

Mathematical Problem-Solving Skills through Inquiry-Based Learning and Academic Performance of Grade 7 Students

Madeliene B. Cura, MAEd

Graduate Student, Tomas Claudio Colleges, Morong, Rizal Philippines

Teacher I, Antipolo National High School, Antipolo City Philippines

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Email of Corresponding Author: mhadie0630@gmail.com

Abstract

This study examined the mathematical problem-solving skills of Grade 7 students through inquiry-based learning and its relationship with their academic performance in Mathematics. The research employed descriptive and correlational methods and was conducted among selected public secondary schools in Antipolo City, namely Antipolo National High School, Dela Paz National High School, and San Jose National High School, during the School Year 2025–2026. The respondents were described in terms of demographic and socio-economic profiles, including age, sex, sibling position, family size, parents' educational attainment, occupation, and monthly income. A researcher-made questionnaire-checklist was utilized to assess students' problem-solving skills, focusing on problem comprehension and analysis, strategy planning and application, and reasoning and justification. Students' academic performance was measured using their average grades in Mathematics for the first and second quarters. Data were analyzed using frequency and percentage, weighted mean, one-way analysis of variance (ANOVA), and correlation analysis. Findings revealed that most respondents were 13-year-old female students, primarily first-born, belonging to small families. Most parents were high school graduates, with fathers engaged in various occupations and mothers commonly serving as housewives. The results indicated that students demonstrated a high level of mathematical problem-solving skills across all domains. Their academic performance in Mathematics was generally satisfactory to very satisfactory. Certain profile variables, such as mother's educational attainment, father's occupation, and monthly family income, showed significant differences in some aspects of problem-solving skills. Furthermore, a significant positive relationship was found between students' mathematical problem-solving skills and their academic performance. The study concluded that inquiry-based learning significantly enhances students' mathematical problem-solving skills and contributes positively to their academic performance. It is recommended that school administrators, teachers, students, and parents collaborate to strengthen the implementation of inquiry-based learning strategies to further improve learners' mathematical competencies. Future researchers are encouraged to explore additional variables and contexts to enrich the understanding of students' problem-solving development.

Keywords: Inquiry-Based Learning, Mathematical Problem-Solving Skills, Academic Performance, Grade 7 Students, Mathematics Education, Descriptive Correlational Research, Problem Comprehension, Strategy Planning, Reasoning and Justification, Student Performance

1. Introduction

Education plays a vital role in shaping an individual's knowledge, skills, and attitudes, enabling learners to become productive and responsible members of society. In the Philippines, this is strongly emphasized in Article XIV, Section 1 of the 1987 Philippine Constitution, which mandates the State to protect and promote the right of all citizens to quality education and ensure its accessibility. This underscores the country's continuing commitment to improving educational outcomes through various reforms and programs that address the evolving needs of learners.

In response to global and local educational demands, the Department of Education (DepEd) has implemented significant reforms, including the MATATAG Curriculum, as stipulated in DepEd Order No. 10, s. 2024. This curriculum aims to make education more relevant by strengthening foundational skills such as literacy and numeracy while promoting 21st-century competencies. These reforms highlight the importance of developing learners' critical thinking and problem-solving abilities, particularly in Mathematics, which remains a fundamental subject in basic education.

Recent literature emphasizes the effectiveness of inquiry-based learning (IBL) in enhancing students' cognitive and problem-solving skills. According to Yonyubon et al. (2022), inquiry-based approaches such as the 5E instructional model allow learners to construct knowledge actively, leading to improved academic performance. Similarly, Khoirunnisa, Haqi, and Anam (2024) found that inquiry-based strategies significantly enhance students' mathematical reasoning and engagement compared to traditional teacher-centered methods. Sasanti et al. (2024) further affirmed that inquiry-based

learning fosters analytical thinking and improves student performance through active participation and structured learning processes.

Local studies also support these findings. Ermac and Tan (2023) reported that student-centered strategies significantly improve mathematical problem-solving skills and learner engagement. Francisco et al. (2022) and Ederon et al. (2024) likewise highlighted the effectiveness of intervention programs and inquiry-based instructional materials in improving students' academic performance and science process skills. These studies collectively demonstrate that active learning approaches positively influence student achievement.

However, despite these advancements, gaps remain in the implementation of inquiry-based learning, particularly among Grade 7 students. Many learners still struggle with applying mathematical concepts to real-life problems and rely heavily on memorization rather than conceptual understanding. Traditional teaching methods continue to dominate classrooms, limiting opportunities for students to engage in higher-order thinking and independent problem-solving. Additionally, limited studies have focused specifically on the relationship between inquiry-based learning and both problem-solving skills and academic performance among Grade 7 learners in the local context of Antipolo City.

Given these gaps, this study aims to examine the mathematical problem-solving skills of Grade 7 students through inquiry-based learning and determine its relationship with their academic performance. The findings of this study will contribute to improving instructional practices and support the development of effective strategies that enhance students' mathematical competencies and overall academic success.

2. Material and methods

2.1 Research Design

This study applied the descriptive method of research utilizing a researcher-made questionnaire-checklist to gather the needed data.

2.2 Locale of the Study

The study was conducted in selected public secondary schools under the City Schools Division Office (SDO) of Antipolo. These schools include Antipolo National High School, Dela Paz National High School, and San Jose National High School. The selected schools are located within the City of Antipolo and provide basic secondary education to diverse groups of learners coming from different communities in the city.

2.3 Respondents of the Study

The study involved selected Grade 7 students from selected public secondary schools under the City Schools Division Office of Antipolo. The population of the study consisted of 373 Grade 7 students.

2.4 Sample and Sampling Procedure

The sample size was determined using Slovin's formula. Simple random sampling was employed in selecting the respondents. The respondents were described according to their age, sex, birth order, and the number of children in their family, parents' educational attainment, parents' occupation, and monthly family income.

2.5 Research Instrument

The study utilized a researcher-made questionnaire-checklist as the primary instrument for data collection, which was divided into two parts. Part I gathered the respondents' demographic profile, including age, sex, birth order, number of siblings, parents' educational attainment, parents' occupation, and monthly family income, while Part II assessed the mathematical problem-solving skills of Grade 7 students through inquiry-based learning, focusing on problem comprehension and analysis, strategy planning and application, and reasoning and justification, with each domain consisting of 10 items for a total of 30 items. The respondents rated each statement using a 5-point Likert scale ranging from "Always" to "Never," corresponding to levels of skillfulness. Students' academic performance in Mathematics was measured based on their average grades for the first and second quarters, interpreted using a performance scale ranging from "Outstanding" to "Did Not Meet Expectation." To ensure the validity of the instrument, it was subjected to content validation by experts in the field, including professorial lecturers, a thesis adviser, a statistician, a master teacher, a numeracy coordinator, a principal, and the dean of the Graduate Studies Program, whose feedback was incorporated to improve the final version of the questionnaire.

2.6 Data Gathering Procedure

The study followed the Gantt Chart of Activities in its conduct. This included the formulation of the research problem, up to the revision of the manuscript and submission of the final copy. The instrument was validated, and approval to conduct the study was secured from the Office of the Schools Division Superintendent. Afterwards, the questionnaire-checklist was administered to the respondents using Google Forms. The researcher was guided by the Data Privacy Act throughout the study. After the responses were retrieved, the data were encoded and processed using the Statistical Package for the Social Sciences (SPSS). The data were analyzed and interpreted according to the sub-problems of the study. A summary of findings, conclusions, and recommendations was formulated based on the analysis. Following the oral defense, the manuscript was revised to incorporate the comments and suggestions of the Oral Examination Committee. It was also subjected to the anti-plagiarism test at the Statistical Center. Finally, the finalized hardbound copies were submitted to the Office of the Graduate Studies Program and other relevant offices.

2.7 Data Analysis Techniques

The study employed several statistical tools to analyze the collected data. Frequency counts, percentages, and rank distribution were used to describe the respondents' demographic profile. The weighted mean was utilized to determine the extent of Grade 7 students' mathematical problem-solving skills through inquiry-based learning across different domains. One-way analysis of variance (ANOVA) was applied to examine whether there were significant differences in students' problem-solving skills when grouped according to their demographic profile. Additionally, frequency, mean, and standard deviation were computed to describe the respondents' level of proficiency in Mathematics. Finally, correlation analysis was conducted to determine the relationship between students' problem-solving skills through inquiry-based learning and their academic performance in Mathematics.

2.8 Ethical Considerations

This study strictly adhered to ethical standards in the conduct of research. Prior to data collection, permission was sought from the school authorities and concerned officials to ensure proper coordination and approval. The respondents were informed about the purpose of the study, and their participation was entirely voluntary. Informed consent was obtained, assuring them that they could withdraw from the study at any time without any consequences. Confidentiality and anonymity of the respondents were strictly maintained by not disclosing their identities and ensuring that all collected data were used solely for academic purposes. Additionally, the researcher ensured that no harm, discomfort, or bias would affect the participants throughout the process. All information gathered was treated with utmost respect and integrity, and results were presented honestly and objectively.

3. Results and Discussion

3.1 Profile of the Respondents in Terms of the Selected Variables

The respondents were mostly 13 years old, comprising 55.8% of the total sample, while only a small percentage were 15 years old. Regarding sex, Of the responders, 35.4% were men and 64.6% were women. Regarding sibling status, most of the participants were first-born children (39.1%), while a smaller number were third-born. In terms of family size, the majority belonged to families with two to three children (50.1%), while only a few came from families with six or more children (7.5%). Regarding parents' educational attainment, the majority of both fathers (29.2%) and mothers (30.8%) were high school graduates. In terms of parents' occupation, most fathers were categorized under various occupations (40.8%), while a large portion of mothers were housewives (46.4%). In terms of monthly family income, a considerable portion of the respondents' families earned Php 20,000 and above (31.1%), while some had a monthly income ranging from Php 15,000 to Php 19,999 (16.9%). Overall, the respondents were mostly 13-year-old female students who were first-born and came from families with two to three children and moderate household income.

Table 1
Profile of the Respondents in Terms of Selected Variables

Age	f	%	Rank
16 years old and above	-	-	-
15 years old	7	1.9	4
14 years old	28	7.5	3
13 years old	208	55.8	1
12 years old and below	130	34.8	2
Total	373	100	
Sex			
Male	132	35.4	2
Female	241	64.6	1
Total	373	100.0	

Sibling Position						
4 th and above	72			19.3		3
3 rd	54			14.5		4
2 nd	101			27.1		2
1 st	146			39.1		1
Total	373			100		
Number of Children in the Family						
6 and above	28			7.5		4
4-5	124			33.2		2
2-3	187			50.1		1
1	34			9.1		3
Total	373					
Parent's Educational Attainment	Father			Mother		
	f	%	Rank	f	%	Rank
College Graduate	102	27.3	2	103	27.6	2
College Level	81	21.7	3	88	23.6	3
High School Graduate	109	29.2	1	115	30.8	1
High School Level	48	12.9	4	49	13.1	4
Elementary Graduate	19	5.1	5	14	3.8	5
Elementary Level	14	3.8	6	4	1.1	6
Total	373	100		373	100	
Parent's Occupation	Father			Mother		
	f	%	F	%	f	%
Government Employee	28	7.5	4	18	4.8	5
Private Employee	84	22.5	2	50	13.4	3
Construction Worker/Housemaid	68	18.2	3	14	3.8	6
Househusband/Housewife	16	4.3	6	173	46.4	1
OFW	25	6.7	5	29	7.8	4
Others	152	40.8	1	89	23.9	2
Total	373	100		373	100	
Monthly Family Income						
Php 20,000 and above	116			31.1		1
Php 15,000 – Php 19,999	63			16.9		4
Php 10,000 – Php 14,999	85			22.8		3
below Php 10,000	109			29.2		2
Total	373			100		

3.2 Extent of Grade 7 Students' Perceptions of Their Own Mathematical Problem- Solving Capabilities Through Inquiry-Based Education in Different Contexts

The results show that students demonstrated high levels of mathematical problem-solving skills through inquiry-based learning, with Problem Comprehension and Analysis obtaining the highest mean score of 4.10, followed closely by Strategy Planning and Application with a mean of 4.08, and Reasoning and Justification with a mean of 4.01. These findings indicate that students are highly capable of understanding problems, identifying relevant information, and planning appropriate solution strategies, although their skills in reasoning and justifying answers still require further enhancement. Overall, the results suggest that inquiry-based learning effectively develops students' problem-solving abilities in a holistic manner, with particular strength in comprehension and analysis. This implies that students are well-prepared to engage with mathematical tasks, though additional opportunities should be provided to strengthen their logical reasoning and ability to articulate and defend their solutions. The findings further highlight the importance of designing learning activities that encourage exploration, multiple solution strategies, and critical thinking. These results are consistent with the findings of Dwianty et al. (2024), who reported that inquiry-based learning significantly enhances students' ability to apply strategies, analyze problems, and develop deeper reasoning in mathematical tasks

Table 2

Extent of Grade 7 Students' Perceptions of Their Own Mathematical Problem- Solving Capabilities Through Inquiry-Based Education in Different Contexts

Aspects	Mean	Verbal Interpretation	Rank
Problem Comprehension and Analysis	4.10	Often (Much Skillful)	1
Strategy Planning and Application	4.08	Often (Much Skillful)	2
Reasoning and Justification	4.01	Often (Much Skillful)	3
Composite WX	4.06	Often (Much Skillful)	—

3.3 Significant Variations in the Degree to Which Students Can Solve Mathematical Problems Through Inquiry-Based Learning Based on Their Profiles in Various Areas

The statistical analysis revealed that the extent of students' problem-solving skills varies depending on their demographic characteristics. As shown in table, there was no significant difference in students' problem comprehension and analysis, strategy planning and application, and reasoning and justification when grouped according to number of children in the family, sibling position, father's educational attainment, and mother's occupation, as indicated by p-values greater than 0.05; hence, the null hypothesis was accepted for these variables. However, significant differences were observed in strategy planning and application based on age and sex ($p = .017$), leading to the rejection of the null hypothesis for this aspect, while no significant differences were found in the other dimensions. Moreover, significant differences were found across all three aspects of problem-solving skills when respondents were grouped according to mother's educational attainment (p-values ranging from .001 to .007), father's occupation (p-values ranging from .000 to .015), and monthly family income (p-values of .000), resulting in the rejection of the null hypothesis in these cases. These findings indicate that parental education, occupation, and economic status significantly influence students' mathematical problem-solving skills, particularly in inquiry-based learning contexts. Overall, the results suggest that while some personal and family-related variables have minimal impact, socio-economic factors play a crucial role in shaping students' ability to understand problems, plan strategies, and justify solutions. These findings are consistent with Copley (2023), who emphasized that students' mathematical development and problem-solving abilities are significantly influenced by their home environment and the support they receive from their families.

Table 3

Significant Variations in the Degree to Which Students Can Solve Mathematical Problems Through Inquiry-Based Learning Based on Their Profiles in Various Areas

Aspects/Variables	F-value	p-value	Ho	Interpretation
Age				
Problem Comprehension and Analysis	3.120	.078	Accepted	Not Significant
Strategy Planning and Application	5.744	.017	Rejected	Significant
Reasoning and Justification	1.509	.220	Accepted	Not Significant
Sex				
Problem Comprehension and Analysis	3.120	.078	Accepted	Not Significant
Strategy Planning and Application	5.744	.017	Rejected	Significant
Reasoning and Justification	1.509	.220	Accepted	Not Significant
Number of Children in the Family				
Problem Comprehension and Analysis	2.204	.087	Accepted	Not Significant
Strategy Planning and Application	1.970	.118	Accepted	Not Significant
Reasoning and Justification	1.069	.362	Accepted	Not Significant
Sibling Position				
Problem Comprehension and Analysis	.762	.516	Accepted	Not Significant
Strategy Planning and Application	.550	.648	Accepted	Not Significant
Reasoning and Justification	.817	.485	Accepted	Not Significant
Father's Educational Attainment				
Problem Comprehension and Analysis	1.987	.086	Accepted	Not Significant
Strategy Planning and Application	1.464	.201	Accepted	Not Significant
Reasoning and Justification	1.285	.270	Accepted	Not Significant
Mother's Educational Attainment				
Problem Comprehension and Analysis	4.114	.001	Rejected	Significant
Strategy Planning and Application	2.911	.014	Rejected	Significant
Reasoning and Justification	3.244	.007	Rejected	Significant

Father's Occupation				
Problem Comprehension and Analysis	4.587	.000	Rejected	Significant
Strategy Planning and Application	2.898	.014	Rejected	Significant
Reasoning and Justification	2.870	.015	Rejected	Significant
Mother's Occupation				
Problem Comprehension and Analysis	1.500	.189	Accepted	Not Significant
Strategy Planning and Application	1.550	.173	Accepted	Not Significant
Reasoning and Justification	1.678	.139	Accepted	Not Significant
Monthly Family Income				
Problem Comprehension and Analysis	18.886	.000	Rejected	Significant
Strategy Planning and Application	18.295	.000	Rejected	Significant
Reasoning and Justification	17.195	.000	Rejected	Significant

3.4 Level of Performance in Mathematics Based on Average Grades in the First and Second Quarters

The table presents the level of academic performance of the respondents in Mathematics as reflected in their average grades for the first and second quarters. The results show that the highest grade obtained was 96, while the lowest was 75, with a mean score of 83.52 and a standard deviation of 4.783, indicating a moderate variation in students' performance. In terms of distribution, the majority of the respondents (147 or 43.6%) fell under the Satisfactory level (80–84), followed by 111 students (32.9%) who were Very Satisfactory (85–89), and 75 students (22.3%) who were Fairly Satisfactory (75–79). Meanwhile, 40 students (11.9%) achieved Outstanding performance (90 and above), and none of the respondents fell under the Did Not Meet Expectations category. Overall, the findings indicate that most students performed within the satisfactory to very satisfactory range, suggesting generally acceptable academic achievement in Mathematics, with only a small proportion attaining outstanding performance. This implies that while students are performing well, there is still room for improvement to further enhance their academic outcomes. The result is supported by Khoirunnisa, Haqi, and Anam (2024), who emphasized that inquiry-based learning improves students' understanding, engagement, and overall performance in Mathematics, leading to better academic achievement.

Table 4

Level of Performance in Mathematics Based on Average Grades in the First and Second Quarters

Grade Range	Descriptors	Frequency	Percentage
90 and above	Outstanding	40	11.9
85–89	Very Satisfactory	111	32.9
80–84	Satisfactory	147	43.6
75–79	Fairly Satisfactory	75	22.3
70–74	Did Not Meet Expectations	0	0
Total		337	100
Highest		96	
Lowest		75	
Mean		83.52	
Standard Deviation		4.783	

3.5. The Connection Between Students' Performance in Mathematics and Their Perception of Their Ability to Solve Mathematical Problems Through Inquiry- Based Learning

The table presents the correlation between students' performance in Mathematics and their ability to solve mathematical problems. The results reveal that all problem-solving skills—problem comprehension and analysis ($r = .200$), strategy planning and application ($r = .196$), and reasoning and justification ($r = .235$)—show a significant relationship with students' mathematics performance, as indicated by p-values of .000, which are all below the 0.05 level of significance. This leads to the rejection of the null hypothesis, implying that there is a significant and positive relationship between the variables. The findings suggest that students who demonstrate better problem comprehension, more effective strategy planning, and stronger reasoning skills tend to achieve higher performance in Mathematics. This highlights the importance of developing problem-solving abilities as a key factor in improving academic outcomes. The result is supported by Antonio and Prudente (2024), who emphasized that inquiry-based learning enhances higher-order thinking skills, which are essential in mathematical problem-solving and contribute to improved academic performance.

Table 5

Calculated T-Value for the Correlation Between Students' Performance in Mathematics and Their Ability to Solve Mathematical Problems

Problem-Solving Skills	r-value	p-value	Decision on Ho	Verbal Interpretation
Problem Comprehension and Analysis	.200	.000	Rejected	Significant
Strategy Planning and Application	.196	.000	Rejected	Significant
Reasoning and Justification	.235	.000	Rejected	Significant

4. Conclusion & Recommendations

The study concludes that inquiry-based learning significantly improves the mathematical problem-solving abilities of Grade 7 students. It was found that students who are more engaged in inquiry-based activities demonstrate stronger skills in problem comprehension, strategy planning, and reasoning, which contribute to better academic performance in Mathematics. The results also indicate a positive relationship between students' problem-solving skills and their academic achievement, suggesting that those who develop higher-order thinking skills through inquiry-based learning tend to obtain higher grades. Overall, the findings highlight the effectiveness of inquiry-based learning in enhancing both cognitive skills and academic performance in Mathematics.

Based on the conclusions, several recommendations are proposed to further strengthen students' learning outcomes. School administrators are encouraged to support professional development programs that promote inquiry-based teaching strategies in Mathematics. Teachers should continue implementing and enhancing inquiry-based learning to further develop students' problem-solving skills, while students are encouraged to actively participate in such learning approaches to improve their analytical and reasoning abilities. Parents and guardians may also provide support by guiding students at home and supplying necessary learning resources. Additionally, the implementation of the proposed action plan is recommended, and future studies may explore other related variables to further expand the understanding of inquiry-based learning and its effects.

Compliance with ethical standards

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REFERENCES

- 1987 Constitution of the Republic of the Philippines. Article XIV, Section 1.
- Antonio, R. P., & Prudente, M. S. (2024). Inquiry-based learning and the development of higher-order thinking skills in mathematics. *Journal of Educational Research and Practice*, 14(2), 55–68.
- Copley, J. V. (2023). The influence of home environment on students' mathematical development. *International Journal of Educational Studies*, 11(1), 22–34.
- Department of Education. (2024). DepEd Order No. 10, s. 2024: MATATAG Curriculum.
- DepEd Order No. 10, s. 2024. MATATAG Curriculum implementation. Department of Education, Republic of the Philippines.
- Dwianty, S., Putri, R., & Handayani, T. (2024). The effect of inquiry-based learning on students' mathematical problem-solving ability. *Journal of Mathematics Education Research*, 12(1), 77–89.
- Ederon, L. S., Cruz, M. D., & Villanueva, R. T. (2024). Instructional interventions and their impact on science and mathematics process skills. *Philippine Journal of Science Education*, 18(2), 101–115.
- Ermac, J. M., & Tan, A. L. (2023). Student-centered approaches and mathematical problem-solving skills. *Asian Journal of Education and Social Studies*, 39(4), 45–58.
- Francisco, A. B., Santos, L. R., & Reyes, M. C. (2022). Improving academic performance through intervention programs in mathematics. *Journal of Educational Innovation*, 10(3), 112–124.
- Khoirunnisa, A., Haqi, F., & Anam, K. (2024). The effect of inquiry-based learning on students' mathematical performance and engagement. *Journal of Mathematics Education*, 15(1), 33–46.
- Republic Act No. 10173. (2012). Data Privacy Act of 2012. Official Gazette of the Republic of the Philippines.
- Sasanti, D., Pratama, Y., & Nugroho, A. (2024). Inquiry-based learning and its effect on analytical thinking and academic performance. *International Journal of Learning and Teaching*, 16(2), 89–102.
- Yonyubon, P., Lestari, N., & Wibowo, H. (2022). The 5E instructional model and its impact on student learning outcomes. *Journal of Science Education Research*, 9(2), 60–72.