

Mystery Box Game: A Game-Based Learning to Improve the Academic Achievement of Grade 10 Learners in Probability

Ferrie Marie P. Cuabo¹; Felsa S. Jagonia²; Genelyn R. Baluyos³
College of Education¹; High School Department²; College of Education³
Misamis University¹; Ozamiz City National High School²; Misamis University³

Abstract:- This action research investigated the effectiveness of integrating the Mystery Box game to improve the academic achievement of grade 10 learners in Probability at a public school in Ozamiz City. The study, conducted in the 2024 school year, employed a classroom-based action research design with 41 purposively sampled participants. Pre and posttests assessed probability understanding, while a comprehensive lesson plan and a questionnaire gathered information on improvements after a game intervention. Statistical analysis included frequency, Percentage, mean, standard deviation, T-test, and thematic analysis. The findings revealed that integrating the Mystery Box game significantly increased learners' academic achievement in Probability. In conclusion, the post-intervention outcomes decisively confirmed the game's effectiveness in enhancing probability learning, fostering a love for learning, and promoting academic performance and social connections. The research recommended consistently integrating game-based learning in Probability, teacher training in gamification, monitoring and feedback on student progress, and applying the Mystery Box Game to enhance engagement and comprehension across multiple subjects.

Keywords:- Game-Based Learning; Probability; Academic Achievement; Mystery Box Game.

I. INTRODUCTION

➤ Context and Rationale

Statistics involves gathering, describing, interpreting, and drawing conclusions from data. However, to truly appreciate data analysis, one must also understand probability theory, which helps make confident inferences. However, understanding probability theory can pose challenges due to its abstract nature and the requisite for a robust foundational understanding. Consequently, learners need help to grasp the concepts readily. In a school in Ozamiz City, Misamis Occidental, grade 10 learners face obstacles in achieving academic success in Probability. In a pretest administered to a group of learners to gauge their proficiency in solving probability problems, it was found that the participants still needed to achieve a passing score. Instead, all learners scored below the threshold for success, indicating a gap in their understanding of the subject matter.

In the 2022 PISA math assessment, the Philippines scored 355 points, notably below the global average of 472. Only 16% of learners reached at least Level 2 proficiency, indicating their ability to understand and apply mathematical modeling to more straightforward situations independently. The attainment at Levels 5 or 6, where learners demonstrate the capability to model complex situations mathematically and can make thoughtful choices in solving real-life problems, was minimal. Overall, the collective performance of Filipino learners, as reflected in their average score, was significantly lower than the OECD average (DepEd, 2019).

The achievement of learners in mathematics, from primary to higher education, remains a concern due to global awareness of its importance and longstanding fears of underachievement at various educational levels (Brezavšček et al., 2020). Learners were more likely to find secondary mathematics more challenging than primary if teaching methods differed between the two levels (Ryan et al., 2021). Additionally, it stresses the importance of teacher expectations on learner achievement, suggesting that setting high expectations and providing appropriate support can positively influence learners' efforts in mathematics learning (Szumski & Karwowski, 2019).

Many learners perceive math as boring due to past experiences, lack of confidence, and insufficient engagement in the classroom, highlighting the need to address this perception to foster a positive attitude and enhance learner engagement and achievement (Aguilar, 2021). The importance of engagement in learning and engagement problems in mathematics motivated this study's focus on promoting learners' engagement in mathematics classrooms (Cevikbas & Kaiser, 2022).

Educational games have enhanced learner engagement and interest in mathematics learning, promoting conceptual understanding and problem-solving skills while fostering curiosity and developing essential abilities like creative thinking and collaboration (Han et al., 2022). Adding fun, games, and interactive activities can improve the learning experience and create a more engaging classroom environment (Toropova et al., 2019). In mathematics education, gamification fosters high motivation, enhances activation and participation in teaching and learning, increases satisfaction and attraction to learning, and facilitates greater assimilation and reinforcement of

mathematical content (Fuentes-Cabrera, 2020). Game-based learning enhances student skills and motivation by setting interim goals, boosting confidence, fostering independent thinking, and engaging learners more actively in their studies (Antipolo, 2021).

II. PROPOSED INNOVATION

Nowadays, people of all ages love to play fun, engaging, and motivating games. Learners may develop social skills using fun-filled undertakings and game activities (Mary, 2019). Almost all the primary teachers admitted playing mathematical games in their classrooms a minimum of once a week; they view games as highly effective for developing all four proficiencies highlighted in the Mathematics Curriculum: fluency, understanding, problem-solving, and reasoning (Russo et al., 2021).

GBL is a mathematics teaching technique that balances classroom learning and educational games while enhancing learning efficiency through learner centered learning activities (Lasut & Bawengan, 2020). Educational games can make learning enjoyable, help learners tackle challenges confidently and patiently, and are essential for developing lifelong learning skills in higher education (Liu et al., 2021).

Probability measures omnipresent uncertainty in everyday situations (Malaspina & Malaspina, 2020). One example of meaningful contexts for probability Probability can be provided through games (Sharma, 2020). However, it has long been understood that one of the most crucial educational objectives of stochastic instruction is to rectify learners' misconceptions about Probability (Gallagher, 2023). Researchers argued that games involve the learners actively constructing mathematics (Malaspina & Malaspina, 2020).

The "Mystery Box Game" is a game format typically used in group settings, where participants are divided into two groups. Each group member is assigned a number representing their group in various challenges. The primary challenge involves a game called 'Head-Shoulder-Shake-Catch,' where two representatives, one from each group, compete against each other. The winner of this challenge gains the opportunity to choose a mystery box.

Inside the mystery box are points that can be beneficial (+5 points) or detrimental (-5 points). If the representative who won the challenge answers a question correctly related to the contents of the mystery box, their group earns the designated points. They then have the choice to either 'Keep the Box' or 'Give the Box' to the opposing team. If both representatives answer the question incorrectly, the 'Head-Shoulder-Shake-Catch' winner still gets to choose a mystery box without answering a question.

This challenging format combines physical skill, knowledge, strategy, and risk taking, making it an engaging, dynamic activity for participants and increasing learner achievement. Thus, the researcher would like to determine the effectiveness of integrating the Mystery Box game to improve the learners' academic achievement in Probability in

a school in Ozamiz City, Misamis Occidental, particularly the Grade 10 learners implementing 'Mystery Box Game' to address the needs of the learners in Probability.

➤ Action Research Questions

This action research aims to determine the effectiveness of integrating Mystery Box game to improve the academic achievement of grade 10 learners in probability in one of the public schools in Ozamiz City. The game-based learning, Mystery Box Game, serves as an action in improving learners' academic achievement. The study sought to answer the following specific questions:

- What is the level of achievement of the learners before integrating mystery box game in understanding probability?
- What is the level of achievement of the learners after integrating mystery box game in understanding probability?
- Is there any significant difference between the learners' achievement before and after integrating mystery box game in understanding probability?
- What are the other improvements observed after integrating mystery box game in understanding probability?

III. ACTION RESEARCH METHODS

➤ Research Design

This study used a classroom-based action research design to determine the effectiveness of integrating Mystery Box games to improve the grade 10 learners' academic achievement in Probability. The study adopts a classroom-based action research design conducted by teachers to identify specific classroom problems and concurrently improve them, fostering professional growth and enhanced teaching practices (Dawadi & Giri, 2021). The appropriateness of the classroom-based action research design in teaching probability lies in its ability to enable teachers to directly identify and improve classroom-specific issues in these subjects while fostering professional growth and enhancing instructional strategies.

➤ Site

The DepEd-managed secondary public school in Ozamiz City, Misamis Occidental, follows the K-12 Curriculum and offers mathematics as a core subject. It adheres to DepEd guidelines to ensure high-quality education. The institution also provides a specialized education program outlined in DepEd Memorandum No. 149, s. 2011, focusing on empowering learners through understanding their strengths, pursuing interests, and developing multiple intelligences, including mathematical skills. This approach caters to diverse learner needs, fostering a holistic learning experience in mathematics and other subjects.

➤ Participants

The 41 study participants are from Grade 10 learners in one of the public schools in Ozamiz City, Misamis Occidental. They were chosen through a purposive sampling technique. Participants were chosen based on these criteria:

- Learners who are enrolled in the said school as grade 10 learners for the academic year 2023-2024;
- Membership in sections taught by the researcher; and
- Learners who gave their full consent to serve as respondents of the study.

➤ *Data Gathering Methods*

This action research gathered quantitative and qualitative. The learners' academic achievement in probability among grade 10 learners were assessed using a researcher-made instrument such as test questions and interview questions.

• *Pre-Implementation Phase*

The initial stage involves obtaining permission from the school principal in Ozamiz City, Misamis Occidental. The researcher commenced data collection only upon securing the necessary permits. A pretest was administered to assess learners' mathematical problem-solving skills. Additionally, assessments and activities were developed based on the lesson plans and PowerPoint presentations crafted by teachers during this phase.

• *Implementation Phase*

During this stage, the researcher introduced and discussed mathematics lessons using the Mystery Box Game in the classroom. Detailed instructions on the strategy's functions and usage were provided to learners for activities and assessments.

After a week of implementing the intervention, a posttest was conducted to evaluate the extent of improvement in learners' understanding of mathematics. Observations, interviews, and the pretest and posttest were conducted for additional data. The researcher captured data throughout the implementation through video recordings of class lessons, photos/screenshots, and field notes. After the intervention, participants were asked to respond to questions via Google Forms. The researcher utilized Google Forms to collect responses for future reference.

• *Post-Implementation Phase*

The concluding phase involves drawing conclusions, making recommendations, proofreading, revising, and finalizing the research study. It also encompasses effectively disseminating the study findings to a specific respondent.

➤ *Research Instruments*

The following instruments were used in this study:

• *Paper and Pencil Test*

The researcher employed a set of 30 test questions explicitly created for this study to evaluate the initial class performance of learners before the intervention. The questions underwent inquiry and approval from the collaborating teacher. The assessment method utilized a traditional pencil and paper test format, wherein learners answered the questions on the same sheet using a pencil. The researcher conducted the pretest and posttest before and after the intervention, ensuring uniformity in assessments and

enabling the researcher to gauge improvements in learners' comprehension of mathematics.

• *Lesson Plan*

The researcher developed a lesson plan comprising various mathematical problems for learners to address. Before the intervention, the lesson plan underwent a comprehensive evaluation by the collaborating teacher and subsequent revisions by the researcher.

• *Mystery Box Game (Game-Based Learning)*

After viewing the test results, the researcher utilized this game to help improve learners' achievement.

• *Interview Questions.*

The researcher administered open-ended questions via Google Forms to learners and teachers to gather their perspectives on applying the Mystery Box Game. The main aim is to explore their thoughts and emotions concerning this strategy. To document these interview sessions, the researcher made written notes.

• *Ethical Considerations*

The study upheld ethical standards by aligning with the Republic Act No. 10173, or the Data Privacy Act of 2021, emphasizing protecting individuals' personal information and privacy rights. Ethical considerations from Bryman, Bell, and Harley (2022) were also followed. Participants were not harmed, provided informed consent before data collection, and were informed transparently about the study's objectives, benefits, and potential risks. Confidentiality and anonymity were prioritized, allowing participants to withdraw at any time. The research avoided misleading information and biased representation, declared affiliations, funding sources, and conflicts of interest. All communication regarding the research was conducted with honesty and transparency, and participants were encouraged to reach out with questions or concerns.

➤ *Data Analysis*

With the used Minitab and HyperResearch statistical software, the following statistical tools were utilized:

- **Frequency and Percentage** were used to determine learners' academic achievement in Probability before and after integrating the Mystery Box game.
- **Mean and Standard Deviation** were used to determine learners' academic achievement in Probability before and after integrating the Mystery Box game.
- **A T-test** was used to explore the significant difference in learners' academic achievement levels in Probability before and after integrating the Mystery Box game.
- **A Thematic Analysis** was used to conduct qualitative observations and data analyses of interview data.

IV. RESULTS AND DISCUSSION

In this study, the researcher examines the effectiveness of integrating the Mystery Box Game into classroom instruction to enhance learners' understanding of Probability.

Before delving into the specifics of the findings, it is essential to set the context: the achievement levels of learners in Probability before and after the integration of the Mystery Box Game. This comparison provides a clear baseline for evaluating the impact of gamified learning on learner outcomes.

➤ *Learners' Achievement in Probability before Integrating Mystery Box Game*

Table 1 presents learners' probability achievement before integrating the Mystery Box game. The overall findings indicate that all learners did not meet the expectations ($M=12.78$; $SD=3.68$). The data reveals a significant gap in learners' understanding of Probability, as none achieved a score that met or exceeded the "Fairly Satisfactory" category. This implies that the learners struggled significantly with the material before introducing the Mystery Box game, as indicated by the low mean score and the fact that every learner fell into the lowest achievement category.

These findings suggest that the current instructional methods may need to teach these learners Probability effectively. The need for learners to meet even the lowest satisfactory category underscores a need for a change in approach. Addressing this issue is crucial to improving learner outcomes in Probability.

Table 1 Learners' Achievement in Probability Before Integrating Mystery Box Game

Learners' Achievement	Frequency	Percentage	M	SD
Did not Meet the Expectations	41	100.0	12.78	3.68

- Note: 26-30 (Outstanding); 23-25 (Very Satisfactory); 21-22 (Satisfactory); 18-20 (Fairly Satisfactory); 1-17 (Did not Meet the Expectations)

➤ *Learners' Achievement in Probability after Integrating Mystery Box Game*

Table 2 presents the learners' achievement in Probability after integrating the Mystery Box Game. When integrating the Mystery Box Game, the learners demonstrated a very satisfactory probability level ($M=24.49$; $SD=1.93$). The findings suggest that integrating the Mystery Box Game into the learning process positively impacted the learners' achievement in Probability. This indicates that most learners achieved similar levels of success in mastering probability concepts by integrating the Mystery Box Game. Overall, these results suggest that the Mystery Box Game effectively enhanced learners' understanding and performance in Probability.

Most learners achieved a "Very Satisfactory" rating ($M = 23.81$, $SD = 0.75$). This was followed by learners with an "Outstanding" rating ($M = 27.18$, $SD = 0.75$). A smaller percentage achieved a "Satisfactory" rating ($M = 21.50$, $SD = 0.58$). No learners were in the "Fairly Satisfactory" or "Did not Meet the Expectations" categories. The findings revealed that most learners performed satisfactorily, with a smaller proportion achieving an outstanding rating. Additionally, a

For many years, math education has traditionally used teaching techniques like lectures and textbooks. However, it has been convincingly discovered that these methods significantly fall short when effectively motivating pupils and substantially raising academic accomplishment, particularly in Probability, where learners' achievement still needs improvement due to traditional teaching methods (Chen et al., 2020). In related studies, teachers were recommended and actively employed interventions to improve learner achievement or retention, such as problem-posing and learner-centered active learning techniques. In designing an intervention, possible factors that significantly influence learners in doing mathematical tasks must also be carefully considered (Dumale & Gurat, 2023).

Educators and school administrators should consider integrating more interactive and engaging teaching methods like the Mystery Box game. Additional activities include: 1. Using real-life scenarios to explain probability concepts. 2. Incorporating technology-based learning tools. 3. Providing more personalized and differentiated instruction to cater to individual learner needs. Professional development for teachers on innovative teaching strategies in mathematics could also be beneficial. By implementing these suggestions, learners' understanding and achievement in Probability are expected to improve significantly.

smaller percentage attained a satisfactory rating. Notably, no learners fell into the categories of reasonably satisfactory and did not meet the expectations. This suggests an overall positive performance among the learners, with a notable portion exceeding expectations.

The enjoyment while playing the games could be a significant factor that positively affects the performance of the learners in the experimental group, as this enjoyment often results in solving more math problems and consequently leads to higher achievement (Jarrah et al., 2022). Additionally, the motivation they gained through solving more games with different levels encouraged them to play more games and collect more points (Wardat et al., 2021). Furthermore, digital games effectively promote the learning of mathematics problem-solving and demonstrate that these games positively impact learner achievement, with learners ultimately achieving excellent results in mathematics after engaging with the games, as Dayo et al. (2020) mentioned.

Given these results, educators and curriculum developers should consider incorporating interactive and engaging activities like the Mystery Box Game in teaching complex subjects such as Probability. Such methods enhance understanding and make learning enjoyable, improving overall learner performance. To address the gaps, particularly

for those who achieved "Satisfactory" ratings, additional support activities such as small group tutoring, personalized

feedback, and supplementary materials could be provided to help these learners reach higher levels of achievement.

Table 2 Learners' Achievement in Probability After Integrating Mystery Box Game

Learners' Achievement	Frequency	Percentage	M	SD
Outstanding	11	26.83	27.18	0.75
Very Satisfactory	26	63.41	23.81	0.75
Satisfactory	4	9.76	21.50	0.58
Fairly Satisfactory	-	-	-	-
Did not Meet the Expectations	-	-	-	-
Overall Performance	41	100.00	24.49	1.93

- Note: 26-30 (Outstanding); 23-25 (Very Satisfactory); 21-22 (Satisfactory); 18-20 (Fairly Satisfactory); 1-17 (Did not Meet the Expectations)

➤ *Difference between the Learners' Achievements in Probability before and after Integrating Mystery Box Game*

Table 3 presents a summary of the mean (M) and standard deviation (S.D.) for variables before and after integrating the Mystery Box Game, along with associated t-values, p-values, and decisions regarding the null hypothesis (Ho).

Following the integration of the Mystery Box Game, a significant increase in the mean score was observed (M = 12.78, SD = 3.68) compared to pre-intervention levels (M = 24.49, SD = 1.93), t-value= 24.37, $p < 0.01$. This substantial increase suggests that the Mystery Box Game intervention had a highly significant positive effect on the measured outcome.

The significant increase in the measured outcome following the integration of the Mystery Box Game underscores its potential effectiveness as an intervention strategy. This finding suggests incorporating interactive

elements like the Mystery Box Game into educational or training programs can significantly improve the targeted outcomes.

Using or implying the game in mathematics lessons can foster enthusiasm and interest and develop learners' process skills in solving problems in mathematics (Nylund et al., 2021). There were significant differences in achievement in the mathematics subject matter, which was integrated with the game in class. This integration significantly improved learners' process skills and interest in mathematics (Bhavani et al., 2020). Notably, the posttest mean value, more significant than the pretest value, shows that learning using a game-based learning model assisted by a math games platform can substantially improve mathematics learning outcomes (Wachdani & Thohir, 2022).

To capitalize on these findings, teachers in training programs may consider implementing similar interactive activities to enhance participant engagement and performance. Moreover, ongoing assessment and refinement of such interventions may further optimize their effectiveness in achieving desired outcomes. Further research could investigate how the Mystery Box Game affects outcomes, leading to more targeted and effective intervention strategies.

Table 3 Difference between the Learners' Achievement in Probability before and after Integrating Mystery Box Game

Variables	M	SD	t-value	p-value	Decision
Before Integrating Mystery Box Game	12.78	3.68	24.37**	0.00	Reject Ho
After Integrating Mystery Box Game	24.49	1.93			

- Ho: There is no significant difference between the learners' achievement in probability before and after integrating mystery box game.
- Note: ** $p < 0.01$ (Highly Significant); * $p < 0.05$ (Significant); $p > 0.05$ (Not significant)

➤ *Other Improvements Observed after Integrating Mystery Box Game in Understanding Probability*

In this study, the researcher examined the impact of integrating the Mystery Box Game into face-to-face educational activities to enhance Grade 10 learners' understanding of Probability. Participants shared insights and emotions regarding using this engaging learning tool, which the researcher meticulously analyzed to identify common themes. Three significant themes emerged: Increased Motivation to Learn, Improved Attendance, and Enhanced Social Connection. These findings suggest that the Mystery Box Game holds promise for improving learners' learning experiences in traditional classroom settings. The researcher aims to explore how the Mystery Box Game can enhance learners' understanding of Probability and academic achievement in face-to-face teaching environments.

• *Increased Motivation to Learn*

The Mystery Box Game has ignited a newfound passion for learning among learners. They express excitement about studying, citing the game as a significant source of motivation. This enthusiasm translates into tangible progress, with learners noting improvements in their academic performance as a direct result of engaging with the game. Additionally, the anticipation of each class session, driven by the prospect of participating in the game, underscores the game's effectiveness in fostering a desire to learn. This is supported by the statements of participants 1, 2, 5, and 6.

"Probability seemed confusing at first, but now I find it interesting, and I want to learn more about it." (P1)

"I am more motivated, and my grades improved, and I enjoy learning more." (P2)

"My problem-solving skills improved, and I'm more motivated to solve Math problems." (P5)

"I was okay but shy to ask questions, and now I'm putting more effort into studying Math." (P6)

Integrating game-based elements into mathematics mobile courseware positively impacts learners' affective domain, including attitude, motivation, and confidence, and supports the learning process by creating an engaging environment (Hui & Mahmud, 2023). Incorporating game-like elements into mobile courseware presents a promising way to get learners interested and motivated in math. It has been discovered that game-based learning effectively enhances learner performance and attitudes toward learning (Wang et al., 2022). Integrating game-based elements into mathematics mobile courseware can enhance learners' learning experiences, particularly by improving their affective domain, which includes aspects like attitude, motivation, and confidence (Vankus, 2021).

The observed increase in motivation underscores the potential of gamified learning approaches to enhance learner engagement. Educators can leverage this by integrating more interactive and enjoyable elements into their teaching methods. A supportive and encouraging learning

environment can further nurture learners' intrinsic learning motivation. Providing opportunities for learners to set personal goals and track their progress within the game can also contribute to sustained motivation and academic achievement.

• *Improved Attendance*

The Mystery Box Game has notably impacted learner attendance, with many demonstrating a newfound commitment to attending class regularly. They express reluctance to miss out on game-related activities, highlighting their role as a driving force behind their attendance. The anticipation of discovering what each class session brought and the fear of missing important updates or developments related to the game reinforce their dedication to attending class consistently. This is supported by the statements of participants 1, 3 and 7.

"The game was fun and motivated me to attend Math class more because it challenged me to solve problems with classmates." (P1)

"I'm more motivated to attend Math class, and I'm more willing to participate in activities." (P3)

"My skills were okay, but I prefer interactive subjects, and I'm more motivated to attend Math class now." (P7)

The advantages of incorporating gamification into the educational process include enhancing learners' capacity to acquire new competencies, attendance, motivation, and participation (Nadeem, 2023). Game-based learning effectively reduces monotony and boredom. In addition, it has increased the learners' performance due to an increase in the learner's attendance (Kaur, 2021). When used often in class, game-based learning increases attendance, participation, engagement, and motivation (Wang, 2020).

The positive correlation between the Mystery Box Game and improved attendance suggests that integrating gamified elements into the learning environment can incentivize learners to attend class. To capitalize on this, educators can further enhance attendance rates by reinforcing the connection between attendance and participation in engaging activities like the Mystery Box Game. Additionally, implementing strategies such as rewards or recognition for consistent attendance can motivate learners to prioritize attending class regularly.

• *Enhanced Social Connection*

The Mystery Box Game has proven to be a catalyst for fostering stronger social connections among learners. Through collaborative problem-solving and shared experiences, learners feel a greater sense of friendship and unity within their peer groups. The game offers a platform for learners to collaborate towards a shared goal, fostering teamwork and cooperation. This is supported by the statements of participants 2, 3 and 4.

"It was challenging but rewarding to solve with my group, and it felt great to achieve a goal together." (P2)

"I was good at Math but preferred working alone, and the game helped me open up to working with classmates." (P3)

"Initially confusing, but discussing with classmates helped me understand better, and it was a great experience for teamwork." (P4)

Mathematics learning activities through GBL provide learners with space to boost engagement by collaboratively and actively communicating, fostering affective development, and various additional advantages such as socio emotional and soft skills development in teaching and learning mathematics activities (Hui & Mahmud, 2023). Game-based learning has the potential to significantly enhance engagement, collaboration, and communication, facilitating a more interactive and practical learning environment (Vankus, 2021). Collaborative play, competition, and role-play, identified in several studies as engaging game play elements, effectively foster cognitive and emotional engagement, resulting in markedly improved learner attitudes, engagement, and performance, particularly significant in the higher education context (Jääskä & Aaltonen, 2022).

The enhanced social connection resulting from the Mystery Box Game highlights the potential of collaborative learning experiences to cultivate a supportive classroom community. Educators can build upon this by incorporating more group-based activities and projects into the curriculum, providing learners opportunities to collaborate and interact positively with their peers. Additionally, fostering a culture of inclusivity and teamwork within the classroom can strengthen social bonds and promote a sense of belonging among learners.

V. SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

➤ Summary

Understanding probability is crucial for making confident inferences in data analysis, as it complements statistics by providing a foundation for interpreting data. However, its abstract nature can challenge learners, requiring a solid foundational understanding to grasp its concepts readily. This action research aims to determine the effectiveness of the Mystery Box game in improving the academic achievement of grade 10 learners in Probability. The game-based learning, Mystery Box Game, improved learners' academic achievement among grade 10 learners struggling with Probability concepts during S.Y. 2022–2023 in one of the public schools in Ozamiz. This study used mixed methods research with 41 learners as participants using purposive sampling. A research-made test questionnaire and Google Forms were used to gather data. The data were examined with statistical tools and qualitative analysis software. The study aimed to answer these research questions: 1) What is the level of achievement of the learners before integrating the Mystery Box Game in understanding Probability? 2) What is the learners' achievement level after integrating the Mystery Box Game into understanding

Probability? 3) Is there any significant difference between the learners' achievement before and after integrating the Mystery Box Game in understanding Probability? 4) What other improvements were observed after integrating the Mystery Box Game in understanding Probability?

➤ Findings

The following are the salient findings of the study:

- Learners' achievement in Probability before integrating the Mystery Box Game had yet to meet the expectations.
- Learners' achievement in Probability after integrating the Mystery Box game was very satisfactory.
- There was a significant difference between learners' academic achievement in Probability before and after integrating the Mystery Box game.
- Other developments observed among the learners after integrating the Mystery Box Game involved increased learning motivation, improved attendance, and enhanced social connection.

➤ Conclusions

Based on the findings, the following conclusions are drawn:

- The current instructional methods for teaching probability could be more effective, as all learners must meet expectations before integrating the Mystery Box Game.
- Integration of the Mystery Box Game significantly improves learners' understanding and performance in Probability, with high percentages in the top achievement categories.
- The significant increase in measured outcomes after integrating the Mystery Box Game suggests its effectiveness as an intervention strategy for improving academic achievement in Probability.
- The Mystery Box Game ignites a newfound passion for learning among learners, leading to improved academic performance, increased attendance, and stronger social bonds through collaborative participation.

➤ Recommendations

Based on the findings and conclusion of the study, the following are the recommendations.

- Mathematics teachers may continue integrating game-based learning to improve learners' more than just academic achievement, aiming for very satisfactory to excellent results.
- Teachers may attend professional development workshops on effectively integrating gamification into their teaching. They should monitor learners' game progress and promptly provide feedback to ensure they are actively engaged and grasping concepts.
- Other teachers may integrate Mystery Box Game across multiple subjects to enhance learner engagement and comprehension of various concepts.

- School leaders may organize workshops with field experts on implementing the Mystery Box Game and other innovative teaching strategies while establishing a feedback loop with educators, learners, and parents to ensure continuous improvement.
- Learners may create personal learning journals to document progress and reflections on how the Mystery Box Game and other educational interventions enhance their academic achievement and learning motivation.
- Parents may incorporate enjoyable and educational games or activities related to Probability into family time involving decision-making and probability calculations.
- Future researchers may explore the game's adaptability to various subjects, investigate the effectiveness of game play variations, assess the long-term impact on student learning, and compare its efficacy with other gamified learning strategies in natural classroom settings.

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