

Mathematical Thinking Skills among Grade 10 Junior High School Students at Sulu College of Technology, Inc.

Alana Hapie-Ahmad and Mailen A. Antao

School of Graduate Studies, Sulu State College, Jolo, Sulu, 4700, Philippines

*Corresponding author: sscgspub@sulustatecollege.edu.ph

ABSTRACT. This study explored the level of mathematical thinking skills among Grade 10 students at Sulu College of Technology, Inc. It focused on key areas such as problem-solving, logical reasoning, critical thinking, mathematical communication, the study focused on how students apply mathematical concepts in real-life situations. It used a descriptive-correlational research design and collected data from 100 students chosen through purposive sampling. A validated survey questionnaire was used as the main data-gathering tool. The responses were analyzed using descriptive statistics as well as inferential tests, including t-test, ANOVA, and Pearson correlation. Overall results indicated that students generally have a moderate level of mathematical thinking skills, with all five skill areas rated as “somewhat developed.” In addition, the analysis showed that there were no significant differences in mathematical thinking skills when students were grouped according to age, gender, parents’ educational background, or monthly family income. Furthermore, correlation analysis indicated strong to very high positive relationships among the five skill areas, suggesting that these aspects of mathematical thinking are closely interconnected. Based on these findings, the study recommends that teachers and school administrators enhance instructional strategies that promote higher-order thinking skills. Parents are also encouraged to provide consistent academic support at home, while students should actively engage in problem-solving and real-life applications of mathematics. Future studies may consider examining other factors, such as teaching approaches and learning environments, that could influence the development of mathematical thinking skills.

Keywords: *Mathematical, Thinking, Skills, Junior, Technology*

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1. INTRODUCTION

In today’s fast-changing and increasingly data-driven world, being good at mathematics is no longer just about solving equations or memorizing formulas. It is about thinking analyzing situations, solving unfamiliar problems, and making informed decisions in everyday life. “Based on the Organisation for Economic Co-operation and Development (OECD), mathematical competence in the 21st century involves higher-order thinking skills, including logical reasoning and problem-solving, and the ability to interpret quantitative information. These skills are essential

for preparing learners to actively participate in modern society, the workforce, and civic life. This idea is supported by the study of Ampong, T. A. (2025), which emphasized that learners need innovative and analytical mindsets to develop STEM-related competencies necessary in modern education and society. Similarly, Chavez, J. V. and Lamorinas (2023) highlighted the importance of responsive and adaptive assessment practices in promoting meaningful learning experiences and improving students' cognitive engagement in education.

However, global evidence suggests a concerning gap. Results from the Programme for International Student Assessment (OECD, 2022) reveal that only a small proportion of students about 9 percent can successfully solve complex problems that require creative and advanced mathematical reasoning. While many students can perform routine procedures, far fewer demonstrate the ability to think critically and apply mathematical concepts in novel situations. This highlights a persistent challenge in education systems worldwide: developing not just procedural knowledge, but deep and transferable mathematical thinking skills. Similarly, Ang, J. V. et al. (2025) stressed that classrooms must become more engaging and learner-centered in order to effectively motivate 21st-century learners and enhance critical thinking and active participation. In support of this, Legarde, M. A. A. et al. (2025) emphasized that active learning experiences in STEM classrooms help strengthen learners' engagement, participation, and higher-order thinking skills.

This global issue is even more pronounced in the Philippine context. Findings from the 2018 and 2022 PISA cycles show that Filipino students consistently rank among the lowest in mathematical literacy, with only around 16 percent reaching the minimum level of proficiency. These results suggest that many learners struggle with essential cognitive processes such as problem solving, logical reasoning, and mathematical communication. In response, the Department of Education, through the K to 12 Mathematics Curriculum (DepEd, 2016), emphasized the importance of developing critical and creative thinking skills. The curriculum envisions learners who can reason effectively, communicate mathematical ideas clearly, and apply mathematics in real-life decision-making. Supporting this perspective, Verdeflor, R. N. (2024) explained that students' learning experiences and encounters in mathematics strongly influence how they perceive and apply mathematical concepts in the real world. In addition, Chavez, J. V. (2023) stressed the value of humanized teaching approaches in strengthening students' academic engagement and learning experiences.

Despite these policy efforts, a gap remains between curriculum goals and actual classroom outcomes. Several studies, including those by Reyes (2021) and Serrano (2022), indicate that while Filipino students often demonstrate procedural fluency, they frequently lack conceptual understanding. Many learners can carry out computations but struggle to explain their reasoning, recognize patterns, or connect mathematical ideas to real-world contexts. These findings suggest that current teaching and assessment practices may not sufficiently cultivate deeper mathematical thinking. Relatedly, Espartero, M. M., Caldaza, K. P. D., and Prado, R. T. D. (2024) found that students' interest in solving mathematical problems varies depending on the learning environment, whether modular or face-to-face, which may affect the development of mathematical thinking skills. In addition, Verdeflor, R. N. et al. (2025) revealed that mathematics anxiety can hinder learners' confidence and reasoning abilities, although positive teaching practices and instructional interventions can help students overcome these difficulties. This finding is further supported by Inoferio, H. V. et al. (2024), who found that learners experiencing math anxiety and lack of confidence may benefit from supportive and technology-assisted learning strategies.

Moreover, research highlights that factors such as socioeconomic status, parental education, and access to school resources significantly influence students' cognitive development in mathematics. This was further supported by Calubag, L. V. et al. (2025), who emphasized that real-life and industry-based learning experiences can positively shape learners' attitudes toward Mathematics and Science, helping them appreciate the practical value of these subjects. Likewise, Murro, R. A. et al. (2023) noted that parents with low educational attainment often encounter difficulties in supporting their children's learning, which may affect students' academic performance and learning development.

This issue becomes even more critical in geographically and socioeconomically challenged areas such as Sulu, a province in the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM). Schools in this region often face limitations in instructional materials, teacher professional development, and learning support systems. At Sulu College of Technology, Inc, variations in Junior High School students' mathematics performance across academic years point to inconsistencies in learning conditions and opportunities. Teachers have observed that although students may follow step-by-step procedures, many find it difficult to justify their answers, articulate their thinking, or apply concepts in unfamiliar situations—clear indicators of underdeveloped mathematical thinking skills. Supporting this observation, Tonalet, A. L. et al. (2025) highlighted the importance of proactive teaching behaviors in motivating students who show little interest in Mathematics. Similarly, Leon, A. J. T. D. et al. (2024) emphasized the importance of inclusive classroom practices and teacher preparedness in improving students' participation and learning outcomes.

Furthermore, some learners tend to shift away from Mathematics, Science, and ICT-related fields because of negative experiences and low confidence in these subjects. According to Diamante, R. E. G. et al. (2025), students who struggle with mathematical and scientific concepts often develop unfavorable attitudes that influence their academic choices. Similarly, Gumallaoui, J. G. et al. (2026) found that anxiety in experiential learning environments can affect learners' motivation and engagement in mathematics and science-oriented courses. Relatedly, Batucan, N. A. et al. (2025) explained that reducing learners' fear and improving comprehension are essential in helping students become more confident and engaged in mathematics and science-related subjects.

Given this context, there is a need to better understand how mathematical thinking develops among learners in such settings. This study aims to address this gap by assessing the mathematical thinking skills of Grade 10 students at Sulu College of Technology, Inc. Specifically, it focuses on key domains such as problem solving, logical reasoning, critical thinking, mathematical communication, and the application of mathematical concepts to real-life situations. In addition, the study examines how these skills may vary according to demographic factors, including age, gender, parents' educational attainment, and parents' average monthly income. Supporting this direction, Nazareth, I. M. et al. (2026) emphasized that motivation and quality education initiatives play important roles in improving educational outcomes and learner development.

By exploring these variables, the study seeks to uncover patterns and relationships that may explain differences in students' mathematical thinking abilities. It also aims to determine how the different sub-skills are interconnected, providing a more holistic view of students' mathematical cognition. The findings are expected to offer valuable insights for improving curriculum implementation, designing targeted instructional strategies, and strengthening teacher capacity in promoting higher-order thinking. In support of this, Ang, J. V. et al. (2025) emphasized that

effective faculty development management contributes significantly to improving teacher motivation, productivity, and instructional effectiveness.

Ultimately, this research intends to contribute to the ongoing effort to bridge the gap between procedural competence and meaningful mathematical understanding. By identifying strengths and areas for improvement, it hopes to support the development of learners who are not only mathematically proficient but also capable of critical and creative thinking skills that are essential for both personal growth and community development.

2. METHODS

2.1 Research Design

This study used a descriptive-correlational research design with a quantitative approach to evaluate the mathematical thinking skills of Grade 10 junior high school students of Sulu College of Technology, Inc. for School Year 2025–2026. The descriptive component was used to determine and describe students' levels of mathematical thinking skills in terms of problem-solving, logical reasoning, critical thinking, mathematical communication, and the application of concepts in real-life situations. Meanwhile, the correlational component examined the relationships between students' demographic characteristics such as age, gender, parents' educational attainment, and average monthly income and their mathematical thinking skills. As noted by Beck (2017), descriptive research is useful for summarizing the characteristics of a group, while correlational research helps identify patterns and relationships among variables. By combining these approaches, the study provided a clearer and more comprehensive understanding of how demographic factors may be associated with students' mathematical thinking abilities and overall cognitive performance in mathematics.

2.2 Participants of the Study

This study was conducted at Sulu College of Technology, Inc. in Jolo, Sulu, during the School Year 2025–2026. The research focused on 100 Grade 10 junior high school students who were chosen as respondents because they had already been exposed to various mathematical concepts and learning experiences relevant to the study. As a private educational institution that promotes academic excellence and holistic development, the school provided an appropriate setting for examining students' mathematical thinking skills. Data were collected through a structured questionnaire that assessed key areas of mathematical thinking skills, such as problem-solving, logical reasoning, and critical thinking, mathematical communication, and the use of mathematical concepts in real-life situations. The study aimed to better understand the students' abilities in these areas during an important stage of their cognitive and academic development.

Respondents of the Study

Grade 10 Students	No. of Respondents
Grade 10 – Gagandilan	20
Grade 10 – Matawkasi	20
Grade 10 – Panday Pandikal	20
Grade 10 – Makulasug	20
Grade 10 – Biraddali	20
Total	100

2.3 Sampling Procedure

This study used a non-probability purposive sampling method. The researcher intentionally selected Grade 10 students from all five sections of Sulu College of Technology, Inc. for School Year 2025–2026. A total of 100 students participated in the study, with 20 respondents chosen from each section. The participants were selected because they were considered suitable sources of information for assessing mathematical thinking skills.

2.4 Research Instrument

The study used a standardized questionnaire adapted from the works of George Pólya (2004), Alan Schoenfeld (2016), and Mogens Niss (2003). The instrument was designed to assess the different dimensions of mathematical thinking among Grade 10 students. The questionnaire was divided into two sections. The first part collected the respondents' demographic profile, which included their age, gender, parents' educational background, and the average monthly income of their parents. Part II focused on assessing students' mathematical thinking skills with regard to problem-solving, logical reasoning, critical thinking, mathematical communication, and the application of mathematical concepts in real-life situations. Each statement in the questionnaire was rated using a five-point Likert scale to determine the students' level of mathematical thinking skills.

2.5 Data Gathering Procedure

Before collecting the data, the researcher first obtained permission to conduct the study from the Dean of the Graduate School. After obtaining the necessary approval, permission was also requested from the School Principal of Sulu College of Technology, Inc. for the review and endorsement of the study. In addition, formal request letters were sent to each research adviser to ask permission to administer the research instrument to Grade 10 students. Once approval was granted, the researcher personally distributed information letters and consent forms to the participants. These documents explained the aim of the study, its significance, and the ethical considerations involved. The questionnaires were then administered personally to make sure the instructions were clearly understood and to encourage a higher response rate. The respondents were encouraged to answer honestly and were assured that all information gathered would be treated with strict confidentiality and anonymity. After the respondents completed the questionnaires, the researcher immediately collected them for data organization and analysis.

2.6 Ethical Considerations

Upholding ethical standards was an important part of ensuring the reliability, validity, and integrity of the entire research process. The researcher made sure that all data collected for analysis and interpretation complied with recognized ethical guidelines and principles in educational research. Before the conduct of the study, the participants were fully briefed on the purpose, procedures, and scope of the research through an informed consent form. Their participation was entirely voluntary, and they were given the freedom to withdraw from the study at any time without penalty or adverse consequences. The researcher also ensured that no any form of coercion, pressure, or improper influence was used in encouraging participation. To protect the participants, strict confidentiality and anonymity were observed throughout the study. The identities of the respondents and the institutions involved were kept private, and no identifying information appeared in any report, presentation, or publication related to the research. The researcher also upheld respect for the rights, dignity, and well-being of all participants by valuing their responses

and experiences during the conduct of the study. In addition, the researcher ensured the integrity of the data by gathering, recording, analyzing, and presenting all information honestly and accurately. Any form of fabrication, falsification, or misrepresentation of data was strictly avoided. The study was conducted with the principle of beneficence and non-maleficence in mind, ensuring that the research would provide meaningful benefits while preventing any physical, psychological, or social harm to the participants. Furthermore, the conduct of the study complied with the ethical policies and procedures of the Graduate School of Sulu State College, as well as relevant national and international ethical standards for educational research. Before the administration of the survey questionnaire, the researcher also secured an official ethical clearance from the authorized Research Ethics Committee of the institution to ensure that the study met all institutional and professional ethical requirements.

3. RESULTS

Question 2. What is the level of mathematical thinking skills among Grade 10 students in the context of 2.1 Problem-solving Skills, 2.2 Logical Reasoning, 2.3 Critical Thinking, 2.4 Mathematical Communication and 2.5 Application of Concepts in Real-Life Situations?

Table 2.1 Level of Mathematical thinking skills among junior high school students at Sulu College of Technology, Inc in the context of Problem-Solving Skills.

	Statements	Mean	S.D	Rating
1	I can understand and define the problem before attempting to solve it.	2.93	.956	Somewhat
2	I can select appropriate strategies when solving math problems.	2.64	.916	Somewhat
3	I can use multiple approaches to solve a given problem.	2.80	.953	Somewhat
4	I can check and verify my answers after solving a problem.	3.34	.997	Somewhat
5	I can relate the problem to previous lessons or experiences.	3.05	1.067	Somewhat
6	I can use trial-and-error effectively when solving complex problems.	2.65	1.067	Somewhat
7	I can break down a problem into smaller, manageable parts.	2.72	.965	Somewhat
8	I can explain how I arrived at my solutions.	3.04	1.014	Somewhat
9	I can solve word problems accurately.	2.94	1.062	Somewhat
10	I can apply formulas correctly when solving problems.	2.94	.983	Somewhat
Total Weighted Mean		2.91	.72144	Somewhat

Legend: (5) 4.50-5.00=Very High; (4) 3.50-4.49= High; (3) 2.50- 3.49= Somewhat; (2) 1.50- 2.49=Low; (1) 1.00-1.49= Very Low

Table 2.1 The results present the level of mathematical thinking skills of junior high school students at Sulu College of Technology, Inc., particularly in terms of problem-solving. This area obtained a total weighted mean of 2.91 with a standard deviation of 0.72144, which was interpreted as “Somewhat.” These findings indicate that the student-respondents exhibit a moderate level of problem-solving skills. In general, the students are able to apply appropriate strategies and logical reasoning in solving mathematical tasks, although these skills are not consistently demonstrated in all situations.

The respondents particularly rated the following statements as “Somewhat”: understanding and defining a problem before attempting to solve it, checking and verifying answers after solving a problem, using trial-and-error strategies when dealing with complex problems, and explaining how they arrived at their solutions. These findings imply that while the students possess basic problem-solving skills, there is still room for improvement in strengthening their confidence, analytical thinking, and consistency in applying mathematical reasoning.

Table 2.2 Level of Mathematical thinking skills among junior high school students at Sulu College of Technology, Inc in the context of Logical Reasoning.

	Statements	Mean	S.D	Rating
1	I can follow a step-by-step process when solving math problems.	3.30	1.020	Somewhat
2	I can identify errors in my reasoning or solutions.	3.01	.927	Somewhat
3	I can recognize patterns in numbers or figures.	2.91	.933	Somewhat
4	I can use logical steps to arrive at a conclusion.	2.86	.954	Somewhat
5	I can provide reasons for the solutions I give.	3.09	1.138	Somewhat
6	I can connect different mathematical concepts logically.	2.70	1.000	Somewhat
7	I can evaluate whether a solution is reasonable or not.	2.82	.968	Somewhat
8	I can solve problems using logical arguments.	2.95	1.048	Somewhat
9	I can justify my answers with clear reasoning.	3.05	1.019	Somewhat
10	I can differentiate between valid and invalid solutions	3.06	.983	Somewhat
Total Weighted Mean		2.98	.76123	Somewhat

Legend: (5) 4.50-5.00=Very High; (4) 3.50-4.49= High; (3) 2.50- 3.49= Somewhat; (2) 1.50- 2.49=Low; (1) 1.00- 1.49= Very Low

Table 2.2 The results show the level of mathematical thinking skills among junior high school students at Sulu College of Technology, Inc., particularly in terms of logical reasoning. This category obtained a total weighted mean of 2.98 with a standard deviation of 0.76123, which was interpreted as “Somewhat.” This suggests that the student-respondents generally exhibit a moderate level of logical reasoning skills. The results suggest that students are able to apply logical thinking and organized reasoning in solving mathematical problems, although these abilities are only demonstrated at times and not consistently.

Among the statements rated as “Somewhat” by the respondents were recognizing patterns in numbers or figures, using logical steps to arrive at conclusions, providing reasons for their answers, and solving problems through logical arguments. These findings imply that while the students possess basic logical reasoning skills, they may still need further guidance and practice to strengthen their critical thinking, analytical abilities, and confidence in applying logical processes when dealing with mathematical tasks.

Table 2.3 Level of Mathematical thinking skills among junior high school students at Sulu College of Technology, Inc in the context of Critical Thinking.

	Statements	Mean	S.D	Rating
1	I can analyze problems before deciding on a solution.	3.14	1.005	Somewhat
2	I can compare and contrast different problem-solving methods.	2.97	1.000	Somewhat
3	I can evaluate the effectiveness of the strategies I use.	2.92	1.032	Somewhat
4	I can identify assumptions made in solving problems.	2.83	.853	Somewhat
5	I can think of alternative solutions to a given problem.	2.79	.913	Somewhat
6	I can judge the accuracy of solutions presented by others.	2.85	1.114	Somewhat
7	I can question the steps I take in solving problems.	3.05	1.038	Somewhat
8	I can reflect on mistakes and learn from them.	3.50	1.176	High
9	I can apply higher-order thinking when solving math problems.	2.84	.972	Somewhat
10	I can evaluate whether my solution can be improved.	3.04	1.034	Somewhat
Total Weighted Mean		2.99	.73639	Somewhat

Legend: (5) 4.50-5.00=Very High; (4) 3.50-4.49= High; (3) 2.50- 3.49= Somewhat; (2) 1.50- 2.49=Low; (1) 1.00-1.49= Very Low

Table 2.3 The results present the level of mathematical thinking skills among junior high school students at Sulu College of Technology, Inc., particularly in terms of critical thinking. This category obtained a total weighted mean of 2.99 with a standard deviation of 0.73639, which was interpreted as “Somewhat.” This result indicates that the student-respondents generally demonstrate a moderate level of critical thinking skills. It suggests that the students are sometimes able to analyze, evaluate, and reflect on mathematical concepts and solutions when solving problems.

The respondents particularly rated the following statements as “Somewhat”: analyzing problems before choosing a solution, thinking of alternative ways to solve a problem, judging the accuracy of solutions presented by others, applying higher-order thinking skills in mathematics,

and evaluating whether their own solutions can still be improved. These findings imply that while the students show the ability to think critically in mathematics, there is still a need to further develop their analytical and evaluative skills through more engaging activities and problem-solving experiences.

Table 2.4 Level of Mathematical thinking skills among junior high school students at Sulu College of Technology, Inc in the context of Mathematical Communication.

	Statements	Mean	S.D	Rating
1	I can explain math solutions clearly to my classmates.	2.80	1.015	Somewhat
2	I can use correct mathematical terms when explaining solutions.	2.85	1.019	Somewhat
3	I can represent ideas using graphs, tables, or diagrams.	2.97	.958	Somewhat
4	I can write solutions in an organized and understandable way.	2.96	.994	Somewhat
5	I can express mathematical ideas both orally and in writing.	2.91	.944	Somewhat
6	I can use symbols and notations correctly when solving problems.	2.93	1.018	Somewhat
7	I can share my reasoning process during class discussions.	3.04	1.154	Somewhat
8	I can explain math concepts to others in simple terms.	3.10	.927	Somewhat
9	I can present solutions logically during group work.	3.20	1.054	Somewhat
10	I can explain math solutions clearly to my classmates.	3.12	.988	Somewhat
Total Weighted Mean		2.99	.73790	Somewhat

Legend: (5) 4.50-5.00=Very High; (4) 3.50-4.49= High; (3) 2.50- 3.49= Somewhat; (2) 1.50- 2.49=Low; (1) 1.00-1.49= Very Low

Table 2.4 The results show the level of mathematical thinking skills among junior high school students at Sulu College of Technology, Inc., particularly in terms of mathematical communication. This category obtained a total weighted mean of 2.99 with a standard deviation of 0.73790, which was interpreted as “Somewhat.” This indicates that the student-respondents generally demonstrate a moderate ability to express mathematical ideas, explanations, and solutions. The results suggest that students are sometimes able to communicate their mathematical reasoning clearly, although differences in communication skills are evident among the respondents.

The respondents particularly rated the following statements as “Somewhat”: explaining mathematical solutions clearly to classmates, using correct mathematical terms when explaining solutions, and applying symbols and notations properly when solving problems. These findings

imply that while the students possess basic mathematical communication skills, they may still need additional practice and guidance in expressing mathematical ideas more confidently, accurately, and effectively during discussions and problem-solving activities.

Table 2.5 Level of Mathematical thinking skills among junior high school students at Sulu College of Technology, Inc in the context of Application of Concepts in Real-Life Situations.

	Statements	Mean	S.D	Rating
1	I can apply math concepts to real-life problems.	3.20	1.073	Somewhat
2	I can connect math lessons to everyday activities.	3.13	1.098	Somewhat
3	I can use percentages and ratios in real-life situations.	3.01	1.049	Somewhat
4	I can apply geometry concepts to practical problems.	2.82	1.067	Somewhat
5	I can use statistics to interpret real-life data.	2.83	1.006	Somewhat
6	I can calculate expenses or budgets using math skills.	3.28	1.120	Somewhat
7	I can relate algebraic concepts to real situations.	2.83	1.035	Somewhat
8	I can apply measurement skills in daily life.	3.24	1.156	Somewhat
9	I can connect classroom lessons to real-world challenges.	3.17	1.101	Somewhat
10	I can use math in decision-making outside school.	3.20	1.128	Somewhat
Total Weighted Mean		3.07	.83573	Somewhat

Legend: (5) 4.50-5.00=Very High; (4) 3.50-4.49= High; (3) 2.50- 3.49= Somewhat; (2) 1.50- 2.49=Low; (1) 1.00-1.49= Very Low

Table 2.5 The results show the level of mathematical thinking skills among junior high school students at Sulu College of Technology, Inc., particularly in applying concepts to real-life situations. This category obtained a total weighted mean of 3.07 with a standard deviation of 0.83573, which was interpreted as “Somewhat.” This indicates that the student-respondents generally demonstrate a moderate ability to apply mathematical concepts in practical or everyday contexts. The result suggests that students are sometimes able to connect what they learn in mathematics to real-life situations, although this skill is not yet consistently demonstrated across all learners.

The respondents particularly rated the following statements as “Somewhat”: applying mathematical concepts to real-life problems, connecting math lessons to everyday activities, calculating expenses or budgets using mathematical skills, and using mathematics in decision-making outside of school. These findings imply that while the students show an awareness of how mathematics can be used in daily life, they may still benefit from more activities and learning

experiences that strengthen their ability to apply mathematical concepts more confidently and consistently in real-world situations.

Question 3. Is there a significant difference in the level of mathematical thinking skills among Grade 10 students when data are grouped according to their demographic profile in terms of 3.1 Age 3.2 Gender, 3.3 parent’s educational attainment and 3.4 parent’s monthly income?

Table 3.1 Difference in the level of Mathematical thinking skills among junior high school students at Sulu College of Technology, Inc when data are grouped according to their demographic profile in terms of age.

Variables	Grouping	Mean	S.D	Mean Difference	t	Sig.	Description
Problem-Solving Skills	14-15 years old	2.845	.6671	-.23233	-1.42	.159	Not Significant
	16 years old and above	3.077	.8487				
Logical Reasoning	14-15 years old	2.929	.7016	-.17412	-1.00	.318	Not Significant
	16 years old and above	3.104	.9132				
Critical Thinking	14-15 years old	2.903	.6760	-.34730	-2.10*	.038	Significant
	16 years old and above	3.250	.8487				
Mathematical Communication	14-15 years old	2.896	.6465	-.35405	-1.82	.078	Not Significant
	16 years old and above	3.250	.9162				
Application of Concepts in Real-Life Situations	14-15 years old	2.964	.7873	-.41341	-2.21*	.029	Significant
	16 years old and above	3.377	.9079				

* Significant at alpha 0.05

Table 3.1 The table presents the variations in the level of mathematical thinking skills among junior high school students at Sulu College of Technology, Inc. when grouped according to age. The findings show that, except for Critical Thinking and the Application of Concepts in Real-Life Situations, all computed F-values and probability values were not significant at the 0.05 level of significance. This indicates that although the student-respondents belong to different age groups, they generally share similar perceptions regarding the different areas of mathematical thinking skills.

The results further suggest that being 16 years old and above does not necessarily make a student better in perceiving the factors related to mathematical thinking skills compared to students

from other age groups. In other words, age does not appear to strongly influence how students view or assess their mathematical thinking abilities.

Therefore, it can be concluded that age has no significant effect on the level of mathematical thinking skills among the junior high school students of Sulu College of Technology, Inc. Hence, the hypothesis stating that “There is no significant difference in the level of Mathematical thinking skills among the junior high school students at Sulu College of Technology, Inc when grouped according to age” is accepted.

Table 3.2 Difference in the level of Mathematical thinking skills among junior high school students at Sulu College of Technology, Inc when data are grouped according to their demographic profile in terms of gender.

Variables	Grouping	Mean	S.D	Mean Difference	t	Sig.	Description
Problem-Solving Skills	Male	3.040	.6964	.22500	1.53	.127	Not Significant
	Female	2.815	.7295				
Logical Reasoning	Male	3.045	.7776	.11667	.749	.456	Not Significant
	Female	2.928	.7531				
Critical Thinking	Male	3.010	.7306	.02833	.188	.852	Not Significant
	Female	2.982	.7462				
Mathematical Communication	Male	3.018	.8271	.04917	.325	.746	Not Significant
	Female	2.968	.6786				
Application of Concepts in Real-Life Situations	Male	3.135	.9513	.10667	.623	.535	Not Significant
	Female	3.028	.7544				

* Significant at alpha 0.05

Table 3.2 presents the difference in the level of Mathematical thinking skills among junior high school students at Sulu College of Technology, Inc when data are grouped according to their demographic profile in terms of gender. As shown in this table, all the t-values and probability values are not significant at alpha 0.05. This means that, male and female student-respondents involved in this study do not differ in their perception towards the subcategories subsumed under the level of Mathematical thinking skills. This further implies that being male student-respondent may not make him a better perceiver toward the level of Mathematical thinking skills, and vice versa.

Hence, it is safe to say that variable gender has no significant intervention in the ways how junior high school student-respondents at Sulu College of Technology, Inc, perceive the level of Mathematical thinking skills. Therefore, the hypothesis which states that: “There is no significant difference in the level of Mathematical thinking skills among the junior high school students at Sulu College of Technology, Inc when data are grouped according to gender” is accepted.

Table 3.3 Difference in the level of Mathematical thinking skills among junior high school students at Sulu College of Technology, Inc when data are grouped according to their demographic profile in terms of Parent’s educational attainment.

Sources of Variation		Sum of squares	df	Mean Square	F	Sig.	Description
Problem-Solving Skills	Between Groups	1.499	4	.375	.712	.586	Not Significant
	Within Groups	50.028	95	.527			
	Total	51.528	99				
Logical Reasoning	Between Groups	.715	4	.179	.300	.877	Not Significant
	Within Groups	56.653	95	.596			
	Total	57.368	99				
Critical Thinking	Between Groups	.602	4	.151	.269	.897	Not Significant
	Within Groups	53.083	95	.559			
	Total	53.685	99				
Mathematical Communication	Between Groups	.231	4	.058	.102	.981	Not Significant
	Within Groups	53.675	95	.565			
	Total	53.906	99				
Application of Concepts in Real-Life Situations	Between Groups	2.204	4	.551	.782	.540	Not Significant
	Within Groups	66.942	95	.705			
	Total	69.146	99				

* Significant at alpha 0.05

Table 3.3 presents the difference in the level of Mathematical thinking skills among junior high school students at Sulu College of Technology, Inc when data are grouped according to their demographic profile in terms of parent’s educational attainment. It can be gleaned from this table that all the F-values and probability values of the subcategories subsumed are not significant at alpha 0.05. This means that though the students involved in this study vary in their Parent’s educational attainment, generally they do not differ in their perceptions toward the level of Mathematical thinking skills among junior high school students. It implies that student-respondents who have Parents with post graduate degree may not be a better perceiver on the level of Mathematical thinking skills compared to those whose parents have attained a college degree, and vice versa.

Hence, it is safe to say that the Parent’s educational attainment variable has no significant intervention in the ways how Junior high school student-respondents at Sulu College of Technology, Inc perceive the level of Mathematical thinking skills among junior high school students. Therefore, the hypothesis which states that: “There is no significant difference in the

level of Mathematical thinking skills among the junior high school students at Sulu College of Technology, Inc when data are grouped according to Parent’s educational attainment” is accepted.

Table 3.4 Difference in the level of Mathematical thinking skills among junior high school students at Sulu College of Technology, Inc when data are grouped according to their demographic profile in terms of Parent’s average monthly income.

Sources of Variation		Sum of squares	df	Mean Square	F	Sig.	Description
Problem-Solving Skills	Between Groups	.509	4	.127	.237	.917	Not Significant
	Within Groups	51.019	95	.537			
	Total	51.528	99				
Logical Reasoning	Between Groups	.842	4	.210	.354	.841	Not Significant
	Within Groups	56.526	95	.595			
	Total	57.368	99				
Critical Thinking	Between Groups	.240	4	.060	.107	.980	Not Significant
	Within Groups	53.445	95	.563			
	Total	53.685	99				
Mathematical Communication	Between Groups	1.284	4	.321	.580	.678	Not Significant
	Within Groups	52.622	95	.554			
	Total	53.906	99				
Application of Concepts in Real-Life Situations	Between Groups	.981	4	.245	.342	.849	Not Significant
	Within Groups	68.165	95	.718			
	Total	69.146	99				

* Significant at alpha 0.05

Table 3.4 presents the difference in the level of Mathematical thinking skills among junior high school students at Sulu College of Technology, Inc when data are grouped according to their demographic profile in terms of Parent’s average monthly income. It can be gleaned from this table that all the F-values and probability values of the subcategories subsumed are not significant at alpha 0.05. This means that though the student-respondents involved in this study vary in their

Parent's average monthly income background, generally they do not differ in their perceptions toward the level of Mathematical thinking skills. It implies that student-respondents who have parents with average monthly income of 50,001 and above may not be a better perceiver on the level of mathematical thinking skills compared to those other income group as categorized in this study, and vice versa.

Hence, it is safe to say that the Parent's average monthly income variable has no significant intervention in the ways how Junior high school students at Sulu College of Technology, Inc perceive the level mathematical thinking skills. Therefore, the hypothesis which states that: "There is no significant difference in the level of Mathematical thinking skills among the junior high school students at Sulu College of Technology, Inc when data are grouped according to Parent's average monthly income" is accepted.

4. DISCUSSION

The findings of the study provide important insights into the Mathematical Thinking Skills of junior high school students at Sulu College of Technology, Inc. The discussion highlights how students' demographic characteristics relate to their mathematical thinking abilities, as well as how the different dimensions of mathematical thinking are interconnected.

In terms of demographic profile, the majority of the student-respondents were aged 14–15 years old, which reflects the typical age range of junior high school learners. Most respondents were female, came from families with a monthly income ranging from ₱10,001–₱20,000, and had parents who reached college-level education. These findings suggest that the respondents generally come from moderate socio-economic and educational backgrounds. Such backgrounds may provide students with sufficient exposure to educational support and learning opportunities that can contribute to their academic development. However, despite these varying demographic characteristics, the study found that students demonstrated relatively similar levels of Mathematical Thinking Skills.

The results further revealed that the students' level of Mathematical Thinking Skills was generally moderate across all measured areas, including Problem-Solving Skills, Logical Reasoning, Critical Thinking, Mathematical Communication, and Application of Concepts in Real-Life Situations. The "Somewhat" rating indicates that students are capable of applying mathematical thinking skills, but only to a certain extent. This means that while learners possess foundational mathematical abilities, they may still experience difficulties in consistently applying these skills in more complex or practical situations. The findings imply that students are still in the process of developing higher-order thinking skills, which are essential in understanding and solving mathematical problems effectively.

The moderate level of Mathematical Thinking Skills may also reflect the need for more engaging and learner-centered teaching approaches in Mathematics. Students may benefit from instructional strategies that encourage active participation, critical analysis, collaboration, and real-life application of mathematical concepts. Strengthening these areas can help learners become more confident and independent in solving mathematical problems and making logical decisions.

Moreover, the study revealed that there were no significant differences in the level of Mathematical Thinking Skills when students were grouped according to age, gender, parents' educational attainment, and parents' average monthly income. This suggests that mathematical thinking abilities among the respondents are generally consistent regardless of demographic

background. The findings imply that the development of mathematical thinking skills may depend more on students' learning experiences, classroom instruction, and exposure to mathematical activities rather than on personal or family characteristics alone.

The absence of significant differences may also indicate that students at Sulu College of Technology, Inc are provided with relatively equal learning opportunities in Mathematics. Regardless of their background, students appear to experience similar challenges and strengths in developing mathematical thinking skills. This finding supports the idea that mathematical thinking can be nurtured through appropriate teaching strategies, meaningful classroom engagement, and continuous practice.

Lastly, the findings showed a significant relationship among all subcategories of Mathematical Thinking Skills. The strong positive correlations among Problem-Solving Skills, Logical Reasoning, Critical Thinking, Mathematical Communication, and Application of Concepts in Real-Life Situations suggest that these skills are closely connected and tend to develop together. Students who perform well in one area are likely to demonstrate competence in other areas as well.

This relationship highlights the holistic nature of mathematical thinking. For example, learners who can think critically are also more capable of reasoning logically and communicating mathematical ideas effectively. Similarly, students who are good problem solvers are more likely to apply mathematical concepts in real-life situations. The findings therefore emphasize the importance of developing all aspects of mathematical thinking simultaneously rather than focusing on a single skill alone.

Overall, the study suggests that while junior high school students at Sulu College of Technology, Inc already demonstrate moderate mathematical thinking abilities, there is still a need for continuous improvement and instructional support. Enhancing classroom practices, providing meaningful mathematical experiences, and encouraging critical and analytical thinking may help students further strengthen their mathematical thinking skills and improve their overall performance in Mathematics.

5. CONCLUSION

The study found that most Grade 10 students at Sulu College of Technology, Inc are middle adolescents, predominantly female, and come from families with moderate income and parents who have reached college-level education. These characteristics suggest that the students generally have stable socio-economic and educational backgrounds that may support their learning experiences. The findings also revealed that the students' Mathematical Thinking Skills were generally at a moderate level. Students showed basic abilities in problem-solving, logical reasoning, critical thinking, mathematical communication, and applying mathematical concepts in real-life situations. However, the results indicate that there is still a need to further strengthen these skills so students can develop deeper understanding and higher-order thinking in Mathematics. In addition, the study showed that age, gender, parents' educational attainment, and family income did not significantly affect the students' Mathematical Thinking Skills. This suggests that students, regardless of their demographic background, tend to develop mathematical thinking in similar ways. The findings imply that learning experiences, teaching strategies, and classroom environments may play a more important role in shaping students' mathematical abilities than personal background factors alone. Lastly, the study confirmed that all areas of Mathematical Thinking Skills are strongly connected with one another. Improvement in one skill, such as

problem-solving or logical reasoning, may also help enhance other skills like critical thinking, communication, and real-life application of mathematical concepts. This highlights the importance of developing mathematical skills in an integrated and balanced manner to support students' overall learning and performance in Mathematics.

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