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Teaching Methods on the Learners' Motivation and Mathematical Abilities

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***Abstract*—*This study primarily focused on evaluating the pedagogical landscape and its impact on student outcomes by addressing five key objectives. Specifically, it sought to determine the level of teachers' teaching methods as perceived by students; the level of the students' motivation; the overall level of learners' mathematical abilities; whether teaching methods significantly correlate to learners' motivation in Mathematics, and if these teaching methods significantly affect the learners' mathematical abilities. To systematically address these objectives, the study utilized a descriptive-predictive research design. Employing a purposive sampling technique, the respondents comprised 79 Grade 11 students currently enrolled in Statistics and Probability at Mayao Parada Agricultural Integrated High School. Data gathering was conducted using a validated, researcher-made instrument consisting of a survey questionnaire to assess pedagogical perceptions and motivation, alongside a structured written examination to evaluate specific cognitive mathematical abilities of the learners. Findings revealed that instructional delivery was exceptionally strong, with all four teaching methodologies rated as Highly Practiced. Similarly, students scored within the Highly Motivated and Motivated bands across all domains. However, their cognitive outcomes consistently fell within the Nearly Proficient tier across all mathematical ability skills. Teaching methods were significantly correlated with learner motivation, demonstrating that classroom strategies act as active drivers of engagement alongside students' external career ambitions. General teaching methods did not significantly affect the students' overall mathematical abilities. Interestingly, technology integration demonstrated a weak positive correlation. Teaching methods significantly correlate with learners' motivation in Mathematics, thereby rejecting the hypothesis. This concludes that the learners are primarily driven by instrumental factors such as future career aspirations and college readiness. Effective instructional strategies serve to bridge the gap between daily classroom activities and these external goals. While teaching methods do not significantly affect the learners' mathematical abilities, leading to the acceptance of the hypothesis. This concludes that while current strategies are motivating, they lack the specific cognitive rigor required to elevate problem-solving, critical thinking, and reasoning skills. It is recommended to Mathematics teachers to utilize instructional methods that actively engage and motivate their students, especially since student motivation is directly linked to the specific teaching methodologies applied in the classroom.*

***Keywords*—** *Instructional strategies, learners' mathematical abilities, learners' motivation, teaching methods, technology integration*

I. Introduction

Mathematics provides the foundational framework for logical reasoning and scientific progress. It serves as a universal language for analyzing data and solving complex problems. Students use mathematical principles to understand economic trends and architectural designs and physical laws. High proficiency in this subject leads to increased career opportunities in engineering and technology.

Within the classroom, teaching methods represent the specific instructional techniques and behaviors teachers employ to deliver curriculum content (Hattie, 2023). These strategies range from direct instruction to collaborative problem-solving activities. Effective pedagogy requires the selection of tools that align with student needs and learning goals. Active learning strategies improve student participation and factual retention.

While learner motivation consists of the internal drive and persistence individuals demonstrate during academic tasks. This psychological state determines the level of effort students invest in learning new concepts. Motivated learners show higher resilience when they encounter difficult equations or word problems. Motivation predicts academic performance and continued interest in scientific disciplines (Schunk and DiBenedetto, 2020).

Mathematical abilities involve the capacity to process numerical information and apply logical steps to reach conclusions. These skills include spatial awareness and quantitative reasoning and computational accuracy.

Learners demonstrate these abilities through the successful manipulation of variables and geometric figures. Strong skills in this area support critical thinking and data driven decision making.

Effective mathematics education connects how teachers teach, how students engage, and what students learn. Therefore, this study seeks to determine whether teaching methods significantly correlate to learners' motivation in Mathematics, and if these teaching methods significantly affect the learners' mathematical abilities. It aims to improve current instructional practices and ensure that students not only perform well academically but also develop a lasting appreciation for the value of mathematics.

1.1 Statement of the Problem

Problem/s which were addressed by the research

This study aimed to determine the connection of teaching methods on the learners' motivation and mathematical abilities.

Specifically, this study sought to find answers to the following questions:

1. What is the level of Teaching Methods as perceived by the Learners in terms of:

1.1 Problem – Based Learning;
1.2 Cooperative Learning;
1.3 Technology Integration; and
1.4 Lecture – Discussion?
2. What is the level of Learners' Motivation in terms of:
   2.1 Integrative Motivation;
   2.2 Instrumental Motivation;
   2.3 Intrinsic Motivation; and
   2.4 Extrinsic Motivation?
3. What is the level of Learners' Mathematical Abilities in terms of:
   3.1 Problem Solving;
   3.2 Critical Thinking;
   3.3 Analytical Reasoning;
   3.4 Logical Reasoning; and
   3.5 Spatial Reasoning?
4. Does the Teaching Methods significantly correlate to the Learners' Motivation in Mathematics?
5. Does the Teaching Methods significantly affect the Learners' Mathematical Abilities?

II. Methodology

The study utilized a descriptive-predictive research design. Employing a purposive sampling technique, the respondents comprised 79 Grade 11 students currently enrolled in Statistics and Probability at Mayao Parada Agricultural Integrated High School. Data gathering was conducted using a validated, researcher-made instrument consisting of a survey questionnaire to assess pedagogical perceptions and motivation, alongside a structured written examination to evaluate specific cognitive mathematical abilities of the learners.

III. Results and Discussion

This part discusses the presentation, analysis, and interpretation of the data collected, which shows the correlation between teaching methods and learners' motivation, as well as the effects of these methods on learners' mathematical abilities.

Level of Teaching Methods

In this study, teaching methods include lecture–discussion, cooperative learning, problem-based learning, and technology integration as applied in Statistics and Probability Class. By examining this multifaceted spectrum of teaching methods, the research captures both traditional, teacher-directed strategies and modern, student-centered constructivist frameworks.

These pedagogical variables are evaluated strictly through the lens of learner perception. Capturing the students' vantage point is essential, as their direct, day-to-day experience and reception of these instructional methods ultimately dictate their cognitive engagement and mathematical comprehension.

To systematically quantify these perceptions across the specified teaching indicators the gathered survey data was subjected to statistical analysis.

The level of teaching methods as perceived by the learners in terms of problem – based learning, cooperative learning, technology integration and lecture – discussion was treated statistically using mean and standard deviation.

Table 1. Level of Teaching Methods as Perceived by the Learners in Terms of Problem – Based Learning

Statement My teacher . . .	Mean	SD	Remarks
…presents real-world problems for us to solve in class.	4.39	0.65	Strongly Agree
…gives complex, open-ended problems to work on in groups.	4.18	0.67	Agree
…encourages us to find our own solutions to a problem.	4.34	0.71	Strongly Agree
…provides activities that require us to apply math concepts to practical situations.	4.56	0.64	Strongly Agree
…uses case studies or real-life scenarios to teach new math concepts.	4.34	0.73	Strongly Agree
Weighted Mean		4.36	
SD		0.68	
Verbal Interpretation		Highly Practiced	

Table 1 presents the level of teaching methods as perceived by the learners in terms of Problem-Based Learning, including the indicators with their corresponding mean, standard deviation, and remarks.

The results revealed that the use of problem-based learning in mathematics instruction is looked upon as having a very favorable view by learners. Teachers received very high scores for presenting authentic/real world problems, guiding students towards developing their own solutions, and providing activities that enabled students to apply the concepts of mathematics to real-life situations.

With a total weighted average of 4.36 and a deviation of 0.68 from the average, it can be said that teachers use Problem Based Learning "He". A lower standard deviation from the weighted means suggests that teachers seem to have similar views about how well the strategies were implemented.

In summary, this implies that teachers are effectively using problem-based learning strategies in math classes and are utilizing these strategies to support real world applications as well as support independent thinking. By focusing more on collaborative and open-ended problem-solving activities, teachers may enhance students' engagement and help their students develop an even greater comprehension of mathematics.

Table 2. Level of Teaching Methods as Perceived by the Learners in Terms of Cooperative Learning

Statement My teacher . . .	Mean	SD	Remarks
…assigns us to small groups to complete math activities.	4.13	0.70	Agree
…gives group projects where each member has a specific role.	4.27	0.87	Strongly Agree
…guides our group discussion to help us figure out different topics.	4.52	0.73	Strongly Agree
…discusses and shares different ways to solve a problem with the class.	4.63	0.64	Strongly Agree
…encourages peer-to-peer teaching within our groups.	4.16	0.72	Agree
Weighted Mean	4.34		
SD	0.74		
Verbal Interpretation	Highly Practiced		

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Table 2 presents the level of teaching methods as perceived by the learners, focusing specifically on the implementation of Cooperative Learning in the mathematics classroom. The table details the individual item means, their corresponding standard deviations, descriptive remarks, and the overall summary metrics.

The individual indicators reveals that the highest-rated statement is Item 4, which notes that the teacher "...discusses and shares different ways to solve a problem with the class." This item achieved the highest mean score of 4.63 with a standard deviation of 0.64, drawing a verbal remark of Strongly Agree. This is closely followed by Item 3, "...guides our group discussion to help us figure out different topics," which obtained a mean score of 4.52 with a standard deviation of 0.73, also interpreted as Strongly Agree. Item 2, which highlights that the teacher "...gives group projects where each member has a specific role," registered a mean score of 4.27 with a standard deviation of 0.87, maintaining a descriptive remark of Strongly Agree.

Conversely, the lower-rated items in the cluster still received positive feedback from the participants. Item 5, concerning the teacher "...encouraging peer-to-peer teaching within our groups," garnered a mean score of 4.16 with a standard deviation of 0.72, while Item 1, "...assigns us to small groups to complete math activities," recorded the lowest mean score at 4.13 with a standard deviation of 0.70. Both items are verbally interpreted as Agree. The standard deviations across all five indicators range from 0.64 to 0.87, showing low variance and demonstrating that the respondents' perceptions are closely aligned around the calculated values.

Overall, the cooperative learning category yielded an overall weighted mean score of 4.34 with a standard deviation of 0.74, which translates to a verbal interpretation of Highly Practiced.

In summary, the data reveals that the Grade 11 learners perceive Cooperative Learning as a Highly Practiced teaching method in their mathematics course. The students consistently experience a supportive learning framework defined by strategic group dynamics, structured peer collaboration, and strong teacher guidance.

Table 3. Level of Teaching Methods as Perceived by the Learners in Terms of Technology Integration

Statement My teacher . . .	Mean	SD	Remarks
…uses educational websites or apps to explain concepts.	4.14	0.80	Agree
…allows the use of calculators or computers to solve and visualize mathematical problems.	4.72	0.48	Strongly Agree
…includes digital presentations (like PowerPoint or video) in class.	4.54	0.69	Strongly Agree
…utilizes online simulations or interactive tools to learn math.	4.42	0.69	Strongly Agree
…integrates social media or other online platforms to share resources.	4.05	0.83	Agree
Weighted Mean		4.37	
SD		0.70	
Verbal Interpretation		Highly Practiced	

Table 3 Table 3 presents the learners' perceptions regarding Technology Integration, detailing how digital tools, presentation platforms, and interactive mathematical software are incorporated into instruction. It also shows how students view the use of technology in their math class. Overall, digital tools are used often, which is shown by a total average score of 4.37 and a standard deviation of 0.70. However, looking closely at the numbers shows two very different ways technology is applied.

Technology is mainly used as a hands-on tool to help students solve and picture math problems during class time. For example, letting students use calculators or computers to solve math problems got the highest average score of 4.72 and a standard deviation of 0.48. Digital presentations like PowerPoint or videos are also frequently used, scoring an average of 4.54 and a standard deviation of 0.69. Using online interactive tools to learn math is also common, with an average of 4.42 and a standard deviation of 0.69. These high scores show a classroom where technology is used actively to do math.

On the other hand, technology is used much less for sharing outside information. Using social media or other online platforms to share learning materials got the lowest average score of 4.05 and a standard deviation of 0.83. Similarly, relying on educational websites or apps just to explain concepts scored a lower average of 4.14 and a standard deviation of 0.80.

In short, technology in this classroom is mostly used for active calculating and visual learning during class. There is much less focus on using the internet or apps simply to share resources or give outside reading.

Table 4. Level of Teaching Methods as Perceived by the Learners in Terms of Lecture – Discussion

Statement My teacher . . .	Mean	SD	Remarks
…gives detailed lectures and explanations before activities.	4.76	0.51	Strongly Agree
…leads discussions and asks questions during class.	4.68	0.57	Strongly Agree
…uses the board to write formulas and examples.	4.71	0.56	Strongly Agree
…explains the steps of solving a problem one by one.	4.73	0.50	Strongly Agree
…answers our questions and clarifies concepts through discussion.	4.77	0.48	Strongly Agree
Weighted Mean 4.73			
SD 0.52			
Verbal Interpretation Highly Practiced			

The Table 4 results revealed that the use of lecture-discussion in mathematics instruction is looked upon as having a very favorable view by learners. Teachers received very high scores for answering questions and clarifying concepts through discussion, giving detailed lectures and explanations before activities, and explaining the steps of solving a problem one by one.

With a total weighted average of 4.73 and a deviation of 0.52 from the average, it can be said that teachers use Lecture-Discussion "Highly Practiced". A lower standard deviation from the weighted means suggests that learners seem to have highly similar views about how well the strategies were implemented.

Level of Learners' Motivation

In this study, motivation is defined as the level of drive students demonstrate toward learning mathematics. It is conceptualized as the multifaceted psychological drive that energizes, directs, and sustains a student's behavioral engagement.

The level of learners' motivation of learners in terms of integrative motivation, instrumental motivation, intrinsic motivation and extrinsic motivation was treated statistically using mean and standard deviation. The mean score establishes the central tendency to reveal the predominant motivational levels, while the standard deviation measures data dispersion to indicate the degree of consensus or divergence among individual student responses.

Table 5. Level of Learners' Motivation in Terms of Integrative Motivation

Statement My teacher . . .	Mean	SD	Remarks
…I feel a sense of belonging in my math class.	4.25	0.78	Strongly Agree
…I enjoy working with my classmates on math problems.	4.20	0.72	Agree
…I feel closer to my classmates when we solve math problems together.	4.19	0.83	Agree
…I want to succeed in math to connect and interact better with my classmates.	4.25	0.84	Strongly Agree
…I feel connected to my math teacher and my classmates.	4.29	0.86	Strongly Agree
Weighted Mean		4.24	
SD		0.81	
Verbal Interpretation		Highly Motivated	

Table 5 presents the level of learners' motivation in terms of Integrative Motivation. The results revealed that the students possess a very favorable level of integrative motivation within their mathematics classes. The highest scores were recorded for the learners feeling connected to their math teacher and classmates with the of 4.29, feeling a sense of belonging in their math class, mean of 4.25, and wanting to succeed in math to connect and interact better with their peers, mean of 4.25.

With a total weighted average of 4.24 and a standard deviation of 0.81, it can be said that the students are "Highly Motivated" in terms of integrative motivation. The standard deviation from the weighted mean indicates that the learners share generally similar views, acknowledging that social connection plays a significant role in their drive to learn.

Table 6 presents the level of learners' motivation in terms of Instrumental Motivation. The results revealed that the students strongly recognize the practical and educational value of the subject. Among the specific indicators, the learners gave the highest rating to the statement, "I realize that learning math is important for achieving my academic goals," which garnered a mean score of 4.38. This indicates that the learners' strongest instrumental drive is deeply rooted in their desire to reach their immediate educational milestones.

Overall, with a total weighted average of 4.30, it can be concluded that the students are "Highly Motivated" in terms of instrumental motivation, this implies that the learners view mathematics as a highly essential stepping stone for their future success.

Table 6. Level of Learners' Motivation in Terms of Instrumental Motivation

Statement My teacher . . .	Mean	SD	Remarks
…I understand that studying math is required for my future career.	4.29	0.79	Strongly Agree
…I believe or see that being good at math will lead to a better job.	4.30	0.69	Strongly Agree
…I realize that learning math is important for achieving my academic goals.	4.38	0.72	Strongly Agree
…I understand how a good grade in math will help me get into my desired college.	4.34	0.73	Strongly Agree
…I see why learning math is necessary for my future courses.	4.18	0.80	Agree
Weighted Mean		4.30	
SD		0.74	
Verbal Interpretation		Highly Motivated	

Table 7. Level of Learners' Motivation of in Terms of Intrinsic Motivation

Statement My teacher . . .	Mean	SD	Remarks
…I find mathematics interesting and enjoyable.	4.00	0.85	Agree
…I develop curiosity about mathematical concepts and a desire to learn more.	4.06	0.90	Agree
…I enjoy the challenge of doing my math homework.	4.11	0.80	Agree
…I participate eagerly in math class discussions.	4.01	0.85	Agree
…I feel a sense of accomplishment when I solve a difficult math problem.	4.13	0.84	Agree
Weighted Mean 4.06			
SD 0.84			
Verbal Interpretation Motivated			

Table 7 presents the learners' level of Intrinsic Motivation towards mathematics. Overall, the students exhibit a strong internal drive to learn, as reflected by a composite weighted mean of 4.06 and a descriptive rating of "Motivated." Furthermore, the standard deviation of 0.84 indicates a relatively strong consensus among the learners regarding their personal interest and internal push to understand the subject.

These students are primarily motivated by the intellectual challenge of the discipline. They gave the highest ratings to the sense of accomplishment felt when solving difficult problems and their enjoyment of challenging math homework. While still positively rated, indicators related to finding math generally enjoyable and eager class participation scored slightly lower, signifying their intrinsic drive is tied more to the personal triumph of overcoming a mathematical obstacle than just general classroom activities.

In summary, these findings imply that the learners are highly motivated by the inherent challenge that mathematics provides.

Table 8 presents the learners' level of Extrinsic Motivation towards mathematics. Overall, the students show a positive external drive to study the subject, reflected by a total weighted mean of 4.02 and a descriptive rating of "Motivated." The standard deviation of 0.85 suggests a general agreement among the learners regarding the outside factors that push them to perform well.

Table 8. Level of Learners' Motivation of Learners in Terms of Extrinsic Motivation

Statement My teacher . . .	Mean	SD	Remarks
…I work hard in math to get a good grade.	4.30	0.74	Strongly Agree
…I am interested to do well in math to get praise from my teachers or parents.	3.92	0.87	Agree
…I feel motivated to learn math to avoid punishment or a bad grade.	4.20	0.81	Agree
…I study math to get rewards or incentives.	3.76	0.98	Agree
…I am feeling determined by the recognition I receive for doing well in math.	3.92	0.86	Agree
Weighted Mean		4.02	
SD		0.85	
Verbal Interpretation		Motivated	

Looking closely at the specific indicators, the students are primarily driven by the desire for high academic marks. The statement indicating they work hard to get a good grade received the highest mean score of 4.30 and a descriptive remark of Strongly Agree. Another strong external factor is the pressure to avoid negative outcomes, such as bad grades or punishment, which scored a mean of 4.20. In contrast, studying purely to get physical rewards or incentives received the lowest score with a mean of 3.76, showing it is a much less common driver for these students.

Moreover, these findings implies that the learners' extrinsic motivation is tied greatly to their official academic standing, chasing good grades and avoiding bad ones rather than physical rewards or verbal praise from others.

Level of Learners' Mathematical Abilities

To get a clear profile of the students, these math abilities were divided into five specific areas: problem-solving, critical thinking, analytical reasoning, logical reasoning, and spatial reasoning. The scores for these five areas were analyzed using frequency and percentage.

Using frequencies gives an exact count of how many individual students fall into each performance level for every skill. At the same time, turning these numbers into percentages shows the overall proportion of the class. This makes it easy to see what percentage of the students have mastered a skill and what percentage still need help. Together, these simple tools show exactly where the students are strongest and where they need the most improvement.

Table 9. Level of Learners' Mathematical Abilities in Terms of Problem Solving

Scores	Frequency	Percentage	Descriptive Equivalent
13-15	8	8.99%	Highly Proficient
10-12	18	20.22%	Proficient
7-9	31	34.83%	Nearly Proficient
4-6	20	22.47%	Low Proficient
1-3	2	2.25%	Not Proficient
Total	79	100%	

Weighted Mean = 8.35
SD=2.78

Table 9 presents the level of learners' mathematical abilities in terms of problem solving, including the distribution of scores with their corresponding frequency, percentage, and descriptive remarks.

The result shows that most of the learners (34.83%) were found to be at the near-proficient level. The remaining number of respondents who were assessed as proficient (20.22%) or very proficient as defined by this study (8.99%) were less than a third of the entire sample of respondents; while those that were rated as low proficiency level comprised twenty-two point forty-seven percent (22.47%) of the sample and that were considered to have no proficiency, comprised two point twenty-five percent (2.25%) of the overall assessed population.

Individually, the sample of all respondents had a calculated mean of eight point thirty-five (8.35) with a calculated standard deviation of two point seventy-eight (2.78) indicating that the mean score is within the near-proficient level. In addition, the average of such a moderate standard deviation indicates that while the majority of the sample had similar appropriateness of performance in problem solving, there were still some differences among the individual sample members with regard to their respective skills in problem solving.

In summary, this implies that most of the learners remain in the developing stages of their problem-solving skills as evidenced by the high percentage of learners at the near proficiency level. Therefore, the small numbers of respondents who fall under the lowest classification level suggests there is a need for additional support for those very few that have been assessed at the lowest level of proficiency. As such, it is necessary to enhance instructional practices and enable learners to use guided practice as well as practice in problem solving through more extensive directed practice and purposeful opportunities; thus, assisting learners in their quest for increased proficiency in mathematics.

Table 10. Level of Learners' Mathematical Abilities in Terms of Critical Thinking

Scores	Frequency	Percentage	Descriptive Equivalent
13-15	7	7.87%	Highly Proficient
10-12	31	34.83%	Proficient
7-9	32	35.96%	Nearly Proficient
4-6	8	8.99%	Low Proficient
1-3	1	1.12%	Not Proficient
Total	79	100%	

Weighted Mean = 9.29
SD=2.50

Table 10 shows that most of the learners (35.96%) were found to be at the nearly proficient level. The remaining number of respondents who were assessed as proficient (34.83%) or highly proficient as defined by this study (7.87%) comprised a significant portion of the entire sample of respondents; while those that were rated as low proficient level comprised eight point ninety nine percent (8.99%) of the sample and that were considered to be not proficient, comprised one point twelve percent (1.12%) of the overall assessed population.

Individually, the sample of all respondents had a calculated mean of nine point twenty-nine (9.29) with a calculated standard deviation of two point fifty (2.50) indicating that the mean score is within the nearly proficient level.

Table 11. Level of Learners' Mathematical Abilities in Terms of Analytical Reasoning

Scores	Frequency	Percentage	Descriptive Equivalent
13-15	10	11.24%	Highly Proficient
10-12	13	14.61%	Proficient
7-9	41	46.07%	Nearly Proficient
4-6	15	16.85%	Low Proficient
1-3	0	0.00%	Not Proficient
Total	79	100%	

Weighted Mean = 8.67
SD=2.54

Table 11 presents the level of learners' mathematical abilities in terms of analytical reasoning, including the distribution of scores with their corresponding frequency, percentage, and descriptive remarks.

The result shows that most of the learners (46.07%) were found to be at the nearly proficient level. The remaining number of respondents who were assessed as proficient (14.61%) or highly proficient as defined by this study (11.24%) comprised just over a quarter of the entire sample of respondents; while those that were rated as low proficient level comprised sixteen point eighty-five percent (16.85%) of the sample and that were considered to be not proficient, comprised zero percent (0.00%) of the overall assessed population.

Individually, the sample of all respondents had a calculated mean of eight point sixty-seven (8.67) with a calculated standard deviation of two point fifty-four (2.54) indicating that the mean score is within the nearly proficient level. In addition, the average of such a moderate standard deviation indicates that while the majority of the sample had similar appropriateness of performance in analytical reasoning, there were still some differences among the individual sample members with regard to their respective skills in analytical reasoning.

Table 12. Level of Learners' Mathematical Abilities in Terms of Logical Reasoning

Scores	Frequency	Percentage	Descriptive Equivalent
13-15	14	15.73%	Highly Proficient
10-12	15	16.85%	Proficient
7-9	28	31.46%	Nearly Proficient
4-6	19	21.35%	Low Proficient
1-3	3	3.37%	Not Proficient
Total	79	100%	

Weighted Mean = 8.71
SD=3.25

Table 12 shows that most of the learners (31.46%) were found to be at the nearly proficient level. The remaining number of respondents who were assessed as proficient (16.85%) or highly proficient as defined by this study (15.73%) comprised almost a third of the entire sample of respondents; while those that were rated as low proficient level comprised twenty-one point thirty five percent (21.35%) of the sample and that were considered to be not proficient, comprised three point thirty-seven percent (3.37%) of the overall assessed population.

Individually, the sample of all respondents had a calculated mean of eight point seventy-one (8.71) with a calculated standard deviation of three point twenty-five (3.25) indicating that the mean score is within the nearly proficient level. In addition, the average of such a standard deviation indicates that while many in the sample had similar appropriateness of performance in logical reasoning, there were still some differences among the individual sample members with regard to their respective skills in logical reasoning.

This implies that most of the learners remain in the developing stages of their logical reasoning skills as evidenced by the highest percentage of learners at the nearly proficient level.

Table 13. Level of Learners' Mathematical Abilities in Terms of Spatial Reasoning

Scores	Frequency	Percentage	Descriptive Equivalent
13-15	0	0.00%	Highly Proficient
10-12	7	7.87%	Proficient
7-9	53	59.55%	Nearly Proficient
4-6	16	17.98%	Low Proficient
1-3	3	3.37%	Not Proficient
Total	79	100%	

Weighted Mean = 8.57
SD=2.94

Table 13 illustrates that the majority of the learners (59.55%) performed at the nearly proficient level. Only a small fraction of the respondents demonstrated advanced skills, with 7.87% assessed as proficient and none (0.00%) as highly proficient. On the lower end of the spectrum, 17.98% of the students were classified as having low proficiency, while 3.37% of the overall population were considered not proficient.

The group recorded an overall mean score of 8.57, which falls squarely within the nearly proficient category. Additionally, the standard deviation of 2.94 reveals a moderate spread in the data. This indicates that while the bulk of the learners share a similar baseline in their spatial reasoning performance, there are still distinct variations in their individual skill levels.

These findings imply that most of the students are still in the developmental phase of their spatial reasoning abilities. This is strongly evidenced by the heavy concentration of learners operating at the nearly proficient level, with very few having fully mastered the competency.

Significant Relationship between Teaching Methods and Learners' Motivation in Mathematics

To test the significant relationship between teaching methods and learners' motivation in mathematics, the data was treated statistically using Jamovi (Version 2.3.28) to run the Pearson correlation coefficient. This specific inferential analysis was applied to determine the strength and direction of the linear relationship between the perceived pedagogical strategies and the four distinct indicators of motivation:

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integrative motivation, instrumental motivation, intrinsic motivation, and extrinsic motivation.

Table 14. Teaching Methods and Learners' Motivation in Mathematics

Teaching Methods (IV)		Integrative	Learners' Motivation in Mathematics (DV) Instrumental	Intrinsic	Extrinsic
Problem -: Based Learning	Pearson Correlation	0.29*	0.23*	0.23*	0.24*
	Significance(2Tailed)	0.011	0.038	0.045	0.035
	N	79	79	79	79
Cooperative: Learning	Pearson Correlation	0.26	0.25*	0.29**	0.24*
	Significance(2-Tailed)	0.023*	0.026	0.009	0.031
	N	79	79	79	79
Technology: Integration	Pearson Correlation	0.20	0.30**	0.34**	0.29*
	Significance(2-Tailed)	0.075	0.007	0.002	0.010
	N	79	79	79	79
Lecture –: Discussion	Pearson Correlation	0.10	0.24*	0.14	0.16
	Significance(2-Tailed)	0.365	0.032	0.216	0.150
	N	79	79	79	79

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

Table 14 presents the relationship between teaching methods and learners' motivation in Mathematics, particularly in terms of integrative, instrumental, intrinsic, and extrinsic motivation, using the Pearson correlation coefficient.

The results revealed that there is a generally weak to weakly positive correlation between the different types of instructional methods and the learners' motivation, although some of these correlations have been shown to be statistically significant with p-values < 0.05. To summarize, there is evidence that various types of methods correlated with student motivation, but the strength of the correlation is either low or very low.

In terms of Problem-Based Learning, there are very weak to weak positive relationship, statistically significant correlations with Integrative Motivation (r = 0.29, p = 0.011) and very weak but statistically significant correlations with Instrumental Motivation (r = 0.23, p = 0.038); Intrinsic Motivation (r = 0.23, p = 0.045); and Extrinsic Motivation (r = 0.24, p = 0.035). This result implies that encouraging students to participate in problem-solving activities will have a small but positive relationship with the various forms of motivation. Similar results were obtained for Cooperative Learning, with very weak to weak positive and statistically significant correlations observed for Integrative Motivation (r = 0.26, p = 0.023) and Intrinsic Motivation (r = 0.29, p = 0.009) and very weakly but statistically significant correlated with Instrumental Motivation (r = 0.25, p < 0.05); and Extrinsic Motivation (r = 0.24, p = 0.031). This means that using cooperative or collaborative strategies will be able to provide minor increases in motivation; however, the strength of the increase remains somewhat limited as well.

Technology integration has been found to have weak positive correlations with different forms of learner motivation related to Instrumental (r = 0.30, p = 0.007), Intrinsic (r = 0.34, p = 0.002), and Extrinsic (r = 0.29, p = 0.010) motivation, and, consequently, combining the use of technology could enhance various aspects of learner motivation; however, there is no significant weak positive correlation between Technology Integration and Integrative Motivation (r = 0.20, p = 0.075). Therefore, this indicates that using technology is more effective in enhancing the motivational aspects of Instrumental, Intrinsic, and Extrinsic forms; it is less effective in enhancing the motivational aspects of Integrative form.

On the other hand, Lecture-Discussion is shown to have very weak to weak or non-significant correlations on the motivational aspects of Integrative (r = 0.10, p = 0.365), Intrinsic (r = 0.14, p = 0.216), and Extrinsic (r = 0.16, p = 0.150) motivation with only one weak, but statistically significant (p < 0.05) positive correlation between Lecture-Discussion and Instrumental Motivation (r = 0.24, p = 0.032). Thus, it can be deduced that traditional instructional methods provide minimal influence on enhancing learner motivation.

In summary, this implies that, although problem-based learning, cooperative learning, and technology integration strategies appear to have very weak to weak statistically significant correlations with enhanced learner motivation in mathematics, as a whole, these methods must still be enhanced by implementing stronger instructional strategies to achieve greater levels of motivation among learners.

Significant Effect of Teaching Methods on the Learners' Mathematical Abilities

The significant effect of teaching methods on the learners' mathematical abilities in terms of problem solving, critical thinking, analytical reasoning, logical reasoning and spatial reasoning, was treated statistically using Real Statistics Data Analysis Tools using multiple regression analysis

Table 15. Regression Analysis on the Effect of Teaching Methods on the Learners' Mathematical Abilities

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.86	4	0.96	1.35	0.259
	Residual	52.67	74	0.71		
	Total	56.53	78			

a. Dependent Variable: Learners' Mathematical Abilities_Overall
b. Predictors: Problem – Based Learning, Cooperative Learning, Technology Integration and Lecture – Discussion

Coefficients[a] Unstandardized Coefficients

Model	B	Std. Error	T	Sig.
(Constant)	1.76	1.29	1.36	0.177
Problem – Based Learning	-0.16	0.22	-0.71	0.477
Cooperative Learning	-0.14	0.21	-0.68	0.500
Technology Integration	0.45	0.22	2.05	0.044*
Lecture – Discussion	0.16	0.27	0.60	0.553

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

A multiple regression analysis was conducted to determine whether the different teaching methods Problem-Based Learning, Cooperative Learning, Technology Integration, and Lecture Discussion could significantly predict learners' mathematical abilities.

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Regression results indicate that the teaching methods do not predict as a whole learners' overall mathematics ability, and therefore the combined set of variables does not provide a strong model for predicting student success in mathematics, based on ANOVA Analysis.

Except for Technology Integration ($B = 0.45$, $t = 2.05$, $p = 0.044$), all are not significant. Problem-Based Learning ($B = -0.16$, $p = 0.477$), Cooperative Learning ($B = -0.14$, $p = 0.500$), and Lecture-Discussion ($B = 0.16$, $p = 0.553$) are not significant predictors of the mathematics ability of learners.

While the set of teaching methods do not have a significant effect on the mathematics ability of learners, Technology Integration does. The unique predictive dominance of technology.

IV. Conclusion and Recommendations

Teaching methods play a significant role in shaping learner motivation, acting as a vital support system for the students' underlying ambitions. Consequently, the first hypothesis which posited no significant relationship between teaching methods and student motivation is rejected. This concludes that the learners are primarily driven by instrumental factors such as future career aspirations and college readiness effective instructional strategies serve to bridge the gap between daily classroom activities and these external goals. However, while current pedagogical practices successfully engage students and sustain their motivation, this psychological drive does not naturally translate into cognitive mastery.

On the other hand, teaching methods do not significantly affect the learners' actual mathematical abilities; hence, the second hypothesis is accepted. This concludes that while current strategies are motivating, they lack the specific cognitive rigor required to elevate problem-solving, critical thinking, and reasoning skills. These presents a clear directional path for educational improvement. The weak positive connection between technology integration and mathematical abilities highlights that traditional or generalized methods are no longer sufficient on their own.

In the formulated conclusions from the findings, it is recommended that:

School Administrators and Curriculum Planners might consider prioritizing institutional funding toward procurement of interactive math software, graphing applications, and physical computing devices.

Mathematics Teachers can restructure the application of collaborative and problem-based learning methods to ensure they move beyond "highly practiced" status and toward actual academic impact. This includes integrating more interactive simulations and digital visualization tools into these activities to bridge the gap between student motivation and their current "nearly proficient" skill levels.

Teachers and Department Heads might consider to refine the use of traditional Lecture-Discussion by incorporating more diagnostic assessments and immediate feedback loops. While this method is highly practiced, its minimal influence on student drive suggests a need to transform passive listening into active, technology-aided participation to better support spatial and analytical reasoning.

Students are suggested to leverage their high instrumental motivation by actively engaging with digital learning platforms and math software. By aligning their strong career-oriented goals with hands-on technological practice, students can take an active role in elevating their own proficiency from the developing stage to full mastery.

Future Researchers may conduct follow-up studies to explore specific qualitative factors that hinder traditional teaching methods from impacting proficiency. Additionally, future research could investigate the long-term effects of intensive technology-based interventions on the spatial and critical thinking skills of learners in agricultural school contexts. To further explore other factors that may influence students' struggles, coping mechanisms, and motivation in learning Mathematics.

Reference

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