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Exploring the Correlation between Student's Attitudes and the Development of Mathematical Skills

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***Abstract*—** This study determined the attitude toward mathematics and the development of the mathematical skills of Grade 7 students in the City of Bacoor National High School – Springville. Specifically, it examined the students' attitudes in terms of concept development, skills development, and values development, as well as their level of mathematical skill development. The study also explored the relationship between the students' attitudes and their mathematical skill levels and identified the problems faced by learners in developing their attitudes and skills. A descriptive correlational research design was employed, with data collected through a modified attitudinal scale, documentary analysis, unstructured interviews, and observation. Statistical treatments included frequency count, weighted mean, ranking, and Pearson r correlation coefficient. The findings revealed that the students had a positive attitude toward developing mathematical concepts, skills, and values. However, their level of mathematical skill development varied, with higher competence in gathering statistical data and using appropriate graphs, and lower competence in organizing data and illustrating measures of central tendency and variability. The study found a significant positive relationship between the students' attitudes and their mathematical skill levels. The key problems faced by students in developing positive attitudes were the high cost of learning materials, negative past experiences, lack of encouragement and support, and fixed mindsets about mathematical abilities. In terms of skill development, the main challenges were limited availability of learning resources, struggles with mastering basic concepts, ineffective teaching techniques, and difficulties in interpreting and translating word problems. The study concluded that the students' positive attitudes can be leveraged to engage further and motivate them while addressing the varying skill levels and identifying problems through targeted interventions. Further research is recommended to explore longitudinal trends, different instructional approaches, and the influence of various factors on attitude and skill development.

***Keywords*—** Attitudes toward Mathematics, Descriptive Correlational, Development of Mathematical Skills, Learning Package.

I. INTRODUCTION

In the context of global education, mathematics is universally recognized as a critical subject that underpins various scientific and technological advancements. Across different countries, there is a consistent emphasis on improving mathematical literacy, given its key role in embracing logical reasoning, problem-solving skills, and analytical thinking. However, despite its importance, there is a significant variation in students' attitudes toward mathematics and their subsequent performance, which has become a focal point of educational research worldwide.

The international discourse on mathematics education often highlights the dual challenge of enhancing students' development of student's mathematical skills and cultivating a positive attitude toward the subject. Numerous studies have identified that a student's attitude toward mathematics can significantly influence their engagement, motivation, and ultimately their academic success. This relationship underscores the need for a comprehensive understanding of the factors that shape students' attitudes and the development of effective instructional strategies to address these factors.

The correlation between students' attitudes toward mathematics and their development of student's mathematical skills is a critical aspect of mathematics education. Research indicates that students' positive attitudes toward mathematics can lead to improved performance and overall achievement in the subject (Wakhata et al., 2022). Factors such as enjoyment of mathematics and confidence in pursuing the subject significantly influence students' engagement and motivation (Mazana et al., 2018). It has been emphasized that solely relying on rote memorization of math facts may not effectively enhance math scores, underscoring the importance of instructional strategies that boost students' understanding and enjoyment of mathematics (Skinner & Cuevas, 2023).

In a similar sense, the term "attitude" in educational psychology refers to a learned predisposition to respond positively or negatively towards a particular subject or learning experience. In the context of mathematics education, a student's attitude encompasses their feelings, beliefs, and behaviors towards the subject. This attitude plays a crucial role in influencing students' engagement, motivation, and academic success in mathematics. Positive attitudes are often associated with increased effort and perseverance in learning mathematics, leading to better performance, while negative attitudes can result in anxiety, avoidance, and poor academic outcomes (Quaye & Pomeroy, 2021).

On the other hand, the development of students' mathematical skills in mathematics is a crucial indicator of students' understanding, mastery of mathematical concepts, problem-solving abilities, and capacity to apply mathematical knowledge in various settings, both academic and real world. Achieving strong development of student's mathematical skills in mathematics is not solely dependent on study habits but is also influenced by students' motivation, interest, and attitudes toward the subject (Casinillo et al., 2020). Research has indicated that students' attitudes towards mathematics are critical in their academic achievements (Alibraheim, 2021). Positive attitudes toward mathematics have been linked to improved development of student's mathematical skills, while negative attitudes can result in lower performance, anxiety, and avoidance of the subject (Peteros et al., 2019).

Large-scale assessments such as the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) provide valuable insights into the comparative performance of students in mathematics across different countries (Ghasemi & Burley, 2019). These assessments reveal significant disparities in mathematical proficiency and highlight areas needing improvement. For instance, countries in East Asia, such as Singapore, South Korea, and Japan, consistently score high in these assessments, often attributed to rigorous curricula and high societal regard for education. In contrast, many students in developing countries face challenges such as inadequate resources, insufficiently trained teachers, and large class sizes, which adversely affect their performance.

Attitudes towards mathematics vary widely around the world and are influenced by cultural, social, and educational factors (Oracion & Abina, 2021). Positive attitudes are generally associated with higher engagement and better performance. In many high-performing countries, there is a strong cultural emphasis on the importance of education, leading to positive attitudes towards mathematics. Conversely, in regions where mathematics is perceived as difficult or inaccessible, students often develop negative attitudes, leading to math anxiety and lower performance.

In the Philippines, the state of mathematics education reflects many of the global challenges and trends, while also being influenced by local factors. Despite these efforts, recent international assessments, such as the Programme for International Student Assessment (PISA), have revealed a decline in Filipino students' mathematical performance, indicating a need for targeted interventions to address this issue Andrade et al. (2020). The country has been striving to improve its educational system, with particular emphasis on enhancing students' proficiency in mathematics, given its importance for national development and global competitiveness (Dicdiquin et al., 2023). The Philippines participates in international assessments such as the Trends in International Mathematics and Science Study (TIMSS) and the PISA. Results from these assessments have often highlighted areas of concern, with Filipino students typically scoring below the international average in mathematics. These results have prompted educational authorities to critically evaluate and reform the mathematics curriculum and teaching methodologies. Likewise, in the Philippines, students' attitudes towards mathematics vary widely. While some students exhibit a positive outlook and enthusiasm for the subject, a significant number experience math anxiety and perceive mathematics as a challenging and intimidating subject. This negative attitude can be attributed to several factors, including traditional teaching methods that emphasize rote learning over conceptual understanding, large class sizes, and a lack of sufficient instructional materials.

Filipino students face several challenges that impact their performance in mathematics (Andrade & Pasia, 2020). One is math anxiety where many students experience significant anxiety when dealing with mathematical concepts, which can hinder their ability to learn and perform well. Another is resource limitations where schools in underprivileged areas often lack basic educational resources, such as textbooks, teaching aids, and technology, which are essential for effective mathematics instruction. Then, the large class sizes which are overcrowded classrooms make it difficult for

teachers to provide individual attention and support to students struggling with mathematical concepts. In this sense, the state of mathematics education in the Philippines is marked by ongoing efforts to improve both student attitudes and development of student's mathematical skills.

This research is anchored with Article XIV, section 1 of the Philippine Constitution about the role of quality education in human development and the achievement of national goals. It states that:

"The state shall protect and promote the right of its citizens to quality of education at all levels and shall take appropriate steps to make such education accessible to all."

To attain this, the Department of Education (DepEd), being the government unit that takes charge of the education system of the country, continuously undergoes enhancing and upgrading of the basic education curriculum. This research would like to share insights among educators about the role of student's attitudes towards the subject they are learning, mathematics in this case, and eventually come up with recommendations to consider attitude in the teaching practices of teachers.

At the City of Bacoor National High School – Springville, the learning environment for Grade 7 students in mathematics is shaped by a combination of educational policies, school resources, teacher capabilities, and the socio-economic background of the students. As part of a rapidly urbanizing area, the school benefits from relatively better infrastructure and resources compared to rural schools. However, challenges such as large class sizes, varied student backgrounds, and differing levels of prior knowledge can impact the effectiveness of mathematics instruction.

The attitudes of Grade 7 students towards mathematics are influenced by their previous experiences with the subject, the influence of their teachers, peer interactions, and parental support. Positive early experiences, enthusiastic and supportive teaching, collaborative peer environments, and active parental involvement can foster a positive attitude towards mathematics, while negative experiences and lack of support can lead to math anxiety and disengagement.

The development of student's mathematical skills of these students can be assessed through standardized test scores, classroom assessments, and class participation. Standardized tests benchmark academic achievement and understanding of the curriculum, while regular quizzes, homework, exams, and active class engagement offer insights into students' day-to-day performance and interest in mathematics.

Despite these assessments, Grade 7 students face several challenges in learning mathematics, including math anxiety, resource limitations, and diverse learning needs. Anxiety can hinder performance and participation, limited access to advanced teaching aids and materials can impact learning quality, and the varying levels of prior knowledge and abilities among students make it difficult to address individual needs effectively.

To improve mathematics education, teachers can implement strategies such as differentiated instruction, interactive learning, and fostering parental involvement. Additionally, continuous professional development for teachers is essential to enhance the quality of instruction and stay updated with modern teaching methodologies. These measures are crucial for creating a supportive and effective mathematics learning environment. Therefore, researching student attitudes toward mathematics instruction about their development of student's mathematical skills is essential to identify specific areas for improvement and develop targeted strategies to enhance attitudes and academic outcomes in mathematics.

II. OBJECTIVES

This study determined the attitude toward mathematics and the development of the' mathematical skills of Grade 7 students in the City of Bacoor National High School – Springville.

Specifically, it identified attitude of students towards mathematical instructions in terms of: Concept development; Skills development; Values development; The level of development of students' mathematical skills; To know if there is a significant relationship between the attitude of the students toward mathematics and the level of development of their mathematical skills; Do the learners meet the problems in the development of attitudes and development of their mathematical skills.

III. METHODOLOGY

This study determined the attitude toward mathematics and the development of Grade 7 students' mathematical skills in the City of Bacoor National High School—Springville. It used a descriptive correlational research

design, with data collected through a modified attitudinal scale, documentary analysis, unstructured interviews, and observation.

Thirty-eight Grade 7 students were the respondents. The data collection methods were a modified survey questionnaire on the Attitude of the Students toward Mathematics (ATMI) adopted from Tapia (1996), documentary analysis, unstructured interviews, and observation. Frequency count, weighted mean, ranking, and Pearson r correlation coefficient were the statistical treatments used.

IV. RESULTS AND DISCUSSION

1. Attitude of Students Towards Mathematics Instruction

Concept Development

Table 1.1 presents the results of a survey on student attitudes towards mathematics instruction, specifically focusing on concept development. The table shows the average score ($\bar{x}$) and briefly describes each of the ten indicators used to assess the students' attitudes. The students have a very strong positive attitude towards the development of mathematical concepts. This is evident from the overall average score of 4.42, described as "Agree."

The table provides several indicators demonstrating the students' positive attitude towards concept development. The three highest-scoring indicators are: "I find mathematical concepts to be interesting topics to discuss with" with a weighted mean of 4.55, interpreted as agree.

"I believe studying advanced mathematics concepts is useful" has a weighted mean of 4.50, described as agree. "I am comfortable expressing my ideas on how to find solutions to a difficult problem in math" has a weighted mean of 4.50, described as agree.

These high scores suggest that the students find mathematical concepts engaging and enjoyable, particularly when discussing them with others. They also believe that studying advanced mathematics is valuable, and they are confident in their ability to solve complex mathematical problems.

Table 1.1 *Attitude towards concept development*

Indicators	$\bar{x}$	Description
1. I appreciate understanding and learning mathematical concepts.	4.39	Agree
2. I am confident in my ability to learn new mathematical ideas	4.24	Agree
3. Learning mathematical ideas is exciting and interesting	4.47	Agree
4. I am confident that I could learn advanced mathematical facts.	4.37	Agree
5. I find mathematical concepts to be interesting topics to discuss with	4.55	Agree
6. I am willing to discuss to my teachers and classmates topics about mathematics.	4.37	Agree
7. I enjoy the challenge of mathematical problems necessary for concept formulation	4.42	Agree
8. I believe studying advanced mathematics concepts is useful.	4.50	Agree
9. I believe studying mathematical ideas helps me with problem-solving in other areas.	4.39	Agree
10. I am comfortable expressing my ideas on how to find solutions to a difficult problem in math.	4.50	Agree
Average	4.42	Agree

On the other hand, the three lowest-scoring indicators, though still indicating a strong positive attitude, are: "I am confident in my ability to learn new mathematical ideas" has a weighted mean of 4.24 described as agree; "I believe studying mathematical ideas helps me with problem-solving in other areas" has a weighted mean of 4.39 described as agree; and "I appreciate understanding and learning mathematical concepts" has a weighted mean of 4.39 described as agree. These three lowest-scoring indicators, though still indicating a strong positive attitude, provide some insights into potential areas for improvement or further development in the students' attitudes towards mathematics concept development. The high scores across all indicators suggest the students have a strong intrinsic motivation and enthusiasm for learning and engaging with mathematical concepts. They find the process of concept development, including discussions and problem-solving, to be exciting and rewarding. This positive attitude can contribute to the overall development of student's mathematical skills and success in mathematics. The findings from this table can be linked to the importance of fostering a positive and engaging learning environment for mathematics instruction. When students have a strong enthusiasm for concept development, they are more likely to be actively

engaged in the learning process, ask questions, and seek deeper understanding. This, in turn, can lead to better retention of mathematical knowledge and improved problem-solving skills, which are essential for success in various academic and professional domains.

The consistently high scores across all indicators of attitude towards mathematics skills development paint a clear picture: these students are intrinsically motivated and genuinely enthusiastic about learning and engaging with mathematical concepts. They do not simply view mathematics as a subject to be endured but rather, find the process of concept development, including discussions and problem-solving, to be stimulating and rewarding.

This intrinsic motivation and positive attitude are invaluable assets for academic success in mathematics. Research has consistently shown a strong correlation between positive attitudes towards mathematics and higher levels of achievement in the subject (Dowker et al., 2016). Students who enjoy the learning process are more likely to invest effort, persevere through challenges, and, ultimately, perform better (Potvin & Hasni, 2017).

This intrinsic motivation is also linked to a deeper engagement with the material. When students are genuinely interested in understanding mathematical concepts, they are more likely to actively participate in class discussions, ask insightful questions, and seek clarification when needed. This active learning approach, as opposed to passive information absorption, leads to better knowledge retention and the development of critical problem-solving skills (Bryan & Bryan, 2015).

The findings from this table underscore the importance of fostering a positive and engaging learning environment for mathematics instruction. Educators can build on this intrinsic motivation by incorporating interactive activities, real-world applications, and collaborative learning opportunities into their teaching practices. When creating a space where students feel comfortable exploring mathematical ideas, making connections, and even making mistakes, we can nurture their enthusiasm and set them on a path towards greater academic and professional success in mathematics-related fields (Tosto et al., 2016).

Skills Development

Table 1.2 reveals a highly positive attitude towards mathematics skills development among the respondents. This positive disposition is evident in their strong agreement with statements reflecting motivation, real-world application, comfort, confidence, and enjoyment in engaging with mathematical tasks.

The average score across all ten indicators is 4.41, which falls under the "Agree" category. This indicates a strong overall positive sentiment towards mathematics skills development. Respondents exhibit a strong desire to enhance their mathematical abilities. This is evident in their agreement, obtaining a weighted mean of 4.61, or agreement with the statement, "I am driven to become more proficient in acquiring skills in the field of mathematics." Furthermore, they derive genuine enjoyment from tackling novel mathematical challenges, as indicated by their agreement, obtaining a weighted mean of 4.58 with the statement, "I enjoy solving new mathematics problems."

Table 1.2 *Attitude Towards Skills Development*

Indicators	$\bar{x}$	**Description**
1. I am driven to become more proficient in acquiring skills in the field of mathematics.	4.61	Strongly Agree
2. I can think of many real-world applications of mathematics.	4.42	Agree
3. I feel calm and relaxed when I have to do a mathematics problem.	4.32	Agree
4. I feel comfortable working on tasks that involve mathematics.	4.39	Agree
5. Tasks that involve mathematics do not make me feel uneasy.	4.29	Agree
6. I am confident in my math abilities, especially in applying such to project completion	4.29	Agree
7. I can solve mathematics problems without too much difficulty.	4.29	Agree
8. I feel a sense of security when attempting and engaging in mathematical tasks	4.39	Agree
9. I enjoy solving new mathematics problems	4.58	Agree
10. I believe that the skills in solving mathematical tasks have a remarkable application in community life.	4.53	Agree
Average	4.41	Agree

Beyond personal satisfaction, respondents recognize the practical value of mathematics in real-world scenarios. This is reflected in their agreement, 4.42 weighted mean with the statement, "I can think of many real-world applications of mathematics." This understanding is further reinforced by their belief, 4.53 weighted mean in the relevance of mathematical skills within a community context, as expressed through their agreement with the statement, "I believe that the skills in solving mathematical tasks have a remarkable application in community life."

Importantly, respondents approach mathematical tasks with a sense of ease and self-assurance. They report feeling calm and relaxed, with a 4.32 weighted mean when confronted with mathematical problems and express comfort, a weighted mean of 4.39, and security has 4.39 in engaging with such tasks. This positive mindset is coupled with confidence, with a weighted mean of 4.29, in their mathematical capabilities, and the belief has a 4.29 weighted mean, that they can effectively solve problems without difficulty. The data suggests that respondents perceive mathematics skills development positively. Their motivation stems not just from personal satisfaction but also from recognizing its practical applications in various aspects of life. This understanding likely contributes to their confidence and comfort in mathematical tasks.

This understanding of the utility of mathematics translates into a sense of self-assurance and ease when engaging with mathematical tasks. Mathematical challenges do not daunt respondents; instead, they approach them with a sense of capability and composure. Their awareness likely fosters this positive outlook that the skills they develop have value and relevance beyond the confines of a classroom or textbook. They see mathematics not as an abstract or isolated subject but as a tool that can be applied to solve problems and navigate various aspects of their lives and communities.

This positive attitude towards mathematics skills development is a promising indicator for educators and policymakers. It suggests a receptive audience for programs to enhance these skills, potentially leading to greater engagement and success in mathematics-related fields. The positive attitude towards mathematics skills development exhibited by the respondents presents a highly encouraging sign for both educators and policymakers. This receptiveness suggests a fertile ground for implementing programs designed to further cultivate these crucial skills. When individuals hold positive attitudes towards a subject, they are more likely to engage with it willingly, invest effort in learning, and persevere through challenges.

This finding aligns with existing research on the impact of attitudes on academic achievement. Studies, such as the one by Lipnevich, Preckel, and Krumm (2016), have consistently demonstrated that positive attitudes towards mathematics are significantly associated with higher levels of achievement in the subject. Moreover, research indicates that positive attitudes can act as a buffer against math anxiety, which has been shown to impact performance negatively (Dowker et al., 2012). Therefore, capitalizing on this positive disposition towards mathematics learning could lead to several beneficial outcomes. Students may be more inclined to participate actively in class, pursue advanced mathematics courses, and, ultimately, consider careers in STEM fields. This, in turn, can contribute to a more mathematically literate and scientifically proficient society.

Values Development

Table 1.3 presents students' attitudes towards the development of values in the context of their mathematics education. The high mean scores ($\bar{x}$) across all the indicators, ranging from 4.42 to 4.66 and an overall average of 4.56 or agree, suggest that students have a very positive perception of how mathematics classes contribute to the cultivation of various values and personal qualities.

Examining the top three indicators more closely, the results show that students strongly believe mathematics helps them develop self-reliance, with a mean score of 4.66, described as strongly agree with the statement, "I believe Mathematics is one of the most essential subjects to study because it can improve my being self-reliant."

Table 1.3 *Attitude Towards Values Development*

Indicators	$\bar{x}$	Description
1. I feel a great sense of satisfaction when I solve a mathematics problem.	4.58	Agree
2. I believe that the value of becoming analytical is enhanced in mathematics class.	4.55	Agree
3. I am confident that the value of being fair is honed in mathematics class.	4.55	Agree

4. I believe camaraderie is enhanced every time group work is applied in mathematics class.	4.58	Agree
5. I enjoy learning mathematics because it develops my patience.	4.58	Agree
6. I believe Mathematics is one of the most essential subjects to study because it can improve my being self-reliant	4.66	Strongly Agree
7. I like and enjoy mathematics because my becoming open-minded is developed	4.58	Agree
8. I am happier and more engaged in math than any other class.	4.42	Agree
Average	4.56	Agree

This indicates that they recognize the role of mathematics in fostering this important personal quality. Also, they derive a great sense of satisfaction from successfully solving mathematics problems, as evidenced by the mean score of 4.58 described as agree for the indicator "I feel a great sense of satisfaction when I solve a mathematics problem." This suggests that the problem-solving aspects of mathematics can positively impact their overall learning experience and attitudes.

In a similar sense, students acknowledge the value of mathematics in developing their analytical skills, with a mean score of 4.55 indicating that they agree with the statement, "I believe that the value of becoming analytical is enhanced in mathematics class." This indicates that they recognize the role of mathematics in cultivating analytical thinking, which is highly valued in various academic and professional contexts.

While the lower three indicators show a positive attitude, they suggest that some aspects of value development may not be perceived as prominently as others. For instance, the indicator "I am happier and more engaged in math than any other class" has the lowest mean score of 4.42 described as agree, suggesting that while students generally enjoy and value mathematics, they may not necessarily feel happier or more engaged in math compared to other subjects. Similarly, the indicators related to the development of open-mindedness, with a mean score of 4.58, and the enhancement of camaraderie through group work, with a mean score of 4.58, are still positive but may not be seen as the most significant value-added aspects of their mathematics education.

The data from the table suggests that students have a very positive attitude towards the value-development aspects of their mathematics education, with a strong emphasis on developing self-reliance, analytical skills, and personal satisfaction in problem-solving. The high level of agreement across the indicators suggests that students perceive mathematics as an effective vehicle for developing important values and personal qualities. For example, they feel a great sense of satisfaction when solving math problems (indicator 1), believe that mathematics enhances their analytical skills (indicator 2), and feel that it helps them develop patience (indicator 5) and self-reliance (indicator 6). Likewise, the students seem to appreciate the social and collaborative aspects of mathematics, as indicated by their agreement that mathematics classes foster camaraderie (indicator 4) and open-mindedness (indicator 7). These findings align with the notion that mathematics education when delivered effectively, can contribute to student's holistic development beyond the acquisition of content knowledge and technical skills.

Critical thinking and personal qualities in mathematics education can have a profound impact on students' overall growth and well-being through fostering the development of values. The research underscores the importance of critical thinking skills in mathematics education, highlighting that teaching critical thinking through mathematics is a fundamental aspect of schooling (Mulyanto et al., 2018). Mathematical critical thinking is crucial for students as it enables them to analyze, interpret, and process mathematical ideas and arguments effectively (Yanuari, 2023). Also, mathematics education is instrumental in shaping students to become resilient, creative, and critical thinkers when faced with problem-solving tasks (Telaumbanua et al., 2023). Critical thinking in mathematics education is a multifaceted concept that involves not only the acquisition of mathematical skills but also the development of student's abilities to think critically, creatively, and reflectively. With various teaching approaches, considering students' personal qualities, and utilizing innovative methods, teachers can effectively nurture students' critical thinking skills in mathematics, ultimately contributing to their holistic development and well-being.

2. Level of Development of Students' Mathematical Skills

The data presented in Table 2 provides valuable insights into the level of development of students' mathematical skills, specifically in the domain of statistics.

Table 2. Level of Development of Students' Mathematical Skills

MATHEMATICAL SKILLS	MPS (%)	Description
1. Gathering statistical data.	76.00	Developed
2. Representing and organizing data using: pie chart, bar graph, line graph, histogram, and ogive.	73.00	Developed
3. Calculating the measures of central tendency of ungrouped and grouped data.	72.00	Nearly Developed
4. Organizing data in a frequency distribution table.	63.00	Nearly Developed
5. Illustrating the measures of central tendency (mean, median, and mode) of statistical data.	63.00	Nearly Developed
6. Illustrating the measures of variability (range, average deviation, variance, standard deviation) of a statistical data.	57.00	Nearly Developed
7. Formulating simple statistical instrument.	52.00	Nearly Developed

The table reveals a varied circumstance in students' mastery of essential statistical skills. While they demonstrate proficiency in data gathering and representation, challenges arise in problem formulation, applying measures of central tendency and variability, and interpreting complex graphical representations.

The most developed skill among the students is gathering statistical data, with an MPS of 76% described as developed. This indicates that students have a strong ability to effectively collect and compile relevant data for statistical analysis. The second most developed skill is representing and organizing data using various graphical methods, such as pie charts, bar graphs, line graphs, histograms, and ogives. With an MPS of 73% described as developed, this skill is well-developed, suggesting that students can effectively communicate and visualize data using appropriate graphical representations.

Calculating the measures of central tendency of ungrouped and grouped data is the third most developed skill, with an MPS of 72% described as nearly developed. This implies that students have a good grasp of applying various central tendency measures, such as mean, median, and mode, to both simple and more complex data sets.

Organizing data in a frequency distribution table and illustrating the measures of central tendency (mean, median, and mode) of statistical data are the next two skills, both with an MPS of 63% described as nearly developed. These skills are considered nearly developed, indicating that students have a relatively good understanding of structuring data in a tabular format and identifying the central tendencies within a data set.

The sixth ranked skill is illustrating the measures of variability (range, average deviation, variance, and standard deviation) of statistical data, with an MPS of 57% or nearly developed. This skill is also nearly developed, suggesting that students have a relatively good comprehension of the various measures of data dispersion and their applications. The least developed skill among the students is formulating simple statistical instruments, with an MPS of 52% or nearly developed. This indicates that this skill is nearly developed, meaning that students have a relatively good understanding of creating basic statistical tools for data gathering and analysis.

One of the most notable findings is that the majority of the skills (5 out of 7) are classified as "Nearly Developed," indicating that students have a relatively good understanding of these concepts, but there is still room for growth and refinement. The two skills that are considered "Developed" are gathering statistical data and representing and organizing data using various graphical methods. These results suggest that students have a strong foundation in the fundamental aspects of data collection and visualization, which are crucial for effective statistical analysis and communication.

However, the table also reveals areas where students' skills are less developed. Formulating simple statistical instruments and illustrating the measures of variability (range, average deviation, variance, and standard deviation) have the lowest MPS. These skills are also classified as "Nearly Developed," indicating that targeted interventions and additional instruction may be necessary to improve students' proficiency in these areas. The remaining skills, such as organizing data in a frequency distribution table, illustrating the measures of central tendency, and calculating the measures of central

tendency, fall within the "Nearly Developed" range as well. This suggests that while students have a good grasp of these concepts, there is still potential for further development and refinement.

To evaluate the development of students' mathematical skills, particularly in statistics, it is essential to consider various factors influencing their abilities. Research indicates that the utilization of Brain-Based Learning (BBL) approaches, such as incorporating Autograph software, can significantly enhance students' mathematical communication skills Triana et al. (2019). Moreover, the implementation of Realistic Mathematics Education (RME) approaches has been shown to improve students' mathematical communication abilities in statistics courses (Paroqi et al., 2020).

The creation of teaching materials based on Problem-Based Learning (PBL) models has proven effective in enhancing students' mathematical communication skills, which are fundamental for mastering statistical concepts (Sitopu et al., 2019). Studies have emphasized the significance of students' initial mathematical abilities in shaping their mathematical critical thinking skills, which are vital for statistical learning (Angraini et al., 2023). Furthermore, the integration of Constructivism-based mathematics learning multimedia has been demonstrated to enhance students' mathematical communication skills, providing them with effective means to communicate mathematical ideas (Syukri et al., 2020).

Apart from teaching methodologies, students' perceptions of mathematics and their confidence levels significantly impact their mathematical communication abilities. Students with positive perceptions of mathematics tend to demonstrate better mathematical communication skills, which is essential for statistical literacy (Purwanto, 2022; Yakar & Yılmaz, 2017). Moreover, fostering students' 21st-century skills, including critical thinking, through mathematics education can further improve their problem-solving abilities in statistics (Sholihah et al., 2017). To conclude, incorporating innovative teaching approaches like BBL, RME, and PBL, focusing on students' initial mathematical abilities, addressing perceptions of mathematics, and nurturing critical thinking skills, educators can effectively support the development of students' mathematical skills, particularly in statistics.

Significant Correlation Between the Students' Attitude and the Level of Development of Mathematical Skills

The study explores the significant correlation between students' attitudes and their development of mathematical skills. A sample of 38 students revealed a very strong positive correlation between attitudes towards mathematical concepts and skill development, with a Pearson correlation coefficient of 0.848. This indicates that positive attitudes are likely to enhance mathematical skills, while negative attitudes can hinder them.

The analysis also highlighted that improvements in students' attitudes towards skills development correspond with substantial gains in their mathematical abilities, evidenced by a Pearson coefficient of 0.852. This aligns with the understanding that students' perceptions greatly influence their learning outcomes.

Furthermore, the study found a strong positive correlation (0.772) between attitudes towards values in mathematics and skill development, suggesting that appreciation for mathematical principles can enhance engagement and motivation.

The strong positive correlation between between students' attitudes and their development of mathematical skills highlights the importance of fostering a positive attitude towards mathematics and concept development among students. Being appropriately addressed by teachers may be able to enhance the development of their mathematical skills and competencies, ultimately leading to improved academic outcomes in the subject.

This data serves as evidence to support the notion that addressing the affective domain, in addition to the cognitive domain, is crucial for effective mathematics instruction and learning. Teachers should consider incorporating strategies that promote positive attitudes and value development alongside the development of technical mathematical skills.

The very strong positive correlation between students' attitudes towards skill development and their mathematical skill level underscores the importance of addressing the affective domain in mathematics education. When students value the development of mathematical skills and see their relevance, they are more likely to engage actively, practice diligently, and ultimately achieve higher levels of competence in the subject.

This data provides empirical evidence to support the notion that effective mathematics instruction should

focus not only on the delivery of content and the development of technical skills but also on cultivating positive attitudes and perceptions among students. To address both the cognitive and affective domains, teachers can create a learning environment that fosters overall mathematical proficiency and success.

Teachers should consider incorporating instructional strategies and activities that help students recognize the importance and practical applications of mathematical skills. This, in turn, may lead to the development of more positive attitudes towards skill development, ultimately supporting the growth of students' mathematical capabilities. Incorporating instructional strategies and activities that emphasize the practical applications and importance of mathematical skills can significantly impact students' attitudes toward skill development and support the growth of their mathematical capabilities. By integrating real-world contexts and emphasizing the relevance of mathematics in various domains, educators can enhance students' engagement and motivation to learn mathematics. The strong positive correlation between students' attitudes towards values development and their mathematical skill level underscores the importance of addressing the affective domain in mathematics education alongside the cognitive domain. By appreciating the values and principles underlying mathematics, teachers can create a learning environment that not only imparts technical skills but also nurtures a deeper understanding and appreciation for the subject. A comprehensive approach to mathematics instruction should consider the interplay between students' attitudes and perceptions and the development of their mathematical skills. To address the affective and cognitive domains concurrently, teachers can better support students in achieving overall mathematical proficiency and success.

3. Problems Met by the Learners in the Development of Attitudes and Mathematical Skills

Table 3.1 presents the key problems that learners face in developing positive attitudes towards mathematics. These problems span various factors, including financial, emotional, environmental, and cognitive-related challenges. The table lists 11 different problems that can hinder the development of positive attitudes towards mathematics, ranked based on the frequency (f) of their occurrence. The most common problem is the high cost of learning materials, followed by negative past experiences, lack of encouragement and support, and fixed mindsets about mathematical abilities.

Table 3.1 *Problems Met by the Learners in the Development of Attitudes*

Problems Met	f	Rank
1. Some learning materials in mathematics are costly, and such makes me passive about the learning area.	32	1
2. My past negative experiences in mathematics, such as poor performance, embarrassment, or unsupportive teachers or peers, have shaped my attitudes and created a lasting aversion to the subject.	30	2
3. I do not feel encouraged, praised, or supported by my parents, teachers, or peers, which makes it difficult for me to develop a positive attitude and appreciation for the value of mathematics.	28	3
4. I hold a fixed mindset about my mathematical abilities, believing that I am "not a math person," which undermines my confidence and motivation to improve.	25	4
5. The way my teachers teach the subject, such as not allowing me to practice or verify, makes me disengage from the subject.	23	5
6. I often feel anxious, fearful, or uncomfortable when faced with mathematics, hindering my willingness to engage and persist.	20	6
7. I am heavily influenced by my peers' attitudes and perceptions towards mathematics, and I often compare myself to their performance, which can negatively impact my self-confidence and attitude.	19	7
8. I struggle to understand how mathematics is applicable and relevant to my daily life, which leads to a disconnect and disinterest in the subject.	18	8.5
9. I often find mathematics an inherently difficult and complex subject, which makes me feel overwhelmed and discouraged, making it harder to maintain a positive attitude.	18	8.5
10. When my peers manifest disinterest in mathematics, I have to do the same.	17	10
11. I do not find mathematics engaging or enjoyable, and I struggle to see the inherent beauty and wonder in the subject, which hinders my overall attitude and motivation.	15	11

The second and third-rank problems highlight the significant role that emotional and environmental factors play in shaping students' attitudes. Past negative experiences, such as poor performance, embarrassment, or unsupportive teachers and peers, can create lasting aversions to mathematics. Similarly, a lack of encouragement, praise, and support from influential figures like parents, teachers, and peers can undermine students' confidence and motivation to develop a positive attitude.

The fourth and fifth-rank problems point to the influence of cognitive factors, such as fixed mindsets about mathematical abilities and the perceived quality of instructional approaches. When students believe they are "not a math person" or feel that their learning needs are not being adequately addressed, it can lead to disengagement and a diminished appreciation for the subject. The remaining problems, including anxiety, peer influence, perceived irrelevance, and inherent difficulty, further emphasize the complexity of the challenges faced by learners in cultivating positive attitudes towards mathematics.

The insights provided by Table 3.1 underscore the need for a multifaceted approach to addressing the problems that hinder the development of positive attitudes towards mathematics. Effective interventions must consider the financial, emotional, environmental, and cognitive factors that contribute to these challenges. Strategies that can help mitigate these problems may include providing affordable or subsidized learning materials, implementing targeted support and mentorship programs to address past negative experiences, fostering a nurturing and encouraging learning environment, promoting growth mindsets, and implementing engaging and responsive instructional practices. To address the diverse range of problems identified in the table, teachers and policymakers can work towards creating a learning environment that empowers students to develop positive attitudes and a stronger appreciation for the value and relevance of mathematics. This, in turn, can enhance students' overall engagement, motivation, and, ultimately, their mathematical proficiency.

In totality, to implement a holistic approach that considers students' attitudes, perceptions, and the development of their mathematical skills, educators and policymakers can create a supportive learning environment that fosters positive attitudes towards mathematics. Through collaborative efforts and the implementation of effective instructional strategies, students can be empowered to appreciate the value and relevance of mathematics, leading to enhanced learning outcomes and a deeper understanding of the subject.

Table 3.2 outlines the key problems that learners face in developing their mathematical skills. These problems span various aspects of the learning process, including access to resources, conceptual understanding, instructional approaches, and problem-solving strategies. The table lists 11 different problems that can hinder the development of mathematical skills, ranked based on the frequency (f) of their occurrence. The most common problem is the limited availability of mathematics learning resources, followed by struggles with mastering basic concepts, ineffective teaching techniques, and problems with interpreting and translating word problems.

Table 3.2 *Problems Met by the Learners in the Development of Mathematical Skills*

Problems Met	**f**	**Rank**
1. The limited mathematics learning resources make my learning in mathematics class difficult.	33	1
2. I struggle with mastering basic mathematical concepts and operations, such as arithmetic, making it difficult to build upon and progress in more advanced topics.	32	2.5
3. The teachers' use of not-so-effective teaching techniques hinders my learning in mathematics class.	32	2.5
4. I find it challenging to interpret and translate word problems into the appropriate mathematical expressions and equations, preventing me from successfully solving real-world applications.	28	4
5. I have trouble grasping the underlying logic and reasoning behind mathematical principles, leading to a superficial understanding that makes it difficult to apply concepts effectively.	27	5
6. I have difficulty organizing my work and keeping track of the various steps involved in solving a mathematical problem, which can lead to confusion and errors.	25	7
7. When my peers find are hard to grasp mathematical concepts, I have to act the same.	25	7

8. I struggle to comprehend and properly use the specialized mathematical language, symbols, and notations, which can hinder my understanding and communication of mathematical concepts.	25	7
9. I tend to make careless mistakes when solving mathematics problems, negatively impacting my overall performance and confidence.	23	9
10. I am often slow in completing mathematical computations, which hinders my ability to work efficiently and effectively.	20	10
11. I have trouble understanding the different steps in solving mathematical problems and often feel confused when applying appropriate problem-solving strategies.	19	11

The data in Table 3.2 provide valuable insights into the multifaceted challenges that students encounter in developing their mathematical skills. The top-rank problem, the limited availability of learning resources, suggests that a lack of access to essential materials can significantly impede the learning process.

The second and third-rank problems highlight the importance of building a strong foundation in basic mathematical concepts and operations. When students struggle with mastering these fundamental skills, it becomes increasingly difficult for them to progress and build upon more advanced topics. The fourth and fifth-rank problems underscore the

critical role of instructional approaches and conceptual understanding. Problems in translating word problems into appropriate mathematical expressions and a lack of grasp on the underlying logic and reasoning behind mathematical principles can prevent students from successfully applying concepts in real-world contexts.

The remaining problems, such as challenges with organization, mathematical language and notation, careless mistakes, computational speed, and problem-solving strategies, further emphasize the diverse range of skills and competencies required for effective mathematical learning.

The insights provided by Table 3.2 underscore the need for a comprehensive and multifaceted approach to addressing the problems that hinder the development of mathematical skills. Effective interventions must consider the availability of learning resources, the quality of instructional practices, the development of conceptual understanding, and the cultivation of problem-solving strategies.

Strategies that can help mitigate these problems may include: increasing the availability and accessibility of high-quality learning materials, implementing targeted interventions to address skill gaps in basic concepts, providing professional development for teachers to enhance their instructional techniques, fostering a deeper understanding of mathematical reasoning and applications, and incorporating structured problem-solving frameworks into the curriculum.

To address the diverse range of problems identified in the table, educators and policymakers can work towards creating a learning environment that empowers students to develop the necessary mathematical skills and competencies. This, in turn, can enhance their ability to apply mathematical concepts effectively, improve their overall performance, and foster a stronger appreciation for the subject.

V. CONCLUSIONS AND RECOMMENDATIONS

Based on the preceding findings, the researcher concepts, skills, and values. While they demonstrate a developed level of mathematical skills in gathering statistical data and utilizing appropriate graphs, their performance in organizing data, illustrating measures of central tendency and variability, and applying statistics to real-life scenarios indicates a need for further improvement and targeted instruction in these areas. Moreover, there is a significant correlation between students' attitudes towards mathematics and their level of mathematical skills development.

However, students face several challenges in cultivating positive attitudes, including the high cost of learning materials, negative past experiences, a lack of support and encouragement, and fixed mindsets regarding their mathematical abilities. In terms of skill development, issues such as limited learning resources, difficulties with mastering basic concepts, ineffective teaching techniques, and challenges in interpreting and translating word problems are prevalent. To address these issues, a proposed mathematical learning package could serve as a valuable tool for enhancing students' attitudes and learning outcomes.

Based on these conclusions, several recommendations are put forth. First, it is essential to leverage the students' strong positive attitude towards mathematics by

enhancing their enthusiasm for mathematical concepts and skills. This can be achieved through lessons and activities designed to deepen their appreciation for the subject. Additionally, differentiated instruction and varied learning resources should be provided to accommodate the diverse skill levels present in the classroom.

To strengthen the connection between attitudes and skill development, strategies that foster positive attitudes should be prioritized, as the strong correlation suggests this can significantly enhance mathematical skill growth. Regular assessment of the relationship between attitudes and skill development will help identify areas needing improvement. Furthermore, addressing the identified challenges involves exploring ways to reduce the financial burden of learning materials, such as offering affordable or free resources. Negative past experiences and fixed mindsets can be tackled through targeted counseling, mentoring, and interventions aimed at promoting a growth mindset. Increasing the availability of mathematics learning resources and improving teaching techniques will also better support skill development.

Implementing lesson exemplars that incorporate problem-based learning (PBL), realistic mathematics education (RME), and bridging activities (BBL) can create a positive learning environment conducive to skill development. It is important to monitor the effectiveness of these exemplars and make necessary adjustments to maximize their impact on students' attitudes and skills.

Finally, future studies should be conducted to further explore the findings of this research. Suggested areas for investigation include longitudinal studies on attitude and skill development, comparative studies of different instructional approaches, qualitative explorations of student perspectives, investigations into teacher-related factors, and examinations of socioeconomic and cultural influences. Additionally, cross-subject comparisons of attitude-skill relationships could provide further insights into this critical area of education.

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