

Problem-Based Instructions Through Tiktok App on the Learner's Motivation and Performance in Mathematics

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Abstract—This study aimed to determine the effect of problem-based instruction delivered via the TikTok application on learners' motivation and performance in Mathematics. Specifically, it assessed the level of problem-based instruction, learners' motivation and performance in mathematics, the significant relationship between problem-based instruction delivered through TikTok and learners' motivation, and the effect of problem-based instruction on learners' performance. The study employed a descriptive-correlational research design to determine the relationships and differences among variables. A total of 151 Grade 8 learners from San Pedro Relocation Center National High School served as the respondents of the study. Data were collected using a validated self-developed questionnaire and teacher-made tests ensuring reliability, accuracy, and relevance of findings. The results revealed that problem-based instruction delivered via the TikTok app was highly acceptable. Learners' motivation in Mathematics was also found to be extremely high. In addition, students performed better in the quarterly test than in the diagnostic test. The significant difference between these scores indicates an improvement in learners' mathematics performance. Moreover, a significant relationship was identified between problem-based instruction via TikTok and motivation, indicating increased engagement and a greater willingness to learn. However, no significant effect on learners' academic performance was observed, indicating that this instructional approach did not predict their overall achievement. There is a significant difference in the learners' performance in Mathematics, leading to the rejection of the null hypothesis, which concludes that learners' performance improved. There is also a significant relationship between problem-based instruction through the TikTok app and the learners' motivation, resulting in the rejection of the null hypothesis, which concludes that the instructional approach positively influenced learners' engagement in Mathematics. However, there is no significant effect of problem-based instruction through the TikTok app on learners' performance in Mathematics, leading to the acceptance of the null hypothesis, signifying that other factors influenced academic performance. It is recommended that teachers use TikTok-based problem-solving activities to improve engagement in Mathematics.

Keywords— Problem-based instruction, TikTok, learners' motivation, learners' performance, Mathematics.

I. INTRODUCTION

Social media has transformed the way the modern generation communicates and consumes information, and the TikTok App is now primarily used for entertainment and social interaction by most students. But recently, teachers have started using it as a learning tool too. Magbago (2025) explained that when TikTok videos are made with the lesson in mind, they can help students better understand math

because the topics are presented in short, easy ways. The Youth Policy Lab (2022) also shared that many "mathfluencers" are already teaching through TikTok, making math look less scary and more enjoyable for students.

Problem-based instruction (PBI) in mathematics can work well together with TikTok as a learning tool. Since PBI encourages students to solve real-life problems and apply concepts in practical situations, TikTok can serve as the medium for introducing these problems through short, engaging, and relatable videos. For example, instead of only solving textbook equations, students can be presented with problem scenarios in TikTok videos that connect math to their daily lives. This approach makes the lesson more interactive and enjoyable promoting critical thinking, collaboration, creativity, deeper understanding, and sustained learner engagement. Asmara, Ramadanti, and Jumri (2024) emphasized that problem-based learning helps strengthen students' mathematical skills and motivation, which means combining it with a platform like TikTok has strong potential to make learning more effective.

Motivation is one of the most important things in learning, and TikTok seems to play a role in this. Alfitri (2025) found that short, creative videos can motivate students to learn, especially when lessons connect to real life. She also said that students are already motivated to use TikTok for fun and self-expression, so teachers can leverage that by creating lessons that capture their interest and keep them focused on solving math problems.

Regarding performance, Nakiranda (2024) found that some students believe TikTok helps them with their studies, while others say it distracts them. Xie (2023) also warned that excessive time spent on short videos can negatively affect learning habits. But if TikTok is used carefully and only for learning tasks, it can improve performance by giving students guided practice in a fun and simple way. Thus, proper guidance and structured use are essential to maximize its benefits in learning.

This study focused on the learners of San Pedro Relocation Center National High School. Many of these students already have their own TikTok accounts and use the app regularly. Meltwater (2025) even reported that the Philippines is among the top countries for TikTok use, indicating that students are already very familiar with it. Because of this, it is worth investigating whether using TikTok for problem-based math lessons can really improve their motivation and performance in school.

1.1 Statement of the Problem

Problem/s which were addressed by the research

This study aimed to determine the effect of Problem-based instruction through the TikTok App on the learners' motivation and performance.

Specifically, it sought to answer the following research questions:

1. What is the level of Problem-Based Instruction through the TikTok App in terms of:
 - 1.1 Perceived Usefulness,
 - 1.2 Perceived Ease of Use, and
 - 1.3 Behavioral Intention?
2. What is the level of learners' motivation in Mathematics in terms of:
 - 2.1 Learners' Interest,
 - 2.2 Perceived Relevance,
 - 2.3 Activation of Prior Knowledge,
 - 2.4 Goal Orientation, and
 - 2.5 Self-Efficacy?
3. What is the level of the Learners' Performance in Mathematics in terms of:
 - 3.1 Diagnostic test and
 - 3.2 Quarterly test?
4. Is there a significant difference between Learners' Performance in Mathematics in terms of the Diagnostic Test and the Quarterly Test?
5. Is there a significant relationship between Problem-Based Instructions via the TikTok App and the Learners' Motivation in Mathematics?
6. Does Problem-Based Instructions through the TikTok App have a significant effect on the Learners' Performance in Mathematics?

II. METHODOLOGY

The study employed a descriptive-correlational research design to determine the relationships and differences among variables. A total of 151 Grade 8 learners from San Pedro Relocation Center National High School served as the respondents of the study. Data were collected using a validated self-developed questionnaire and teacher-made tests ensuring reliability, accuracy, and relevance of findings.

III. RESULTS AND DISCUSSION

This part presents, analyzes, and interprets the data collected, showing a significant difference in Learner's Performance in Mathematics, a significant relationship between Problem-based Instructions through TikTok App and Learner's Motivation in Mathematics, and a significant effect of Problem-Based Instructions through TikTok App on Learner's Performance in Mathematics.

Problem-based Instructions through TikTok App

In this study, the focus is on how teachers use TikTok as a platform to deliver problem-based lessons, making Mathematics more engaging, relatable, and interactive for learners. Through short and informative videos, teachers present mathematical problems, explanations, and demonstrations that help learners understand the concepts

more clearly. This method allows mathematical ideas to be presented visually and in an easy-to-follow way, which may increase students' interest and participation during the learning process. It also lets students review lessons anytime, anywhere to better understand them, reinforce key concepts, revisit challenging topics, and learn at their own pace.

Furthermore, using TikTok in problem-based instruction encourages learners to think critically about the problems presented rather than simply memorizing procedures. The short video format helps teachers break complex mathematical concepts into smaller, more manageable parts while keeping learners' attention. It also supports flexible learning, as students can watch the videos repeatedly, pause them when needed, and review the steps for solving the problems.

Table 1. Level of Perceived Usefulness of Problem-Based Instructions via TikTok App

STATEMENTS	MEAN	SD	REMARKS
Problem-based instructions on TikTok help me ...			
... helps me understand the clear goals of each mathematics lesson before we start the activities.	4.63	0.54	Strongly Agree
...allows me to complete the games and tasks we do in our mathematics lessons and the topics we are studying.	4.66	0.50	Strongly Agree
...lets me interpret what my teacher expects me to learn and achieve by the end of each mathematics lesson.	4.50	0.54	Strongly Agree
...guides me to summarize the steps, targets, or milestones I need to complete during the activities to reach the lesson goals.	4.59	0.56	Strongly Agree
...supports my understanding of the mathematics concepts being taught.	4.56	0.57	Strongly Agree
Weighted Mean	4.59		
SD	0.54		
Verbal Interpretation			Extremely Effective

Table 1 presents the level of Problem-Based Instruction through the TikTok App in terms of Perceived Usefulness, as perceived by the students. The table includes several indicators with their corresponding Mean, standard deviation, and remarks.

The results revealed that the TikTok app, when used for problem-based instruction, was perceived as extremely effective in supporting mathematics learning. Among other things, students indicated that using TikTok provided them with clear lesson objectives before they began their learning activities, helped them successfully complete the related tasks and games for each lesson, and enabled them to understand what teachers wanted them to achieve by the conclusion of a mathematics lesson. Additionally, TikTok-based activities help students summarize the necessary steps, targets, or milestones to achieve lesson objectives and enhance their understanding of the mathematical concepts being taught.

With a weighted mean of 4.59 and a standard deviation of 0.54, the majority of respondents strongly agree that problem-based instruction through the TikTok app is highly acceptable and useful in facilitating mathematics learning. This finding suggests that learners perceive TikTok as an effective instructional platform that supports their understanding of

mathematical concepts and makes learning more accessible and relevant to their everyday experiences.

In summary, the results demonstrate the efficacy of using the TikTok app to promote student learning in mathematics through problem-based instruction. Each indicator had consistently high ratings, indicating that the use of TikTok-based instructional activities helps students identify the lesson objectives and complete related learning activities, resulting in improved student understanding of the mathematical concepts and expected learning outcomes associated with the lesson.

Table 2. Level of Perceived Ease of Use of Problem-Based Instructions via TikTok App

STATEMENTS	MEAN	SD	REMARKS
The use of TikTok as a platform for problem-based instructions helps me to ...	4.40	0.78	Strongly Agree
...solve mathematical problems easily by learning how to use TikTok.			
...navigate problem-based learning activities through the easy-to-use TikTok interface.	4.52	0.62	Strongly Agree
...comprehend mathematics lessons on TikTok because they are clear and understandable.	4.58	0.63	Strongly Agree
...master the skills needed to use TikTok effectively for learning math.	4.52	0.58	Strongly Agree
...utilize TikTok flexibly for various problem-based math activities.	4.58	0.59	Strongly Agree
Weighted Mean	4.52		
SD	0.64		
Verbal Interpretation			Extremely Effective

Table 2 presents the level of Problem-Based Instruction through the TikTok App in terms of Perceived Ease of Use, as perceived by the students in the selected sample of this study. The table shows the indicators, their corresponding means, standard deviations, and remarks for each item included and analyzed.

The results revealed that TikTok, as a platform for problem-based instruction in Mathematics, was perceived as extremely effective. Students shared that it helped them solve mathematical problems more easily, navigate learning activities, understand lessons more clearly, and develop the skills needed to use the platform for learning. They also noted that TikTok can be used flexibly for a variety of problem-based mathematics activities.

With a weighted mean of 4.52 and a standard deviation of 0.64, the majority of respondents strongly agree that the use of TikTok for problem-based instruction is highly acceptable in terms of ease of use among the participants in this study. This implies that learners find the platform convenient, user-friendly, and easy to navigate when completing mathematics learning activities. Because the platform is familiar and easy to use, students can participate more actively in the lesson without difficulty with the technology.

The results further show that TikTok can serve as an effective and accessible platform for mathematics instruction. When students encounter fewer challenges with a learning tool, they are more likely to focus on understanding the lesson rather than on the platform's technical aspects. As a result, learners become more engaged in the learning process and are

more willing to apply the mathematical concepts presented through problem-based activities. This suggests that the ease of using TikTok contributes to a more interactive and supportive learning environment for students enhancing motivation, confidence, participation, collaboration, retention, and overall academic performance.

Table 3. Level of Problem-Based Instructions via TikTok App in terms of Behavioral Intention

STATEMENTS	MEAN	SD	REMARKS
The use of TikTok as a platform for problem-based instructions helps me to realize that I...	4.60	0.57	Strongly Agree
...intend to use TikTok frequently for learning mathematics.			
...predict the continued use of TikTok in the future to study math.	4.49	0.60	Strongly Agree
...plan to use TikTok specifically for completing problem-based mathematics tasks.	4.67	0.53	Strongly Agree
...expect to use TikTok regularly as a tool to support my overall math learning.	4.54	0.54	Strongly Agree
...recommend TikTok to others as an effective platform for learning mathematics.	4.70	0.50	Strongly Agree
Weighted Mean	4.60		
SD	0.55		
Verbal Interpretation			Extremely Effective

Table 3 presents the level of Problem-Based Instruction through the TikTok App in terms of Behavioral Intention, as perceived by the students. The table shows the different indicators along with their corresponding mean, standard deviation, and remarks.

The results revealed that TikTok was perceived as an extremely effective platform for learning Mathematics. Students expressed their intention to continue using TikTok, noting that they are willing to use it frequently for studying Mathematics, especially when working on problem-based tasks. They also shared that they plan to continue using it as a learning tool in the future to support continuous academic improvement. Moreover, many students said they would recommend TikTok to others as an effective platform for learning Mathematics highlighting its accessibility, engagement, usefulness, convenience, and potential for collaborative learning.

With a weighted mean of 4.60 and a standard deviation of 0.55, the majority of respondents strongly agree that using TikTok for problem-based instruction is highly acceptable in terms of behavioral intention. This implies that students not only recognize the platform's usefulness and ease of use but also show a strong willingness to continue using it as part of their mathematics learning experience.

The results further indicate that integrating TikTok into mathematics instruction can encourage students to adopt digital tools as part of their learning habits and daily academic routines. When learners perceive that a technology is both beneficial and easy to use, they are more likely to incorporate it into their regular study practices and rely on it to support their understanding of mathematical concepts.

Learner's Motivation in Mathematics

In this study, motivation is measured in terms of interest, relevance, activation of prior knowledge, goal orientation, and self-efficacy.

The level of learners' motivation in mathematics, in terms of learners' interest, perceived relevance, activation of prior knowledge, goal orientation, and self-efficacy, was analyzed statistically using means and standard deviations.

Table 4. Level of Learner's Motivation in Mathematics in Terms of Interest

STATEMENTS	MEAN	SD	REMARKS
The use of TikTok as a platform for problem-based instructions help me to realize that I ...	4.63	0.54	Strongly Agree
...like learning mathematics through TikTok problem-based lessons.			
...enjoy solving mathematical problems using TikTok videos.	4.64	0.54	Strongly Agree
...like it when TikTok mathematics lessons challenge me to think harder.	4.65	0.54	Strongly Agree
...value the achievement of mastering new math concepts by engaging with problem-based TikTok content.	4.68	0.50	Strongly Agree
...feel more motivated to participate in math discussions because of TikTok-style content.	4.61	0.53	Strongly Agree
Weighted Mean	4.64		
SD	0.53		
Verbal Interpretation	Highly Motivated		

Table 4 presents the level of Learner's Motivation in Mathematics in terms of Learner's Interest. The table shows the indicators, along with their corresponding means, standard deviations, and remarks for each item. This shows how learners' interest affects their overall motivation in Mathematics.

The results revealed that students were highly motivated by TikTok as a platform for problem-based instruction, which increased their interest in learning Mathematics. They shared that they enjoy learning through TikTok-based lessons, especially when solving problems using videos and engaging in activities that challenge their thinking. Students also noted that these lessons encourage them to participate more actively in discussions and learning tasks, making the overall learning experience more enjoyable and engaging.

With a weighted mean of 4.64 and a standard deviation of 0.53, the respondents strongly agree that TikTok-based instruction is extremely effective in increasing learners' interest in mathematics. This suggests that integrating TikTok into problem-based instruction helps create a learning environment that encourages curiosity, participation, and enthusiasm for mathematical activities. The use of familiar digital platforms may also help reduce students' anxiety toward the subject and encourage them to explore mathematical ideas more confidently.

The findings further indicate that when lessons are presented in engaging and relatable formats, students are more likely to develop a positive attitude toward the subject. The use of TikTok videos provides learners with interactive and visually appealing learning experiences that can capture their attention and motivate them to actively participate in solving mathematical problems. As a result, students become more

interested in exploring mathematical concepts and are more willing to take part in classroom discussions and activities. This increased engagement can also contribute to improved understanding and better academic performance in Mathematics, as students become more active, confident, consistent, and more independent in their learning.

Table 5. Level of Learner's Motivation in Mathematics in Terms of Perceived Relevance

STATEMENTS	MEAN	SD	REMARKS
The use of TikTok as a platform for problem-based instructions help me to realize that I ...	4.59	0.61	Strongly Agree
...relate the math problems I see on TikTok to the things I do in my everyday life.			
...am able to reach my own math learning goals by using problem-based lessons on TikTok.	4.59	0.52	Strongly Agree
...recognize that TikTok-based mathematics learning will be useful for me in the future.	4.70	0.47	Strongly Agree
...clearly see how the math lessons on TikTok help me better manage my daily chores and hobbies.	4.49	0.55	Strongly Agree
...believe that watching math videos on TikTok helps me solve problems faster in real life.	4.61	0.54	Strongly Agree
Weighted Mean	4.60		
SD	0.54		
Verbal Interpretation	Highly Motivated		

Table 5 presents the level of Learner's Motivation in Mathematics in terms of Perceived Relevance. The table shows the indicators, along with their corresponding means, standard deviations, and remarks for each item included in the analysis.

The results revealed that students were highly motivated by TikTok as a platform for problem-based instruction, as it helped them see the relevance of Mathematics in their daily lives. They shared that they can relate TikTok-based math problems to their everyday experiences and better recognize their practical value for future learning and real-life situations. Students also noted that watching TikTok videos on mathematics helps them understand how mathematical concepts can be applied to solve real-life problems.

With a weighted mean of 4.60 and a standard deviation of 0.54, the respondents strongly agree that TikTok-based instruction is extremely effective in terms of perceived relevance. This suggests that when mathematics lessons are presented through familiar and engaging platforms, students are more able to recognize the value of what they are learning and how it connects to their real-life experiences. As a result, learners begin to view mathematics not only as a classroom subject but also as a useful tool that can help them understand and solve everyday situations.

The findings further indicate that presenting mathematical lessons through TikTok allows learners to see how mathematics can be applied beyond the classroom in real-life, everyday situations. When students understand the practical value of mathematical concepts, they become more motivated to learn and participate in problem-solving activities. This

approach also helps learners appreciate the usefulness of mathematics in different aspects of life, such as decision-making, managing daily tasks, and understanding real-world situations.

Table 6. Level of Learner's Motivation in Mathematics in Terms of Activation of Prior Knowledge

STATEMENTS	MEAN	SD	REMARKS
The use of TikTok as a platform for problem-based instructions helps me to realize that I ...	4.36	0.80	Strongly Agree
...connect what I learn in TikTok math videos to the lessons I have already studied in school.			
...replay TikTok mathematical problems repeatedly until I fully understand them.	4.54	0.65	Strongly Agree
...identify the exact parts of a math lesson on TikTok that I find difficult to understand at first.	4.50	0.69	Strongly Agree
...relate the problem-solving videos on TikTok to my own life situations and school activities.	4.41	0.69	Strongly Agree
...use the math tricks I saw on TikTok to solve the problems my teacher gives in class.	4.42	0.77	Strongly Agree
Weighted Mean	4.45		
SD	0.72		
Verbal Interpretation	Highly Motivated		

Table 6 presents the level of Learner's Motivation in Mathematics in terms of Activation of Prior Knowledge. The table shows the indicators together with their corresponding means, standard deviation, and remarks.

The results revealed that students were highly motivated by the use of TikTok as a platform for problem-based instruction, as it helped them activate their prior knowledge in Mathematics. They shared that they could connect what they learned from TikTok math videos to the lessons they had previously studied in school. Students also mentioned that they replay videos until they fully understand the concepts and can identify parts of the lesson, they initially find difficult. In addition, they noted that the strategies and techniques they observe in TikTok videos help them solve the problems given by their teachers.

With a weighted mean of 4.45 and a standard deviation of 0.72, the respondents strongly agree that TikTok-based instruction is extremely effective in activating learners' prior knowledge. This suggests that students can recall and apply previously learned concepts when encountering similar mathematical ideas presented through TikTok-based problem-solving activities. It further indicates that the platform helps learners make meaningful connections between past and present lessons, strengthening comprehension, improving retention, and supporting the effective application of mathematical strategies in solving both familiar and new problems.

The findings further indicate that using TikTok videos enables learners to review and reinforce previously learned mathematical concepts. By replaying and reflecting on the content, students can strengthen their understanding, recall important prior knowledge, and connect past lessons to new mathematical ideas more effectively. This process supports

deeper learning, improves knowledge retention, and helps students become more confident in applying mathematical strategies and concepts when solving both familiar and unfamiliar problem-solving tasks.

Table 7. Level of Learner's Motivation in Mathematics in Terms of Goal Orientation

STATEMENTS	MEAN	SD	REMARKS
The use of TikTok as a platform for problem-based instructions help me to realize that I ...	4.64	0.55	Strongly Agree
...strive to excel in math activities on TikTok so that I achieve my personal and academic objectives.			
...aim to succeed in mathematics when using TikTok lessons.	4.62	0.53	Strongly Agree
...feel more excited to finish my math homework when I can use TikTok for help.	4.58	0.53	Strongly Agree
...work harder at solving complex math tasks so I can receive higher grades in my classes.	4.33	0.77	Strongly Agree
...want to learn more about different math topics by watching TikTok videos.	4.66	0.49	Strongly Agree
Weighted Mean	4.57		
SD	0.57		
Verbal Interpretation	Highly Motivated		

Table 7 presents the level of Learner's Motivation in Mathematics in terms of Goal Orientation. The table shows the indicators, along with their corresponding means, standard deviations, and remarks for each item included in the analysis. The results revealed that students were highly motivated by TikTok as a platform for problem-based instruction, which strengthened their goal orientation in learning Mathematics. They shared that they strive to do well in mathematics activities on TikTok to achieve their personal and academic goals. Students also reported feeling more eager to succeed in Mathematics and more excited to complete their homework when using TikTok as a learning aid. In addition, they noted that watching TikTok mathematics videos encourages them to explore more topics.

With a weighted mean of 4.57 and a standard deviation of 0.57, respondents strongly agree that TikTok-based instruction is extremely effective in fostering goal orientation. This suggests that integrating TikTok into problem-based instruction encourages students to set clear academic goals and work consistently toward achieving better results in mathematics. The use of engaging and interactive content helps learners stay focused on their objectives, maintain interest throughout the learning process, and motivates them to complete learning tasks with greater effort, determination, and persistence. Furthermore, this indicates that TikTok-based learning can strengthen students' sense of responsibility for their academic progress and long-term achievement.

The findings further indicate that engaging, interactive learning platforms such as TikTok can encourage students to become more determined in completing their academic tasks and to consistently strive for academic success. When learners feel motivated and supported in their learning environment, they are more likely to put greater effort into solving mathematical problems and improving their performance in

the subject. This also helps students develop a stronger sense of responsibility toward their learning, as they become more eager to understand mathematical concepts and achieve their personal and academic goals.

Table 8. Level of Learner's Motivation in Mathematics in Terms of Self-Efficacy

STATEMENTS	MEAN	SD	REMARKS
The use of TikTok as a platform for problem-based instructions helps me to realize that I ...	4.67	0.55	Strongly Agree
...feel confident that I can answer mathematical problems shown in TikTok lessons.			
...understand math concepts with complete confidence after watching the explanations in TikTok videos.	4.70	0.50	Strongly Agree
...believe that I can get good results in mathematics with the help of TikTok lessons.	4.51	0.53	Strongly Agree
...solve higher-level math problems successfully by following the methods shown on TikTok.	4.62	0.54	Strongly Agree
...believe I can learn difficult math topics on my own by watching TikTok tutorials.	4.62	0.54	Strongly Agree
Weighted Mean	4.62		
SD	0.53		
Verbal Interpretation	Highly Motivated		

Table 8 presents the level of Learner's Motivation in Mathematics in terms of Self-Efficacy. The table shows the indicators, along with their corresponding means, standard deviations, and remarks for comprehensive interpretation and analysis.

The results revealed that students were highly motivated by TikTok as a platform for problem-based instruction, which helped improve their confidence in learning Mathematics. They shared that they feel more confident in answering mathematical problems presented in TikTok lessons and that they understand concepts more clearly after watching the explanations in the videos. Students also noted that these lessons help them believe in their ability to achieve better results in Mathematics and tackle more challenging problems by following the strategies demonstrated.

With a weighted mean of 4.62 and a standard deviation of 0.53, respondents strongly agree that TikTok-based instruction is extremely effective for self-efficacy. This suggests that using TikTok as a learning platform helps students build greater confidence in their mathematical abilities and encourages them to believe they can successfully complete mathematics tasks.

The findings further indicate that when students are exposed to clear explanations and guided demonstrations through TikTok videos, they become more confident in understanding mathematical concepts. As students repeatedly watch and practice the methods presented, they gradually develop the belief that they can solve mathematical problems independently and successfully, with improved accuracy, greater confidence, deeper understanding, and stronger problem-solving skills.

Learner's Performance in Mathematics

In this study, this refers to the measurable outcomes of learners' academic work in mathematics, specifically assessed through formative and quarterly tests.

The level of learner's performance in mathematics in terms of diagnostic test and quarterly test was treated statistically using the frequency and percentage.

Table 9. Level of Learner's Performance in Mathematics in Terms of Diagnostic Test

Scores	Frequency	Percentage	Descriptive Equivalent
31-35	2	2.65%	Mastery
26-30	11	8.61%	Closely Approaching Mastery
21-25	29	19.87%	Moving Towards Mastery
16-20	32	34.44%	Average
11-15	29	31.79%	Low Average
6-10	32	2.65%	Very Low
0-5	0	0.00%	Absolutely No Mastery
Total	151	100%	

Weighted Mean = 18.25

SD = 5.44

Verbal Interpretation = Average

Table 9 presents learners' performance in Mathematics on the Diagnostic Test, including the distribution of scores, their corresponding frequencies, percentages, and descriptive remarks.

The results of the diagnostic test indicate that the highest percentage of learners (34.44%) earned scores ranging from 16 to 20, which are in the average range. This implies that a large number of learners have intermediate levels of knowledge and ability in mathematics. In addition, 31.79% of students scored in the low-average range (11-15), indicating that a significant number of learners will require additional support to build a solid foundation of math skills.

Conversely, 19.87% of students had scores in the moving toward mastery range (21-25), and 8.61% had scores in the closely approaching mastery range (26-30). Only 2.65% of the student population achieved scores between 31 and 35; this is considered mastery and indicates how few students had a high level of prior understanding of the mathematics tested on the diagnostic. Conversely, there were 2.65% of learners who scored between 6 and 10, representing very low scores, and no learners had scores between 0 and 5, indicating that these students had no mastery.

Moreover, the average mathematics performance of students on the diagnostic test was 18.25 with a standard deviation of 5.44; this is in the average performance range. This indicates that students, on average, have a moderate amount of prior mathematical knowledge to begin intervention services based on their performance. The standard deviation provides a measure of variability between learners, indicating that there is substantial variation among students with regard to their mathematics skills.

In summary, the diagnostic results indicate that the majority of students scored in the average to low-average range, with very few reaching or nearing the mastery level. Thus, it is evident that many students will need additional instructional support or effective teaching strategies to build their foundational understanding of mathematics and improve their overall performance across different learning

competencies and academic tasks. The need for specifically selected instructional interventions is apparent from the diagnostic results; these interventions will assist learners on their path to attaining higher levels of mathematical mastery while strengthening confidence, motivation, engagement, problem-solving abilities, conceptual understanding, retention, and sustained academic improvement over time.

Table 10. Level of Learner's Performance in Mathematics in Terms of Quarterly Test

Scores	Frequency	Percentage	Descriptive Equivalent
31-35	70	46.36%	Mastery
26-30	60	39.74%	Closely Approaching Mastery
21-25	17	11.26%	Moving Towards Mastery
16-20	4	2.65%	Average
11-15	0	0.00%	Low Average
6-10	0	0.00%	Very Low
0-5	0	0.00%	Absolutely No Mastery
Total	151	100%	

Weighted Mean = 29.57

SD = 3.38

Verbal Interpretation = Mastery

Table 10 presents learners' level of performance in mathematics on the Quarterly Test. The table shows the distribution of students by score, frequency, percentage, and corresponding remarks.

The results show that most learners achieved high scores on the quarterly test. A total of 70 students (46.36%) obtained scores ranging from 31–35, which falls under the Mastery level. Meanwhile, 60 students (39.74%) scored between 26 and 30, interpreted as Closely Approaching Mastery. A smaller number of students, 17 learners (11.26%), obtained scores ranging from 21–25, categorized as Moving Towards Mastery, while only 4 learners (2.65%) fell under the Average level with scores between 16–20. No students were recorded in the lower score ranges of Low Average, Very Low, or Absolutely No Mastery.

The computed weighted mean of 29.57 with a standard deviation of 3.38 indicates that the overall performance of the learners in the quarterly test is at a high level of mastery. This suggests that most students demonstrated a strong understanding of the mathematical concepts covered during the quarter with consistent academic achievement.

These findings indicate that learners generally performed well on the quarterly assessment, reflecting their improved understanding and application of the mathematical concepts taught during the learning period, supported by effective instructional strategies and guided practice.

Test of Significant Difference between Learners' Performances in Mathematics

The significant difference between learners' performance in mathematics in terms of diagnostic test and quarterly test was treated statistically using Real Statistics Data Analysis Tools using the T-Test for two paired samples.

Results show that students' average score on the Quarterly Test (29.64) is significantly higher than their average score on the Diagnostic Test (18.32). The mean difference of 11.32 demonstrates an increase in students' math performance after an instructional intervention was used.

Additionally, the t-value of 1.98, with a p-value of $< .001$, shows that there is a statistically significant difference between the diagnostic and quarterly test scores of learners at the .01 level of significance. Therefore, students' performance improvements were statistically meaningful and not due to chance.

Table 11. Test of Significant Difference between Learner's Performances in Mathematics

Test	Mean	Mean Difference	t-value	p-value	Cohen's d
Diagnostic	18.32				
Quarterly	29.64	11.32	1.98	$< .001$	3.85 (Very Large)

df = 28; **Significant at .01 level; Cohen's d: 0.20 (Small); 0.50 (Medium); 0.80 (Large)

Lastly, Cohen's d value of 3.85 indicates that the intervention had a Very Large effect size, meaning it had a very strong effect on students' math performance. This indicates that the instructional strategy used during the intervention played a significant role in improving learners' understanding and mastery of mathematical concepts resulting in substantial academic performance gains.

Based on these findings, the improvement in learners' performance is clearly statistically significant and meaningful. Thus, the null hypothesis that there is no significant difference in learners' performance in Mathematics between diagnostic and quarterly tests is rejected. This shows that a significant difference exists between the two sets of scores, with higher results observed in the quarterly test. Overall, the learners demonstrated improved performance after implementing the instructional strategy.

Test of Significant Relationship between the Problem-based Instructions through TikTok App and the Learner's Motivation in Mathematics

To test the significant relationship between the Problem-based Instructions through the TikTok App and the learner's motivation in Mathematics in terms of learner's interest, perceived relevance, activation of prior knowledge, goal orientation, and self-efficacy, was treated statistically using Jamovi 2.3.28 using the Pearson correlation coefficient.

Table 12 presents the relationship between Problem-Based Instruction through the TikTok App and the Learner's Motivation in Mathematics in terms of learners' interest, perceived relevance, activation of prior knowledge, goal orientation, and self-efficacy using the Pearson correlation coefficient.

The results revealed that all of the dimensions of motivation for learners demonstrate a significant, positive relationship with perceived utility of problem-based instruction via the TikTok app. To elaborate, learners' motivations for learning are positively and significantly correlated with perceived utility and, most notably, learners' interest ($r = 0.41$, $p < 0.001$) and the relevance of lessons ($r = 0.40$, $p < 0.001$). Activation of prior knowledge has a very weak ($r = 0.255$, $p = 0.002$), while weaker positive correlations exist for goal orientation ($r = 0.31$, $p < 0.001$) and self-efficacy ($r = 0.37$, $p < 0.001$). This implies that if learners perceive TikTok-based instruction as useful, their interest in

learning, how they perceive the relevance of the lessons being taught in class, their goals for learning the material, as well as their confidence in mathematics, will tend to increase based on

how strongly they view each of those relationships as either extremely weak to weak, respectively.

Table 12. Problem-based Instructions through TikTok App and the Learner's Motivation in Mathematics

Problem-based Instructions through TikTok App		Learner's Motivation in Mathematics				
		Learner's Interest	Perceived Relevance	Activation of Prior Knowledge	Goal Orientation	Self-Efficacy
Perceived: Pearson Correlation		0.41***	0.40***	0.255**	0.31***	0.37***
Usefulness Significance(2-Tailed)		<.001	<.001	0.002	<.001	<.001
N		149	149	149	149	149
Perceived: Pearson Correlation		0.50***	0.52***	0.21**	0.30***	0.28***
Ease of Use Significance(2-Tailed)		<.001	<.001	0.009	<.001	<.001
N		149	149	149	149	149
Behavioral: Pearson Correlation		0.50***	0.43***	0.17*	0.37***	0.32***
Intention Significance(2-Tailed)		<.001	<.001	0.043	<.001	<.001
N		149	149	149	149	149

Note: *p<.05, **p<.01, ***p<.001

In a similar manner, the perceived ease of use of the TikTok app was found to have a positive, significant relationship with students' motivation levels. Specifically, it was determined that there is a moderate correlation with the student's interest ($r = 0.50$, $p < .001$) and a slightly higher correlation with the student's perceived relevance ($r = 0.52$, $p < .001$). However, there were only very low correlations with the activation of prior knowledge ($r = 0.21$, $p = .009$), with goal-directed behavior ($r = 0.30$, $p < .001$), and with self-efficacy ($r = 0.28$, $p < .001$). Overall, these results imply that students who find the TikTok platform easy to use are likely to have increased interest in mathematics, perceive the lessons as valuable, and increase their motivation to achieve their goals and sustain their engagement in learning activities.

In addition, there is a statistically significant, positive relationship between behavioral intentions to primarily use TikTok to help students learn and all motivational variables. The correlation between students' behavioral intention to use TikTok primarily to help them learn and their interest is moderate ($r = 0.50$, $p < .001$). The medium to weak level of association between perceived relevance ($r = 0.43$, $p < .001$), goal orientation ($r = 0.37$, $p < .001$), and self-efficacy ($r = 0.32$, $p < .001$) is indicative of a weak to moderate association with the behavioral intention to use TikTok to help students learn mathematics.

However, a very low level of association can be attributed to activation of prior knowledge ($r = 0.17$, $p = 0.043$). This implies that previous research demonstrating that students intending to engage in further learning via TikTok as a learning resource report a greater degree of motivation to learn mathematics than those indicating an intention to use other methods. Although the relationship is weak, the statistically significant result suggests that activating prior knowledge through TikTok-based learning may still contribute positively to learners' motivation by helping them connect previously learned concepts with new mathematical ideas, thereby supporting understanding, engagement, and continued interest in the learning process.

The study's findings show that problem-based learning via TikTok is positively associated with students' motivation in mathematics. Although most relationships are weak to

moderate, they are all statistically significant, indicating that integrating TikTok can still influence various aspects of learner motivation. Therefore, the null hypothesis is rejected, indicating that a significant relationship exists between the variables.

This suggests that using TikTok as a learning platform can increase students' interest, improve their perception of lesson relevance, and encourage them to set goals and build confidence in mathematics. It may also help learners connect prior knowledge with new concepts, making learning more meaningful. As students engage with interactive and accessible content, they become more motivated and develop a more positive attitude toward mathematics. Moreover, the use of familiar and engaging digital platforms can reduce anxiety toward the subject, promote active participation, and support a more student-centered learning environment that enhances both motivation and engagement.

Table 13. Effect of Problem-Based Instructions via TikTok App on the Learners' Performance in Mathematics in terms of Diagnostic Test

ANOVA ^a					
Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	1.35	4	0.45	0.64	0.592
Residual	103.59	147	0.70		
Total	104.94	151			

a. Dependent Variable: Diagnostic Test

b. Predictors: Perceived Usefulness, Perceived Ease of Use and Behavioral Intention

Coefficients^a

Model	Unstandardized Coefficients		T	Sig.
	B	Std. Error		
(Constant)	2.01	1.23	1.64	0.104
Perceived Usefulness	-0.10	0.28	-0.37	0.711
Perceived Ease of Use	0.28	0.23	1.23	0.222
Behavioral Intention	0.04	0.25	0.15	0.882

A multiple regression analysis was conducted to determine whether problem-based instruction through the TikTok app, in terms of perceived usefulness, perceived ease of use, and behavioral intention, could significantly predict learners' mathematics performance, as measured by diagnostic test

scores and overall academic achievement while examining the relative contribution of each predictor variable.

The findings of the Analysis of Variance ($F(4, 147) = 0.64$, $p = 0.592$) show that the Regression Analysis indicates there is no significant ability for the combined independent factors (e.g., perceived usefulness, perceived ease of use, and behavioral intention) to predict student scores on the diagnostic tests for mathematics, during the pre-assessment phase of the study,

An evaluation of each independent variable indicates that none are significant predictors of learner scores on the diagnostic test at an alpha level of 0.05. The independent variable of perceived usefulness ($B = -0.10$, $t = -0.37$, $p = 0.711$) did not provide the ability to predict a student's score on the diagnostic test. The independent variable of perceived ease of use ($B = 0.28$, $t = 1.23$, $p = 0.222$) did not exhibit the ability to predict a student's score on the diagnostic test. Similarly, the independent variable of behavioral intention ($B = 0.04$, $t = 0.15$, $p = 0.882$) also did not exhibit any statistically significant ability to predict learner scores on the diagnostic test.

In summary, the results show that using the TikTok app as a medium for teaching problem-solving did not have a significant effect on students' performance in mathematics based on the diagnostic test. Therefore, the null hypothesis is accepted, indicating that no significant effect exists between the variables. This may be explained by the nature of the diagnostic test, which measures students' prior knowledge before the instructional intervention was implemented and does not reflect the actual learning gains achieved during the intervention period where meaningful academic improvement may have later occurred.

Table 14. Effect of Problem-Based Instructions via TikTok App on the Learners' Performance in Mathematics in terms of Quarterly Test ANOVA^a

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	0.42	4	0.14	0.57	0.637
Residual	36.50	147	0.25		
Total	36.92	150			

a. Dependent Variable: Quarterly Test

b. Predictors: Perceived Usefulness, Perceived Ease of Use and Behavioral Intention

Coefficients^a

Model	Unstandardized Coefficients		T	Sig.
	B	Std. Error		
(Constant)	4.29	0.73	5.87	0.000
Perceived Usefulness	0.06	0.16	0.38	0.701
Perceived Ease of Use	0.12	0.14	0.89	0.377
Behavioral Intention	-0.08	0.15	-0.55	0.580

A multiple regression analysis was conducted to determine whether problem-based instruction through the TikTok app, in terms of perceived usefulness, perceived ease of use, and behavioral intention, could significantly predict learners' mathematics performance, as measured by quarterly test results and overall academic performance.

The outcomes of an analysis of variance revealed no statistically significant effect of the regression model ($F(3,147) = 0.57$, $p = 0.637$) at predicting learners' quarterly test scores in mathematics as a result of a combination of predictors. Therefore, it was concluded that the combined predictors of perceived usefulness, perceived ease of use, and behavioral intentions do not have a statistically significant predictive effect on the quarterly test scores of all students participating in the study.

None of the individual predictor variables (perceived usefulness, perceived ease of use, and behavioral intention) was found to be a significant predictor of learners' quarterly test scores at the 0.05 level of significance. Specifically, perceived usefulness ($B = 0.06$, $t = 0.38$, $p = 0.701$) did not have a statistically significant influence on quarterly test performance in mathematics. A similar finding was observed regarding perceived ease of use ($B = 0.12$, $t = 0.89$, $p = 0.377$); likewise, for behavioral intention ($B = -0.08$, $t = -0.55$, $p = 0.580$) and quarterly test performance.

In summary, the results show that problem-based learning through the TikTok application, as measured by perceived usefulness, perceived ease of use, and behavioral intention, did not significantly affect learners' mathematics performance on the quarterly test. Therefore, the null hypothesis is accepted, indicating that there is no significant effect between the variables. Although the predictors showed small positive and negative values, they were not strong enough to be considered significant. This suggests that other factors not included in the model may have a greater influence on students' performance. Overall, academic performance may depend on a combination of different instructional and learner-related factors.

IV. CONCLUSION AND RECOMMENDATIONS

There is a significant difference between the learners' diagnostic and quarterly test scores; therefore, the null hypothesis is rejected. This concludes a clear improvement in the learners' diagnostic and quarterly test performance was observed, indicating that Problem-Based Instruction through the TikTok App significantly enhanced learners' performance in Mathematics and contributed to improved understanding, engagement, and academic achievement.

There is a significant relationship between Problem-Based Instruction through the TikTok App and learners' motivation; therefore, the null hypothesis is rejected. This concludes that a positive change in learners' motivation was observed, indicating that technology-based instructional strategies can positively influence students' engagement, attitudes, and overall motivation toward learning Mathematics, making the learning experience more meaningful and interactive.

However, there is no significant effect of Problem-Based Instruction through the TikTok App on learners' performance in Mathematics; therefore, the null hypothesis is accepted. This signifies that while the approach may enhance motivation, it may not, on its own, significantly improve academic performance without the support of other instructional strategies, classroom interventions, and consistent teacher guidance.

Based on the formulated conclusions from the findings, the following are recommended:

Curriculum developers incorporate more technology-driven strategies into mathematics lessons to better align students' digital experiences.

School administrators assist teachers by providing training and professional development on effectively using technology in teaching.

Mathematics teachers use TikTok-based problem-solving activities to make their lessons more engaging, interactive, and easier for students to relate to.

Students use TikTok responsibly as an extra learning tool to better understand math concepts and enhance their study habits.

Future research could explore various grade levels, subjects, or schools to better understand how TikTok-based strategies influence students' motivation and performance.

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