Learning Style, Academic Performance, and Mathematics Proficiency of Grade 9 Students in Calaca District

Carla Joy A. Cabaces

Batangas State University-The National Engineering University, College of Teacher Education-Graduate School, Pantay, City of Calaca, Batangas, Philippines, +639166920019
carlajoy.cabaces@gmail.com

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Abstract: This study aimed to prepare an instructional guide for grade 9 mathematics to enhance students' mathematics proficiency. The study sought to determine the profile of the respondents in terms of learning styles and academic performance, ascertain the level of the mathematics proficiency of the students, find the difference in the level of mathematics proficiency of students when grouped according to profile variables, and identify topics in the mathematics proficiency test that students find difficult. It was limited to two hundred sixty- five Grade 9 students in the public junior high schools in Calaca District, for the SY 2021- 2022. The sample was selected through proportionate stratified random sampling. This study was quantitative-descriptive and utilized a combination of the adapted questionnaire, the KLSI, and the researcher-made thirty-item Mathematics Proficiency Test. Results showed that divergent learning style was dominant to almost half of the total respondents; the academic performance of the respondents in Mathematics was very satisfactory; the majority of the respondents' mathematics proficiency was at the developing level; there is a statistically significant difference in the mathematics proficiency when grouped according to learning styles and academic performance; accommodative learners are more proficient than the learners with other learning styles, and students with Outstanding academic performance are more proficient than those students having other levels. Students find difficulty in the topics about characterizing and describing the roots of quadratic equations, quadratic inequalities, quadratic functions, graphing quadratic functions analyzing the effects on the graph, and solving problems involving quadratic functions.

Keywords: learning style, academic performance, mathematics proficiency test, instructional guide

1. INTRODUCTION

Mathematics is a complex subject that necessitates students to attain the learning standards and competencies expected at each grade level. Today's mathematics education is spiral in approach and that is progressive. With the struggles in providing quality education and minimizing perennial problems in mathematics, various studies were taken into consideration to determine the gaps occurring that cause low achievement among the students.

Learners are expected to gain appreciation and understanding in representations, reasoning, making connections, problem-solving, and critical thinking in Mathematics, as it is a major subject in the Philippines for elementary and secondary levels [1]. Various factors affect the performance of the learners in mathematics, as determined by the grades they attained. Filipino pupils perform well while learning facts, but they perform poorly when learning concepts that call for higher-order thinking skills [2-3].

The 2013 report from Trends in International Mathematics and Science Study confirmed the lag performance of Filipino students in the national and international surveys on science and mathematics compared to other Asian countries [4]. Also, the country's quality of education was put into the limelight because of the results of Filipino students' low performance in 2019, according to Gonzales [5].

Aside from the National Achievement Test, the results of the Programme for International Student Assessment (PISA) of the Organization for Economic Co-operation and Development (OECD) revealed that from 79 countries that participated, Filipino students ranked last in science and mathematics. From the National Report of the Philippines in PISA 2018, it has been stated that 353 points was the average score reached by Filipino students in mathematical literacy, which is considerably lower than the 489 average points set by the OECD. This score of the Filipino learners' proficiency was below Level 1. Specifically, Region 4A- CALABARZON with a mean score of 367 (compared to the OECD average of 489 points) was at Proficiency Level 1.

Most of the Filipino learners (80.70%) were determined below Level 2 proficiency, with 54.4 percent below Level 1 proficiency. One out of five students or 19.7 percent achieved Proficiency Levels 2 to 4. These students can apply basic skills and procedures to work out problems involving whole numbers.

However, DepEd continues its programs to address these needs in developing proficiency levels at the nationwide and regional levels. Project All Numerates (Project AN), Project NumAT (Numeracy Assessment Tool), and Regional Unified Numeracy Test (RUNT) were conducted on various regions in response to DepEd Order No. 12, s. 2015 or the Guidelines on the Early Language, Literacy and Numeracy (ELLN) Program: Professional Development Component were conducted at the elementary level in public schools [6].

DepEd's numeracy programs are mainly for learners at the elementary level, and there is no available standardized proficiency test for the junior high school level to determine the student's level of mathematics proficiency. Despite the various initiated programs, due to various factors like inconsistency of the implementation of programs, time constraints, mismatched remediation and enrichment activities, diverse learners, and teachers' commitment,

developing mathematics proficiency was not attained. With this, there is a need to assess the mathematics proficiency level and study possible factors that may affect students' performance.

Pupils' aptitude for math problem-solving is impacted by their learning preferences [7]. Studies on the learning preferences of underachievers have shown that they employ instructional methods and learning styles that are very different from those of kids who excel in school [8]. Learning style refers to how people start to focus, analyze, adopt, and remember the challenging material. Additionally, students can employ many methods to perceive and absorb information [9].

Since it is known that the way how students learn affects performance. Understanding and using various styles of learning in the academe stimulates additional effective learning, that further enhances academic success [10]. Supported by some foreign and local studies that revealed that learning style is significant to academic achievement [11,12,13].

In Calaca District, there is no recorded study about mathematics proficiency in the Grade 9 level Mathematics. Most research conducted is the numeracy level of elementary learners. Also, Grade 9 Mathematics includes four main contents: quadratic equations, variations and radicals, parallelograms, triangle similarity, and fundamental concepts in trigonometry, which need a strong foundation of the basic skills from the prerequisite levels.

Based on the current situation, there is a need to conduct research on mathematics proficiency as well as the factors that may affect the student's performance. The researcher believed that a determined level of mathematics proficiency through a test and the understanding of the learning style would aid in the construction of an output truly beneficial for the enhancement of mathematics performance and the teaching-learning process.

2. OBJECTIVES

This study aimed to prepare an instructional guide for the teachers to enhance the mathematics proficiency of the students. The following specific objectives were sought to answer:

1. Determine the profile of Grade 9 students in terms of:
    1.1 learning style; and
    1.2 academic performance in Mathematics.
2. Ascertain the level of mathematics proficiency of the students.
3. Find the difference in the level of mathematics proficiency of students when grouped according to profile variable.
4. Identify topics in the mathematics proficiency test the students find difficult.
5. Prepare a grade 9 mathematics instructional guide based on the learning styles and level of mathematics proficiency of the students.

3. MATERIALS AND METHODS

3.1 Research Design

This study used a descriptive method of research. An accurate and methodical description of a population, circumstance, or phenomenon is the goal of descriptive research. Using a variety of research methods, a descriptive study can explore one or more variables [14].

The researcher utilized this method because the researcher wanted to generate facts about the description of the situation regarding mathematics proficiency in the research locale.

3.2 Respondents of the Study

The respondents of the study were the students from the Grade 9 level of the junior high schools in Calaca District, SDO- Batangas Province, for the SY 2021- 2022. The sample size of two hundred sixty- five (265) taken from eight hundred forty- nine (849) total population was determined using the Raosoft Calculator at a 5% margin of error. The selection of the sample was conducted through the proportionate stratified random sampling.

Table 1
Frequency Distribution of the Respondents

Junior High Schools	Population	Sample
A	112	35
B	392	122
C	77	24
D	245	76
E	23	7
Total	849	265

3.3 Data Gathering Instrument

3.3.1 Construction. The instrument that was employed in this investigation has two components. The respondents' profiles in terms of KLSI-based learning styles and academic achievement in mathematics, specifically the students' first-quarter period grades, were included in the first section.

The study used the KLSI version 3 to determine the most dominant learning style among the respondents. To determine the performance in Mathematics, the researcher sought help from the mathematics teachers in the research locale to give a copy of the student's grades during the first quarter period. The purpose was to ensure that the grades being written by the students were accurate. However, the researcher still included Letter B of Part I. Profile of the Respondents where the grades were asked of the respondents.

The second part of the questionnaire included the researcher-made thirty-item multiple-choice mathematics proficiency test. The topics and MELCs in the First Quarter Period were the scope of the test. The table of specifications was provided by the researcher together with the solution and answer key. The mathematics proficiency test has undergone validation from internal and external experts. The high-caliber professors of Batangas State University and DepEd's experts helped the researcher to come up with the mathematics proficiency test by giving their comments and suggestions.

3.3.2 Validation. The adapted Kolbs' Learning Style Inventory version 3 was used in Letter A of Part I. Kolb's Version 3 LSI (1999) showed good internal consistency (.43-

.79) and test-retest reliability (.91-99) on all six LSI scales [15].

For the mathematics proficiency test, after the conduct of several procedures, like pilot testing to the non-sampled students, the coefficient alpha =0.85 (a score higher than 0.70 is consistent and reliable), using the Kuder- Richardson 20 was recorded. An item analysis was also made to ascertain the difficulty indices and discrimination indices of the test material given to the non-sampled participants during the pilot testing. The difficulty indices ranged from 0.26-0.49 which falls within the bracket of Average (0.25- 0.75). Furthermore, the discrimination indices ranged from 0.33-0.67 which falls within the bracket Reasonably Good (0.30-0.39) and Very Good (0.40 and above).

3.3.3 Administration. In the process of administration of the tool, the researcher asked permission from the Public Schools District Supervisor in Calaca, which allowed the researcher to conduct the administration of the questionnaire in the junior high schools in Calaca District. With the approval letter of the PSDS, the researcher then asked permission from the school's principals and the department heads, which allowed the researcher to ask for the help of the Grade 9 Mathematics teachers at the respective schools.

Due to the constraints and challenges of distance learning, the researcher performed various ways on the distribution of the questionnaire. The researcher humbly asked the mathematics teachers at the junior high schools about the availability and preferences of the students to answer the questionnaire. Students under the limited face-to-face were given directly, while students in online classes were given online through a Google form.

Furthermore, students in modular distance learning were given printed materials. It was a tough process for the researcher to distribute and retrieve the questionnaire alone, but with the help and support of the Mathematics teachers and the department heads from the junior high schools, the process of data gathering was made possible. The researcher prepared a parent's consent beforehand to inform both the parents and students of the necessity to conduct the present study. With the proper guidance and instructions given to the concerned bodies from each school, the respondents were able to answer the questionnaire.

3.3.4 Scoring of Responses. The three scoring guides used in the present study are shown below:

Learning Styles. In scoring the KLSI, the researcher followed the scoring in the adapted instrument. Scores from Column B were subtracted from the scores in Column A. Then, the scores from Column D were subtracted from the scores in Column C. The difference was considered as an ordered pair (A-B, C-D) that was plotted against the KLSI quadrant. The plotted points were then connected, and the quadrant from where the line lies is the preferred learning style.

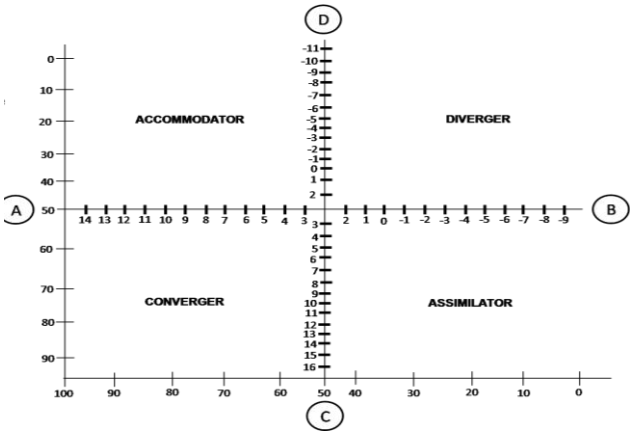

Figure 4. KLSI Quadrant

Academic Performance. To determine the level of academic performance, the scoring guide below was used.

Grading Scale	Descriptors	Remarks
90-100	Outstanding	Passed
85-89	Very Satisfactory	Passed
80-84	Satisfactory	Passed
75-79	Fairly Satisfactory	Passed
Below 75	Did Not Meet Expectations	Failed

Reference: DepEd Order No. 8, s.2015

Mathematics Proficiency Test. In scoring the 30-item mathematics proficiency test, one answer is correct in the given multiple-choice type of test. The total score of each of the students was used to determine the level of mathematics proficiency of the students.

Score	Proficiency Level	Remarks
22-30	Proficient	Needs Enrichment
16-21	Approaching Proficiency	Needs Remediation
7-15	Developing	Needs Remediation
0-6	Beginning	Needs Remediation

3.4 Data Gathering Procedure

The researcher then prepared for the actual distribution of the questionnaire for the respondents. The researcher ready the letter seeking the approval of the public school district supervisor, school principals, and department heads of the research locale to allow the conduct of data gathering in the respective schools.

The researcher also secured consent from parents and an assent form from students to allow the participation of the students as the respondents of the study. The substitution took place when there was an unavailable respondent during the data gathering that transpired on the group of respondents in the limited face-to-face modality. However, no substitution happened in the group of randomly selected students who preferred to answer the questionnaire through online and Google form modality.

Following all the ethical considerations, all information gathered was collected and treated with confidentiality. The accomplished questionnaire was retrieved, tabulated, and tallied and the data gathered was prepared for statistical treatment.

3.5 Statistical Treatment of the Data

The data being collected was treated using the following statistical methods.

3.5.1 Frequency Count and Percentage. The frequency count determined the number of responses made by the respondents in terms of the most dominant learning styles, academic performance in Mathematics, and mathematics proficiency test. The percentage determined the percent of the responses on the profile of the respondents.

3.5.2 Mean and Standard Deviation. The mean was used to ascertain the average grade of students' academic performance and the mathematics proficiency test's mean score. Standard deviation was used to analyze the spread of the results.

3.5.3 Analysis of Variance (ANOVA). It was used to determine the significant difference between the mathematics proficiency when grouped according to profile variables: learning styles and academic performance in Mathematics of the students.

4. RESULTS AND DISCUSSION

This part showed the presentation, analysis, and interpretation of data gathered by the researcher.

4.1 Profile of Grade 9 Students

The study looked into the profile of grade 9 students concerning learning styles and academic performance. Table 2 presents the profile in terms of learning styles.

Table 2
Profile of Grade 9 Students in Terms of Learning Style

Learning Style	Frequency	Percentage
Diverging	141	53.21
Assimilating	69	26.04
Accommodating	55	20.75
Converging	0	0
Total	**265**	**100.00**

Table 2 shows the dominant learning style among the respondents in the Grade 9 Level in Calaca District, SDO-Batangas Province for the SY 2021- 2022 was the diverging learning style which comprises more than fifty percent (50%) while the other portion is assimilating and accommodating. Also, it can be observed that there are no respondents with converging learning styles.

Results in Table 2 showed that most of the respondents have strength in making conclusions and synthesis through observation. Also, divergent learners are those who build on previous experience. In the stages of mathematics learning, in diverging learning styles, a new concept is described in a manner familiar to learners in terms of known concepts. Learners are unable to discern new ideas and previously held concepts at this level.

The assimilation learning style, on the other hand, focuses on the logical organization of the material and abstract notions. Students approach problem-solving in a sequential, logical manner that starts with the underlying premises and ends with the solution. The new concept is assimilated into the body of current information as one learns mathematics. At this point, learners can make connections between the new concept and existing ideas, but they lack the knowledge necessary to define the concept's distinctive features.

Also, accommodating learning styles takes concrete experiences mixed with active experimentation in a hands-on experience. In the stages of mathematics learning, comparison, measurement, and exploration are used to distinguish the new concept from known concepts. At this stage, learners realize a concept is new, but do not know how it relates to what is already known.

This result is in support of the study that showed that students were mostly divergent types of learners [13]. Most students preferred diverging learning styles followed by accommodating, assimilating, and converging [11]. Similarly, the majority of the students are divergent regardless of the difference in department or discipline of style [17].

The study also determined the profile of grade 9 students concerning academic performance in mathematics during the First Quarter Period, SY 2021- 2022 in Table 3.

Table 3
Profile of Grade 9 Students in Terms of Academic Performance

Academic Performance	Frequency	Percentage
Outstanding (90- 100)	25	9.43
Very Satisfactory (85- 89)	135	50.94
Satisfactory (80- 84)	98	36.98
Fairly Satisfactory (75-79)	7	2.64
Total	**265**	**100.00**

Mean: 85.20 ***SD: 3.15***

It showed that the academic performance of the respondents in terms of the student's grades during the First Quarter had a mean of 85.20 (SD=3.15) which falls under Very Satisfactory (85-89).

Students are mostly categorized in the Very Satisfactory level, followed by the Satisfactory level. However, students in the Outstanding are then followed by the students in the Fairly Satisfactory. There are no records below 74 grades. Half of the respondents, as shown in Table 3, have very satisfactory academic performance, indicating that the fundamental knowledge, skills, and understanding were very satisfactorily delivered in the collaboration of teachers, parents, and learners.

This could mean that they were able to perform well even through the adoption of various learning modalities. The results also imply that students can perform the required written and performance works that are based on their grades in mathematics subject. The results confirm that the study showed that the students have positive perceptions regarding modular distance learning in Mathematics with some difficulties [18]. Additionally, learning in modular distance had a beneficial impact on students' performance, as seen by the fact that students' performance in mathematics was highly satisfactory.

Furthermore, the utilization of modules promotes autonomous study [19]. The improvement of students' self-

study or learning skills is one advantage of employing modules for instruction.

4.2 Level of the Mathematics Proficiency of the Students

To ascertain the level of mathematics proficiency of the students, the present study utilized a 30-item Mathematics Proficiency Test. Table 4 shows the results of the conducted test. This mathematics proficiency test covered topics discussed in the First Quarter Period.

Table 4
Level of the Mathematics Proficiency of the Grade 9 Students

Proficiency Level	Frequency	Percentage
Proficient		
Approaching	13	4.91
Proficiency	54	20.38
Developing	179	67.55
Beginning	19	7.17
Total	**265**	**100.00**

Mean: 13.30 SD: 4.58

Near 70 percent (67.55%) of the students are in the developing level of proficiency which conforms to being divergent in terms of learning style. In the stages of mathematics learning, in diverging learning styles, a new concept is described in a familiar context in terms of known concepts. At this stage, students cannot differentiate the new concept from known concepts.

It also revealed that more than half of the respondents can only answer the 30-item Mathematics Proficiency Test with less than or equal to 15 items or 50 percent correctly, with a mean score of 13.03. The SD of 4.58 indicates a spread of the scores of the students. That further means that students categorized under beginning, developing, and approaching proficiency need remediation, while proficient students need enrichment activities.

These results confirm that the mathematics proficiency of Grade 9 students was at the beginning level [20-21]. Also, the academic performance of the respondents is satisfactory in both patterns and algebra and geometry, but the proficiency level did not meet expectations, and there is a significant difference between the academic performance and the proficiency level of the learners [22].

4.3 Significant Difference in the Students' Mathematics Proficiency Level when Grouped According to Profile Variable

To test the hypothesis, the difference in the level of mathematics proficiency of students when grouped according to profile variables was computed.

Table 5
Difference on the Level of Mathematics Proficiency when grouped according to Profile

Profile Variables	df	F-value	p-value	Decision on H_0	Interpretation
Learning Styles	26 4	4.71	*0.010	Reject	Significant
Academic Performance		4.94	*0.000	Reject	Significant

α=0.05

Table 5 shows the F-value of 4.71 with a p-value of 0.010 which is less than 0.05 level of significance, hence the null hypothesis is rejected. This means that there is a significant difference in the level of Mathematics proficiency of Grade 9 students when they are grouped according to their learning styles. Grade 9 students of varying learning styles tend to have different levels of mathematics proficiency.

This result was similar to the study that stated that learning styles affect the student's ability to solve mathematics problems [7]. Also, learning style could be used as a technique to help students perform better in a mathematics course. The findings also imply that students' mathematical skill is influenced by their preferred learning style [23].

To find which learning styles have significant differences, a post-hoc analysis was conducted. Table 6 shows the multiple comparisons of the mathematics proficiency between the determined dominant learning styles among the respondents. The p-value of 0.984 which is greater than 0.05 indicates that the mathematics proficiency of students with diverging and assimilating learning styles are not significantly different. On the other hand, the p-value of 0.012 which is less than 0.05 indicates that there is a significant difference between the mathematics proficiency of students with diverging and accommodating learning styles. In addition, the p-value of 0.036 which is less than 0.05 indicates that there is a significant difference between the mathematics proficiency of the students with assimilating and accommodating learning styles.

Table 6
Post-hoc Analysis on the Level of Mathematics Proficiency of Students when grouped according to Dominant Learning Styles

Dominant Learning Styles	Mean Difference	Std. Error	p-value	Decision on H_0	Interpretation
Diverging vs Assimilating	0.124	0.718	0.984	Failed to Reject	Not Significant
Diverging vs Accommodating	-1.903*	0.664	0.012	Reject	Significant
Assimilating vs Accommodating	-2.027*	0.817	0.036	Reject	Significant

α= 0.05

In determining which learning style preference performed better in the conducted mathematics proficiency test, accommodative learners have a mean score of 14.44 more proficient than the divergent learners (mean of 12.56) and assimilative learners (mean of 12.44). This means that, in this study, accommodators and divergent learners have different assessments on the given proficiency test. Also, assimilators and accommodators have different assessments on the given mathematics proficiency test. This is probably because accommodators like doing things and involving them in the experience, while divergent learners prefer to have information presented to them in a detailed, systematic, and reasoned manner, and the assimilators require good clear explanation rather than practical opportunity.

This result is similar to the study that determined the accommodative and divergent learners' ability to solve mathematics problems. The findings demonstrated that accommodator learners in high school could meet all mathematical connection indicators. While students with different learning styles are unable to correctly apply mathematical concepts to solve mathematics problems [24]. Also, it was stated that students with converging and accommodating learning styles are better than those diverging and assimilating learning styles in mathematical problem-solving [25]. On the contrary, assimilator learners outperform students with other learning styles in terms of academic accomplishment [13].

Moreover, Table 5 shows the F-value of 4.94 with a p-value of 0.000 which is less than 0.05 level of significance, hence the null is rejected. This means that there is a significant difference in the level of mathematics proficiency of Grade 9 students when they are grouped according to their academic performance. Grade 9 students of varying academic performance tend to have different levels of mathematics proficiency.

A post-hoc analysis was conducted to determine the significant difference in the level of mathematics proficiency of the students when grouped according to their academic performance.

Table 7 shows the results of the comparison of the level of mathematics proficiency of students with different academic performances. The p-value of 0.000 which is less than 0.05 indicates that the mathematics proficiency of students with academic performance that belongs to Satisfactory (80- 84) and Very Satisfactory (85- 89) are significantly different. The mean of mathematics proficiency of students with satisfactory performance is 10.90 which is less than that of the mean of the mathematics proficiency of students with Very Satisfactory performance of 14.14. This indicates that students with better academic performance tend to have higher mathematics proficiency.

Table 7
Post-hoc Analysis on the Level of Mathematics Proficiency of Students when grouped according to Academic Performance

Academic Performance		Mean Difference	Std. Error	p-value	Decision on H_0	Interpretation
Fairly Satisfactory (75-79)	Satisfactory (80-84)	.673	1.664	.978	Failed to Reject	Not Significant
	Very Satisfactory (85-89)	-2.569	1.649	.405	Failed to Reject	Not Significant
	Outstanding (90-100)	-4.229	1.819	.095	Failed to Reject	Not Significant
Satisfactory (80-84)	Very Satisfactory (85-89)	-3.243*	.565	.000	Reject	Significant
	Outstanding (90-100)	-4.902*	.953	.000	Reject	Significant
Very Satisfactory (85-89)	Outstanding (90-100)	-1.659	.926	.280	Failed to Reject	Not Significant

α= 0.05

This is also true in the comparison of the mathematics proficiency of students with Satisfactory and Outstanding performance. The mean of mathematics proficiency of students with satisfactory performance is 10.90 which is less than that of the mean of mathematics proficiency of students with Outstanding performance of 15.80.

Similarly, there is a correlation between the respondents' results in the numeracy level test and their average grade performance in Mathematics [12].

4.4 Topics in the Mathematics Proficiency Test that Students Find Difficulty

Identifying the topics in the first quarter period that students find difficult was one of the objectives of the present study. Table 8 presents the list of topics, along with their corresponding learning competencies. The percentage of the correct responses per item and the difficulty index were shown.

Table 8
Topics in the Mathematics Proficiency Test that Students Find Difficulty

Topics	Learning Competency	Percent of Correct Responses	Difficulty Index	
Characterizing and Describing the Roots of Quadratic Equation	Characterizes the roots of a quadratic equation using the discriminant.	36.23	0.19	Very Difficult
	Solves equations transformable to quadratic equations (including rational algebraic equations).	27.17	0.15	Very Difficult
Quadratic Inequalities	Illustrates quadratic inequalities	22.64	0.14	Very Difficult
	Solves quadratic inequalities.	13.96	0.09	Very Difficult
	Solves problems involving quadratic inequalities.	38.11	0.21	Very Difficult
		20	0.13	Very Difficult
Quadratic Functions	Represents a quadratic function using: (a) table of values; (b) graph; and (c) equation.	43.02	0.23	Very Difficult
Graphing Quadratic Functions and Analyzing the Effects on its Graph	Graphs a quadratic function: (a) domain; (b) range; © intercepts; (d) axis of	36.23	0.23	Very Difficult
		23.4	0.14	Very Difficult

	symmetry; (e) vertex; (f) direction of the opening of the parabola.			
	Analyzes the effects of changing the values of a, h, and k in the equation y = a (x – h)2 + k of a quadratic function on its graph.	21.13	0.14	Very Difficult
	Determines the equation of a quadratic function given: (a) a table of values; (b) graph; (c) zeros.	33.58	0.19	Very Difficult
		35.85	0.22	Very Difficult
Solves Problems Involving Quadratic Functions	Solves problems involving quadratic functions.	29.06	0.20	Very Difficult
		27.17	0.12	Very Difficult
		25.28	0.15	Very Difficult

Based on the item analysis, with the aid of the table of specifications of the 30-item test, it was revealed that topics: Characterizing and Describing the Roots of Quadratic Equations, Quadratic Inequalities, Quadratic Functions, Graphing Quadratic Functions and Analyzing the Effects on its Graph and Solves Problems Involving Quadratic Functions were the topics that students find difficulty.

It can be seen in the table that competencies that involve problem-solving, graphing, and analysis have difficulty indices interpreted as Very Difficult. In item analysis, the indices 0.00- 0.24 state that an item is very difficult. From the data being presented, recorded difficulty indices were from 0.09 to 0.23. The results show the perennial problem of the students in analyzing, graphing, and problem-solving.

This result proved that students face difficulties in decoding the language and visualizing the problem. Almost all students can read and understand what is being asked in the problem, but there is difficulty in developing the correct structure of the problem. This also supports the weakness of divergent learners who are not yet able to distinguish the new concept from known concepts.

Supported by some studies that students find problems on tasks involving graphs and that technology must be incorporated in mathematics [26-27]. Furthermore, due to negligence, a lack of comprehension, changing values, and unfamiliar terminology, 40 percent of the respondents' translations of written difficulties fall short of appropriate levels [28].

Moreover, students find difficulty in understanding the keywords from the long math problems which results in difficulty in interpreting words into mathematical symbols [29]. Furthermore, the result implies that the topics students find difficult in the conducted test are the usual topics of difficulty, especially for grade 9 students.

4.5 Grade 9 Mathematics Instructional Guide for Teachers based on the Learning Styles and Mathematics Proficiency

The instructional guide provides comprehensive, in-depth coverage of the topics in Grade 9 Mathematics that students find difficult based on the conducted mathematics proficiency test in the present study. This includes five (5) topics and ten (10) Most Essential Learning Competencies in the First Quarter Period from K to 12 Curriculum Guide. The instructional guide is designed to cater to the needs of teachers in preparing lessons that are integrated with the learning styles: diverging, accommodating, and assimilating.

The Instructional Guide is designed with a visualization of a classroom set up in a public high school with students who need remediation and/or enhancement after the administration of the Mathematics Proficiency Test. This guide is attached with Kolb's LSI to be able to know the student's dominant learning styles beforehand.

The guide includes the lesson and the corresponding ways how to facilitate the lesson on each of the learning styles depending on which types of learners will be given remediation and enrichment.

5. CONCLUSIONS

From the collected, investigated, and explained data, conclusions being drawn are shown below.

1. Divergent learning style was dominant to almost half of the total respondents. The academic performance of the respondents in Mathematics was very satisfactory.
2. Most of the respondents' mathematics proficiency was at the developing level.
3. There is a statistically significant difference in mathematics proficiency when grouped according to learning styles and academic performance. Accommodative learners are more proficient than learners with other learning styles, and students with Outstanding academic performance are more proficient than those students having other levels.
4. Students find difficulty in the topics characterizing and describing the roots of quadratic equations, quadratic inequalities, quadratic functions, graphing quadratic functions analyzing the effects on its graph, and solving problems involving quadratic functions.
5. The instructional guide integrated the strengths of the learning styles determined to be significant to mathematics performance. The guide to be used by the teachers aimed to enhance the mathematics proficiency among the topics difficult for the Grade 9 learners.

6. RECOMMENDATIONS

Based on the present study, the following statements are recommended:

1. The present study recommends that teachers determine the learning style preferences of the students may utilizing Kolb's Learning Style Inventory.
2. The present study also recommends conducting the administration of the crafted Mathematics Proficiency

Test in a classroom set up, after the end of the First Quarter Period.

3. The Grade 9 Mathematics Instructional Guide prepared in this study must undergo validation and be a subject for an experimental study.

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