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| RESEARCH ARTICLE

Numeracy Skills of Junior High School Students in Mathematics: An Intervention Plan

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| ABSTRACT
This research aimed to assess the numeracy skills of the Junior High School students in a National High School in the City of Naga Division, Cebu, Philippines, as a basis for crafting an intervention plan. It utilized a descriptive quantitative correlational research design using DepEd's adapted numeracy skill questionnaire. A total of 142 Grade 7 students were selected to participate in the study. The gathered data were treated using frequency, percentage, mean, standard deviation, Multiple Regression, and the Wilcoxon Signed Rank Test. Results showed that the respondents were dominated by males, aged below 14 years old, had a satisfactory mathematics rating in the 1st quarter, with building and construction as the main occupation of fathers and housewives for mothers, and parents were mostly high school graduates. Moreover, the level of numeracy skills of the respondents in addition and subtraction indicated that they did not meet expectations. Also, it was found that they were weak in solving integers with different signs and strong otherwise. Gender and first-quarter grade in mathematics showed a significant relationship with the level of numeracy skills of the respondents. In addition, there was a significant difference among the numeracy skill levels of the respondents by area. The students' extremely low numeracy is indicated by not meeting the skills in adding and solving integers. It is recommended that an intervention plan be adapted to help struggling students in mathematics.

| KEYWORDS

Descriptive-quantitative research, Junior High School, numeracy skills, teaching Mathematics, Philippines.

| ARTICLE INFORMATION

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1. Introduction

The numeracy skills of Junior High School students in the Philippines are of paramount importance due to their direct impact on academic achievement, problem solving abilities, and future career prospects. Proficiency in numeracy is foundational not only for success in mathematics courses but also for the acquisition of critical thinking skills essential for navigating various aspects of daily life.

In the Philippines, where education serves as a powerful tool for socio-economic mobility, a strong emphasis on numeracy skills is crucial to ensure that students are equipped to meet the challenges of an increasingly quantitative and data driven world. Furthermore, numeracy skills contribute to a well-rounded education, fostering analytical reasoning, quantitative literacy, and logical decision-making. As the country continues to embrace advancements in science, technology, engineering, and mathematics (STEM), enhancing the numeracy skills of junior high school students is not only an educational imperative but also a strategic investment in the nation's human capital development.

The Programme for International Student Assessment (PISA) assesses the knowledge and skills of 15-year-old students in mathematics, reading, and science. The tests explore how well students can solve complex problems, think critically, and communicate effectively. (Megawati & Sutarto, 2021) The Philippines participated in PISA for the first time in 2018. PISA 2022 showed that average 2022 results were about the same as in 2018 in mathematics and science. Over the most recent period

(2018 to 2022), the gap between the highest-scoring students (10% with the highest scores) and the weakest students (10% with the lower scores) narrowed in mathematics, while it did not change significantly in reading and science. In mathematics, low achievers became stronger, while performance did not change significantly among high achievers. Moreover, students in the Philippines scored less than the OECD average in mathematics, reading, and science. (OECD,2023). The dismal performance of the Philippines in the 2022 PISA indicates that students in the country are five to six years behind the learning competencies, according to the Department of Education (DepEd,2023).

The Philippines did not fare better in the 2019 Trends in International Mathematics and Sciences Study (TIMMS), which evaluated the performance of Grade Four students in math and science proficiency. It ranked lowest among the 58 countries that were included in the study. (UNESCO, 2023)

The Philippines also did not do well in the 2019 Southeast Asia Primary Learning Metrics (SEA-PLM), which measured the capacity of Grade 5 students in reading, writing, and mathematics. The country of the six in the region that participated in the assessment, alongside Cambodia, Lao PDR, and Malaysia, performed below the regional average in all three areas. Only ten percent of Filipino students could meet the minimum required proficiency level for reading at the end of lower primary education. DepEd's statement in response to the SEA-PLM results said that they would evaluate short-mid-and long-term interventions to "further raise the literacy and numeracy skills" of learners. (UNICEF&SEAMEO,2020)

On the other hand, the country fell eight slots lower in the 2022 Global Innovation Index and is now in the 59th spot among 132 economies. While the report recognized the country as having strong potential for transforming the global innovation landscape, it is noteworthy that the county-specific report indicated that education in the Philippines as a weakness, focusing on low PISA scores and pupil-teacher ratio at the secondary level. (UNESCO Institute for Statistics,2019)

Numeracy skills are crucial for making informed decisions and avoiding negative consequences. A robust foundation in numeracy skills during junior high school is very important as it serves as the bedrock for academic success and future accomplishments. Proficiency in numeracy not only ensures mastery in mathematics, a core subject during this critical educational phase but also cultivates crucial life skills. With a solid numerical foundation, students are empowered to think critically, solve problems systematically, and approach complex mathematical concepts with confidence. Moreover, a strong numerical foundation lays the groundwork for future career success, preparing students for the demands of an increasingly data-driven world. As technology continues to evolve, numeracy skills are integral to technological fluency, equipping students to engage with emerging technologies and contribute meaningfully to the workforce. In other words, a strong foundation in numeracy skills in junior high school is not merely an academic pursuit but it is an investment in the holistic development of individuals, fostering critical thinking, problem-solving abilities, and lifelong competence.

Mathematics is a critical subject taught in elementary and secondary education that provides students with fundamental knowledge and skills to organize their lives. Unfortunately, the COVID-19 pandemic has exacerbated the current education crisis and widened the learning gap in mathematics among young students (Sokonan & Seemungal,2023). The situation has led a decline in math learning, as students may need more remediation to progress to new lessons, leading to learning gaps. Despite the challenges, it is essential to prioritize efforts to close the learning gap in mathematics ensuring that the students have the knowledge and understanding for their academic and future careers.

Hence, this research aims to assess the numeracy skills of Junior High School students in selected public schools in the Department of Education – City of Naga Division as the basis for an intervention plan to improve the numeracy skills of the Junior High School students and prepare them for the challenges of the 21st century.

2. Theoretical Background

This research is anchored on the following theories namely: Sociocultural Theory (also called Social Development Theory) by Vygotsky (1978), Constructivism by Piaget (1973), and Constructivist Theory by Bruner (1961). Furthermore, this is supported by some legal bases such as the Republic Act 10533, Department of Education Order No. 20, s. 2013, Republic Act No. 9155, DepEd Memorandum No. 117, s. 2019. Social Development Theory by Vygotsky emphasizes the role of social interactions and cultural context in cognitive development. In the context of numeracy skills, Vygotsky highlighted the importance of collaborative learning and the Zone of Proximal Development (ZPD), where students engage in activities just beyond their current capabilities with the help of more knowledgeable peers or instructors. Collaborative mathematical discussions and problem-solving activities in a social context can enhance numeracy skills.

Another theory that can be applied to the development of numeracy skills is the sociocultural theory by Vygotsky (1978). This theory emphasizes the role of social interactions and cultural context in shaping students' learning and development. According

to Vygotsky, learning occurs through social interactions, and cultural tools and practices influence students' cognitive development in their environment.

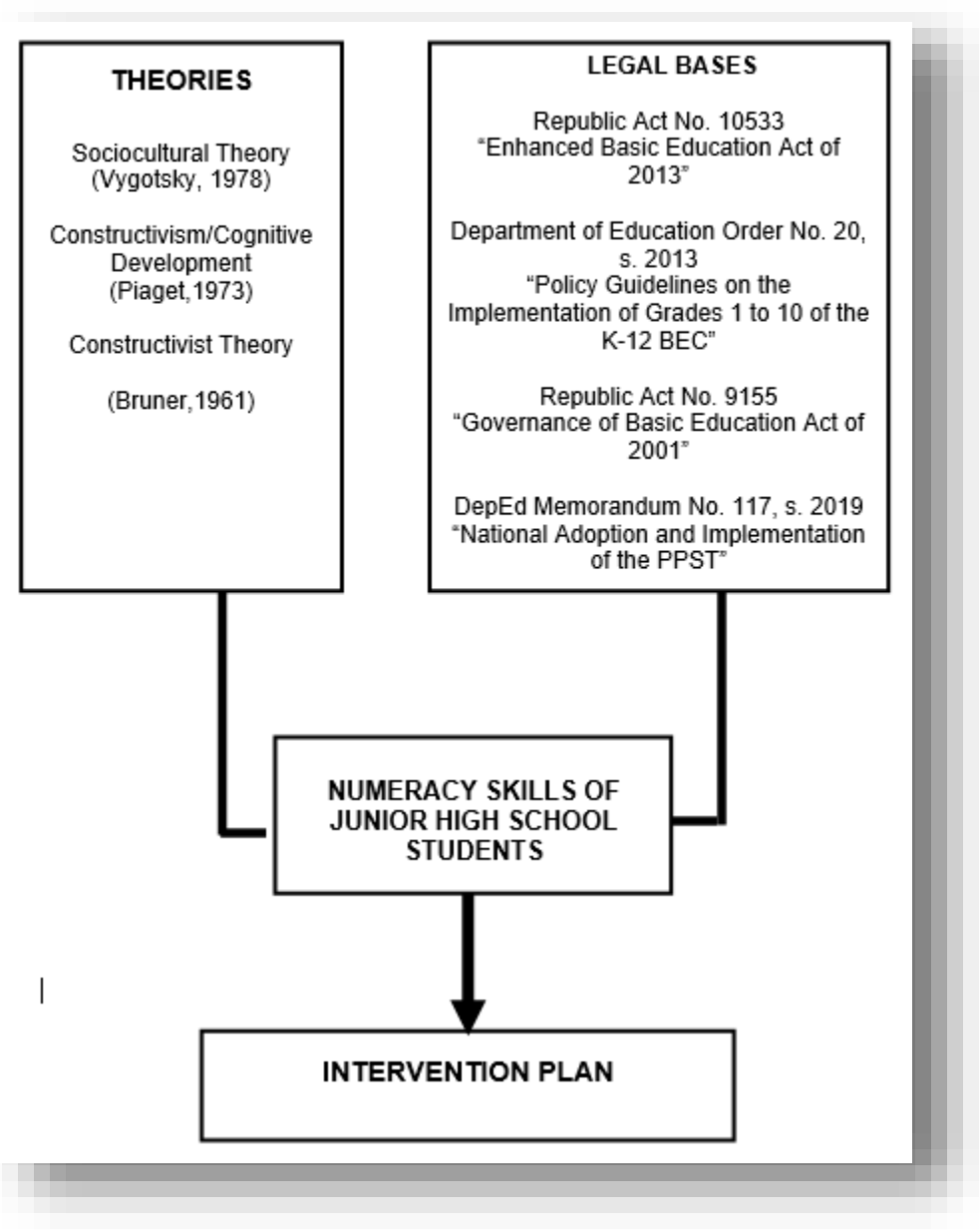

Figure 1. Theoretical/Conceptual Framework

The Sociocultural theory, developed by Vygotsky (1978), emphasizes the importance of social interactions and cultural context in learning and development. This theory has important implications for understanding students' acquisition of numeracy skills.

According to Vygotsky, learning occurs through interactions with others and the cultural tools and artifacts surrounding us. These interactions can occur in many contexts, including formal schooling, play, and everyday life. Regarding numeracy skills, Vygotsky argued that children learn mathematical concepts and skills through interactions with teachers, peers, and family members, as well as through their use of mathematical tools and symbols in everyday life.

In terms of numeracy skills, Vygotsky's theory suggests that teachers and peers can play an important role in supporting students' learning by providing scaffolding and guidance. This might involve breaking down complex mathematical concepts into smaller, more manageable parts, providing feedback and support during problem-solving activities, or encouraging students to explain their thinking and strategies to others.

Overall, Vygotsky's sociocultural theory (1978) provides a valuable framework for understanding students' acquisition of numeracy skills. It highlights the importance of social interactions, cultural context, and the ZPD in learning. It suggests that teachers and peers can play an important role in supporting students' development of mathematical concepts and skills.

Another theory is Constructivism by Piaget (1973), which focuses on the idea that learners actively construct their understanding of the world through experiences and interactions. In the realm of numeracy, Piaget's stages of cognitive development (sensorimotor, preoperational, concrete operational, and formal operational) suggest that educators should tailor instructional methods to match students' cognitive abilities at different developmental stages. This theory underscores the importance of hands-on, concrete experiences for building a solid foundation in numeracy.

Wu et al. (2018) applied Piaget's theory to examine the relationship between cognitive development and mathematics achievement among primary school students in China. They found that students in the formal operational stage of cognitive development performed better in mathematics tests than in the concrete operational stage.

Piaget's cognitive development theory (1964) provides a useful framework for understanding the development of numeracy skills among students. It highlights the importance of children's cognitive development stage, their interactions with their environment, and their active participation in constructing their knowledge of mathematical concepts. The theory has been widely applied in research on mathematics education and has contributed significantly to our understanding of how children acquire numeracy skills.

On the other hand, the Constructivist Theory by Bruner (1961) emphasizes the importance of active learning, discovery, and the scaffolding of information. Regarding numeracy skills, Bruner suggested that students should encounter mathematical concepts in a spiral curriculum, revisiting topics at increasing levels of complexity. The theory also highlights the significance of providing multiple representations of mathematical ideas to enhance understanding. Guided discovery and problem-solving activities align with Burner's constructivist approach to numeracy education.

There are several legal bases for the development of numeracy skills among students in the Philippines. These include national policies, laws, and regulations that promote the enhancement of mathematics education and the development of numeracy skills.

Republic Act No. 10533, or the Enhanced Basic Education Act of 2013, mandates the implementation of the K-12 program in the Philippines. This law aims to strengthen the quality of basic education in the country, including the enhancement of mathematics education, to prepare students for college and the workforce.

Department of Education Order No. 20, s. 2013, or the Policy Guidelines on the Implementation of Grades 1 to 10 of the K to 12 Basic Education Curriculum, which provides the curriculum framework for the K-12 program, including the Mathematics curriculum. It sets the standards and competencies that students should achieve in mathematics at each grade level.

Republic Act No. 9155, or the Governance of Basic Education Act of 2001, which outlines the responsibilities of the Department of Education (DepEd) in the development and implementation of educational policies, programs, and projects. This law also emphasizes the importance of providing quality education in mathematics and other subject areas.

DepEd Memorandum No. 117, s. 2019, or the National Adoption and Implementation of the Philippine Professional Standards for Teachers, provides guidelines for teachers' professional development, including the development of their competencies in teaching mathematics.

These legal bases demonstrate the importance of numeracy skills in the education system in the Philippines and the government's commitment to providing quality mathematics education to students. They provide a framework for developing and implementing policies, programs, and projects that aim to enhance the numeracy skills of students in the country.

In general, the legal bases and theoretical framework are critical components of research on the numeracy skills of the respondents of this study. They provide a structured approach to understanding and measuring these skills, ensuring the research produces valid, reliable, and applicable results that inform policy and practice.

Here are some of the related studies about the numeracy skills of Junior High School students across the world.
In Indonesia, the quality of education, as seen in the results of PISA, TIMMS, and Indonesian Student Competency Assessment, is still very relatively low. One of the policies implemented by the Indonesian government was the abolition of the National

Examination and being replaced by the National Assessment, which has the national standards in the field of education, namely the Minimum Competency Assessment and the Character Survey. The minimum competency assessment focuses on measuring students' thinking competence when reading texts (literacy) and numeracy. Results of the analysis indicated that students' numeracy skills were obtained in terms of Minimum Competency Assessment, standard math problems, and factors that affect students' numeracy skills. (Megawati & Sutarto, 2021)

A study by Koponen et al. (2019) in Finland examined the role of verbal counting skill as an early predictor of math performance and difficulties in the middle school. The role of the fourth-grade level arithmetical skills (i.e., calculation fluency, multi-digit arithmetic like the procedural calculation, and word problem-solving) as mediators was also investigated. Path modeling showed that verbal counting in kindergarten strongly predicts basic math performance in seventh grade. Verbal counting had a unique predictive relation to middle school math performance above and beyond the basic arithmetical and problem-solving skills in fourth grade. Poor kindergarten verbal counting skill was a significant indicator for later difficulties in mathematics.

In Vietnam, a study by Cao et al. (2022) on exploring numeracy skills of lower secondary school students in mountainous areas showed that Vietnamese students tended to perform better in arithmetic and algebra problems than in real-life problems. The results provide convincing evidence of the practical performance in numeracy of students in various ethnic minority groups in Northern Vietnam.

In the Philippines, Indefenso and Yazon (2020) found that there is a significant positive correlation between numeracy and financial literacy. Similarly, it was revealed that a substantial and direct relationship between problem-solving ability and financial literacy exists. Moreover, the results of the structural equation in the study of (Cheung et al., 2020) showed that parents' education level, calculation fluency, and own math activities also had indirect links with children's numeracy skills through home numeracy resources and home numeracy activities.

3. Objectives of the Study

This research aimed to assess the numeracy skills of the Junior High School students in the identified public schools in the City of Naga Division during the school year 2023-2024 as basis for crafting intervention plans.

Specifically, this study sought to answer the following sub-problems:

1. What is the profile of the respondents in terms of: age and gender; parents' occupation; parents' highest educational attainment; and final grade in the 1st quarter?
2. What is the level of numeracy skills of the respondents in Mathematics in the following areas: addition of integers; and subtraction of integers?
3. In what areas are the students' numeracy skills weak; strong?
4. Is there a significant relationship between the profile of the respondents and their level of numeracy in mathematics?
5. Is there a significant difference among the numeracy skill levels of the respondents by area?
6. Based on the findings of the study, what intervention plan may be proposed?

3.1 Statement of the Null Hypothesis

Based on the objectives of the study, the following null hypothesis was tested at a 0.05 level of significance:

Ho1: There is no significant relationship between the profile of the respondents and the level of the numeracy skills.
Ho2: There is no significant difference among the numeracy skill levels of the respondents by area.

4. Methodology

4.1 Research Design

This research utilized a quantitative descriptive correlational design. This research design focused on describing the characteristics of a population or phenomenon through the use of numerical data and statistical analysis. According to Creswell (2014), descriptive quantitative research is a useful method when the purpose of the study is to describe the distribution of variables, explore associations between variables, or provide a snapshot of a phenomenon, specifically the analysis of the numeracy skills of the students.

The input of the study involved the profile of the respondents, the numeracy level of the students in operations of integers which includes addition and subtraction, test of the significance of the relationship and test of the significance of the difference of and between the identified variables. The process involved the securing of permissions from the schools with regards to the conduct of the study. Once approved, the researchers proceeded with the data gathering, systematic analysis through test-statistics and

the interpretation, conclusion, and recommendations of the study. The output of the study was the intervention plan that made to fill the gaps for the improvement of the level of numeracy skills of the students.

4.2 Environment

The study was conducted in a public school in City of Naga Division, Philippines that was established in the year 2009 and started to operate as a Night School with three (3) teachers only. The pioneering learners were allowed to occupy one of the classrooms located near the artesian well (puso artesyano), the first facility the guests' set eyes on upon entry to the campus. This arrangement is daily from 2:30 in the afternoon down to 9:30 at night; the Administration of the Elementary School continued to let the secondary learners and teachers to borrow the said classroom as a temporary learning space (TLS) until such time a school building of four classrooms for the National High School (Evening) has been established. Due to its growing population in 2014, it was transferred to a more spacious and permanent location where the school is located at present.

Currently, a full – time school head or principal managed the school who worked collaboratively with the parents and the Local Government Unit (LGU). In 2018, the school had been very lucky to become a recipient of the 150 wood with metals armchairs given by the Rotary Club – Naga Central Chapter in which our students sit comfortably during their classes. In the same year, one of the school buildings went through major repairs / improvement and the rehabilitated school building provide access to safety and security benefiting the students and teachers which had been proven to be contributory to the improved learning environment of the school.

The daily operation of the school had been in full swing with the implementation of the K to 12 curriculums from Grade 7 to 10. Expectantly, the proposed opening of a Senior High School could provide more meaningful educational experiences to all learners of the different parks of barangay Inayagan, especially those who live in mountainous areas like Pangilatan and Palanas.

In school year 2020-2021, in the middle of COVID – 19 crisis, the biggest secondary school both the Junior High and senior High in the City of Naga felt the need to end congestion issues in order to address the continuous problem of swelling enrolment and lack of classrooms during the opening of classes. Inayagan National High School's Junior High completers, seeking access at the nearest Senior High School in the City of Naga and at the bording Senior High School in the Municipality of Minglanilla should also end. Because of this, the barangay LGU of Inayagan has decided to take on the challenge of establishing a Senior High School to be added to the existing Junior High School to resolve the felt need of every Inayagan National High School completers' access to secondary education, a complete public secondary school within the barangay.

The Junior High School completers residing in Barangay Inayagan, at present, have enrolled and have been distributed in the nearby barangays and municipality with operating complete public secondary schools that offered Senior High School namely; Tuyan and Tungkop. Based on SY 2020-2021 data of grade 10 completers, there should be 237 incoming Grade 11 learners to support the proposed Senior High School apart from, the few Grade 10 pursuing admittance in private schools.

The need to establish a Senior High School in the National High School even in the midst of this pandemic was a challenge taken seriously by the Barangay Inayagan National High School Faculty and Administration with its PTA; thus; conducting a feasibility study. The strong commitment of the people involved in the said endeavor and the extensive engagement and support of other development partners who strongly stand up as proponents of the Senior High School establishment helped promote a strategic management to harmonize concerted efforts to achieve the target results. When all were settled then, seeking for the endorsement of DepEd – City of Naga Schools Division Office, Philippines and the approval from DepEd- Regional Office 7 of the Regional Director for the creation of that envisioned the Senior High School followed.

Finally, in school year 2021 – 2022, the Senior High School was established. This was essential to answer the need of a senior high school in the barangay in the midst of pandemic. Now, on its second year, the Senior High School has three strands; STEM, HUMS and SMAW. Inayagan is a fast economy growing barangay in the north border of the City of Naga, Cebu, Philippines with a growing population which caters a big enrolment to the National High School and is one of the medium high schools in the City of Naga Division, Cebu, Philippines.

4.3 Respondents

The research respondents were from the National High School, Naga, Cebu, Philippines that has garnered huge enrollment since the beginning of admissions for the school year 2023 – 2024. The total number of student enrollees for the school year in the National High School is 601. All grade 7 students are the respondents of the study where numeracy skills were tested through a numeracy skills test tool. Total enumeration was used. The distribution of respondents by the school is shown in Table 1.

Table 1. Distribution of the Respondents

Gender	f	%
Male	79	55.63
Female	63	44.37
Total	142	100.00

The total number of Grade 7 enrollees is 142. All these students were the respondents of the study which can be considered as population data. Population data is generally considered to be better than sample data because it is more accurate, representative, generalizable, and precise. However, there are situations where collecting data from the entire population may not be feasible or practical, in which case sampling may be necessary. In the case of the study, population data can be obtained, hence, all of the grade 7 students of these identified schools are chosen as respondents.

4.4 Instrument

This research utilized the Numeracy Skill Test given by the Department of Education – City of Naga Division, Cebu, Philippines. This was used to measure the level of numeracy skills of the students in Grade 7 during the first quarter. The most essential learning competencies (MELCS) being tested in this tool was to perform fundamental operations on integers (M7NS-Ic-d-1). The questions were further classified into three levels of difficulty to check the level of understanding of the students such that 25 items out of 50 or 60 percent of the questions belongs to the easy level, 18 questions out of 50 or 30 percent belongs to the average level, and seven (7) questions out of 50 or 10 percent belongs to the difficult level. From here, data of their level in the operations on integers, strong points, and weak areas were interpreted using descriptive statistics.

The students in this study took a 50- item Multiple Choice Test on Addition and Subtraction of Integers. This test was comprised of two parts: 25-item question on Addition of Integers and 25-item question on Subtraction of Integers. The students answered the test for one hour by solving the questions and encircling the letter of the correct answer. For every section, there is one teacher that administers the test. The time duration was based on the section's Math class schedule.

4.5 Gathering Procedure

There are three parts in the implementation of this study which include the preliminary, data gathering, and post data gathering stages. This is vital to have a systematic way of conducting the research. The careful planning and implementation of the study could lead to more reliable and ethically motivated results.

Preliminary Stage. In the gathering of data, the researcher asked permission from the Department of Education – City of Naga Division School's Division Superintendent through a request or transmittal letter to conduct a study among junior high school students in the selected public schools in DepEd – City of Naga Division. Another letter of request to conduct the study were given to the designated Principal. Once consent is granted, the researcher asked the designated personnel to retrieve the schools for their approval.

During Data Gathering Stage. Once the consent was granted, the researcher asked the designated personnel in retrieving the data of the numeracy skills test scores of the students for the first to third quarter of the school year 2023 - 2024. To ensure a better and more accurate outcome, the data mining was personally conducted by the researchers themselves. The researcher further informed the schools and other key personnel that the data obtained were kept with at most confidentiality.

Post Data Gathering Stage. After the data were collected, they were tabulated, collated, analyzed, and interpreted using the appropriate statistical treatment. The results were the basis for the study's interpretation, implication, generalization, and conclusion. It is also important to keep the confidentiality of the data by using codes or disposing of data after use.

4.6 Statistical Treatment

Statistical treatment of data is an imperative part of studying any field. It is an effective and essential way out for using the data in the right form. The use of the treatment provided the researcher with the right information as basis for implication, generalization, or analysis. The responses of the participants in this study were subjected to the following statistical treatment:

The profile of the respondents was measured using frequencies, percentages for the nominal and ordinal data (gender; parents' occupation; and parents' highest educational attainment); means and standard deviations for interval data (age and final grade in the 1st quarter in Math).

In determining the level of students' numeracy level, DepEd's Grading System was employed with the numerical rating, descriptive rating, and verbal interpretation. The numerical rating was evenly distributed and was also categorized into five categories as students to be Outstanding, Very Satisfactory, Satisfactory, Fairly Satisfactory and Did Not Meet Expectations in the test tool.

Means and standard deviations were also be employed to determine the level of numeracy skills of the respondents in Mathematics in the following areas: addition of integers, and subtraction of integers.

The Multiple Regression R was employed to determine the significance of the relationship between the profile and the level of numeracy skills of the students. Likewise, the Wilcoxon Signed Rank Test was used to test the significance of the difference among the numeracy skill levels of the respondents by area with the Kolmogorov-Smirnov Test of Normality used to verify normality of data.

4.7 Ethical Considerations

It was made clear to the respondents that their participation in this study is voluntary, and they are not compelled to participate should they believe it is detrimental to their interest. Furthermore, the participants will be informed that the research is conducted solely for academic purposes and the data gathered from them will be exclusively used for such purpose.

Data Privacy. The researcher ensured the confidentiality of the data gathered relative to the respondents' personal information and would not be disclosed to the public at any cause. These were guaranteed by performing the activities such as, the names of the respondents are replaced by codes, the sheet containing the name of the respondents is removed and kept or destroyed when no longer needed for the research, the researcher would have the sole access to the code's master list, and files containing research data were password protected and encrypted to keep the data safe.

5. Results and Discussion

5.1 Profile of the Respondents

The profile of the respondents as to age and gender, final grade in the 1st quarter in Math, parents' occupation, parents' highest educational attainment are herein presented.

5.2 Age and Gender

Age and gender are considered essential variables that need to be determined in this study, which could help in explaining the results. Table 2 presents the age and gender of the respondents in the National High School.

Table 2. Age and Gender of the Respondents

Variable	f		%
Age (in years)			
Above 15 years old	5		3.52
14 - 15 years old	8		5.63
Below 14 years old	129	5	90.8
Mean: 12.67			
SD:0.94			
Gender			
Male	79	3	55.6
Female	63	7	44.3
Total	**142**	**00**	**100.**

As shown in Table 2, 129 out of 142 respondents, or 90.85 percent are in the age bracket of below 14 years old. Moreover, 8, or 5.63 percent are aged 14-15 years old, and 5, or 3.52 percent are in the age bracket above 15 years old. With regards to the gender of the respondents, 79 out of 142 or 55.63 percent are males while 63 out of 142 or 44.37 percent are females.

The results indicate that the majority of the respondents are under the age bracket of 14 years old and below and male respondents dominated the class. Based on the structure of the K-12 Basic Education of the Department of Education, the methods of assessment should be appropriate to each Grade level at each stage. The Junior High School is for students aged 12 to 15 years old. The data imply that the age of the respondents is appropriate for Grade 7 level.

5.3 Final Grade of Math in the 1st Quarter

Table 3 presents the final grade in the first quarter in Math. As shown in Table 3, 50 out of 142 respondents, or 35.21 percent were rated Satisfactory in their final grade in Mathematics during the first quarter. These were followed by 43 or 30.28 percent who were rated Fairly Satisfactory. Next, 38, or 26.76 percent rated Very Satisfactory, eight (8), or 5.63 percent were Outstanding, and only three (3) or 2.11 percent did not meet expectations.

Table 3. 1st Quarter Final Grade

Final Grade Descriptor (Grading Scale)	f	%
Outstanding (90-100)	8	5.63
Very Satisfactory (85-89)	38	26.76
Satisfactory (80-84)	50	35.21
Fairly Satisfactory (75-79)	43	30.28
Did Not Meet Expectations (Below 75)	3	2.11
Total	**142**	**100.00**
Mean:	*81.85*	
SD:	*4.8*	

The data indicate that the majority of the respondents performed poorly in Mathematics during the first quarter. This result aligns with the PISA 2022 results showing that the results in mathematics did not change significantly when compared to the 2018 results. (OECD, 2023)

5.4 Parents' Occupation

The distribution of the respondents by the occupation of the parents are presented in Table 4. As shown in Table 4, 46 out of 142 father respondents, or 32.39 percent work in building and construction. They were followed by 14 or 9.86 who work in transportation, 7 or 4.93 percent who work as peace officers, 4, or 2.82 who work for banking and business as well as food, and 3 or 2.11 who are OFW workers. There were 64 or 45.07 percent of the respondents whose occupation is not classified. Regarding the occupation of the mothers, the data showed that 54 out of the 142 mother respondents, or 38.03 percent were housewives followed by 12 or 8.45 percent who work in banking and business. Next were caregiver and production with 11 or 7.75 percent, OFW with five (5) or 3.52 percent, and caregiver and teacher with four (4) or 2.82 percent. The last was named others with 41 or 28.87 percent.

Occupation	f	%
Father		
banking and business	4	2.82
building and construction	46	32.39
food	4	2.82
peace officer	7	4.93
transportation	14	9.86
OFW	3	2.11
others	64	45.07
Mother		
banking and business	12	8.45
caregiver	11	7.75
food	4	2.82
housewife	54	38.03
production	11	7.75
OFW	5	3.52
teacher	4	2.82
others	41	28.87

Table 4. Parent-Respondents' Occupation

The result shows that most of the parent respondents had low or middle occupation levels. According to a study occupation of parents affects students' performance in their academics (Odoh et al, 2017). Parent's occupation has an impact on the academic motivation of learners' success. Students from parents with high occupation levels performed poorly compared to those students from parents with low and middle occupation levels (Walter, 2018).

5.5 Parents' Highest Educational Attainment

Table 5 presents the data gathered about the highest educational attainment of parents.

Table 5. Parents' Highest Educational Attainment

Parents' Highest Educational Attainment	frequency			%
	Father	Mother	Total	
College Graduate	12	13	25	8.80
College Level	11	12	23	8.10
HS Graduate	26	31	57	20.07
HS level	22	27	49	17.25
Elem Graduate	11	8	19	6.69
Elem Level	12	7	19	6.69
None	48	44	92	32.39
Total	**142**	**142**	**284**	**100.00**

As presented in Table 5, 57 out of 284 parent respondents, or 20.07 percent were High School Graduate. This was followed by 49 or 17.25 percent who were HS level. There were 25 or 8.80 percent were college graduate while 23 or 8.10 were college level. Next were 19 or 6.69 percent who were Elementary graduate and elementary level. A considerable number of 92 or 32.39 percent of the respondents did not signify their educational attainment.

5.6 Level of Numeracy Skills of the Respondents in Mathematics

The level of numeracy skills of the respondents in Mathematics in addition of integers and subtraction of integers are herein discussed. **Are:**

5.6.1 Addition of Integers

Table 6 presents the data gathered about the level of numeracy skills of the respondents in Mathematics about the addition of integers.

Table 6. Level of Numeracy Skills of the Respondents in Addition of Integers

Level of Numeracy Skills	f	%
Outstanding (90-100)	8	5.63
Very Satisfactory (85-89)	2	1.41
Satisfactory (80-84)	4	2.82
Fairly Satisfactory (75-79)	4	2.82
Did Not Meet Expectations (Below 75)	124	87.32
Total	**142**	**100.00**

Mean = 44.51
SD = 22.03

The data revealed in Table 6, shows that 124 out of 142 respondents, or 87.32 percent Did Not Meet Expectations, were graded below 75 in addition to integers. This was followed by eight (8) or 5.63 percent Outstanding, four (4) were Satisfactory and Fairly Satisfactory, and lastly, two (2) were Very Satisfactory. It has a mean of 11.13 and a standard deviation of 5.51.

The results indicate that the respondents performed poorly in adding integers with higher number of students who *Did Not Meet Expectations* or whose grade is below 75. Mathematics has a vital part in the lives of the students. It offers students job choices across many content areas of sciences, technologies, engineering and mathematics. It helps to promote critical thinking and address student difficulties. This makes them successful in the future in various ways. According to (Layug, 2021), the Philippines' low level of numeracy skills as reflected in the results of PISA in the last two years prompted teachers to employ different interventions for students who are performing poorly in mathematics. In their study, they found out that the commonly used by the Grade 7 mathematics teachers at Baguio City National High is conference with the parent and student. However, the most effective intervention is a one-on-one tutorial. Teachers are continuing to employ these interventions to improve students' numeracy skills.

Students who struggle with adding integers face significant implications that extend beyond the immediate difficulty with a specific mathematical concept. Weakness in adding integers can hinder their ability to advance to more complex mathematical topics, limiting their overall mathematical proficiency. This foundational skill is essential for problem-solving across various contexts and a lack of understanding may erode students' confidence in their mathematical abilities.

5.6.2 Subtraction of Integers

The data gathered on the level of numeracy skills of the respondents in Mathematics on the subtraction of integers are presented in Table 7. As reflected in Table 7, the data showed that 141 out of 142 respondents or 99.30 percent or its majority Did Not Meet Expectations, one (1) or 0.70 percent, none got a grade of Fairly Satisfactory, Satisfactory and Outstanding.

Table 7. Level of Numeracy Skills of the Respondents in Subtraction of Integers

Level of Numeracy Skills	**f**	**%**
Outstanding (90-100)	0	0.00
Very Satisfactory (85-89)	1	0.70
Satisfactory (80-84)	0	0.00
Fairly Satisfactory (75-79)	0	0.00
Did Not Meet Expectations (Below 75)	141	99.30
Total	**142**	**100.00**

Mean = 30.25
SD = 13.75

This data indicate that students have difficulty in subtracting integers. Similar to the numeracy skills of the respondents in adding integers, the result showed that they Did Not Meet Expectations. The data imply immediate intervention like remedial classes for the failed competencies (subtraction of integers) before introducing the next competencies like the multiplication and division of integers.

A study of (Inganah et al., 2023) about the 6C (critical thinking, creativity, collaboration, communication, computational and compassion) integration of 21st century education in to learning mathematics emphasized that integrating 6C into integrated math skills is one of the evolutions in educational practice that meets the needs of the 21st century. They noted that in the process of integrating the 6C into math skills, teachers face several problems. The problems faced by the teachers are influenced by students and teachers themselves. Their study summarizes some of the solutions teachers found to overcome the problem of integrating 6C into their integrated math skills. This includes providing videos, group work. Providing private discussion rooms, providing short material summaries with narration so that the language is easy for students to understand, using timers to set a time, and ask for referrals and exchanges.

Students who lack proficiency in subtracting integers may face several implications that can impact their overall mathematical competence and academic success. Subtraction of integers is a fundamental skill that extends beyond isolated arithmetic operations.

5.7 Areas Where the Students' Numeracy Skills are Weak

The numeracy skills of the respondents in terms of adding and subtracting integers highlighting the weak areas are herein discussed.

5.7.1 Addition of Integers

Table 8 presents the numeracy skills of the respondents in addition of integers. The data revealed that item no. 4 (with the question [10 + (-4)]) ranked first (36, 25.35) got the highest number of respondents who answered the question incorrectly. This was followed by item no.12 ([-5 + 19]) ranked 2nd (39, 27.46), item no. 10 [-18 + 43] and item no. 16 [15 + (-10) + (-6)] ranked 3rd (42, 29.58), and item no. 9 ([- 26 + (-17)]) ranked 5th (44, 30.99).

Table 8. Addition of Integers (Weak Areas)

Item #	Number of Correct Responses	% correct	Rank*
1	134	94.37	24
2	58	40.85	15
3	87	61.27	22
4	36	25.35	1
5	65	45.77	18
6	53	37.32	11
7	51	35.92	9
8	58	40.85	15
9	44	30.99	5
10	42	29.58	3
11	56	39.44	12
12	39	27.46	2
13	57	40.14	14
14	105	73.94	23
15	49	34.51	7
16	42	29.58	3
17	67	47.18	20
18	52	36.62	10
19	47	33.10	6
20	50	35.21	8
21	69	48.59	21
22	56	39.44	12
23	65	45.77	18
24	58	40.85	15
25	52	36.62	10

** with 1 as the least number of responses*

It can be noted that the items where the students failed to answer the questions are those items that uses parenthesis around negative numbers. Parentheses around negative numbers do not mean that one needs to multiply; they are just used to avoid confusion in the use of negatives with subtraction.

The data indicate that students have the difficulty in understanding the concept of adding integers. One problem that students are facing when dealing with integers is that they are confused with signs and operation of the integers which make them struggle in computing the integers. A study of (Sahat et al., 2018) revealed that students faced problems in understanding the concept of adding and subtracting integers. A lack of foundation in mathematics, which includes the computations of integers caused secondary students unable to solve algebraic equations.

5.7.2 Subtraction of Integers

Table 9 presents the weak areas of students' numeracy skills in subtraction of integers.

Table 9. Subtraction of Integers (Weak Areas)

Item #	Correct Number of Responses	% correct	Rank*
1	90	63.38	25
2	42	29.58	17
3	29	20.42	10
4	24	16.90	4
5	44	30.99	18
6	31	21.83	11
7	26	18.31	6
8	18	12.68	1
9	27	19.01	8
10	24	16.90	4
11	19	13.38	2
12	23	16.20	3
13	77	54.23	23
14	33	23.24	12
15	44	30.99	18
16	80	56.34	24
17	54	38.03	22
18	40	28.17	16
19	26	18.31	6
20	28	19.72	9
21	51	35.92	20
22	34	23.94	14
23	33	23.24	12
24	51	35.92	20
25	38	26.76	15

** with 1 as the least number of responses*

As presented in Table 9, the data revealed that item no. 8 [-9-22] ranked first (18, 12.68) got the highest number of students who answered the question incorrectly. This was followed by item no. 11 [8-(-27)] ranked 2nd (19, 13.38), item no. 12 [-3-13] ranked 3rd (23, 16.20), items no. 4 [-8-5] and item no. 10 [15-(-7)] ranked 4th (4, 16.90).

The result indicates that developing comprehension of rational numbers in preparation for formal algebra is a significant part of the lower years. Significantly, the concepts and skills learned in the lower years form the foundation for generalizing algebraic mathematical ideas in more sophisticated ways. Hence, the students are required to build a strong foundation in rational numbers, including integers that contribute to the foundation for Algebra.

According to Lamb et al. (2018), understanding the conceptual aspects and demonstrating the ability to work successfully with integer operations is a foundation for algebra. Knowing that integers are signed numbers using the "-" symbol, one can conceptual characteristic of integers is that students must understand the meaning of the sign to interpret it accurately. However, this symbol can represent more than a negative number.

5.8 Areas Where the Students' Numeracy Skills are Strong

The numeracy skills of the respondents in terms of adding and subtracting integers highlighting the strong areas are discussed here. Tables 10 and 11 presents the results.

5.8.1 Addition of Integers

Table 10 presents the strong areas of the students' numeracy skills in adding integers.

Table 10. Addition of Integers (Strong Areas)

Item #	Number of Correct Responses	% correct	Rank*
1	134	94.37	**24**
2	58	40.85	15
3	87	61.27	**22**
4	36	25.35	1
5	65	45.77	18
6	53	37.32	11
7	51	35.92	9
8	58	40.85	15
9	44	30.99	5
10	42	29.58	3
11	56	39.44	12
12	39	27.46	2
13	57	40.14	14
14	105	73.94	**23**
15	49	34.51	7
16	42	29.58	3
17	67	47.18	**20**
18	52	36.62	10
19	47	33.10	6
20	50	35.21	8
21	69	48.59	**2**1
22	56	39.44	12
23	65	45.77	18
24	58	40.85	15
25	52	36.62	10

** with 1 as the least number of responses*

As presented in Table 10, the data revealed that item no.1[2+14] ranked first (134, 94.37) where majority of the students got the answers correctly. Item no. 14 [11+5+13] ranked second (105, 73.94, item no. 3 [-8+(-11)] ranked third (87, 61.27), item no. 21 [13+9+(-12)] ranked fourth (69, 48.59) and item no. 17 [23+10+(-8)] ranked fifth (67, 47.18). It can be observed that students perform better in adding integers with the same sign and without a parenthesis around numbers (e.g. 2+14=16).

Utilizing number line representations, students skillfully navigate the addition process, accurately moving to the right for positive numbers and to the left for negative numbers. Moreover, they can confidently apply rules governing the addition of integers, such as the principles of like signs resulting in a sum with the same sign and unlike signs leading to subtraction either the sign of the larger absolute value. The data imply the need to help students build a strong foundation in solving integers.

According to Alfarisi et al. (2022), an integer is a significant element that needs to be prepared to establish a strong foundation for students' mastery of algebra. They added that students have difficulty interpreting negative numbers and conducting operations that involve negative numbers.

5.8.2 Subtraction of Integers

Table 11 presents the strong areas of the students' numeracy skills in subtracting integers.

Table 11. Subtraction of Integers (Strong Areas)

Item #	Correct Number of Responses	% correct	Rank*
1	90	63.38	25
2	42	29.58	17
3	29	20.42	10
4	24	16.90	4
5	44	30.99	18
6	31	21.83	11
7	26	18.31	6
8	18	12.68	1
9	27	19.01	8
10	24	16.90	4
11	19	13.38	2
12	23	16.20	3
13	77	54.23	23
14	33	23.24	12
15	44	30.99	18
16	80	56.34	24
17	54	38.03	22
18	40	28.17	16
19	26	18.31	6
20	28	19.72	9
21	51	35.92	20
22	34	23.94	14
23	33	23.24	12
24	51	35.92	20
25	38	26.76	15

** with 1 as the least number of responses*

As presented in Table 11, item no. 1 ([15-8]) got the highest number of students who answered the questions correctly (90, 63.38). This was followed by item no. 16 [8-2-5] or (80, 56.34), item no. 13 [-14-6-24] or (77, 54.23), item no. 17[2-(-15)-3] or (54, 38.03), item no. 21 [-6-7-12] and item no. 24[-12-(-3)-20] or (51, 35.92).

The result indicates that students can subtract integers having the same sign. In connection to their level of numeracy skills in subtraction of integers that denote did not meet expectations, this could imply that teachers must do something in making learning mathematics particularly in solving integers easy.

5.9 Significance of the Relationship Between the Profile of the Respondents and their Level of Numeracy in Mathematics

This section discusses the test of significant relationship between the profile of the respondents and their level of numeracy in mathematics. The hypothesized that there is no significant relationship between the profile of the respondents and the level of the numeracy skills. Table 12 presents the result.

Table 12. Test of the Significance of the Relationship between the Profile Variables and the Level of Numeracy (N=142)

Profile Variables Paired with Level of Numeracy	Multiple R	R Square	p-value	Significance
Age	0.41821	0.17489	0.34508	Not significant
Gender			0.01847*	Significant
Parents' educational attainment			0.07642	Not significant
Occupation (Father)			0.31788	Not significant
Occupation (Mother)			0.45692	Not significant
First Quarter Grades			0.0000*	Significant

** Significant at $\alpha = 0.05$*

As shown in Table 12, the obtained Multiple R value is 0.41821 which signifies a low positive correlation between the profile variables and the level of numeracy skills. The data revealed that the profile variable such as the gender and the first quarter grades of the respondents have the significant relationship with the level of numeracy with the p value of 0.01847 and 0.000, respectively, lesser than 0.05 level of significance. On the other hand, the other profile variables such as the age, parents' educational attainment, and occupation of both parents showed no significant relationship with the level of numeracy having the p value of greater than ▪ = 0.05.

The results are supported with the study of (Mejía-Rodríguez et al., 2021) pointed out that gender differences in students' self-concept in mathematics are significant in most countries, usually in favour of boys as early as in fourth grade. Although gender differences in academic performance has received considerable attention over the years, the study of (Mozahem et al., 2021) investigates gender differences in the sources of information that lead to perceived self-efficacy in math and whether the information changes with age. They found that older girls are more likely to receive negative information leading them to develop lower levels of perceived self-efficacy in math. Another study from (Rodriguez et al., 2020) indicate that tended to exhibit less positive attitudes about mathematics than their male classmates, in particular lower motivation, worse perception of competence, and higher rates of anxiety.

5.10 Significance of the Difference among the Numeracy Skill Levels of the Respondents by Area

This study hypothesized that there is no significant difference among the numeracy skill levels of the respondents in addition and subtraction of integers. The Wilcoxon Signed Rank Test was used considering the data for addition was not normally distributed. Table 13 presents the results.

Table 13. Test of the Significance of the Difference of the Numeracy Skill Levels by Area (N=142)

AREA	Mean	SD	Wilcoxon W	Z	p-value	Significance
Addition	11.13	5.51	982.5	-7.4805	0.0000*	Significant
Subtraction	7.56	3.44				

** Significant at α = 0.05, two-tails*

The study reveals that the numeracy skill levels of the respondents in addition and subtraction of integers has a significant relationship by area. The computed p-value of 0.0000 is significantly lower than 0.05. The data signify that the numeracy skills in addition differed with the numeracy skills in subtraction with addition obtaining a higher mean of 11.13.

The results support the notion that addition and subtraction are complimentary in nature as they are considered inverse operations. Addition involves combining two or more numbers to find their total while subtraction entails separating one from another to determine the difference. These operations are interconnected in such a way that they can be seen as undoing each other's effects. The interdependence of addition and subtraction forms a foundational aspect of arithmetic and algebra (Utami & Prabawanto, 2023), allowing for comprehensive understanding of mathematical concepts and their practical applications (SMITH, 2021).

6. Conclusion and Recommend Ations

Based on the findings of the study, it is concluded that respondents had very poor numeracy skills that was being indicated in not meeting the competencies in adding and solving integers. Poor numeracy skills in adding and subtracting integers may indicate gap in understanding the foundational principles of arithmetic, potentially affecting problem-solving abilities and overall mathematical confidence.

From the findings and conclusion arrived in the study, it is imperative to provide targeted support and interventions such as additional practice, focused tutoring, or interactive learning resources, to address these challenges and help the students build a stronger mathematical foundation. Hence, the adoption and implementation of the intervention plan are hereby recommended.

The following are recommended: Teachers and schools should recognize students who are susceptible to underperforming in math early at the beginning of school year. Continue and step-up government efforts, organizations and businesses that offer gadgets and telecom businesses in growing affordable and fast internet for public schools. Administrators, guidance

coordinators and teachers should create activities in school that would help students to strive for higher academic achievements which require stronger mathematical proficiency. Mathematics teachers need to be upskilled and reskilled in order to work with students who are at risk of failing so they can design activities that would motivate students the students to learn and value of mathematics in higher occupational aspirations. Schools should continue engaging parents as parents in reminding the students to be persistent in difficult subjects like mathematics, appreciating higher occupational goals for the students.

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