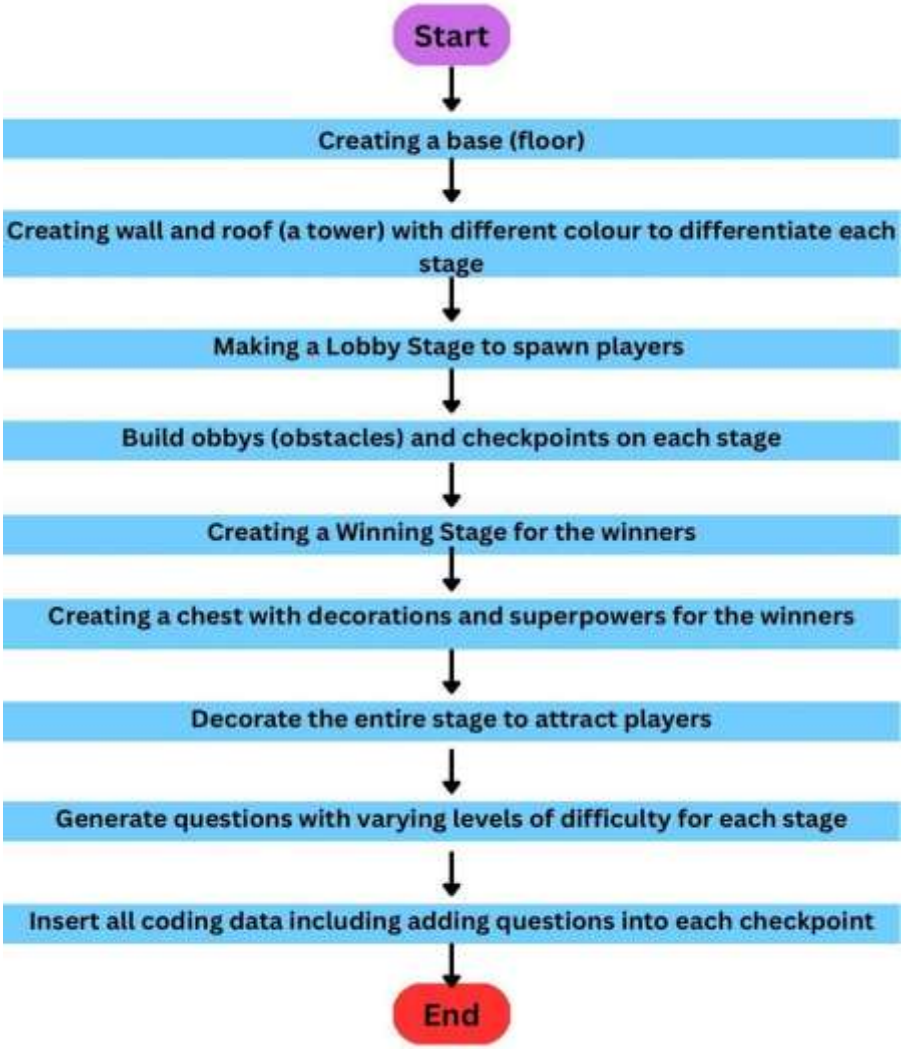


Figure 2: Flow Chart of Development Process

Mathematical Concept

The "Tower of Differentiation" is built upon the Differentiation topic. The game utilises a Scaffolded Difficulty model, where players must demonstrate increasing levels of differentiation mastery to progress from basic algebraic manipulation to advanced differential analysis across 25 questions.

The early stages of the game evaluate the application of fundamental rules to algebraic and transcendental functions. This includes the constant rule $\frac{d}{dx}(c) = 0$, sum and difference rule $\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$ and the derivatives basic trigonometric functions, for example $\frac{d}{dx}(\sin a\,x) = a\cos a\,x$. As players ascend, the core incorporates Logarithmic and Exponential Functions requiring the application of identities such as $\frac{d}{dx}\left(e^{f(x)}\right) = e^{f(x)} \cdot f'(x)$ and $\frac{d}{dx}(\ln f(x)) = \frac{f'(x)}{f(x)}$. These stages ensure students have the prerequisite skills for more complex operations in the upper levels. The mathematical core reaches its peak complexity in the final stages, focusing on the interactions between multiple variables and parameters. Advanced differentiation rules which are product rules $\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}$ and quotient rules $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$ are used for functions where components need to be multiplied or divided. Players use the chain Rule $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$ for questions involving differentiation of composite functions. Implicit differentiation used by player to find

$\frac{dy}{dx}$ when y cannot be isolated and parametric differentiation when x and y are defined by a third parameter, t. Higher order differentiation which are finding second derivative $\frac{d^2y}{dx^2}$ or third derivative $\frac{d^3y}{dx^3}$ used when players need to determine the rate of change of a slope.

RESULTS AND DISCUSSIONS

The game was easily accessible via a provided Roblox link, allowing participants to join conveniently regardless of their location. A total of 70 participants took part in the testing, comprising foundation students across several institutions. This diverse group provided a wide range of feedback and perspectives. Therefore, the feedback collected contributes to the refinement process of the game, with the aim of making it more effective as an educational tool through further improvements and enhancements. Because the evaluation relied on a post-game perception survey, the results should be interpreted as descriptive evidence of user experience rather than direct evidence of learning gains.

Analysis

A survey was conducted to investigate students' interests and views on the Obby Game, which combines mathematical concepts with differentiation-based challenges. It also aims to assess the ability of students to solve the questions within the time given. Approximately 70 foundation students who studied mathematics participated in the survey. Based on this survey, all the suggestions and feedback will be taken into consideration to improve the overall quality of the game, as it is accessible to all users and can be played at any time. Overall, the results below are presented descriptively and are used primarily to identify strengths and areas for further refinement.

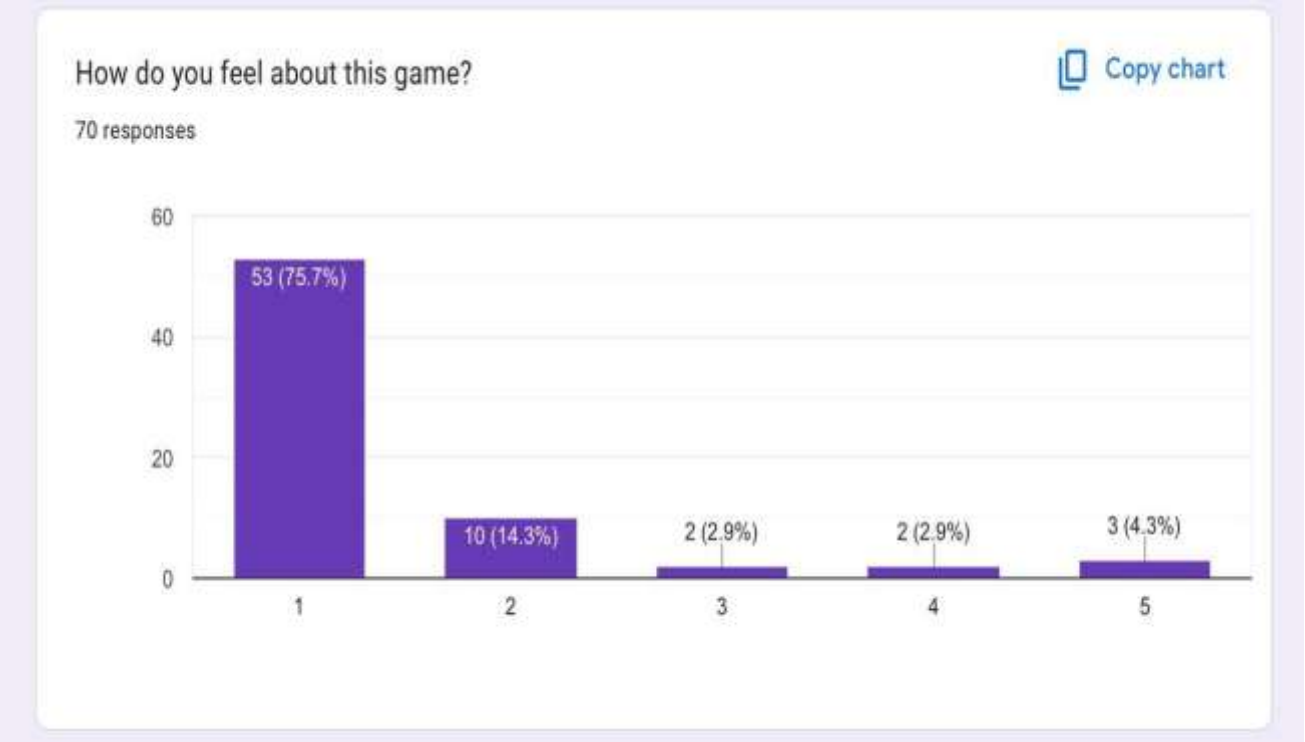


Figure 3: Overall feedback about the game

As shown in Figure 3, more than half of the respondents which is 75.7% gave the highest possible rating 1, indicating that the core gameplay loop is fun and engaging. According to the qualitative feedback, the "colourful paths and obstacles" are a major reason for this positive feeling. The small percentage of players who disliked the game which is 4.3% at rating 5 likely felt this way due to the technical bugs or difficult obstacles mentioned in their comments. Overall, the majority of players which is 92.9% reported a positive experience with ‘Tower of Differentiation’. The high concentration of rating 1 suggests that the integration of

mathematical concepts into an 'Obby' format does not reduce the entertainment value. However, the 7.2% negative feedback highlights a need to refine specific stage mechanics to prevent player frustration.

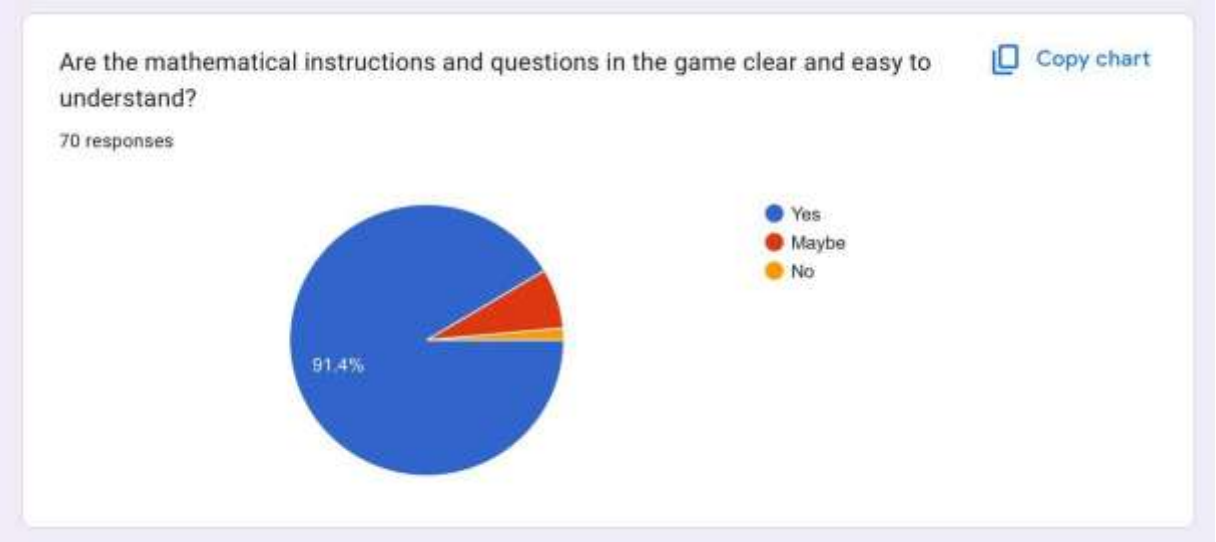


Figure 4: Mathematical instruction

From Figure 4, over 91.4% found the mathematic questions in the game is clear and easy to understand. This suggests that the choice of notation was well-received and understandable by the players. The 8.6% who answered "Maybe" might have struggled with the typing problem mentioned in the comments. If a player knows the math but the game doesn't read their answer correctly, they often report that the question or instruction was unclear.

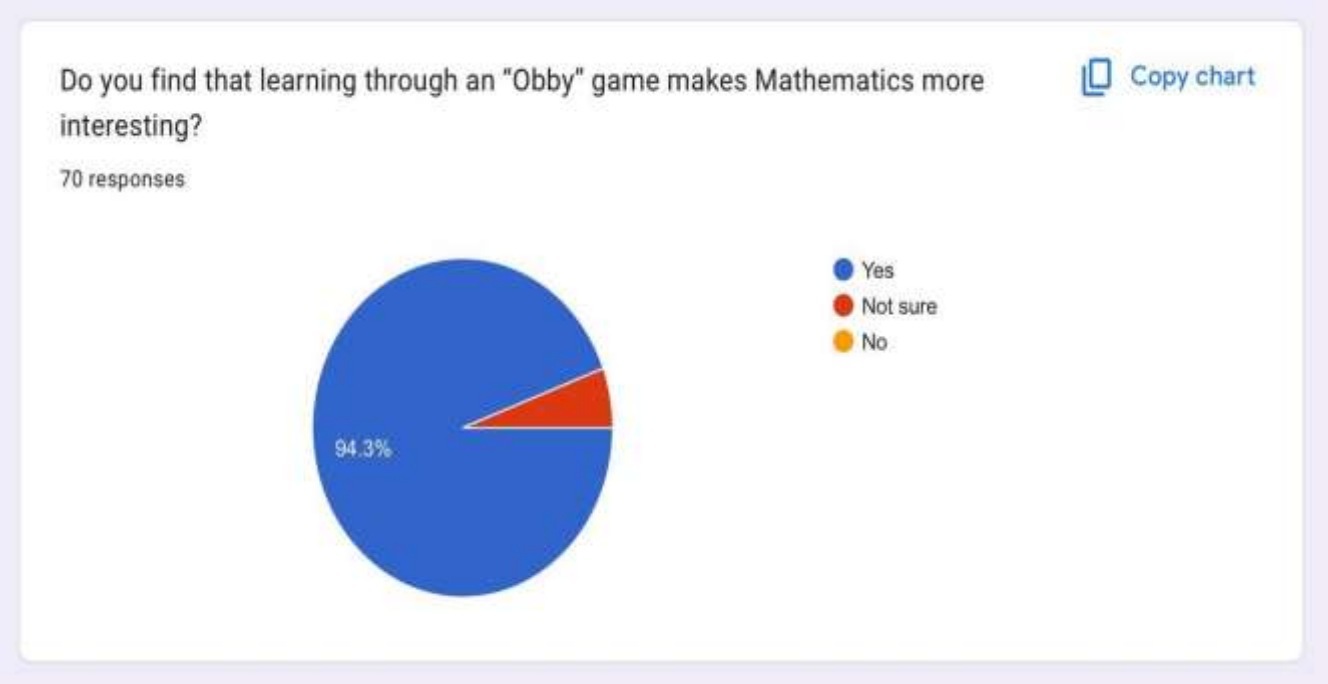


Figure 5: Students' learning experience

As shown in Figure 5, the survey results indicate a significant positive shift in student interest toward Mathematics. An overwhelming 94.3% of the 70 participants agreed that the 'Obby' format makes learning Mathematics more interesting. Notably, 0% of respondents dismissed the method, while a small minority remained undecided. These findings demonstrate that 'Tower of Differentiation' serves as a highly effective gamification tool, successfully transforming complex academic topics into an engaging and interactive experience. However, the finding should be described as increased perceived interest rather than a statistically

demonstrated shift in interest because the study did not measure interest before gameplay or use a control group. From a theoretical perspective, the result is consistent with Flow Theory, in which clear goals, challenge, feedback, and an appropriate level of difficulty can support engagement (Kiili et al., 2012).

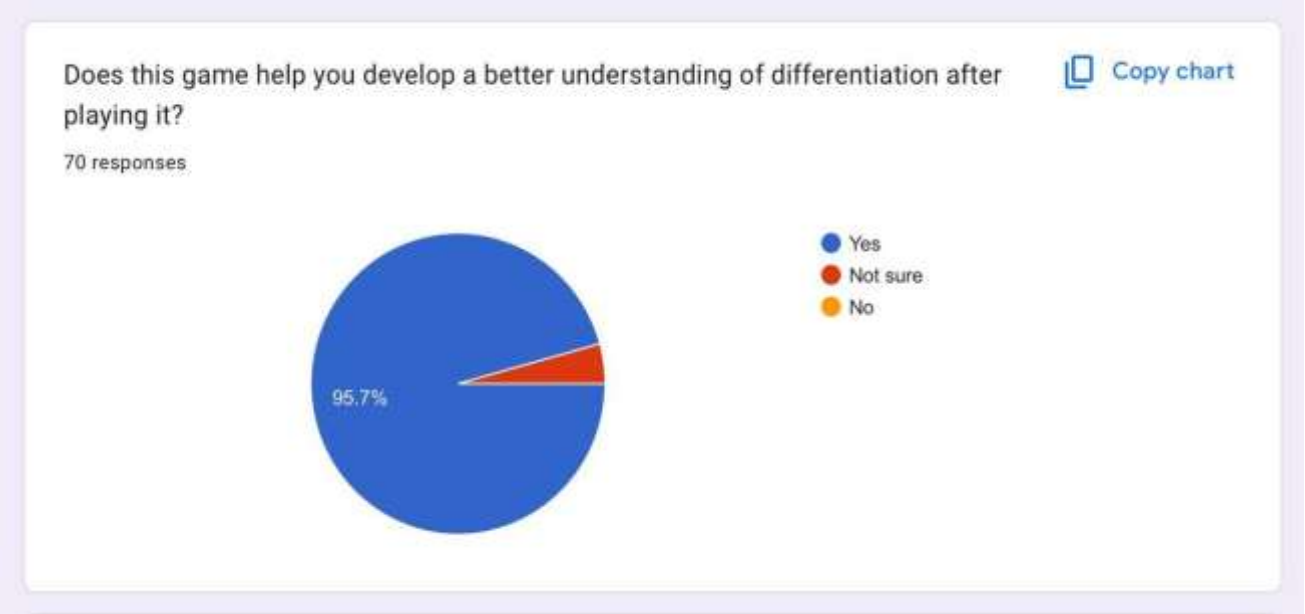


Figure 6: Students' understanding

The most significant result of this study is the game's impact on student comprehension. In Figure 6, an overwhelming 95.7% of respondents stated that the game helped them develop a better understanding of differentiation. This high success rate indicates that the integration of interactive obstacles with calculus problems facilitates a more effective learning environment than traditional methods alone. Even among the other 4.3%, there was no complete rejection of the instruction quality.

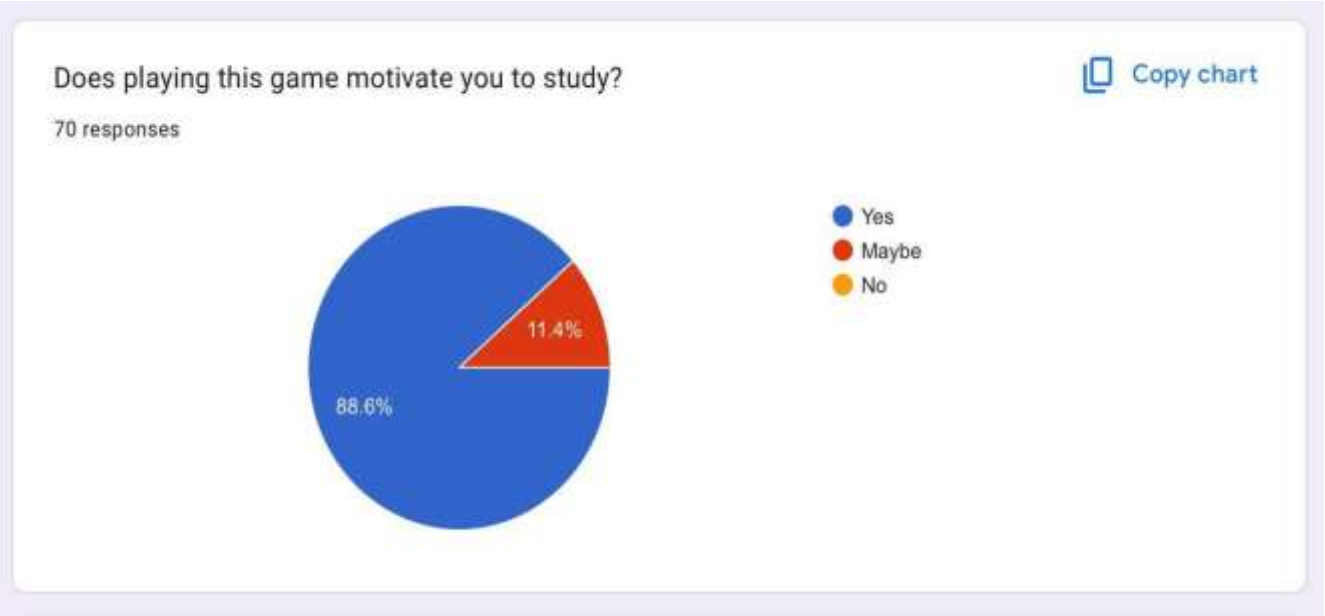


Figure 7: Students' motivations

From Figure 7, 88.6% of participants reported that playing 'Tower of Differentiation' motivated them to study further. This positive psychological impact is crucial for subjects like mathematics, which students often find intimidating. By providing a reward like an obby experience, the game successfully connects entertainment and academic discipline, ensuring that students remain engaged with the curriculum. This result suggests a positive motivational perception among participants. Particularly through chances to experience competence

and autonomy, the game's multiplayer elements, challenges, rewards, and staged growth offer tenable motivating mechanisms aligned with Self-Determination Theory (Ryan & Deci, 2000). However, the results should not be taken as clear proof that particular psychological requirements were met because the survey was not a validated SDT measure.

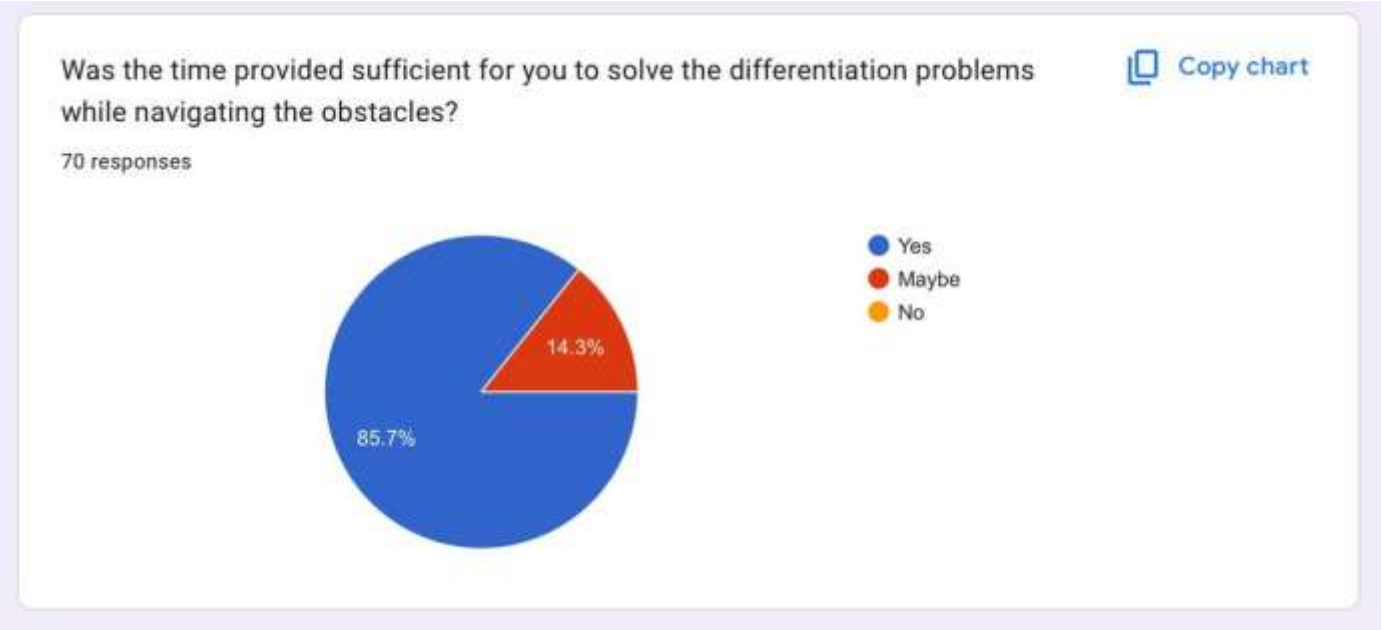


Figure 8: Timing of the game

As shown in Figure 8, about 85.7% of players reported that the time provided was sufficient for them to solve the differentiation problems while navigating the obstacles, while 14.3% of players found the time to be maybe not sufficient or insufficient. The remaining responses suggest that timing should be flexible since different learners may have different cognitive demands when solving mathematics problems while overcoming difficulties.

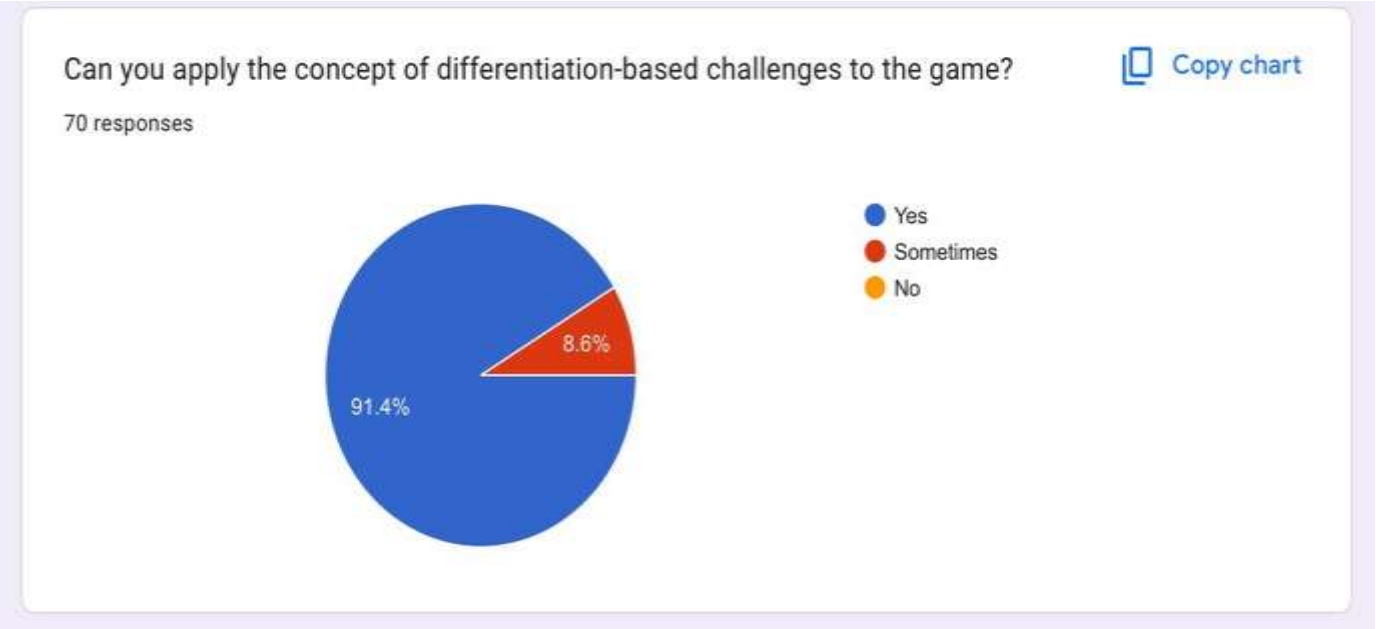


Figure 9: Concept challenges in the game

A significant majority of 91.4% of players stated that they can use the concept of differentiation-based challenges in the game, while 8.6% of players responded that there is a question about whether they can use the concept or not at all, as shown in Figure 9.

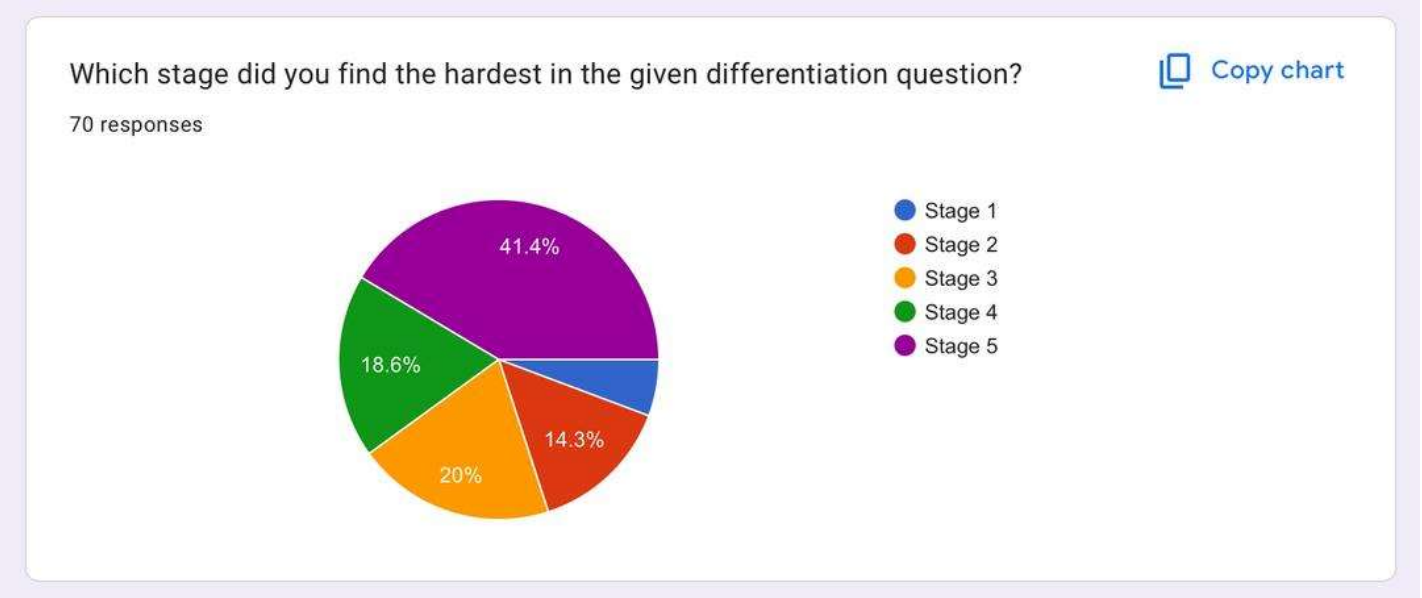


Figure 10: Level of difficulty of stages

Based on the data collected as shown in Figure 10, stage 5 was considered the hardest stage by approximately 41.4% of respondents, followed by stage 4 at 18.6%, stage 3 at 20%, stage 2 at 14.3% and stage 1 at 5.7%. The proposed scaffolded-difficulty design, which includes increasingly complex differentiation criteria in later phases, is generally compatible with this concept. The outcome also demonstrates the necessity of keeping an eye on the challenge-skill balance to ensure that rising difficulty does not become unnecessarily frustrating.

The development of “Tower of Differentiation” demonstrates the feasibility of integrating differentiation problems with a Roblox-based obstacle-course game for pre-university mathematics. The five-stage structure provides a scaffolded progression from foundational differentiation rules to more advanced rules, while checkpoints, obstacles, rewards, and multiplayer interaction provide opportunities for challenge and engagement. The preliminary survey showed positive perceptions of the game: most participants reported that the format was captivating, that the mathematical questions were clear, that the game supported their perceived understanding, and that it motivated them to study further. These findings are consistent with the engagement mechanisms described by flow theory and the motivational considerations of self-determination theory, while the design refinements also reflect concerns from cognitive load theory. However, the findings should not be interpreted as proof that the game improves mathematical achievement. The present evaluation was descriptive, relied on self-reported perceptions, and did not include a pre-test, post-test, control group, or inferential statistical analysis. Stronger follow-up study should use a quasi-experimental or experimental design, compare game-based learning with conventional instruction, administer objective differentiation tests before and after the intervention, use validated measures of motivation and engagement, establish instrument reliability, and report appropriate statistical tests and effect sizes. Future study should provide stronger evidence of the game's educational effectiveness and determine whether its engaging features translate into measurable improvements in students' differentiation skills.

Challenges and Solutions

During the development and upgrade process of the game "Tower of Differentiation", several challenges and solutions were encountered throughout all the stages. Firstly, one challenge was that the questions sometimes did not appear. This caused players to be unable to see the questions because, at the beginning of the coding, it was set to allow only one player at a time to view them. As a result, the questions would not pop up until that one player had completed all the stages. The solution to this problem was to recode the system and continuously test the game until it functioned properly. Next, the Mathematics questions such as $y = 5x^6$ and $\frac{dy}{dx}$ did not appear professional in Roblox because the power symbol of "^" is not suitable for this type of game. It could confuse players and make it harder for them to understand the questions. The solution to this challenge was to use superscript formatting to represent powers. For example, instead of writing $y = 5x^6$, superscript

formatting was used to display it as $y = 5x^6$.

Other than that, obstacles included a lava section, a shattered glass step, moving platforms, a narrow beam, and a blinking laser, which are also challenges faced during the game. The lava section is a molten floor hazard where players will be eliminated instantly upon contact. The solution is that players require a series of precise jumps to clear the gaps. Next, the shattered glass step presents a deceptive climbing challenge consisting of a series of double-path steps, and the solution to this challenge is that players must choose between the left or right path, since one of them is a fake stair that players will fall through. This requires a leap of faith to find the solid and correct route. Moreover, the moving platforms create a two-part transit challenge featuring a set of horizontal platforms and a diagonal lift. Players must perfectly and carefully time their movement between these dynamic surfaces during their brief pauses. Furthermore, the narrow beam is a thin-layer path that demands absolute focus. Players need to maintain balance while crossing, as any slight deviation can cause them to fall. Finally, the blinking laser is a laser beam that cycles between a safe inactive state and a deadly active state. The solution to this challenge is that players need to time their movement during the one-second window of safety. Failure to do so will result in elimination. To enhance the Tower of Differentiation project, technical issues such as bugs and input problems should be fixed to ensure smooth gameplay. The game should be optimised for mobile devices by adjusting screen layout, button size, and controls. This ensures players using phones can play comfortably without blocked views, screen limitations or typing issues. Next, reducing advertisement interruptions and improving mobile compatibility will create a better user experience. This will help make the gameplay smoother and less frustrating, as frequent ads can disrupt players' focus and break the flow of the game.

RECOMMENDATION FOR FUTURE ENHANCEMENT OF THE GAME

To further improve the effectiveness of the 'Tower of Differentiation' game, several enhancements can be considered for future development. Firstly, more stages can be added, featuring a wider variety of obstacles to increase engagement and progressively challenge players. Increasing the number of stages will also allow for more questions, providing students with greater opportunities for practice and reinforcing their understanding of differentiation. The inclusion of a "hardest stage" or final boss level would provide a sense of achievement and motivation for students to apply their differentiation skills at a higher level. In addition, incorporating a wider range of question difficulty, from basic to advanced, can better support students with different levels of understanding. This would help strengthen their conceptual grasp of differentiation while allowing gradual improvement through practice. Moreover, the game can be enhanced by adding more fun and visually appealing decorations, such as themed environments, animations, and interactive elements. Creating a more exciting and immersive atmosphere will make the learning experience more enjoyable and encourage sustained participation. Finally, integrating sound effects, rewards, and feedback systems such as points, badges, or hints can further motivate students and provide instant reinforcement of learning. These improvements will not only make the game more engaging but also enhance its effectiveness as an educational tool for mastering differentiation concepts.

LIMITATIONS OF THE STUDY

Several limitations should be considered when interpreting the findings. First, the study used a single post-game survey without a control or comparison group. Consequently, internal validity is limited because changes in perceptions cannot be separated from selection effects, prior experience, or other experiences occurring around the testing period. Secondly, the study measured self-reported perceptions rather than objective learning gains. This creates a construct-validity limitation because perceived understanding and motivation do not equate to demonstrated knowledge differentiation or transfer. Third, the survey instrument was developed for the project, and its reliability and validity were not established; therefore, Cronbach's alpha or other reliability coefficients cannot be reported for the existing dataset. Fourth, the results are descriptive percentages only. Without individual-level pre- and post-data or a comparison group, inferential tests and effect sizes cannot appropriately be used to establish causal effectiveness. Finally, the evaluation was conducted in one specific game and educational context, so the findings should be regarded as preliminary evidence of user experience rather than broadly generalisable evidence of educational effectiveness.

CONCLUSION

The development of this Roblox-based mathematics game successfully achieved its primary objective. One of these is bridging the gap between abstract calculus theory and interactive application. By integrating differentiation concepts into a high-stakes, time-constrained environment, the project effectively fostered critical thinking and strategic planning among players. Not only that, the game-based methodology proved to be a viable tool for enhancing problem-solving skills, as users were required to analyse mathematical problems rapidly to make effective decisions within the game's progression. Ultimately, this project demonstrates that immersive platforms like Roblox can significantly enhance the understanding of complex mathematical disciplines through engagement and active participation.

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