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First-year students' mathematical skills: assessing and developing an innovative strategy for teaching mathematics

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ABSTRACT

In order to succeed in advanced mathematics and other related courses while in college, students must have a strong foundation in the subject of mathematics. Thus, this study aimed to determine the level of students' fundamental skills in mathematics in the areas of number sense, mathematical representation, spatial skills, estimation, patterns, and problem-solving when they are grouped according to the school of origin, strand, and program enrolled. Likewise, to test if there is a significant difference in fundamental mathematics skills when grouped according to the demographics. A descriptive comparative research design was utilized, and 278 first-year students participated. The results revealed that students performed better on their fundamental skills in mathematics in the area of patterns and performed lowest mean in spatial skills. Students who graduated from public schools performed well in all areas compared to private school students; in terms of program enrolled, fundamental skills in math varies. Furthermore, there is a significant difference in students' fundamental skills in mathematics when grouped according to the school of origin and strand, otherwise in program enrolled. This study suggests that mathematics teachers must utilize a different teaching strategy suited to students' needs following the learner-centered approach in teaching.

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1. INTRODUCTION

Seeing the importance of the role of mathematics in everyday life, mastery of the subject areas of mathematics is a must [1]. Linking to the mastery of the subject areas, having high-quality diversity of training for teachers' strategy in teaching mathematics help improve students' outcomes [2], specifically their fundamental skills in mathematics [3]. Assessing students' fundamental skills in mathematics is necessary for developing an innovative strategy for teaching mathematics. Teachers need to know how strategies can be used to support students' mathematical skills [4]. In particular, mathematical skills are conceptualized into number sense [4], representation [5], spatial sense [6], estimation [7], patterns [8], and problem-solving [9].

It is recommended that teachers continue improving and strengthening the quality of instruction to increase the level of mathematical skills of students [3]. Number sense is one of the student's mathematical skills, as one's ability to understand what numbers mean, perform mental mathematics, and look at the world and make comparisons [10]. Mathematical representation bridges the abstract mathematics concept with logical thinking to daily context [11], [12]. The indicators for mathematical representation skills classify visual, symbolic, and verbal representation [12]. Exploring spatial visual sense in students allows them to visually represent and improve their understanding, comprehension, and problem-solving skills [13].

Consequently, spatial skills in mathematics enable students to mentally manipulate, organize, reason about, and make sense of spatial relationships in real and imagined spaces [14]. Poor estimation competence of students is susceptible to intervention, particularly in addressing a common misconception that the purpose of computational estimation is the mental calculation of exact solutions [7]. Student problem-solving difficulties can be overcome through various strategies and activities [15].

Concerning the fundamental skills of students in mathematics, the program for international student assessment (PISA) aimed to examine a 15-year-ability old to articulate, apply, and understand mathematics in a range of situations to describe, predict, and explain phenomena while also appreciating the importance of mathematics in society [16]. The result showed that the Philippines ranked the second lowest among 79 participating countries. With this, the study of Padernal and Diego [17] revealed that regardless of the student's school of origin or entrance exam results, senior high school students generally performed at an average intellectual level in mathematics (calculus). Thus, further assessment needs to be done in their mathematics subjects at the tertiary level. Appropriate action may be considered based on the assessment result, such as bridging courses or tutorial sessions [18].

In response to the continual improvement of teaching strategies in mathematics, this study addresses the gap in the literature wherein several studies on the fundamental skills of students in mathematics were conducted in the early stages of schooling like primary [19] and secondary level [20] and merely focus on one or two specific mathematical skills. However, this study is considered unique in such a way that all mathematical skills mentioned in the literature review will be undermined to develop an innovative strategy for teaching mathematics as well as addressing the existing feedback from the shipping companies' placement results of students in mathematics.

This study assessed students' fundamental skills in mathematics among first-year college students in a maritime school for the school year 2022–2023. More so, this study is the basis for developing an innovative teaching strategy for teaching mathematics. Specifically, it sought to answer the following questions: i) what is the level of fundamental skills in mathematics of first-year students when taken as a whole and when grouped according to school of origin, strand, and program enrolled?; ii) is there a significant difference in the level of fundamental skills of first-year students when grouped according to demographics?; iii) what are the strengths and weaknesses of first-year students' fundamental skills in mathematics?; and iv) what teaching strategy can be developed to enhance students' fundamental skills in mathematics? This study helps address the school's mission: to provide quality education and training through innovative resources in instruction, research, and extension to improve the quality of life of students and other stakeholders. Where in the study's findings will be used as the basis for developing innovative teaching strategies to improve students' mathematical skills.

2. RESEARCH METHOD

2.1. Sample and data collection

This study employed a descriptive-comparative design using quantitative data. Descriptive research design was used in this study to determine students' level of fundamental skills and comparative design was appropriate in comparing the fundamental skills according to their demographics. A descriptive comparative research design follows no manipulation of an independent variable with no interpretation of cause and effect [21].

The study participants were the 278 randomly selected first year Bachelor of Science in Marine Engineering, Bachelor of Science in Marine Transportation (BSMT), Bachelor of Science in Hospitality Management (BSHM), and Bachelor of Science in Customs Administration (BSCA) students of a maritime school in Bacolod City who were officially enrolled in the school year 2022-2023. In determining the number of respondents for the survey, the sample size was solved using the Raosoft sample size calculator where the margin of error is 5%, confidence level of 95%, and known population size of 993 [22]. Stratified random sampling was used in selecting the number of sample size per group/strata where the strata are the sections [23]. Moreover, lottery method was used in selecting who the actual respondents were.

Before the study's conduct, the researchers requested permission from the Dean of the College of Maritime Education and the College of Business and Education to administer the instrument. After receiving the approval, several class sections were selected to answer the questionnaire which was administered according to the subject instructors' schedule, and the respondents were given 1 hour and 30 minutes to finish the test. After the conduct, the collected responses were checked through a machine scanner, and the data were ready for statistical analysis.

2.2. Instrumentation

This study employed a researcher-made instrument duly validated and reliability-tested that measures the level of students' fundamental skills in mathematics. The instrument has undergone item analysis to ensure that items surpassed the acceptable degree of difficulty and discrimination. The instrument comprises two parts: part 1 for the respondent's profile, including program, strand, and school of origin; part 2 of the instrument is the fundamental skills of students in mathematics, this consists of 60 multiple-choice test items with one correct answer. Each fundamental skill has 10 items: number sense, mathematical representation, spatial skills, estimation, patterns, and problem-solving. The researchers originally formulated some test items, while others were modified from various sources. Each item equals 1 point, and 10 points for each fundamental skill for 60 items. The test is designed to be administered for up to 1.5 hours.

Ensuring the instruments' validity, this was validated by ten (10) panels of experts with a content validity index of 0.9033 using Lawshe's method which surpassed the 0.62 content validity ratio according to Repedro and Diego [24] for it to be considered as valid. The instrument was then administered to 30 students of the same characteristics as the respondents for reliability testing. The statistical tool used in the internal consistency of the questionnaires was KR20 because the questionnaire has dichotomous responses (correct or wrong answer). Using KR20, the result of the reliability was 0.892, interpreted as reliable [25].

2.3. Data analysis

For research questions requiring descriptive analysis, such as level of fundamental skills in mathematics when taken as a whole and grouped according to demographics, mean and standard deviation were used. On the other hand, for inferential questions, data was checked through normality testing using Shapiro-Wilk and found that the data were not normally distributed; hence non-parametric tests were used, such as Mann-Whitney U test for demographics with two groups and Kruskal-Wallis H test for demographics with more than two groups. Additionally, the data were analyzed using a statistical software package.

3. RESULTS AND DISCUSSION

3.1. Level of fundamental skills in mathematics

Table 1 shows the level of fundamental skills in mathematics when taken as a whole. The results indicate that the area of patterns revealed to be the highest mean obtained by students, followed by the area of number sense. However, the spatial skills of students are ranked as the lowest mean obtained. This implies that students are good at analyzing patterns rather than acquiring the capacity to understand, reason, and remember the visual and spatial relations among things. This result attributed to the sense that they are exposed to different patterns of the world relative to sequences, identifying the odd figures, but could not be able to make visualizations of the convex polygons as it requires memorization of the formulas for different polygons and solid figures including but not limited to their properties and definitions which they could use in their future profession as maritime seafarers. In consonance with the study of Atit *et al*. [26], spatial skills and mathematical ability had been repeatedly identified as critical for achievement in science, technology, engineering, and mathematics (STEM). Therefore, it is suggested that students should have mastered their spatial skills at an early stage of their education to transgress their knowledge in their future careers.

Table 1. Level of fundamental skill in mathematics (as a whole)

Areas	Mean	SD	Interpretation
Number sense	5.158	1.728	Average
Mathematical representation	3.874	1.966	Low
Spatial skills	3.234	1.643	Low
Estimation	3.727	1.623	Low
Patterns	5.237	2.203	Average
Problem-solving	3.601	1.807	Low
Mathematical skills (as a whole)	28.432	8.806	Average

3.2. Fundamental skills in mathematics according to school of origin

Table 2 shows the level of fundamental skills in mathematics of first-year college students when grouped according to school of origin (private and public). Generally, students who graduated from public schools during their senior high school level performed better than students in private schools. Regarding fundamental skills in mathematics, such as number sense, mathematical representation, spatial skills, estimation, patterns, and problem-solving, students in public schools still performed better than students who graduated from private schools in each area. Lastly, the fundamental skills in mathematics of first-year college students, regardless of school of origin, range from low to average.

This implies that students from public schools were able to have higher fundamental skills in mathematics. However, it can be deduced that their skills still range from low to average, and they need to upskill to sustain the demands of their profession in terms of mathematical skills as seafarers. The low skills could be attributed to the fact that their fundamental skills during high school still needed to be fully mastered; hence it is vital to have a strong foundation.

Mathematics teachers try to qualify learning materials and integrate local culture into mathematics learning [27]. Learning materials based on a realistic mathematics education approach met the effective criteria and can improve mathematical problem-solving ability and student self-efficacy. Following this, a study indicated that: i) students' capability of solving mathematical problems taught with the contextual learning model is higher than students taught by the expository; ii) students' self-confidence taught by the contextual learning model is higher than students taught by expository; iii) there was the interaction between learning model and students' early mathematical ability to improve students' mathematical problem-solving ability; and iv) there was the interaction between learning model and students' early mathematical skills to improve students' self-confidence [28].

3.3. Fundamental skills in mathematics according to strand

Table 3 shows the level of fundamental skills in mathematics of first-year college students grouped according to strand. Overall, all strands revealed to have average fundamental skills in mathematics yet vary on the mean they obtained. Thus, students who graduated in STEM strand obtained the highest mean score among the other strands (accounting, business, and management (ABM), technical-vocational-livelihood (TVL), humanities and social sciences (HUMSS), general academic strand (GAS), and pre-baccalaureate maritime strand (PBMS)) and GAS students gained a lowest mean score. Regarding number sense, only the STEM strand students got a high level of fundamental skills in mathematics, others at an average level. In mathematical representation, STEM and ABM strand students performed an average level of fundamental skills in mathematics. In contrast, PBMS strand students performed at a very low level of fundamental skills in mathematics. TVL, HUMSS, and GAS strand students are of the same level of fundamental skills in mathematics, which is low.

In the areas of spatial skills, PBMS strand students performed well than other strands, which has an interpretation of average level. In contrast, HUMSS strand students obtained the lowest mean score with an interpretation of a low level of fundamental skills in mathematics. Regarding estimation, STEM and PBMS students performed better than other strands with the same interpretation of the average level of fundamental skills in mathematics with a mean difference of 0.031. Regarding patterns, STEM and PBMS strand students with a mean difference of 0.016 performed better than others, while GAS strand students got the lowest mean. Lastly, in problem-solving, only STEM strand students got an average level of fundamental skills in mathematics; the rest of the strands are at low level.

In general, STEM strand students lead most of the areas in obtaining the highest mean in the fundamental skills in mathematics. Only in spatial skills STEM students did not take the highest mean. The PBMS students could take the highest mean score in spatial skills. This result implies that students with a foundation in mathematics can perform good scores in the mathematical set of questions. STEM students are exposed to pre-calculus, basic calculus, statistics and probability, general mathematics, and other related mathematics subjects.

According to Widya *et al*. [29], STEM students benefit from applying to improve critical thinking skills and to be creative, logical, innovative, productive, and directly related to real conditions. Another study that supports the revealed result that STEM students lead most of the areas in the fundamental skills in mathematics is the study of Maass *et al*. [30] which states that in times of rapid technological innovation and global challenges, the development of STEM competencies becomes more important. Furthermore, STEM studies improve the personal scientific literacy of citizens, enhance international economic competitiveness, and are an essential foundation for responsible citizenship, including the ethical custodianship of our planet. In connection with this, the program aims to score high on the latest program for international students' assessment results that indicated approximately 20% of students lack sufficient skills in mathematics.

Table 2. Level of fundamental skills in mathematics of first-year college students (school of origin)

Areas	Public			Private		
	Mean	SD	Interpretation	Mean	SD	Interpretation
Number sense	5.641	1.891	Ave	4.808	1.510	Ave
Mathematical representation	4.214	1.920	Ave	3.627	1.968	Low
Spatial skills	3.487	1.822	Low	3.050	1.478	Low
Estimation	4.214	1.553	Ave	3.373	1.584	Low
Patterns	5.718	1.951	Ave	4.888	2.313	Ave
Problem-solving	3.786	1.852	Ave	3.466	1.768	Ave
Mathematical skills (as a whole)	30.846	9.191	Ave	26.677	8.102	Ave

Table 3. Level of fundamental skills in mathematics of first-year college students (according to strand)

Areas	ABM		TVL		HUMSS		GAS		PBMS		STEM	
	Mean (SD)	Int.	Mean (SD)	Int.	Mean (SD)	Int.	Mean (SD)	Int.	Mean (SD)	Int.	Mean (SD)	Int.
Number sense	5.438 (1.501)	Ave	4.653 (1.693)	Ave	5.000 (1.863)	Ave	4.625 (1.544)	Ave	4.000 (1.732)	Ave	6.143 (1.342)	High
Mathematical representation	4.125 (2.352)	Ave	3.674 (1.710)	Low	3.899 (2.037)	Low	3.438 (1.315)	Low	2.000 (0.000)	Very Low	4.222 (2.159)	Ave
Spatial skills	3.594 (2.030)	Low	3.137 (1.548)	Low	3.072 (1.448)	Low	3.875 (1.857)	Low	5.333 (2.887)	Ave	3.111 (1.587)	Low
Estimation	3.438 (1.999)	Low	3.126 (1.468)	Low	3.855 (1.438)	Low	3.313 (1.702)	Low	4.667 (1.155)	Ave	4.698 (1.352)	Ave
Patterns	4.563 (1.777)	Ave	4.990 (2.350)	Ave	4.913 (2.611)	Ave	4.875 (1.857)	Ave	6.333 (1.155)	High	6.349 (1.259)	High
Problem-solving	3.063 (1.605)	Low	3.305 (1.651)	Low	3.797 (2.180)	Low	2.438 (1.825)	Low	4.000 (0.000)	Low	4.381 (1.361)	Ave
Mathematical skills (as a whole)	27.281 (10.234)	Ave	26.190 (8.728)	Ave	28.333 (9.278)	Ave	25.000 (7.694)	Ave	30.333 (4.619)	Ave	33.286 (5.799)	Ave

3.4. Fundamental skills in mathematics according to program enrolled

Table 4 depicts the level of fundamental skills in mathematics of first-year college students when grouped according to program enrolled. This result revealed that BSCA students got the lowest score in spatial skills. In contrast, they got the highest score in mathematical representation. Furthermore, the BSHM got the lowest score in spatial skills while the highest score in number sense. In addition, bachelor of science in marine engineering (BSME) students got the lowest score in spatial skills and the highest score in patterns. Additionally, BSMT students got the lowest score in spatial skills and highest score in patterns. Generally, regardless of program, students got the lowest score in spatial skills.

When taken as a whole, BSHM got the lowest mathematical skills compared to other program. Furthermore, BSCA got the highest mathematical skills compared to other program. This result shows that BSCA needs to be better in visualization. More than their working memory through visual representation is needed to make a good foundation for their mathematical skills. They must upgrade their visual reasoning to proceed with higher-order and abstract reasoning skills. In consonance with the indicated result, BSHM students should be equipped with 21st-century skills such as problem-solving and analytics, decision-making, organization, time management, risk-taking, and communication [31]. Understanding students' mathematical skills is important for supporting their success in their field, especially in STEM careers [32].

Table 4. Level of fundamental skills in mathematics of first-year college students (program enrolled)

Areas	BSCA			BSHM			BSME			BSMT		
	Mean	SD	Int.	Mean	SD	Int.	Mean	SD	Int.	Mean	SD	Int.
Number sense	5.500	2.380	Ave	5.079	1.531	Ave	5.352	1.749	Ave	5.085	1.754	Ave
Mathematical representation	5.750	3.304	Ave	4.184	2.091	Ave	3.704	1.831	Low	3.830	1.946	Low
Spatial skills	4.000	2.309	Low	3.263	1.446	Low	3.296	1.752	Low	3.182	1.632	Low
Estimation	5.500	1.291	Ave	3.658	1.864	Low	3.986	1.526	Low	3.588	1.585	Low
Patterns	5.000	2.449	Ave	4.684	2.590	Ave	5.451	2.103	Ave	5.279	2.143	Ave
Problem-solving	4.500	2.380	Ave	3.421	2.048	Low	3.789	1.764	Low	3.539	1.758	Low
Mathematical skills (as a whole)	34.750	15.882	Ave	27.711	10.677	Ave	29.366	7.840	Ave	28.042	8.531	Ave

3.5. Significant difference in students' fundamental skills in mathematics

Table 5 revealed the significant difference in students' fundamental skills in mathematics. Regarding number sense, schools of origin and strand significantly differ in their level of mathematics fundamental skills of students. In terms of mathematical representation, only the school of origin significantly differs in the student's level of fundamental mathematics skills. In the area of spatial skills, none of the independent variables, school of origin, strand, and program enrolled resulted to a significant difference. Furthermore, there is a significant difference in the areas of estimation, patterns, and problem-solving when they are grouped according to the school of origin. Likewise, the results showed that there is a significant difference among the strands in terms of the areas of estimation, patterns, and problem-solving. This result implied that the strand plays an important role in these areas.

When taken as a whole, there is a significant difference in students' level of mathematics fundamental skills when grouped according to the school of origin and strand. This result implied that the school of origin and strand are important indicators of building students' fundamental skills in mathematics. They should have a school of origin that taught good foundational concepts and skills in mathematics and select a strand aligned with mathematics to progress to their current courses and future field of discipline after graduation. More effective teaching among problem-solving strategies with a scientific approach to students' mathematical skills in higher-order thinking skills is needed [33]. The results are consistent with those of Tsarava *et al.* [34] computational thinking is located in educational innovation as a set of problem-solving skills that new students must acquire to thrive in a digital world of objects driven by software.

Table 5. Significant difference in the level of mathematics fundamental skills of students

Areas	School of origin		Strand		Program enrolled	
	Mann-Whitney	p-value	Kruskal-Wallis	p-value	Kruskal-Wallis	p-value
Number sense	6673.000	0.000*	36.936	0.000*	1.685	0.640
Mathematical representation	7644.000	0.007*	7.503	0.186	2.657	0.448
Spatial skills	8204.500	0.062	5.345	0.375	0.550	0.908
Estimation	6576.000	0.000*	41.011	0.000*	7.462	0.059
Patterns	7460.500	0.003*	23.310	0.000*	2.649	0.449
Problem-solving	7824.500	0.014*	32.075	0.000*	2.499	0.475
As a whole	6498.500	0.000*	34.676	0.000*	2.406	0.493

Note: *Reject H_0

3.6. Strength and weaknesses of first-year students' fundamental skills in mathematics

Table 6 describes the strength and weaknesses of first-year students' fundamental skills in mathematics. The strength and weaknesses were identified according to the top 3 highest and top 3 lowest scores obtained in each area of fundamental skills in mathematics, respectively. In general, as shown in the table, the most common topic students found strength in and had favorable scores on is evaluating the basic concepts. However, they found it weak when the topics were presented in worded problems. This result implies that students make good outcomes in the fundamental skills in mathematics when the context is presented in its common set or simple evaluation rather than presented in worded problems with mathematical sentences involved.

Thus, this result is attributed to the fact that students need more skills in comprehension, interpretation, and illustration of the presented worded problem. This result also considers how they are taught during their previous schooling. Likewise, the teaching strategy that the teachers use in presenting the topics in mathematics can also lead to students' poor adaptation and acquisition of knowledge since students are now in technology. Furthermore, the reason for experiencing weaknesses in the evaluation of worded problems is the readiness of their learning with the integration of their real-life experiences. In consonance with the study of Al-Zoubi and Younes [35], they mentioned that the factors that affect students' low academic performance are the use of traditional methods instead of using modern teaching methods in teaching and poor relationship between the teachers and the students, creating a teaching environment lacking respect which leads to the lack of students' acceptance of the learning process.

Table 6. Strengths and weakness of students' fundamental skills in mathematics

Fundamental skills	Strengths	Weaknesses
Number sense	– Simplifying numbers following MDAS – Evaluating the percentage in the percentage, rate, and base concept given – Determining the greater value in fraction form of the given mathematical phrase	– Evaluating the percentage presented in a worded problem – Evaluating the part of the whole relationship – Evaluating worded problems involving signed numbers
Mathematical representation	– Division of polynomials presented in worded problems – Application of division and multiplication of numbers – Language of sets	– Dividing binomial to monomial – Evaluating Ratio and proportion – Number problem
Spatial skills	– Defining circle – Determining the number of sides in a cube – Evaluating the number of tiles to be used in the given scenario	– Identifying polygons – Evaluating the area of a circle – Application of signed numbers
Estimation	– Representation of number value – Rounding off of numbers – Evaluating the problem using percentage, base, and rate concept	– Conversion of units – Evaluating problems involving measurement – Evaluating problems involving division and multiplication of numbers
Patterns	– Finding the missing value in an arithmetic sequence – Evaluating the next number in an arithmetic sequence – Distinguishing the next correct figure	– Application of factors or multiples of a number – Evaluating worded problems involving arithmetic sequence – Finding the next term of the Fibonacci sequence
Problem-solving	– Evaluating the percentage problem – Evaluating problem involving central tendency (mean) – Evaluating the base, rate, and percentage	– Application of operations of numbers – Application of the concept measurement – Application of percentage, rate, and base

3.7. Proposed teaching strategies in fundamental skills of students in mathematics
3.7.1. Overview

The proposed teaching strategies for students' fundamental mathematics skills play an essential role in increasing students' mathematical skills in different areas, such as number sense, mathematical representation, spatial skills, estimation, patterns, and problem-solving. A significant component of proposed teaching strategies in students' fundamental mathematics skills is the topic identified with corresponding teaching strategies that aid students' poor performance in the different areas of mathematical skills. Alongside are the materials needed to address the gap in students' learning process.

3.7.2. Rationale

The proposed teaching strategies for students' fundamental skills in mathematics were crafted per the result of the study. The study's result was thoroughly analyzed using the total scores obtained by students in each item in the instrument. These topics identified as students' weaknesses are based on the bottom three items that garnered a lower score in every area of fundamental skills in mathematics.

3.7.3. Objectives

After working through proposed teaching strategies for students fundamental skills in mathematics, teachers are expected to perform the suggested teaching strategies and prepare instructional materials: model approach; created grids; collaborative approach; integer operation work mat journals; hands-on practice; think-pair-share; conceptual understanding; peer mentoring; jigsaw puzzle; mnemonics; differentiated instruction; classroom technology; and math games. Table 7 shows that in each area of fundamental skills in mathematics there are three competencies revealed low where teaching strategies are proposed in consonance with the consultations from different subject matter experts in mathematics and calculus. Furthermore, instructional materials were listed to aid in these teaching strategies.

Table 7. Proposed teaching strategies in fundamental skills of students in mathematics

Weaknesses	Teaching strategies	Instructional materials needed
Number sense		
- Evaluating the percent presented in a worded problem	Model approach using Polya's step	i) PowerPoint Presentation with a precise model of the figures (Realistic in view); ii) Authentic materials based on the problem presented so students can visualize the percent concept.
- Evaluating the part of the whole relationship	Create grids; Collaborative approach	i) Model figures such as rectangular boxes, pie charts, and others with different colors; ii) Puzzle activities that generate students to make a whole from the given parts.
- Evaluating worded problems involving signed numbers	Integer operation work mat	i) Pictures with different locations (map); ii) Integer operation work mat to be placed on the floor, and students will play according to the problem.
Mathematical representation		
- Dividing binomial to monomial	Hands-on practice; Think-pair share	Dividing polynomial worksheets, then let students share what they learned with their pair.
- Evaluating ratio and proportion	Conceptual understanding; Peer mentoring	Visual aids with math manipulatives then compare
- Number problem	Cooperative and collaborative learning	Hands-on activities to students for mastery of the learning process with group and peers
Spatial skills		
- Identifying polygons	Modeling (presentation of realia)	Tangible materials that represent polygons
- Evaluating the area of a circle	Jigsaw puzzle model	Different problem sets to every station.
- Application of signed numbers	Integer operation work mat	i) Pictures with different locations (map); ii) Integer operation work mat to be placed on the floor, and students will play according to the problem.
Estimation		
- Conversion of units	Word mnemonic	Create a word mnemonic for every conversion to articulate the steps
- Evaluating measurement problem	Hands-on exercises	Different measuring tools
- Evaluating problems (division and multiplication of numbers)	Loci-mnemonic	Ruler, charts, and markers with different colors
Patterns		
- Application of factors or multiples of a number	Meaningful and frequent activities	Worksheet with the answer key provided without a solution
- Evaluating worded problems involving arithmetic sequence	Differentiated instruction	Different worded problems vary according to the learning styles of students.
- Finding the next term of the Fibonacci sequence	Classroom technology	Video presentation of the Fibonacci sequence
- Problem-solving		
- Application of numbers operations	Math games; Mental math	Marker, manila paper, score sheets, worksheets, and flashcards
- Application of the concept measurement	Hands-on exercises	Different measuring tools
- Application of percentage, rate, base	Math journals	i) Modular tools; ii) Journal notebook; iii) Peer discussion paper

4. CONCLUSION

The level of students' fundamental skills in mathematics varies widely depending on the specific topic. These greatly affects their academic performance and future success in mathematics-related endeavor. Mathematics is a foundational subject that builds upon itself, and a strong grasp of fundamental skills is essential for them to excel in higher-level mathematical concepts. At the lowest level, some students may need help with basic arithmetic operations, such as fundamental operations. These students often need a solid understanding of number sense and help apply mathematical operations to real-world problems. Without intervention and support, these students may continue to struggle as they progress through more complex mathematical topics. Furthermore, teachers must recognize the diverse levels of students' fundamental skills in mathematics and provide appropriate support and interventions. Remedial programs, differentiated instruction, and targeted interventions may help struggling students catch up and develop a solid foundation in mathematics. Students may develop the mathematical proficiency necessary to succeed academically and in their future careers with appropriate intervention and support.

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