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Source of Knowledge, Strategies and the Belief System in Mathematics of the Students

Ericka Pauline Rana
Laguna State Polytechnic University Sta. Cruz Laguna 4009 PHILIPPINES
Email address: erickapauline.rana@deped.gov.ph

***Abstract*—*This study determined the relationship between students' source of knowledge, strategies and belief systems in mathematics. Specifically, it examined the levels of sources of knowledge, strategies and belief systems among male and female students. It also investigated the differences between male and female students in terms of source of knowledge, strategies, and belief systems in mathematics, and the relationships between the students' sources of knowledge, strategies and belief systems in mathematics. The study utilized predictive-correlational research design, and data were gathered through a self-made checklist questionnaire from a purposively sampled group of eighty-six Grade 7 – 10 students (41 males and 45 females) at Poten & Eliseo M. Quesada Memorial National High School – Annex School Year 2025–2026. A Statistical tool such as mean, standard deviation, t-test, and Pearson correlation coefficient were utilized in analyzing the data. The findings revealed that both male and female respondents demonstrated high levels of sources of knowledge, strategies, and belief systems in mathematics. Statistically, no significant difference was found between male and female students regarding their sources of knowledge and strategies. However, a significant difference was observed in their belief systems in mathematics. Furthermore, a significant relationship was found between the students' sources of knowledge, strategies, and belief systems in mathematics. According to the given variable, there is no significant difference between male and female in terms of source of knowledge, strategies and belief system, leading to acceptance of the null hypothesis, implying that both groups share similar perceptions when acquiring mathematical skills. The findings revealed that both sources of knowledge and strategies had significant relationships with the belief systems in mathematics, leading to the rejection of those null hypotheses. This demonstrates that students who actively engage with diverse knowledge sources and frequently implement effective strategies tend to develop stronger self-beliefs. Based on these findings, it is recommended that students actively utilize diverse sources of knowledge and apply effective learning strategies to improve their belief systems in mathematics. Teachers are encouraged to implement varied, student-centered approaches and explicitly teach strategies.*

***Keywords*—** *Source of knowledge, students' strategies, belief system, descriptive-correlational study.*

I. INTRODUCTION

Mathematics is often regarded as the language of logic and reasoning, serving as a foundation for disciplines such as science, technology, and engineering. Within the academic setting, the ability to solve mathematical problems goes beyond the mastery of formulas and procedures, it requires both a solid grasp of mathematical knowledge and an effective belief system about one's capability to engage with and succeed in problem-solving tasks. For students, problem-solving is not merely a test of skill, but also a reflection of how their attitudes, perceptions, and confidence influence their performance. This intricate relationship between knowledge and belief presents a compelling area of study, as it has the potential to shape students' approaches to mathematics and their academic success more broadly.

Learners who perceive mathematics as difficult and unattainable are more likely to experience anxiety and avoidance, even when they possess adequate knowledge. On the other hand, students with positive beliefs about mathematics and about their own abilities tend to demonstrate resilience, persistence, and flexibility in tackling problems. These findings point to the interdependent nature of knowledge and belief, highlighting that effective problem-solving emerges from a balance between cognitive competence and affective disposition.

Therefore, the researcher aims to analyze the link between the source of knowledge and strategies to the belief system of students, with a focus on understanding how these two dimensions interact in the process of problem-solving. By examining this connection, the study seeks to provide insights into the ways in which beliefs either enhance or inhibit the application of mathematical knowledge. It also intends to identify patterns that may explain why some students excel in problem-solving despite limited knowledge, while others underperform despite strong academic backgrounds. Such insights can contribute to more effective teaching strategies, where educators address not only the cognitive but also the affective needs of learners.

1.1 Statement of the Problem

Problem/s which were addressed by the research

This study aimed to determine the correlation of source of knowledge, students' strategies and students' belief systems in problem solving.

Specifically, it sought to answer the following questions:

1. What is the level of Source of Knowledge in Mathematics as rated by the group of respondents in terms of:
   1.1 Informal Knowledge;
   1.2 Facts;
   1.3 Routine Procedures;
   1.4 Non-Routine Procedures; and
   1.5 Propositional Knowledge?
2. What is the level of Strategies in Mathematics as rated by the group of respondents in terms of:
   2.1. Drawing Figures;
   2.2. Exploring Related Problems;

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2.3. Working Backwards;
2.4. Testing and Verification; and
2.5. Decision Making?

3. What is the level of the Belief Systems in Mathematics as rated by the group of respondents in terms of;
   3.1 Self-Concept;
   3.2 Self-Efficacy; and
   3.3 Self-Esteem?
4. Is there a significant difference between the group of respondents in terms of:
   Source of Knowledge in Mathematics of the Students;
   4.1 Strategies in Mathematics of the Students; and
   4.2 Belief System in Mathematics of the Students?
5. Is there a significant relationship between the Source of Knowledge and Belief System in Mathematics of the Students?
6. Is there a significant relationship between the Strategies and Belief System in Mathematics of the Students?

II. Methodology

The study utilized predictive-correlational research design, and data were gathered through a self-made checklist questionnaire from a purposively sampled group of eighty-six Grade 7 – 10 students (41 males and 45 females) at Poten & Eliseo M. Quesada Memorial National High School – Annex School Year 2025–2026. A Statistical tool such as mean, standard deviation, t-test, and Pearson correlation coefficient were utilized in analyzing the data.

III. Results and Discussion

This part deals with the presentation, analyses, and interpretation of the data gathered.

Level of Source of Knowledge in Mathematics

In this study, this refers to where students primarily obtain mathematical understanding as identified in their responses. The level of the source of knowledge in terms of informal knowledge, facts, routine procedures, non-routine procedures and propositional knowledge.

The following tables present the results of the study. The level of the students' sources of knowledge in mathematics in terms of informal knowledge, facts, routine procedures, non-routine procedures, and propositional knowledge is shown in the following tables. These tables present the statements, mean, standard deviation, remarks, and verbal interpretation based on the respondents' perspectives.

Table 1 presents the level of source of knowledge in mathematics of the students as rated by the group of respondents in terms of informal knowledge.

For male respondents, the highest mean was obtained in the statement "plays an important role in developing my basic mathematics understanding" (M = 4.32, SD = 0.65, Strongly Agree), while the lowest mean was observed in "supports my learning of mathematics through interaction and observation" (M = 3.66, SD = 1.06, Agree). The weighted mean of 3.97 with a standard deviation of 0.81 indicates a high level of informal knowledge as a source of mathematical understanding among male students

On the other hand, female respondents also showed consistently a high rating, with the highest mean in "plays an important role in developing my basic mathematics understanding" (M = 4.31, SD = 0.70, Agree) and the lowest in "supports my learning of mathematics through interaction and observation" (M = 3.71, SD = 0.97, Agree). The weighted mean of is 4.05 with a standard deviation of 0.79 likewise reflects a high level of informal knowledge among female students.

Table 1. Level of the Source of Knowledge in Mathematics as rated by the group of respondents in Terms of Informal Knowledge

Statements	Group of Respondents					
As a student, informal knowledge…	MALE MEAN	SD	REMARKS	FEMALE MEAN	SD	REMARKS
…helps me understand mathematics in daily life.	4.00	0.74	Agree	4.04	0.67	Agree
…is useful to connect mathematics to real-life situations.	3.88	0.71	Agree	4.20	0.81	Agree
…plays an important role in developing my basic mathematics understanding.	4.32	0.65	Strongly Agree	4.31	0.70	Strongly Agree
…guides me in solving problems using practical experiences.	3.98	0.88	Agree	4.00	0.80	Agree
…supports my learning of mathematics through interaction and observation.	3.66	1.06	Agree	3.71	0.97	Agree
Weighted Mean SD Verbal Interpretation	3.97 0.81 High			4.05 0.79 High		

The respondents are generally in agreement with a weighted mean of 3.97 for male and 4.05 for female, both verbally interpreted as "High". The overall standard deviations 0.81 and 0.79 indicate consistency in their responses.

Overall, the results suggest that both male and female respondents recognize informal knowledge as an important factor in learning mathematics.

In summary, informal knowledge is consistently perceived by both groups as a significant contributor to students' mathematical learning, with female respondents showing slightly higher agreement than male respondents, as indicated by a mean difference (MD) of 0.08.

Table 2 presents the level of the source of knowledge in mathematics of the students as rated by the group of respondents in terms of facts. The results show that both male and female respondents obtained a high level of agreement

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across all indicators, indicating that factual knowledge plays an important role in students' mathematical learning.

For male respondents, the highest mean was obtained in the statement "important in remembering mathematical facts and formulas" (M = 4.20, SD = 0.78, Agree), while the lowest mean was observed in "key to applying facts in new situations" (M = 3.95, SD = 0.86, Agree). The weighted mean of 4.09 with a standard deviation of 0.80 indicates a high level of informal facts as a source of mathematical knowledge among male students.

On the other hand, female respondents obtained the highest mean in "important in remembering mathematical facts and formulas" (M = 4.42, SD = 0.81, Strongly Agree) and the lowest in "key to applying facts in new situations" (M = 3.82, SD = 0.78, Agree). The weighted mean of 4.12 with a standard deviation of 0.79 likewise reflects a high level of informal facts among female students.

Table 2. Level of the Source of Knowledge in Mathematics as rated by the group of respondents in Terms of Facts

Statements As a student, I view facts as…	Group of Respondents MALE			FEMALE		
	MEAN	SD	REMARKS	MEAN	SD	REMARKS
…important in remembering mathematical facts and formulas.	4.20	0.78	Agree	4.42	0.81	Strongly Agree
…useful in recalling definitions and mathematical rules.	4.05	0.86	Agree	4.04	0.80	Agree
…necessary in comprehending mathematical principles.	4.17	0.70	Agree	4.24	0.74	Strongly Agree
…helpful in achieving accuracy in problem solving.	4.10	0.77	Agree	4.09	0.82	Agree
…key to applying facts in new situations.	3.95	0.86	Agree	3.82	0.78	Agree
Weighted Mean	4.09			4.12		
SD	0.80			0.79		
Verbal Interpretation	High			High		

The respondents are generally in agreement, as reflected by the weighted mean of 4.09 for male and 4.12 for female, both verbally interpreted as "High". The overall standard deviations of 0.80 and 0.79 indicate consistency in their responses. Overall, the findings suggest that both groups consistently perceive facts as a significant component of mathematics learning.

In summary, both male and female respondents highly value informal factual knowledge in mathematics, with female students showing slightly higher agreement than male students, as reflected in the mean difference (MD = 0.03).

Table 3. Level of the Source of Knowledge in Mathematics as rated by the group of respondents in Terms of Routine Procedures

Statements As a student, I consider routine procedures as…	Group of Respondents MALE			FEMALE		
	MEAN	SD	REMARKS	MEAN	SD	REMARKS
…helpful in guiding me step-by-step in solving problems.	4.34	0.73	Strongly Agree	4.51	0.66	Strongly Agree
…useful in applying commonly taught solution methods.	4.24	0.80	Strongly Agree	4.36	0.71	Strongly Agree
…important in maintaining accuracy during computations.	4.12	0.78	Agree	4.13	0.79	Agree
…necessary in solving familiar mathematical tasks.	3.95	0.84	Agree	3.87	0.79	Strongly Agree
…effective in strengthening my confidence in problem solving.	4.10	0.70	Agree	4.27	0.81	Strongly Agree
Weighted Mean	4.15			4.23		
SD	0.77			0.75		
Verbal Interpretation	High			Very High		

Table 3 presents the level of the source of knowledge in mathematics of the students as rated by the group of respondents in terms of routine procedures.

For male respondents, the highest mean was obtained in "helpful in guiding me step-by-step in solving problems" (M = 4.34, SD = 0.73, Strongly Agree), while the lowest mean was observed in "necessary in solving familiar mathematical tasks" (M = 3.95, SD = 0.84, Agree). The weighted mean of 4.15 with a standard deviation of 0.77 indicates a high level of routine procedures as a source of mathematical knowledge among male students.

On the other hand, female respondents obtained the highest mean in "helpful in guiding me step-by-step in solving problems" (M = 4.51, SD = 0.66, Strongly Agree), while the lowest mean was found in "necessary in solving familiar mathematical tasks" (M = 3.87, SD = 0.79, Strongly Agree). The weighted mean of 4.23 with a standard deviation of 0.75 reflects a very high level of routine procedures among female students.

The respondents are generally in strong agreement, as reflected by the weighted mean of 4.15 for male, interpreted as "High" and 4.23 for female, interpreted as "Very High". The overall standard deviations of 0.77 and 0.75 indicate consistency in their responses. Overall, the findings indicate that both groups perceive routine procedures as an essential component in learning mathematics.

In summary, routine procedures is perceived as high level by both male and female respondents, with female students showing higher agreement than male students, as reflected in the mean difference (MD = 0.08).

Table 4. Level of the Source of Knowledge in Mathematics as rated by the group of respondents in Terms of Non-Routine Procedures

Statements	Group of Respondents					
As a student, I recognize non-routine procedures as…	MALE			FEMALE		
	Mean	SD	Remarks	MEAN	SD	Remarks
…trying alternative strategies when common procedures do not work.	4.32	0.69	Strongly Agree	3.73	1.01	Agree
…enjoying the challenge of solving unfamiliar and complex mathematics problems.	3.66	0.99	Agree	3.67	1.00	Agree
…helpful for exploring different ways to solve problems	4.02	0.79	Agree	4.00	0.88	Agree
…necessary for tackling complex math problems.	3.56	0.92	Agree	3.44	3.91	Agree
…effective in enhancing critical and analytical thinking skills.	3.90	0.89	Agree	3.91	1.00	Agree
Weighted Mean	3.89			3.75		
SD	0.86			0.94		
Verbal Interpretation	High			High		

Table 4 presents the level of the source of knowledge in mathematics of the students as rated by the group of respondents in terms of non-routine procedures. The results reveal that both male and female respondents obtained a high level of agreement across all indicators, suggesting that non-routine procedures contribute to students' ability to solve unfamiliar and complex mathematical problems.

For male respondents, the highest mean was obtained in the statement "trying alternative strategies when common procedures do not work" (M = 4.32, SD = 0.69, Strongly Agree), while the lowest mean was observed in "necessary for tackling complex math problems" (M = 3.56, SD = 0.92, Agree). The weighted mean of 3.89 with a standard deviation of 0.86 indicates a high level of non-routine procedures as a source of mathematical knowledge among male students.

On the other hand, female respondents obtained the highest mean in "trying alternative strategies when common procedures do not work" (M = 3.73, SD = 1.01, Agree) and the lowest mean in "necessary for tackling complex math problems" (M = 3.44, SD = 3.91, Agree). The weighted mean of 3.75 with a standard deviation of 0.94 also reflects a high level of non-roue procedures among female students.

The respondents are generally in agreement, as reflected by the weighted mean of 3.89 for male and 3.74 for female, both interpreted as "High". The overall standard deviations of 0.86 and 0.94 indicate relatively consistent responses, though with slightly more variability among female students. Overall, the findings indicate that students recognize the importance of non-routine procedures as an important aspect of mathematical learning.

In summary, both male and female respondents rated the non-routine procedures as highly important in learning mathematics, with male students showing slightly higher agreement than female students, as reflected in the mean difference (MD = 0.14).

Table 5 presents the level of the source of knowledge in mathematics of the students as rated by the group of respondents in terms of propositional knowledge. The table shows several indicators describing how students understand propositional knowledge, along with their corresponding mean, standard deviation, and verbal interpretation.

Table 5. Level of the Source of Knowledge in Mathematics as rated by the group of respondents in Terms of Propositional Knowledge

Statements	Group of Respondents					
As a student, I understand propositional knowledge to be…	MALE			FEMALE		
	Mean	SD	Remarks	Mean	SD	Remarks
…important in comprehending mathematical principles.	4.29	0.75	Strongly Agree	4.38	0.81	Strongly Agree
…useful in logically explaining mathematical rules.	4.05	0.74	Agree	3.91	0.76	Agree
…necessary in analyzing math relationships.	3.83	0.97	Agree	3.87	1.01	Agree
…helpful in applying concepts to solve problem.	3.90	1.04	Agree	4.04	0.77	Agree
…effective in justifying solutions through logical reasoning.	4.07	0.82	Agree	3.78	0.82	Agree
Weighted Mean	4.03			4.00		
SD	0.86			0.83		
Verbal Interpretation	High			High		

For male respondents, the highest mean was obtained in the statement "important in comprehending mathematical principles" (M = 4.29, SD = 0.75, Strongly Agree), while the lowest mean was observed in "necessary in analyzing math relationships" (M = 3.83, SD = 0.97, Agree). The weighted mean of 4.03 with a standard deviation of 0.86 indicates a high level of propositional knowledge as a source of mathematical understanding among male students.

On the other hand, female respondents obtained the highest mean in "important in comprehending mathematical principles" (M = 4.38, SD = 0.81, Strongly Agree), while the lowest mean was found in "effective in justifying solutions through logical reasoning" (M = 3.78, SD = 0.82, Agree). The weighted mean of 4.00 with a standard deviation of 0.83 likewise reflects a high level of propositional knowledge among female students.

The respondents are generally in agreement, as reflected by the weighted mean of 4.03 for male students and 4.00 for female students, both verbally interpreted as "High." The overall standard deviations of 0.86 and 0.83 indicate consistency in their responses. This suggests that students consistently perceive propositional knowledge as an essential component of mathematics learning.

In summary, both male and female respondents showed a high level of agreement on propositional knowledge as a source of mathematical understanding, with male students showing a slightly higher mean than female students, as reflected in the mean difference (MD = 0.03).

Level of Strategies in Mathematics

In this study, this refers to the specific approaches or methods students employ when solving mathematical problems, including both cognitive and metacognitive processes.

Table 6 shows the level of the strategies in mathematics of the students as rated by the group of respondents in terms of drawing figures.

Table 6. Level of the Strategies in Mathematics as rated by the group of respondents in Terms of Drawing Figures

Statements	Group of Respondents					
As a student, I consider drawing figures to be…	MALE			FEMALE		
	Mean	SD	Remarks	Mean	SD	Remarks
…helpful in visualizing mathematical problems.	4.12	0.87	Agree	4.00	0.93	Agree
…useful in organizing ideas clearly.	4.05	0.95	Agree	4.18	0.68	Agree
…helpful in understanding complex problems.	4.12	0.90	Agree	4.02	0.94	Agree
…useful in simplifying mathematical analysis.	4.12	0.75	Agree	3.98	0.89	Agree
…effective in improving problem-solving accuracy.	4.17	0.74	Agree	4.04	0.93	Agree
Weighted Mean	4.12			4.04		
SD	0.84			0.87		
Verbal Interpretation	High			High		

For male respondents, the highest mean was obtained in the statement "effective in improving problem-solving accuracy" (M = 4.17, SD = 0.74, Agree), while the lowest mean was observed in "useful in organizing ideas clearly" (M = 4.05, SD = 0.95, Agree). The weighted mean of 4.12 with a standard deviation of 0.84 indicates a high level of agreement on the use of drawing figures as a mathematical strategy among male students.

On the other hand, female respondents obtained the highest mean in "useful in organizing ideas clearly" (M = 4.18, SD = 0.68, Agree), while the lowest mean was found in "helpful in understanding complex problems" (M = 4.02, SD = 0.94, Agree). The weighted mean of 4.04 with a standard deviation of 0.87 likewise reflects a high level of agreement among female
students.

The respondents are generally in agreement, as reflected by the weighted mean of 4.12 for male students and 4.04 for female students, both verbally interpreted as "High." The overall standard deviations of 0.84 and 0.87 indicate consistency in their responses. This suggests that students consistently perceive drawing figures as an essential strategy in mathematics learning, particularly in improving visualization, organization of ideas, and problem-solving accuracy.

Overall, the findings suggest that drawing figures is recognized by both groups as an important strategy in mathematics, particularly in improving visualization, organizing ideas, and enhancing problem-solving accuracy.

In summary, both male and female respondents showed a high level of agreement on the use of drawing figures in mathematics, with male students showing slightly higher agreement than female students, as reflected in the mean difference (MD = 0.08).

Table 7 presents the level of the strategies in mathematics of the students as rated by the group of respondents in terms of exploring related problems. The results show that both male and female respondents obtained a high level of agreement across all indicators.

Table 7. Level of the Strategies in Mathematics as rated by the group of respondents in Terms of Exploring Related Problems

Statements	Group of Respondents					
As a student, I…	MALE			FEMALE		
	Mean	SD	Remarks	Mean	SD	Remarks
…solve similar problems before attempting more difficult ones.	4.12	0.87	Agree	4.07	0.65	Agree
…review examples to understand new problems.	4.29	0.81	Strongly Agree	4.31	1.06	Agree
…apply solutions from related problems.	3.93	0.85	Agree	4.13	0.81	Agree
…look for patterns in previous problems to solve new ones.	4.12	0.75	Agree	4.09	1.00	Agree
…analyze past mistakes to improve my solutions.	4.27	0.74	Strongly Agree	3.98	4.16	0.74
Weighted Mean	4.15			4.15		
SD	0.80			0.85		
Verbal Interpretation	High			High		

For male respondents, the highest mean was obtained in the statement "review examples to understand new problems" (M = 4.29, SD=0.81, Strongly Agree), while the lowest mean

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was observed in "apply solutions from related problems" (M = 3.93, SD = 0.85, Agree). The weighted mean of 4.15 with a standard deviation of 0.80 indicates a high level of agree on exploring related problems among male students.

On the other hand, female respondents obtained the highest mean in "review examples to understand new problems" (M = 4.31, SD = 1.06, Agree), while the lowest mean was found in "analyze past mistakes to improve my solutions" (M = 3.98, SD = 4.16, SD = 0.74 – corrected SD needed). The weighted mean of 4.15 with a standard deviation of 0.85 likewise reflects a high level of agreement among female students.

Both groups obtained an equal weighted mean of 4.15, indicating that male and female respondents share the same level of agreement in terms of exploring related problems. The standard deviations of 0.80 and 0.85 further suggest consistency in their responses. This implies that students commonly rely on prior examples, patterns, and past experiences when solving new math problems.

In summary, both male and female respondents showed a high level of agreement on exploring related problems in mathematics, indicating that this strategy is equally valued by both groups in enhancing problem-solving skills.

Table 8 presents the level of the strategies in mathematics of the students as rated by the group of respondents in terms of working backwards.

For male respondents, the highest mean was obtained in the statement "effective in strengthening logical reasoning" (M = 4.17, SD = 0.77, Agree), while the lowest mean was observed in "useful in checking and verifying answers" (M = 3.88, SD = 0.87, Agree). The weighted mean of 4.01 with a standard deviation of 0.82 indicates a high level of agreement on the use of working backwards as a mathematical strategy among male students.

Table 8. Level of the Strategies in Mathematics as rated by the group of respondents in Terms of Working Backwards

Statements	Group of Respondents					
As a student, I view working backwards as…	MALE			FEMALE		
	Mean	SD	Remarks	Mean	SD	Remarks
…helpful in understanding solution processes.	4.07	0.82	Agree	4.18	0.94	Agree
…useful in checking and verifying answers.	3.88	0.87	Agree	4.13	0.81	Agree
…important in solving complex problems.	4.02	0.96	Agree	3.84	0.80	Agree
…necessary in analyzing step-by-step solutions.	3.90	0.66	Agree	4.29	0.87	Strongly Agree
…effective in strengthening logical reasoning.	4.17	0.77	Agree	4.07	0.75	Agree
Weighted Mean	4.01			4.10		
SD	0.82			0.83		
Verbal Interpretation	High			High		

On the other hand, female respondents obtained the highest mean in "necessary in analyzing step-by-step solutions" (M = 4.29, SD = 0.87, Strongly Agree), while the lowest mean was found in "important in solving complex problems" (M = 3.84, SD = 0.80, Agree). The weighted mean of 4.10 with a standard deviation of 0.83 likewise reflects a high level of agreement among female students.

In summary, female respondents showed slightly higher agreement than male respondents in using working backwards as a strategy in mathematics, as reflected in the mean difference (MD = 0.09).

The study reveals that working backwards strengthens students' logical reasoning and problem-solving abilities in mathematics.

Table 9 presents the level of the students' strategies in mathematics as
rated by the group of respondents in terms of testing and verification. The results show that both male and female respondents obtained a high level of agreement across all indicators, indicating that testing and verification is an important strategy in ensuring accuracy and correctness in mathematical problem-solving.

Table 9. Level of the Strategies in Mathematics as rated by the group of respondents in Terms of Testing and Verification

Statements	Group of Respondents					
As a student, I…	MALE			FEMALE		
	Mean	SD	Remarks	Mean	SD	Remarks
…carefully check my answers before final submission.	4.35	0.66	Strongly Agree	4.42	0.69	Strongly Agree
…verify my solutions using alternative methods.	4.10	0.74	Agree	3.82	0.94	Agree
…re-check my computations for accuracy.	4.20	0.90	Agree	4.11	1.01	Agree
…try different methods to confirm my results.	4.15	0.65	Agree	4.22	0.85	Strongly Agree
…ensure correctness by reviewing all solution steps.	4.17	0.77	Agree	4.36	0.71	Strongly Agree
Weighted Mean	4.19			4.19		
SD	0.74			0.84		
Verbal Interpretation	High			High		

For male respondents, the highest mean was obtained in the statement "carefully check my answers before final submission" (M = 4.35, SD = 0.66, Strongly Agree), while the lowest mean was observed in "verify my solutions using alternative methods" (M = 4.10, SD = 0.74, Agree). The weighted mean of 4.19 with a standard deviation of 0.74 indicates a high level of agreement on testing and verification strategies among male students.

In comparison, the female respondents obtained the highest mean in the Statement "carefully check my answers before final submission" (M = 4.42, SD = 0.69, Strongly Agree), while the lowest mean was found in "verify my solutions using alternative methods" (M = 3.82, SD = 0.94, Agree). The weighted mean of 4.19 with a standard deviation of 0.84

likewise reflects a high level of agreement among female students.

In summary, both male and female respondents obtained an equal weighted mean of 4.19, indicating no difference in their level of agreement in terms of testing and verification strategies.

Table 10 presents the level of the strategies in mathematics of the students as rated by the group of respondents in terms of decision making. The results show that both male and female respondents obtained a high level of agreement across all indicators, indicating that decision making is an important strategy in selecting appropriate approach when solving problems.

For male respondents, the highest mean was obtained in the statement "selecting the most appropriate strategy before solving a problem" (M = 4.12, SD = 0.81, Agree), while the lowest mean was observed in "adjusting my strategy depending on the difficulty of the problem" (M = 3.76, SD = 0.80, Agree). The weighted mean of 3.93 with a standard deviation of 0.84 indicates a high level of agreement on decision-making strategies among male students.

Table 10. Level of the Strategies in Mathematics as rated by the group of respondents in Terms of Decision Making

Statements	Group of Respondents					
As a student, I perceived decision making through…	MALE			FEMALE		
	Mean	SD	Remarks	Mean	SD	Remarks
…selecting the most appropriate strategy before solving a problem.	4.12	0.81	Agree	4.09	0.76	Agree
…evaluating different methods before choosing one.	3.88	0.93	Agree	3.96	0.98	Agree
…adjusting my strategy depending on the difficulty of the problem.	3.76	0.80	Agree	3.69	0.92	Agree
…reflecting on my choices after completing a task.	3.88	0.93	Agree	4.07	0.99	Agree
…deciding which approach best fits the problem.	4.02	0.72	Agree	3.96	0.95	Agree
Weighted Mean	3.93			3.95		
SD	0.84			0.92		
Verbal Interpretation	High			High		

On the other hand, female respondents obtained the highest mean in "reflecting on my choices after completing a task" (M = 4.07, SD = 0.99, Agree), while the lowest mean was found in "adjusting my strategy depending on the difficulty of the problem" (M = 3.69, SD = 0.92, Agree). The weighted mean of 3.95 with a standard deviation of 0.92 likewise reflects a high level of agreement among female students.

In summary, both male and female respondents showed a high level of agreement on decision-making strategies in mathematics, with female students showing slightly higher agreement than male students, as reflected in the mean difference (MD = 0.02).

Level of Belief Systems in Mathematics

In this study, belief systems in mathematics refer to the internal set of beliefs held by students regarding their own capabilities, the nature of mathematics, and the process of problem-solving. These beliefs influence how students approach mathematical tasks, respond to challenges, and perceive their competence in learning mathematics.

The level of belief systems in mathematics of the students in terms of self-concept, self-efficacy, and self-esteem was statistically analyzed using the mean and standard deviation.

Table 11 presents the level of the belief systems in mathematics of the students as rated by the group of respondents in terms of self-concept. The table shows several indicators describing how students perceive their self-concept in learning mathematics, along with their mean, standard deviation, and verbal interpretation. For male respondents, the highest mean was obtained in the statement "positive toward learning mathematics" (M = 4.37, SD = 0.73, Strongly Agree), while the lowest mean was observed in "strong in handling mathematical tasks" (M = 3.80, SD = 0.81, Agree). The weighted mean of 4.07 with a standard deviation of 0.80 indicates a high level of self-concept among male students in mathematics.

Table 11. Level of the Belief Systems in Mathematics as rated by the group of respondents in terms of Self-Concept

Statements	Group of Respondents					
As a student, I describe my self-concept as…	MALE			FEMALE		
	Mean	SD	Remarks	Mean	SD	Remarks
…positive toward learning mathematics.	4.37	0.73	Strongly Agree	4.31	0.82	Strongly Agree
…confident in understanding mathematical concepts.	4.02	0.82	Agree	4.22	0.85	Strongly Agree
…capable of solving mathematics problems.	3.95	0.84	Agree	4.20	0.84	Agree
…strong in handling mathematical tasks.	3.80	0.81	Agree	4.00	0.95	Agree
…favorable toward mathematical learning.	4.20	0.81	Agree	4.29	0.79	Strongly Agree
Weighted Mean	4.07			4.20		
SD	0.80			0.85		
Verbal Interpretation	High			High		

On the other hand, female respondents obtained the highest mean is a "positive toward learning mathematics" (M = 4.31, SD = 0.82, Strongly Agree), while the lowest mean was found in "strong in handling mathematical tasks" (M = 4.00, SD = 0.95, Agree). The weighted mean of 4.20 with a standard deviation of 0.85 likewise reflects a high level of self-concept among female students.

The respondents are generally in agreement, as demonstrated by the weighted mean of 4.07 for male students

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and 4.20 for female students, both verbally interpreted as "High." The overall standard deviations of 0.80 and 0.85 indicate consistency in their responses. Overall, the findings suggests that students consistently perceive themselves as capable and positive learners in mathematics.

In summary, both male and female respondents demonstrated a high level of self-concept in mathematics, with female students showing slightly higher agreement than male students, as reflected in the mean difference (MD = 0.13).

Table 12 presents the level of the belief systems in mathematics of the students as rated by the group of respondents in terms of self-efficacy. This table shows indicators describing how students evaluate their self-efficacy in mathematics, along with their corresponding mean, standard deviation, and verbal interpretation.

For male respondents, the highest mean was obtained in "motivating toward achieving academic success" (M = 4.22, SD = 0.88, Strongly Agree), while the lowest mean was observed in "strong in solving difficult problems" (M = 3.98, SD = 0.94, Agree). The weighted mean of 4.04 with a standard deviation of 0.87 indicates a high level of self-efficacy among male students in mathematics.

On the other hand, female respondents obtained the highest mean in "persistent despite challenges" (M = 4.36, SD = 0.71, Strongly Agree), while the lowest mean was found in "keeping trying even when math is hard" (M = 3.96, SD = 0.71, Agree). The weighted mean of 4.09 with a standard deviation of 0.78 likewise reflects a high level of self-efficacy among female students.

Table 12. Level of the Belief Systems in Mathematics as rated by the group of respondents in Terms of Self-Efficacy

Statements	Group of Respondents					
As a student, I evaluate my self-efficacy as…	MALE			FEMALE		
	Mean	SD	Remarks	Mean	SD	Remarks
…strong in solving difficult problems.	3.98	0.94	Agree	3.91	0.82	Agree
…high in performing mathematical tasks successfully.	4.02	0.82	Agree	4.04	0.80	Agree
…persistent despite challenges.	4.00	0.89	Agree	4.36	0.71	Strongly Agree
…keeping trying even when math is hard	4.00	0.84	Agree	3.96	0.71	Agree
…motivating toward achieving academic success.	4.22	0.88	Strongly Agree	4.20	0.87	Agree
Weighted Mean	4.04			4.09		
SD	0.87			0.78		
Verbal Interpretation	High			High		

The respondents are generally in agreement, as reflected by the weighted mean of 4.04 for male students and 4.09 for female students, both verbally interpreted as "High." The overall standard deviations of 0.87 and 0.78 indicate consistency in their responses, with female students showing slightly more consistent perceptions. Overall, the findings suggest that students generally believe in their capability to succeed in mathematics, particularly in maintaining persistence, motivation, and confidence when dealing with challenging mathematical tasks.

In summary, both male and female respondents demonstrated a high level of self-efficacy in mathematics, with female students showing slightly higher agreement than male students, as reflected in the (MD = 0.05).

Table 13 presents the level of the belief systems in mathematics of the students as rated by the group of respondents in terms of self-esteem. The table shows several indicators describing how students describe their self-esteem in relation to mathematics, along with their corresponding mean, standard deviation, and verbal interpretation.

For male respondents, the highest mean was obtained in "satisfying when completing tasks successfully" (M = 4.29, SD = 0.81, Strongly Agree), while the lowest mean was observed in "encouraging in overcoming mistakes" (M = 4.05, SD = 0.80, Agree). The weighted mean of 4.18 with a standard deviation of 0.81 indicates a high level of self-esteem among male students in mathematics.

Table 13. Level of the Belief Systems in Mathematics as rated by the group of respondents in Terms of Self-Esteem

Statements	Group of Respondents					
As a student, I describe my self-esteem as…	MALE			FEMALE		
	Mean	SD	Remarks	Mean	SD	Remarks
…positive regarding my mathematical achievements.	4.15	0.85	Agree	4.09	0.76	Agree
…motivating toward continuous improvement.	4.22	0.76	Strongly Agree	4.13	0.73	Agree
…encouraging in overcoming mistakes.	4.05	0.80	Agree	4.20	0.84	Agree
…supportive in building confidence.	4.17	0.80	Agree	4.16	0.71	Agree
…satisfying when completing tasks successfully.	4.29	0.81	Strongly Agree	4.36	0.88	Strongly Agree
Weighted Mean	4.18			4.19		
SD	0.81			0.78		
Verbal Interpretation	High			High		

On the other hand, female respondents obtained the highest mean in "satisfying when completing tasks successfully" (M = 4.36, SD = 0.88, Strongly Agree), while the lowest mean was found in "positive regarding my mathematical achievements" (M = 4.09, SD = 0.76, Agree). The weighted mean of 4.19 with a standard deviation of 0.78 likewise reflects a high level of self-esteem among female students.

The respondents are generally in agreement, as reflected by the weighted mean of 4.18 for male students and 4.19 for female students, both verbally interpreted as "High." The overall standard deviations of 0.81 and 0.78 indicate consistency in their responses, with female students showing slightly more consistent perceptions. Overall, the findings suggest that students generally experience a positive sense of satisfaction and confidence in completing mathematical tasks, which supports their motivation to improve and overcome mistakes in mathematics learning.

In summary, both male and female respondents demonstrated a high level of self-esteem in mathematics, with female students showing slightly higher agreement than male students, as reflected in the mean difference (MD = 0.01).

Test of Significant Difference between the Group of Respondents

The significant difference between group of respondents in terms of their source of knowledge, strategies and belief system in mathematics was treated statistically using Real Statistics Data Analysis Tools using the T-Test for Two Independent Samples.

An independent samples t-test was conducted to examine whether there were significant differences between male and female students in terms of source of knowledge, student strategies, and students' belief system.

Table 14. Test of Significant Difference between the Group of Respondents

Group	Test	Mean	Mean Difference	crit t-value	p	Cohen's d
Male	Source Of Knowledge	4.02	0.01	1.99	0.912	0.024 (Small)
Female		4.03				
Male	Strategies	4.07	0.00	1.99	0.997	0.001 (Small)
Female		4.07				
Male	Belief System	4.09	0.01	1.99	<.001	0.962 (Large)
Female		4.08				

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

The result indicates that the group of respondents do not differ significantly regarding their source of knowledge and their strategy for learning as evidenced by the close to equal means (M) and tiny mean differences (MD) between male and female students for each of the variables. The M of males is 4.02 and the M of females is 4.03 with a MD of 0.01 ($t = 1.99$, $p = 0.912$) for source of knowledge. Furthermore, males and females both reported the same M (4.07) for the learning strategies and had an MD of 0.00 ($t = 1.99$, $p = 0.997$). Additionally, the d values are very small for each of the variables (source of knowledge d = 0.024 and strategy d = 0.001) showing no meaningful difference between the two groups.

Comparative analysis between male and female students' shows significantly different ways in which they view and believe about mathematics ($p < .001$), demonstrating significance at the 0.01 level. Although mean Male scores (4.09) are slightly higher than mean Female scores (4.08), the calculated effect size using Cohen's d (0.962) is indicative of a large practical effect.

In summary, while male and female students appear to have similar views regarding the source of knowledge and strategies that students use, male and female students have very different beliefs about mathematics. The significant results on the belief system variable indicate that sex may affect the way students view and internalize their mathematical beliefs; however, their visible strategies and sources of information will be similar.

Test of Significant Relationship between the Source of Knowledge, Strategies and Belief System in Mathematics of the Students

To test the significant students' source of knowledge and students' belief system in terms of self-concept, self-efficacy and self-esteem, was treated statistically using Jamovi 2.3.28 using the Pearson correlation coefficient.

Table 15 presents the relationship between the sources of knowledge, and the belief system in mathematics of the students, specifically in terms of self-concept, self-efficacy, and self-esteem, using the Pearson correlation coefficient.

The results revealed that majority of the aspects of students' source of knowledge relates to their belief system show highly significant relationships, as demonstrated by all the p-values being significant at the .001 level.

Table 15. Significant Relationship between the Source of Knowledge and Belief System in Mathematics of the Students

Strategies in Mathematics of the Students		Belief System in Mathematics of the Students (DV)		
		Self-Concept	Self-Efficacy	Self-Esteem
Informal Knowledge	Pearson	0.54***	0.41***	0.46***
	Sig. (2-tailed)	<.001	<.001	<.001
	N	84	84	84
Facts	Pearson Correlation	0.37***	0.27***	0.33***
	Sig. (2-tailed)	<.001	<.001	<.001
	N	84	84	84
Routine Procedures	Pearson Correlation	0.54***	0.42***	0.53***
	Sig. (2-tailed)	<.001	<.001	<.001
	N	84	84	84
Non-Routine Procedures	Pearson Correlation	0.37***	0.44***	0.46***
	Sig. (2-tailed)	<.001	<.001	<.001
	N	84	84	84
Propositional Knowledge	Pearson Correlation	0.44***	0.37***	0.34***
	Sig. (2-tailed)	<.001	<.001	<.001
	N	84	84	84

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

With respect to informal knowledge, there are moderate positive relationships between informal knowledge and self-concept ($r = .54$, $p < .001$), self-efficacy ($r = .41$, $p < .001$), and self-esteem ($r = .46$, $p < .001$). In other words, students who acquire knowledge from direct experiences are seen as being likely to have a positive view of themselves and their abilities relative to mathematics.

Regarding facts, the analyses showed weak positive relationships between facts and self-concept ($r = .37$, $p < .001$), self-efficacy ($r = .27$, $p < .001$), and self-esteem ($r = .33$, $p < .001$). This indicates that students' knowledge of mathematical facts interacts with their belief system; however, the influence of facts is weaker than that of other forms of knowledge that support students' beliefs.

The correlation of routine procedures moderate positive associations with self-concept ($r=0.54$, $p<0.001$), self-efficacy ($r=0.42$ $p<0.001$), & self-esteem ($r=0.53$ $p<0.001$). This

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indicates that students perform better on standard mathematics routines when they feel confidence and competence.

Non-Routine Procedures correlate weakly/ moderately with self-concept (r=0.37, p<0.001), self-efficacy (r= 0.44, p < 0.001), & self-esteem (r=0.46, p<0.001). Thus, when students participate in these types of tasks they have positive beliefs about their math's capabilities.

Propositional knowledge correlates moderately (r=0.44, p<0.001) with self-concept, weaker than the previous examples for self-efficacy (r=0.37, p<0.001) and self-esteem (r=0.34 p<0.001). These results demonstrate that developing conceptualization/understanding of mathematical principles forms a basis for positive belief systems.

In summary, this implies that students' sources of knowledge and belief systems are positively associated, though the majority show a range from weak to moderate associations. In other words, as students develop their knowledge bases, they also tend to increase in self-concept, self-efficacy and self-esteem related to mathematics.

The findings support the idea that students' sources of knowledge are positively associated with their belief systems in mathematics. Roth (2022) emphasized that informal and experiential knowledge-sharing interactions contribute to deeper learning and confidence development. Similarly, Yang, Kim, and Lee (2022) highlighted that connecting informal and formal knowledge supports deeper mathematical understanding and strengthens learners' confidence in mathematics

Table 16. Significant Relationship between the Strategies and Belief System in Mathematics of the Students

Strategies in Mathematics of the Students		Belief System in Mathematics of the Students (DV)		
		Self-Concept	Self-Efficacy	Self-Esteem
Drawing Figures	Pearson Correlation	0.43***	0.48***	0.52***
	Sig. (2-tailed)	<.001	<.001	<.001
	N	84	84	84
Exploring Related Problems	Pearson Correlation	0.56***	0.52***	0.52***
	Sig. (2-tailed)	<.001	<.001	<.001
	N	84	84	84
Working Backwards	Pearson Correlation	0.62***	0.53***	0.62***
	Sig. (2-tailed)	<.001	<.001	<.001
	N	84	84	84
Testing and Verification	Pearson Correlation	0.57***	0.49***	0.50***
	Sig. (2-tailed)	<.001	<.001	<.001
	N	84	84	84
Decision Making	Pearson Correlation	0.69***	0.57***	0.61***
	Sig. (2-tailed)	<.001	<.001	<.001
	N	84	84	84

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

Table 16 presents the relationship between students' strategies and their belief systems in mathematics in terms of self-concept, self-efficacy, and self-esteem, using the Pearson correlation coefficient.

Specifically, drawing figures shows moderate positive relationships with self-concept (r = 0.43), self-efficacy (r = 0.48), and self-esteem (r = 0.52), suggesting that visual representation supports students' confidence and understanding in problem solving. Exploring related problems also shows moderate positive correlations with self-concept (r = 0.56), self-efficacy (r = 0.52), and self-esteem (r = 0.52), indicating that learning through prior examples strengthens students' belief in their mathematical abilities. Working backwards demonstrates strong relationships with self-concept (r = 0.62) and self-esteem (r = 0.62), and moderate association with self-efficacy (r = 0.53), showing its importance in developing logical thinking and confidence.

In addition, testing and verification reveals that the moderate positive correlations with self-concept (r = 0.57), self-efficacy (r = 0.49), and self-esteem (r = 0.50), which implies that checking and validating answers enhances students' confidence and accuracy in mathematics. Decision making shows the strongest relationships among all strategies, with self-concept (r = 0.69), self-efficacy (r = 0.57), and self-esteem (r = 0.61), indicating that students who actively choose and evaluate strategies tend to have higher belief in their mathematical capabilities. The results revealed that all students' strategies show statistically significant positive relationships with their belief systems, as indicated by p-values less than .001. This implies that students who frequently use mathematical strategies tend to develop stronger and more positive beliefs about their abilities in mathematics.

In summary, the findings imply that students' mathematical strategies are positively and significantly associated with their belief systems. This suggests that the more students engage in strategic and reflective problem-solving, the more they develop strong self-concept, self-efficacy, and self-esteem in mathematics.

The findings support the idea that students' mathematical strategies significantly contribute to the development of positive belief systems in mathematics. Hwang et al. (2020) found that students who use varied problem-solving strategies demonstrate greater flexibility, confidence, and mathematical understanding. Similarly, Güner and Erbay (2021) revealed that students with strong metacognitive and strategic problem-solving skills exhibit higher achievement and stronger mathematical beliefs.

IV. Conclusion and Recommendations

There is no significant difference between the group of respondents among male and female students in terms of source of knowledge and strategies in mathematics; therefore, the null hypothesis is accepted, implying that both groups share similar perceptions and practices in acquiring knowledge and applying strategies in learning mathematics. However, a significant difference exists between the group of respondents among male and female students in terms of belief systems in mathematics, indicating that sex may influence how students perceive their confidence, motivation, and self-worth in learning mathematics.

The sources of knowledge and belief systems in mathematics of the students has a significant relationship; therefore, the null hypothesis is rejected. This implies that these variables are interconnected and mutually reinforcing.

Students who actively engage with diverse knowledge sources tend to develop stronger self-beliefs, which in turn enhance their confidence, motivation, and performance in mathematics.

The strategies of the students in mathematics have a significant relationship with the belief system of the students in mathematics; therefore, the null hypothesis is rejected. Students who frequently use effective strategies such as drawing figures, exploring related examples, working backwards, and testing and verification tend to develop stronger self-concept, higher self-efficacy, and more positive self-esteem in mathematics.

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

Students are encouraged to actively engage in different problem-solving strategies and make use of various knowledge sources. Developing habits such as checking answers, exploring alternative solutions, and reflecting on mistakes can enhance both their performance and belief systems.

Mathematics Teachers may incorporate those diverse instructional approaches that integrate formal and informal knowledge, including real-life applications, collaborative learning, and visual representations. They should also explicitly teach problem-solving strategies such as working backwards, testing solutions, and decision-making to strengthen students' mathematical skills and confidence.

School heads may strengthen the mathematics curriculum by encouraging the integration of not only procedural knowledge but also conceptual understanding and non-routine problem-solving activities. They may support teachers through professional development programs, instructional resources, and classroom monitoring to ensure that students develop both mathematical skills and confidence in learning mathematics.

Future researchers may explore additional variables such as mathematics anxiety, motivation, or teaching styles, and may involve a larger sample size or different grade levels to further validate and expand the findings of this study.

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