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Development and validation of supplementary learning material on Integers for Mathematics 7

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Abstract

This study focused on the development and validation of a supplementary learning material, specifically a Mathematics Handbook on Integers for Grade 7 students at Cagbolo National Vocational High School during the School Year 2023–2024. The main purpose of the study was to improve students' understanding of integers and enhance their reading comprehension and problem-solving skills in Mathematics. The participants were 32 Grade 7 students, composed of 18 Low Performing Group (LPG) and 14 High Performing Group (HPG), who were both exposed to the developed handbook. Their performance was measured using a teacher-made pre-test and post-test covering integer concepts and prerequisite skills, including reading comprehension in word problems. The validity of the instructional material was evaluated using the DepEd Learning Resource Management and Development System (LRMDS) standards, and a paired t-test was used to determine the significant difference between pre-test and post-test scores. Findings revealed that before the intervention, the LPG had difficulty in both integers and prerequisite competencies while the HPG showed only a fairly satisfactory level of performance, indicating a noticeable achievement gap. After the implementation of the Mathematics handbook, both groups showed significant improvement in their post-test results, with the achievement gap reduced and both groups reaching a satisfactory level of performance. The handbook, which included content-focused tasks, interactive exercises, critical thinking activities, production tasks, and problem-solving exercises, was found to be effective in improving students' reading comprehension and mathematical skills. Overall, the study concludes that the developed Mathematics handbook is an effective instructional tool that enhances learning, bridges performance gaps, and supports the development of students' comprehension and problem-solving skills in Mathematics, and it is recommended for use as both a remedial and instructional resource in Grade 7 Mathematics.

Keywords: integers, supplementary learning material, grade 7 mathematics, reading comprehension, problem-solving skills

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1. Introduction

Teaching materials played an important role in the learning process. Adequate learning resources were able to supplement, sustain, and enrich the learning process. Instructional materials are important in teaching and learning at all levels of education because they enable students to extend and deepen their understanding by providing a number of firsthand, developmentally appropriate experiences and assisting students in gaining symbolic skills by providing a range of external aids. And to assist these students in studying in a more efficient manner by designing educational resources that validates their learning (Barile, 2015).

The 21st century learners consider Mathematics as one of the most difficult subjects. It is because critical thinking skills and analyzation are needed for it (Auzar, 2017). One of the problems of students in Mathematics is the word problem-solving. Problem solving is one of the major aspects in mathematics curriculum which required learners to apply and to integrate many mathematical concepts and skills as well as making decision. It is a skill being developed in every country. However, learners were reported to have difficulties in solving mathematical word problems. Besides computations and numerical solutions, solving Mathematical word problems seem to be more difficult because it is the application of the concepts that were tackled. Most of the students have a problem in comprehending the word problems given to them, unable to understand the information and organize it accordingly. This is because they have a low level of comprehension and familiarity about contexts in Mathematics such as translating English sentences to Mathematical sentences.

There are two intertwining factors central to understanding the text of a word problem: the task text itself and the problem solver's individual reading competence. Both can cause difficulties. In recent years, increasing attention has been paid to the task text and its linguistic characteristics that are considered to challenge the processing of the task, such as academic language. However, there have only been a few studies that focus on reading skills as a factor in explaining students' difficulties in dealing word problems. Since reading and understanding the text of a task are fundamental for solving word problems, it can be assumed that, in addition to the linguistic characteristics of the task text itself, reading competence also has an important influence on the solution process.

The learner's solving skill is the ability to solve the mathematical word problems successfully using the literal, inferential and critical interpretation of the text. Mastery of these skills which equate to comprehension level has become a must being the main factors in solving mathematical word problems. In the Philippines, reading comprehension continues to be a major challenge among students. The results of international assessments like PISA (Programme for International Student Assessment) have shown that Filipino students perform below average in reading literacy compared to other countries (Organization for Economic Co-operation and Development [OECD], 2019).

The Philippines' current educational state along Mathematics and English warrants a great deal of attention. As reported by World Bank in 2018 and the United Nations Development Program in 2009, the Filipino students' performance in international examinations administered by the Programme for International Student Assessment (PISA) in 2018 and the Trends in International Mathematics and Science Study (TIMSS)in 2019 is stuck at the bottom while struggling at a passing level locally. This trend is also reflected in national and regional examinations. The NAT results in 2019 also confirm the underperformance of students in Mathematics. This problem, of poor performance according to the Department of Education and the DOST, is attributed to students' poor reading comprehension. This means that Mathematics performance and reading comprehension are interlinked.

Murcia (2018) explained that students solving various Math problems entails reading and computing skills at the same time. Moreover, a lot of students at their high school levels both public and private schools were both poor in comprehending and analyzing Math word problems. This means that problem solving is an important part in Mathematics. Contextualization is one of the keys of engaging the students in teaching-learning process wherein the students can relate their situations on their lesson. It makes the lesson meaningful and relevant to the student's lives by relating the students' context to mathematical content taught in school. Several other studies such as the one conducted on mathematical problem solving, showed that students performed poorly on solving word problems because of the inadequacy of comprehension specifically on the text of the word problem. It is evidently crucial because it is not only a means of conveying information; rather it is used to interpret the events and phenomenon in a way that provokes students' thinking.

In the implementation of K-12 program, problem solving is one of the focal skills in Mathematics that students must possess. Therefore, it is important that students must be able to comprehend and understand concepts in solving problems. DepEd reported that students' performance in the National Achievement Test (NAT) was even more discouraging. Last School Year 2017-2018, the performance of all divisions in the National Achievement Test consistently performed highest in Filipino and Araling Panlipunan while lowest in Mathematics, Science and English. This result is consistent with the findings of the study by Gain and Ancho (2018), where Filipino and Araling Panlipunan were the highest-scoring subjects while English, Math and Science were the lowest scoring. Similarly, Imam reported that learners have difficulty performing reading, Mathematics and Science.

Numeracy skills have been widely recognized during the last two decades as essential for a person's educational achievements and ability to live in a successful life in modern society, including employment opportunities and public health outcomes (Marcos, 2017). Furthermore, in the 2018 Program for International Student Assessment (PISA) report in the worldwide study by the Organization for Economic Cooperation and Development (OECD) of 15-year-old students' scholastic performance in Mathematics in nearly 80 nations, the Philippines ranked 76th with an average score of 353. This result means that Filipinos performed academically poorly in Mathematics, which is below the lowest proficiency level. The deteriorating performance of Filipino students in Mathematics has become a major challenge to Philippine education.

In this connection, the Schools Division Office of Camarines Norte adopted the Albay Numeracy Assessment Tool (ALNAT) to assess the numeracy skills of Grades 4-10 learners. Thus, at the beginning of the school year, a profile of the learners and prior assessment is necessary to determine the level of skills of the learners and provide appropriate lessons suited to their needs. Numeracy skills include knowing and understanding, computing, and solving, estimating, visualizing and modeling, representing and communicating, conjecturing and reasoning, proving and making decisions, and applying and connecting. Each skill is composed of the Most Essential Learning Competencies (MELC) that were rephrased and deemed necessary for the achievement of content and performance standards. These are essential skills for a successful daily life. Mathematics education at the secondary level plays a crucial role in developing learners' logical reasoning and problem-solving skills. Among the fundamental topics in Grade 7 Mathematics is the concept of integers, which serves as a foundation for more advanced mathematical concepts. However, many learners encounter difficulties in understanding operations involving integers, particularly when dealing with negative numbers and real-life applications. These challenges are often attributed to abstract representations, lack of conceptual understanding, and limited instructional materials that cater to diverse learning needs.

To address these gaps, supplementary learning materials have been recognized as effective tools in enhancing students' comprehension and engagement. Such materials provide additional practice, varied representations, and contextualized activities that support mastery of concepts beyond the standard curriculum. The development and validation of these materials are essential to ensure their quality, relevance, and effectiveness in improving learning outcomes. In recent years, there has been increasing emphasis on learner-centered approaches, particularly Independent and Cooperative Learning (ICL), as a strategy to improve academic performance and engagement. Independent learning encourages students to take responsibility for their own learning by working at their own

pace, reflecting on their understanding, and developing self-regulation skills. This approach is especially beneficial in mathematics, where learners need time and practice to internalize abstract concepts such as integers.

On the other hand, cooperative learning involves structured group activities where students work together to achieve shared learning goals. Through collaboration, learners can exchange ideas, clarify misconceptions, and develop deeper understanding through peer interaction. Cooperative learning has been shown to enhance critical thinking, communication skills, and positive attitudes toward mathematics. The integration of Independent and Cooperative Learning (ICL) in supplementary learning materials provides a balanced approach that addresses individual and social dimensions of learning. Activities designed for independent work allow learners to build confidence and mastery, while cooperative tasks promote discussion, reasoning, and collective problem-solving. This dual approach is particularly effective in teaching integers, as students benefit from both personal practice and peer-assisted learning.

In Mathematics education, there is a growing recognition of the importance of contextualization and individualized learning in improving students' understanding of abstract concepts. Contextualization refers to the process of relating mathematical ideas to real-life situations that are meaningful and relevant to learners. In the case of integers, students often struggle to grasp concepts such as negative numbers and operations involving them when these are presented in purely symbolic or abstract forms. By embedding lessons in familiar contexts—such as financial transactions, temperature changes, or daily experiences—learners can construct meaning more effectively and see the practical value of mathematical concepts. Moreover, independent learning emphasizes the need to address the diverse abilities, learning styles, and pacing of students within the classroom. Grade 7 learners exhibit varying levels of readiness and prior knowledge in mathematics, which can affect their ability to master foundational topics like integers. Traditional one-size-fits-all instruction may not adequately support struggling learners or challenge advanced students. Therefore, instructional materials that allow learners to work at their own pace, revisit concepts, and engage in differentiated activities are essential in promoting mastery and confidence.

The integration of contextualization and independent learning in supplementary learning materials provides a more inclusive and effective approach to instruction. Contextualized tasks help bridge the gap between theory and application, while individualized components—such as guided practice, self-assessment, and tiered activities—enable learners to take ownership of their learning. This combined approach not only enhances conceptual understanding but also fosters motivation and active engagement among students. Thus, the development and validation of supplementary learning materials on integers for Grade 7 Mathematics, grounded in contextualization and individualized learning principles, aim to address learners' diverse needs and improve their overall performance. By ensuring that the materials are relevant, adaptable, and learner-centered, the study seeks to contribute to more effective mathematics instruction and meaningful learning experiences.

The Grade 7 students of Cagbolo National Vocational High School in Magallanes, Sorsogon exhibit varying levels of reading comprehension, with some learners demonstrating adequate understanding of texts, while others experience difficulties in interpreting, analyzing, and drawing meaning from written materials. These challenges are commonly associated with limited vocabulary, insufficient reading practice, and gaps in foundational literacy skills. Similar studies conducted in Philippine secondary schools reveal that many Grade 7 learners perform at instructional or frustration levels, particularly in skills such as inferencing and contextual understanding. Given that reading comprehension is essential for understanding academic content across subjects, the observed variation in learners' abilities highlights the need for appropriate instructional support and supplementary learning materials to improve comprehension skills and overall academic performance.

Therefore, the researcher conducted research about the development and validation of supplementary learning materials on integers for Mathematics in Grade 7 students, incorporating Independent and Cooperative Learning (ICL) strategies. By aligning the materials with these approaches, the study aims to enhance students' conceptual understanding, engagement, and overall performance in Mathematics. This is through giving focus on improving the skills and knowledge of students in solving word problems particularly in the Operation of Integers. These

topics were chosen since they play a big part in Algebra. The study conducted by Domanais and Deri (2022) presents the learners' least mastered skills in Grade 7 Mathematics. These are the following: (a) comparing integers with other numbers such as whole numbers, fractions and decimals; (b) solving routine and non-routine problems involving addition or subtraction of fractions using appropriate problem-solving skills; (c) performing two or more operations on whole numbers without or with exponents, and grouping symbols and (4) finding the percentage/ rate/ percent in a given problem. Learning these topics helped the students understand not only integers but also other branches of Mathematics which involve and require same skills, application and concept of the said competencies. Also, based on the test conducted, these topics were determined to be the least learned learning competencies. This intervention was different from other interventions because this developed instructional material was full of learning activities such as giving examples of translating mathematical phrases into verbal phrases and vice versa and the fundamental operations on integers and solving word problems.

Objective - The study aimed to develop and validate the supplementary learning material on Integers for Grade 7 Mathematics students at Cagbolo National Vocational High School for the School Year 2023–2024. Specifically, it aimed to: 1) develop a Supplementary Learning Material on Integers with the integration of the following: a. contextualization, b. independent learning, and c. articles for reading comprehension; 2) determine the validity of the developed material along: a. content, b. format, c. presentation and organization, and d. accuracy and up-to-datedness of information; 3) determine the effectiveness of the developed material in enhancing the performance in integers of the following groups of students: a. high performing group (HPG), and b. low performing group (LPG); and 4) propose an enhanced supplementary learning material on integers.

2. Methodology

This section presents the research methodology of the study, including the research design, population and sample, research instrument, data collection procedure, and data analysis procedure.

Research Design - This study aimed to develop and validate the supplementary learning material (SLM) on Integers for Grade 7 Mathematics students at Cagbolo National Vocational High School for school year 2023-2024. In designing the Supplementary Learning Material on Integers, the study is anchored on the integration of contextualized learning activities, independent learning tasks, and reading comprehension articles. As emphasized by Tomlinson, B. (2020) in his study, well-designed supplementary learning materials should facilitate learner autonomy, situate lessons in real-life contexts, and strengthen comprehension through structured reading inputs. Hence, the material developed in this study incorporates these features to enhance students' conceptual understanding of integers. The teacher-made test and the developed SLM served as the instrument. This study employed the percentage, weighted mean and paired t-test in the analysis and interpretation of the result. The study also employed the two-group pre-test– post-test design to test the effectiveness of reading comprehension in solving Mathematics word problems using the supplementary learning material developed by the researcher.

The Sample - The respondents were the Grade VII students of Cagbolo National Vocational High School of the school year 2023-2024. Each group was identified as the low performing group and the high performing group. The result of their scores on 18-item test on integer used to classify the high performing group (HPG) from Low Performing Group (LPG). There is only one section for Grade VII but they were classified into two groups consisting of 18 and 14 students respectively. Students were identified by the teacher in their scores. The scores from 0-9 is classified as LPG while the scores of 10-18 classified as HPG.

Table 1
The Respondents

GROUP	FREQUENCY	PERCENTAGE
Low Performing Group	18	56.25%
High Performing Group	14	43.75%
TOTAL	32	100%

The table shows that most of the respondents belong to the low performing group, comprising 56.25% of the

total population. This indicates that most participants demonstrate lower levels of performance based on the criteria used in the study. On the other hand, the high performing group accounts for only 43.75% of the respondents, suggesting that fewer participants exhibit higher levels of performance.

The Instrument - The instruments used in this study included a researcher-made pretest and posttest, the developed supplementary learning material (SLM), an evaluation rating sheet for print resources adapted from the Department of Education Learning Resource Management and Development System (DepEd LRMDS), and an open-ended questionnaire for the evaluators to assess the integration of the contextualization, independent learning and articles for reading comprehension. The researcher-made pretest and posttest were utilized to determine the performance of the Grade 7 students before and after the utilization of the developed supplementary learning material. These tests measured the students' understanding of the lessons in Integers, reading comprehension, and mathematical problem-solving skills. The developed supplementary learning material served as the main instructional material of the study. It contained contextualized mathematical situations, reading comprehension activities, problem-solving exercises, and independent learning tasks designed to address the least learned competencies in Integers. To evaluate the quality and acceptability of the developed material, an evaluation rating sheet for print resources adapted from the DepEd LRMDS was used. This instrument assessed the content quality, instructional quality, technical quality, and other relevant components of the supplementary learning material. Furthermore, an open-ended questionnaire was administered to the evaluators to gather comments and suggestions regarding the contextualization, independent learning activities, and reading comprehension articles included in the supplementary learning material. The responses from the evaluators served as the basis for the revision and improvement of the material.

Data Collection Procedures - Prior to data collection, the researcher secured approval from the school head, the teachers involved, and the parents of the Grade 7 students. Baseline data were gathered through the results of a test on integer administered on September 20, 2023. These results were used to determine the students' performance levels and to classify them into low-performing and high-performing groups. Furthermore, the results of the item analysis were obtained to identify the least learned competencies. Through contextual analysis, the prerequisite learning competencies aligned with the content standard were also identified. Based on the identified least learned and prerequisite competencies, the researcher designed the intervention in the form of a Mathematics handbook. A 10-item test focusing on reading comprehension and solving mathematical word problems was also prepared to assess students' understanding of the prerequisite competencies.

The intervention was implemented during the ICL period, with the mathematics handbook utilized for one hour every Friday. The pre-test results served as the basis for grouping the students. Their responses were manually checked and analyzed using a mean profile template. During the intervention period, the 10-item test on reading comprehension and problem-solving was also administered to both groups to further assess their skills. A post-test was conducted on January 24, 2023, to measure the effectiveness of the intervention. Students' answers were checked using a key to correction, and the results were recorded, tabulated, analyzed, and interpreted. The findings from both the pre-test and post-test, as well as the reading comprehension assessment, were used to evaluate improvements in students' performance and to determine the effectiveness of the contextualized Mathematics handbook in enhancing independent learning.

Data Analysis and Procedure - The data gathered in this study were systematically analyzed in accordance with the specific problems stated, focusing on the development, validity, and effectiveness of the supplementary learning material on integers. The development of the supplementary learning material was based on the principles of contextualization, independent learning and articles for reading comprehension. To determine the validity of the material, it was evaluated by selected experts using an Evaluation Rating Sheet for PRINT Resources from DepEd LRMDS that covers the four (4) factors such as content, format, presentation and organization, and accuracy and up-to-datedness of information. Each factor has an evaluation criterion. The rating of five experts were reported using the descriptors as identified DepEd LRMDS. The results were interpreted using the following descriptive scale: *Numerical Rating Descriptive Rating* - 3.50 – 4.00 Very Satisfactory (VS), 2.50 – 3.49 Satisfactory (S), 1.50

– 2.49 Fair (F), and 1.00 – 1.49 Poor (P). Likewise, from the study of Ariate, C. (2023), accuracy was validated by the experts using the same instrument with the scale to wit: *Numerical Rating Descriptive Rating* - 3.50 – 4.00 Not Present, 2.50 – 3.49 Present but very minor & must be fixed, 1.50 – 2.49 Present & requires major redevelopment, and 1.00 – 1.49 Poor/Do not evaluate further.

The Acceptability of the Supplementary Learning Material

FACTOR	Minimum Required Points to Pass	Maximum Points	Remarks
Content	21.00	28.00	PASSED
Format	54.00	72.00	PASSED
Presentation and Organization	15.00	20.00	PASSED
Accuracy and Up-to-datedness of Information	24.00	24.00	PASSED

The evaluation results presented in the table reflect a favorable assessment of the supplementary learning material, as it met or exceeded the minimum required standards across all key evaluation criteria, earning "PASSED" remark in every category. All qualitative comments and suggestions from the evaluators were also considered and used as a basis for revising and improving the material prior to implementation. The effectiveness of the supplementary learning material in enhancing reading comprehension and problem-solving skills was determined using a pre-test and post-test design involving the groups of students (low-performing and high-performing groups). Both groups were given a *pretest* prior to the implementation of the material and a *posttest* after the intervention. To analyze the differences in performance, the statistical tools employed weighted mean, paired sample t-test, and effect Size (Cohen's d). The scores were transformed into transmuted grades using the DepEd order no.8, series of 2015, also known as Policy Guidelines on Classroom Assessment for the K to 12 Basic Education Program. The percentage scores in the pre-test and post-test of the two groups were reported using the descriptors as identified in the same DepEd order. *Performance Level (PL) Description* - 90 – 100 Outstanding (O), 85 – 89 Very Satisfactory (VS), 80 – 84 Satisfactory (S), 75 – 79 Fairly Satisfactory (FS), and 74 and below Did not meet expectations (DNME).

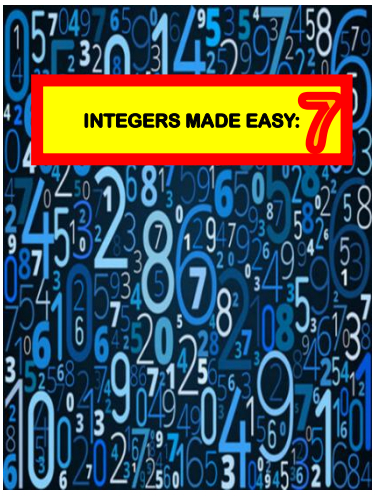
3. Result and Discussion

This section presents the findings, analysis, and interpretation of the data gathered from the respondents. Tables are provided for clearer presentation of the results. The data are presented based on the sequence of the study's problems: (1) the development of the Supplementary Learning Material (SLM); (2) the validity of the developed material in terms of content, format, presentation and organization, and accuracy and up-to-datedness of information; (3) the effectiveness of the material in enhancing students' performance in integers among the High-Performing Group (HPG) and Low-Performing Group (LPG); and (4) the proposed enhanced supplementary learning material on Integers.

3.1 The development of Supplementary Learning Material (SLM) with the integration of contextualization, independent learning and reading comprehension articles.

Integers Made Easy: A Math Handbook for Grade Seven was developed with the goal of transforming students' perceptions of Mathematics particularly integers into something approachable, meaningful, and even enjoyable. This will help the students build new mathematical knowledge through the guided exploration of patterns in word problems which are solidly based on the real-world. This handbook is designed with three features: contextualization, independent learning and reading comprehension articles. By connecting mathematical concepts to real-life situations, learners are able to see the relevance of integers in their daily experiences—whether in measuring temperature changes, managing finances, or understanding elevation. Through contextualized examples and activities, students are encouraged to think critically and apply their knowledge beyond the classroom. This material provides clear explanations, step-by-step procedures, guided examples, and practice exercises that allow students to learn at their own pace. It is structured to build confidence, encourage self-discovery, and develop problem-solving skills essential for lifelong learning.

Plate 1 – Cover Page of the Mathematics handbook

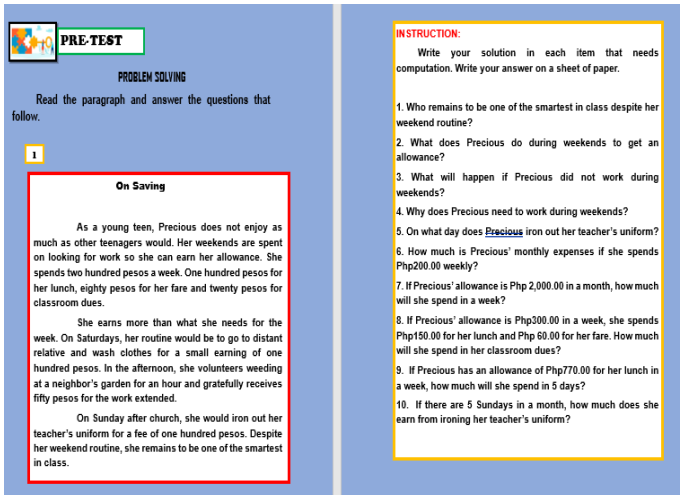


The developed supplementary learning material included the following parts: (a) pre-test for integers and problem solving, (b) integers concepts and pre-requisite competencies, illustrative examples, (c) word problems with contextualized examples, independent learning activities and articles for reading comprehension and (d) posttest. For illustrative purposes, the parts of the developed supplementary learning material on integers for Mathematics 7 is presented below:

Plate 2 - Parts of Supplementary Learning Material on Integers for Mathematics 7

A. Pre-test

Mathematics handbook included a test on integer to assess prior knowledge of integers and problem-solving skills, featuring real-life scenarios such as On Saving and Akiya's Birthday Party.


PRE-TEST

PROBLEM SOLVING

Read the paragraph and answer the questions that follow.

1

On Saving

As a young teen, Precious does not enjoy as much as other teenagers would. Her weekends are spent on looking for work so she can earn her allowance. She spends two hundred pesos a week. One hundred pesos for her lunch, eighty pesos for her fare and twenty pesos for classroom dues.

She earns more than what she needs for the week. On Saturdays, her routine would be to go to distant relative and wash clothes for a small earning of one hundred pesos. In the afternoon, she volunteers weeding at a neighbor's garden for an hour and gratefully receives fifty pesos for the work extended.

On Sunday after church, she would iron out her teacher's uniform for a fee of one hundred pesos. Despite her weekend routine, she remains to be one of the smartest in class.

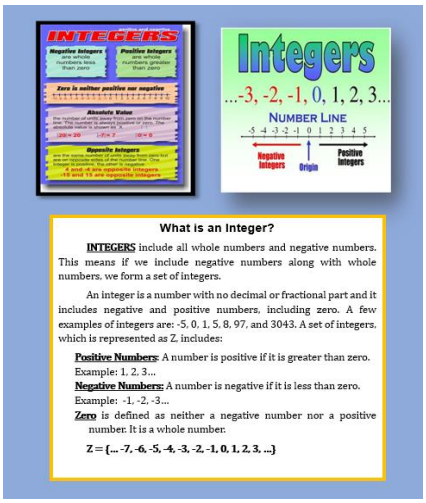
INSTRUCTION:

Write your solution in each item that needs computation. Write your answer on a sheet of paper.

1. Who remains to be one of the smartest in class despite her weekend routine?
2. What does Precious do during weekends to get an allowance?
3. What will happen if Precious did not work during weekends?
4. Why does Precious need to work during weekends?
5. On what day does Precious iron out her teacher's uniform?
6. How much is Precious' monthly expenses if she spends Php200.00 weekly?
7. If Precious' allowance is Php 2,000.00 in a month, how much will she spend in a week?
8. If Precious' allowance is Php300.00 in a week, she spends Php150.00 for her lunch and Php 60.00 for her fare. How much will she spend in her classroom dues?
9. If Precious has an allowance of Php770.00 for her lunch in a week, how much will she spend in 5 days?
10. If there are 5 Sundays in a month, how much does she earn from ironing her teacher's uniform?

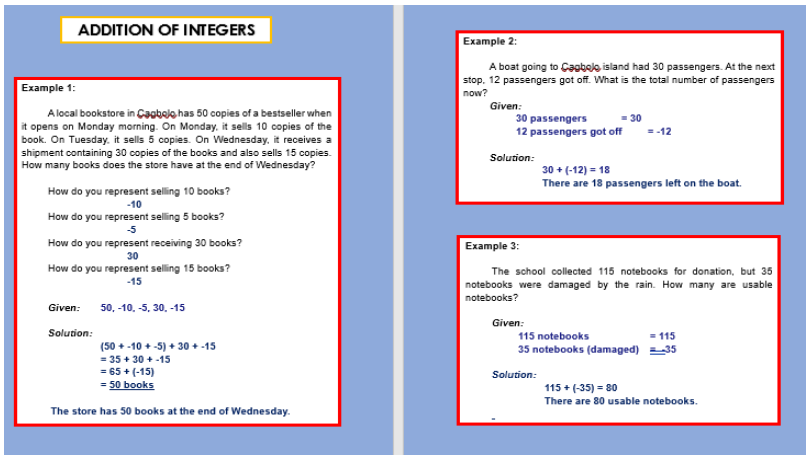
B. Definition of Integers

The core content introduced the definition of integers and their representation on a number line, followed by detailed discussions of the four fundamental operations: addition, subtraction, multiplication and division of integers, each explained with clear progression. It then focuses on translating mathematical phrases into symbols, identifying clues for solving integer word problems, and includes guided activities to reinforce these skills.



C. Illustrative Examples:

Separate sections present word problems categorized by each operation, helping learners apply concepts to practical situations.



ADDITION OF INTEGERS

Example 1:

A local bookstore in Cagbolo has 50 copies of a bestseller when it opens on Monday morning. On Monday, it sells 10 copies of the book. On Tuesday, it sells 5 copies. On Wednesday, it receives a shipment containing 30 copies of the books and also sells 15 copies. How many books does the store have at the end of Wednesday?

How do you represent selling 10 books?
-10
How do you represent selling 5 books?
-5
How do you represent receiving 30 books?
30
How do you represent selling 15 books?
-15

Given: 50, -10, -5, 30, -15

Solution:
(50 + -10 + -5) + 30 + -15
= 35 + 30 + -15
= 65 + (-15)
= 50 books

The store has 50 books at the end of Wednesday.

Example 2:

A boat going to Cagbolo island had 30 passengers. At the next stop, 12 passengers got off. What is the total number of passengers now?

Given:
30 passengers = 30
12 passengers got off = -12

Solution:
30 + (-12) = 18
There are 18 passengers left on the boat.

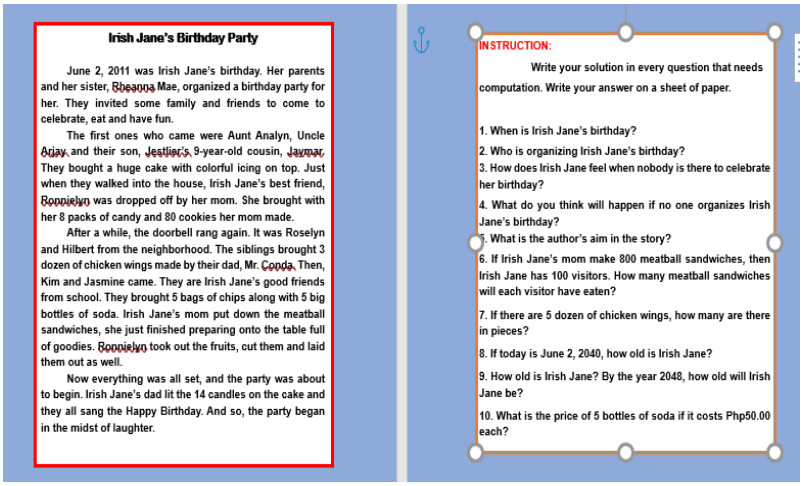
Example 3:

The school collected 115 notebooks for donation, but 35 notebooks were damaged by the rain. How many are usable notebooks?

Given:
115 notebooks = 115
35 notebooks (damaged) = -35

Solution:
115 + (-35) = 80
There are 80 usable notebooks.

D. Post-test



Irish Jane's Birthday Party

June 2, 2011 was Irish Jane's birthday. Her parents and her sister, Rheanna Mae, organized a birthday party for her. They invited some family and friends to come to celebrate, eat and have fun.

The first ones who came were Aunt Analyn, Uncle Arjay and their son, Jestlier's 9-year-old cousin, Jaymar. They bought a huge cake with colorful icing on top. Just when they walked into the house, Irish Jane's best friend, Ronnielyn was dropped off by her mom. She brought with her 8 packs of candy and 80 cookies her mom made.

After a while, the doorbell rang again. It was Roselyn and Hilbert from the neighborhood. The siblings brought 3 dozen of chicken wings made by their dad, Mr. Conda. Then, Kim and Jasmine came. They are Irish Jane's good friends from school. They brought 5 bags of chips along with 5 big bottles of soda. Irish Jane's mom put down the meatball sandwiches, she just finished preparing onto the table full of goodies. Ronnielyn took out the fruits, cut them and laid them out as well.

Now everything was all set, and the party was about to begin. Irish Jane's dad lit the 14 candles on the cake and they all sang the Happy Birthday. And so, the party began in the midst of laughter.

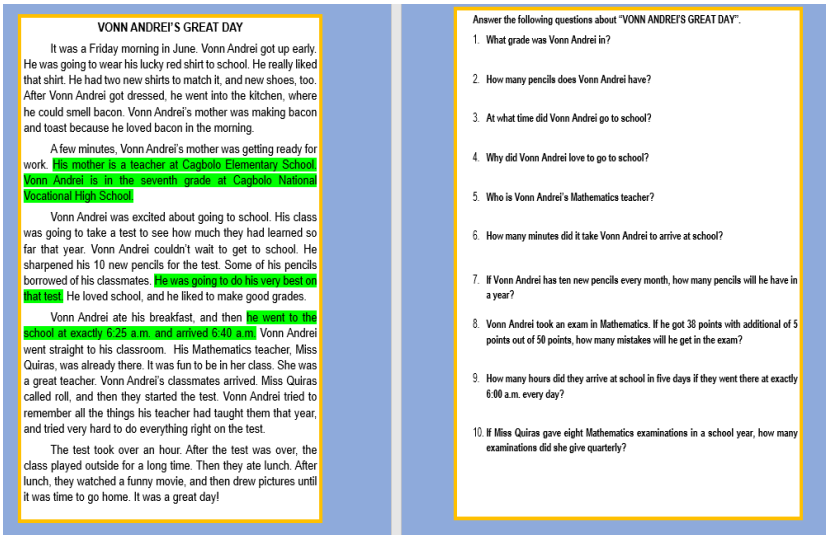
INSTRUCTION:

Write your solution in every question that needs computation. Write your answer on a sheet of paper.

1. When is Irish Jane's birthday?
2. Who is organizing Irish Jane's birthday?
3. How does Irish Jane feel when nobody is there to celebrate her birthday?
4. What do you think will happen if no one organizes Irish Jane's birthday?
5. What is the author's aim in the story?
6. If Irish Jane's mom make 800 meatball sandwiches, then Irish Jane has 100 visitors. How many meatball sandwiches will each visitor have eaten?
7. If there are 5 dozen of chicken wings, how many are there in pieces?
8. If today is June 2, 2040, how old is Irish Jane?
9. How old is Irish Jane? By the year 2048, how old will Irish Jane be?
10. What is the price of 5 bottles of soda if it costs Php50.00 each?

It also included the post-test that determined what the learners have actually learned and retained compared to what they knew before the lesson.

Plate 3 – Contextualized Examples in Mathematics Handbook



VONN ANDREI'S GREAT DAY

It was a Friday morning in June. Vonn Andrei got up early. He was going to wear his lucky red shirt to school. He really liked that shirt. He had two new shirts to match it, and new shoes, too. After Vonn Andrei got dressed, he went into the kitchen, where he could smell bacon. Vonn Andrei's mother was making bacon and toast because he loved bacon in the morning.

A few minutes, Vonn Andrei's mother was getting ready for work. His mother is a teacher at Cagbolo Elementary School. Vonn Andrei is in the seventh grade at Cagbolo National Vocational High School.

Vonn Andrei was excited about going to school. His class was going to take a test to see how much they had learned so far that year. Vonn Andrei couldn't wait to get to school. He sharpened his 10 new pencils for the test. Some of his pencils borrowed of his classmates. He was going to do his very best on that test. He loved school, and he liked to make good grades.

Vonn Andrei ate his breakfast, and then he went to the school at exactly 6:25 a.m. and arrived 6:40 a.m. Vonn Andrei went straight to his classroom. His Mathematics teacher, Miss Quiras, was already there. It was fun to be in her class. She was a great teacher. Vonn Andrei's classmates arrived. Miss Quiras called roll, and then they started the test. Vonn Andrei tried to remember all the things his teacher had taught them that year, and tried very hard to do everything right on the test.

The test took over an hour. After the test was over, the class played outside for a long time. Then they ate lunch. After lunch, they watched a funny movie, and then drew pictures until it was time to go home. It was a great day!

Answer the following questions about "VONN ANDREI'S GREAT DAY".

1. What grade was Vonn Andrei in?
2. How many pencils does Vonn Andrei have?
3. At what time did Vonn Andrei go to school?
4. Why did Vonn Andrei love to go to school?
5. Who is Vonn Andrei's Mathematics teacher?
6. How many minutes did it take Vonn Andrei to arrive at school?
7. If Vonn Andrei has ten new pencils every month, how many pencils will he have in a year?
8. Vonn Andrei took an exam in Mathematics. If he got 38 points with additional of 5 points out of 50 points, how many mistakes will he get in the exam?
9. How many hours did they arrive at school in five days if they went there at exactly 6:00 a.m. every day?
10. If Miss Quiras gave eight Mathematics examinations in a school year, how many examinations did she give quarterly?

To make learning meaningful, the handbook incorporates story-based problems titled *A Good Student*, *A Life of a Fisherman, Vonn Andrei's Great Day, and The Good Fight*, connecting integers to everyday experiences. Pots-tests with parallel scenarios – *On Saving and Irish Jane's Birthday Party*- are included to measure learning progress, followed by an answer key for self-checking, a glossary of key terms, a list of references. The development of the Supplementary Learning Material (SLM) was guided by the need to provide learners with relevant, accessible, and meaningful instructional resources. The materials were carefully designed to integrate contextualized examples that reflect real-life situations familiar to the learners, thereby making the lessons more relatable and easier to understand. This approach supports the principle that learning becomes more effective when students can connect new knowledge to their existing experiences.

Plate 4 – Independent Learning in Mathematics Handbook

The supplementary learning material emphasized independent learning by incorporating self-directed activities, guided questions, and exercises that allow learners to work at their own pace. It is also considered as independent learning because each reading material is provided with answer key and reflection. This structure encourages learners to take responsibility for their own learning process, fostering autonomy and critical thinking skills. The inclusion of clear instructions and organized content also ensures that students can navigate the material without constant teacher supervision. In the study of Dio, R. (2022), the independent learning modalities with the utilization of the digital module brought some big adjustments on the part of the students such as time management skills, need for immediate feedback mechanism, and limited interactions with teachers and classmates.

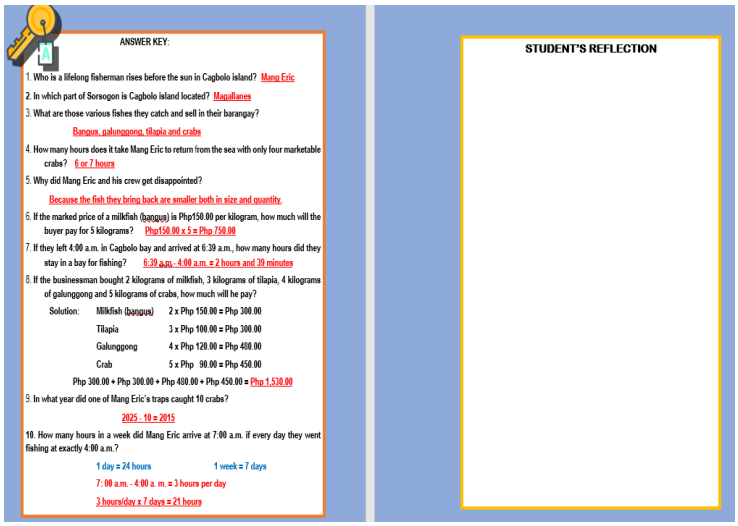
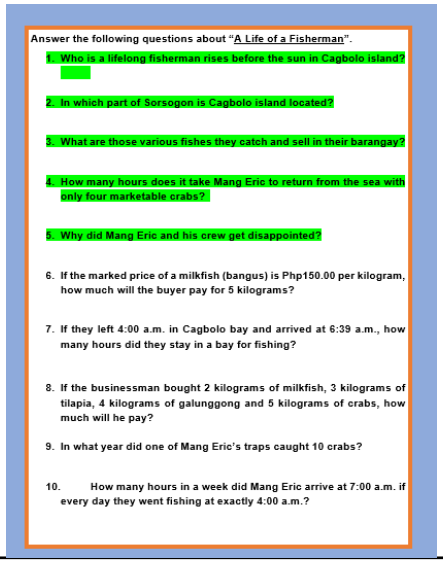


Plate 5 – Articles for Reading Comprehension in Mathematics Handbook



Reading comprehension articles were included as part of the SLM to enhance learners' literacy skills and comprehension abilities. These articles were selected and/or developed based on their relevance to the learners' context and cognitive level. Accompanying activities were provided to assess understanding, analyze content, and develop higher-order thinking skills such as interpretation, inference, and evaluation.

A. Contextualization

Table 1A shows the development of supplementary learning material with the integration of contextualization. It demonstrates that contextualization is not merely an instructional strategy but a powerful approach that makes mathematics accessible and meaningful, integrates values and life skills, supports independent learning and reading comprehension and improves retention and transfer of learning. The findings imply that making learning materials fit the learners' own culture and daily life makes them very useful and important tools for teaching and learning. These materials help students understand lessons better, find meaning in what they study, and actually enjoy learning.

Table 1A

The Development of Supplementary Learning Material with the integration of Contextualization

Title of the Reading Material	Description	Excerpts of Contextualization
A Good Student	Designed to embed integer concepts within a relatable, real-life scenario set in a local Philippine setting- featuring elements like a coconut farm in Cagbolo, the Philippine peso and common daily experiences such as studying by candlelight during power outages.	Cultural and Local Context *"Paul Jeric's father was a farmer. They had a coconut farm in Cagbolo. Neil was from a poor family where sometimes they do not have even sufficient food to eat."* *"Sometimes if electricity was not available, he even tried to study in candlelight."* Numerical and Mathematical Context *"The half-yearly examination will be conducted within 20 days."* *"That person asked him for the money worth Php500 every day for the next 20 days."*
A Life of a Fisherman	Teaches integers through real-life narratives; rooted in the local setting of Magallanes and Cagbolo island; the story centers on a fisherman whose work is described not just as a job but as part of his Filipino cultural identity	Cultural and Local Context *"In the beautiful island of Magallanes, Mang Eric, a lifelong fisherman rises before the sun in Cagbolo island."* Numerical and Mathematical Context *"10 years ago, one of his traps may have caught 10 crabs. Now, only one in 10 catches a single crab."*
Vonn Andrei's Great Day	This story designed to teach integers through relatable, real-life situations; set in the local community of Cagbolo, it follows Vonn Andrei, a Grade 7 student at Cagbolo NVHS, whose mother works as a teacher at Cagbolo ES- rooting the narrative in familiar educational and community settings. The narrative highlights values like preparation, effort, love for learning, and enjoying time with classmates, while the local setting, school names, and daily routines make abstract mathematical ideas meaningful and connected to the learners' own lives and environment.	Cultural and Local Context *"His mother is a teacher at Cagbolo Elementary School. Vonn Andrei is in the seventh grade at Cagbolo National Vocational High School."* Numerical and Mathematical Context *"went to the school at exactly 6:25 a.m. and arrived 6:40 a.m."* Narrative and Value-Based Context *"He was going to do his very best on that test."*
The Good Fight	This is the final anecdote in the handbook framed as a lesson in a Social Studies class taught by Mrs. Sacupon, teacher in Cagbolo NVHS. It is designed as a contextualized Mathematics activity: it includes specific dates, times, durations, events, and references to positions and numbers.	Historical and Cultural Context *"It was a Friday morning when Mrs. Sacupon, a social study teacher tells a story in her class about General MacArthur."* Numerical, Time and Event-Based Context *"Mrs. Sacupon asked ten questions from her students."* – specific number

The findings imply that making learning materials fit the learners' own culture and daily life makes them very useful and important tools for teaching and learning. These materials help students understand lessons better, find meaning in what they study, and actually enjoy learning. They also help learners appreciate their own identity and community, while teaching good values like hard work, respect, and resilience. At the same time, these SLM follow what the education curriculum requires, so they are exactly what students and teachers need. They also serve as a good example that others can follow when creating new learning materials in the future. Literature from the Philippine context also highlights the role of indigenous and contextually relevant instructional materials in language and content instruction (Angelino & Matronillo, 2020). School administrators are urged to facilitate Learning Action Cell (LAC) sessions focused on creating materials that are rooted in local culture and community, aligning closely with the principle of contextualization.

In a study conducted by Hiebert, J.,et.al. (1997) about Making Sense: Teaching and Learning Mathematics with Understanding, this study established that understanding in Mathematics develops only when students work on tasks that are personally meaningful and connected to what they already know. Liwag, R. (2018) research study focused on students in fishing and farming communities, similar to the locale of the study (Cagbolo, Magallanes). She developed materials using fishing, farming, and market scenarios and found that mastery level in operations on integers increased from 42% to 77% after using the localized materials. She concluded that using livelihood-related contexts is the most effective way to teach number concepts in rural Philippine schools.

B. Independent Learning

Table 1B shows the development of supplementary learning material with the integration of independent learning. The integration of independent learning demonstrates that learners become active constructors of knowledge, Mathematics become accessible and meaningful, holistic development is achieved, and education becomes sustainable.

Table 1B

The Development of Supplementary Learning Material with the integration of Independent Learning

Title of the Reading Material	Description	Independent Learning Tasks
A Good Student	Through reading and analyzing the text, learners independently identify problems, compare choices, predict outcomes, and draw conclusions about values, responsibility, and consequences. The story includes numerical details (20 days, Php 500 daily) that learners can examine on their own to understand integer concepts like repeated addition, subtraction, and total amounts.	Students are tasked to answer the written questions by their own sentence. (Page 33 of SLM) Instead of the teacher marking the work, learners use answer key as a guide to audit their own thinking. (Page 34 of SLM) To make reflection actionable, students classify their errors using a simple framework. (Page 35 of SLM)
A Life of a Fisherman	It is designed as an independent learning resource that allows learners to explore mathematical concepts, cultural values and life lessons at their own pace and without direct teacher instruction.	Students are tasked to answer the written questions by their own sentence. (Page 38 of SLM) Instead of the teacher marking the work, learners use answer key as a guide to audit their own thinking. (Page 39 of SLM) To make reflection actionable, students classify their errors using a simple framework. (Page 40 of SLM)
Vonn Andrei's Great Day	The story highlights positive habits: preparation, eagerness to learn, doing one's best, and enjoying time with classmates. Through individual reading and reflection, students observe these behaviors, connect them to their own school experiences, and internalize values that support self-directed learning.	Students are tasked to answer the written questions by their own sentence. (Page 42 of SLM) Instead of the teacher marking the work, learners use answer key as a guide to audit their own thinking. (Page 43 of SLM) To make reflection actionable, students classify their errors using a simple framework. (Page 44 of SLM)

The Good Fight	It is designed as an independent learning resource that blends Mathematics, History, and Social Studies. Learners engage independently by reading, interpreting facts, ordering events, calculating time intervals and analyzing numerical and historical information on their own – without needing direct instruction.	Students are tasked to answer the written questions by their own sentence. (Page 46 of SLM) Instead of the teacher marking the work, learners use answer key as a guide to audit their own thinking. (Page 4 of SLM7) To make reflection actionable, students classify their errors using a simple framework. (Page 48 of SLM)

The results implied that this supplementary learning material works very well as tools for independent learning. They guide students to study and figure things out on their own, while also helping them develop good values, understand lessons much better, and see how what they learn applies to real life. For teachers, they make teaching more effective and focus more on what the students actually need. For those who create learning resources, they serve as a clear example of how to make materials that are relevant, easy to use, and truly helpful to learners. In the study of Dizon, R. (2019) about Independent Reading-Based Activities in Mathematics, results showed that independent reading-math activities improved reading comprehension, mathematical proficiency, and self-confidence. The study noted that stories set in local culture were the most effective in promoting independent thinking.

In a study very similar to the present one proposed by Alibudbud, R. (2021), materials for integers were developed and tested. Results showed that the independent learning approach was highly acceptable, and students exposed to it had significantly higher post-test scores and better retention compared to traditional methods. According to Panadero (2017), self-regulated learning models emphasize the learner's ability to monitor, regulate, and control their cognition, motivation, and behavior. Supplementary materials that include self-assessments, guided practice, and reflection prompts naturally scaffold this self-regulation, allowing students to take charge of their own academic progress.

C. Articles for Reading Comprehension

Table 1C shows the development of supplementary learning material with the integration of articles of reading comprehension. The use of stories followed by questions ranging from literal recall to analysis and application proves that reading and mathematics are interconnected skills.

Table 1C

The Development of Supplementary Learning Material with the integration of articles for Reading Comprehension

Title of the Reading Material	Description
A Good Student	It is designed to measure and develop reading comprehension skills, ranging from literal recall of details, interpretation of information, to application and analysis of mathematical concepts embedded in the text. The questions guide learners go to through the text to find specific facts, understand the characters and events, and use the information obtained to perform integer operations.
A Life of a Fisherman	It requires learners to scan and read the text carefully to locate specific details such as names, places, kinds of fish, time durations, prices, and changes in catch over time.
Vonn Andrei's Great Day	Learners are guided to read the text to find specific information such as grade level, number of items, names, times, and reasons, then use those details to perform operations.
The Good Fight	Challenges reading comprehension with expository and historical text; learners independently identify facts, understand formal language, follow logical flow, interpret dates and events, and analyze complex ideas such as duty, identity and decision-making

The results imply that learners who can read and interpret text accurately are better able to identify what is being asked, extract necessary data, and perform the correct operations. The progression of question (from "Who/ What/ Where" to "Calculate/Solve/ Explain") demonstrates that reading comprehension skills can be systematically developed alongside mathematical skills. This debunks the misconception that "reading is only for English or Filipino subjects"; rather, reading is essential for understanding and solving word problems in Mathematics. In a study of Guthrie,et.al (2004), students who read content-rich articles and answer sequenced questions (from recall to application) show significantly higher achievement in both reading and the subject area

(e.g., Math/History) compared to those who only do isolated exercises. This study supports the design of articles and ten items progressive questions.

According to Bernardo (2005) in his study *Language and Reading Factors in Mathematics Problem Solving*, the primary difficulty encountered by Filipino students in solving mathematical word problems is not a lack of computational skill, but rather a deficiency in reading comprehension. The findings revealed that students frequently fail to arrive at correct answers because they are unable to accurately interpret or understand what the problem states or requires. This finding directly justifies the focus of the present study, as the integration of Articles for Reading Comprehension serves as a strategic solution to this exact issue. By designing activities that guide learners to read carefully, extract information, and interpret meaning before performing operations, the supplementary material explicitly trains students to prioritize understanding the text.

3.2 The validity of the developed material along content, format, presentation and organization, and accuracy and up-to-datedness of information.

The measurement of validity is significant before the reproduction of the SLM to ensure its readiness for utilization. This study used the DepEd LRMDS Evaluation Sheet for Print Resources to obtain the validity on the different aspects of the SLM. The evaluation tool includes four factors namely: a. Content; b. Format; c. Presentation and Organization; and d. Accuracy and Up-to-datedness of Information. The researcher also included supplementary criteria labeled as "Other Factors" to evaluate features and characteristics of the material – such as contextualization, integration of values, and suitability for independent learning in which are not covered by the standard four factors but are essential to the quality and effectiveness of the resource.

A. Content

Table 2a
Validators' Evaluation Score along Content

Indicators	Mean	DR
1. Content is suitable to the student's level of development.	3.60	VS
2. Material contributes to the achievement of specific objectives of the subject area and grade/year level for which it is intended.	4.00	VS
3. Material provides for the development of higher cognitive skills such as critical thinking, creativity, learning by doing, inquiry, problem solving, etc.	4.00	VS
4. Material is free of ideological, cultural, religious, racial and gender biases and prejudices.	4.00	VS
5. Material enhances the development of desirable values and traits such as: (Put a check mark only to the applicable values and traits)	3.80	VS
6. Material has the potential to arouse the interest of target reader.	3.80	VS
7. Adequate warning/cautionary notes are provided in topics and activities were safety and health are of concern.	3.60	VS
Total Points	26.80	Passed

Legend: DR – Descriptive Rating VS – Very Satisfactory

The findings indicate that all indicators received a descriptive rating of "Very Satisfactory (VS)," which means that the instructional material met the required standards for content quality and effectiveness. Indicators 2, 3, and 4 obtained the highest mean score of 4.00, suggesting that the material effectively supports the achievement of learning objectives, develops higher cognitive skills, and remains free from ideological, cultural, religious, racial, and gender biases.

On the other hand, Indicators 1 and 7 obtained the lowest mean score of 3.60, although still verbally interpreted as "Very Satisfactory." This suggests that the content is generally appropriate to the students' developmental level and includes adequate safety and cautionary notes, but validators may have observed aspects that could still be enhanced. Indicators 5 and 6 received a mean score of 3.80, indicating that the material effectively promotes desirable values and traits and has the capacity to stimulate the interest of the target readers. Overall, the total score of 26.80 with a descriptive rating of "Passed" indicates that the material is acceptable and suitable for classroom use. The results imply that the developed instructional material is educationally sound and aligned with the

objectives of quality teaching and learning. The high ratings in achieving subject objectives and promoting higher-order thinking skills demonstrate that the material may contribute significantly to the enhancement of students' critical thinking, creativity, inquiry, and problem-solving abilities. This supports the idea that effective instructional materials should encourage active and meaningful learning experiences rather than mere memorization.

Moreover, the validators' assessment that the material is free from biases and prejudices highlights its inclusivity and appropriateness for diverse groups of learners. This is important in promoting equality, respect, and fairness within the educational environment. The positive ratings on the development of desirable values and the ability to arouse learners' interest further suggest that the material may help improve student engagement and character formation. However, the relatively lower ratings on developmental suitability and safety or cautionary notes indicate the need for further refinement in adapting the material more closely to learners' abilities and ensuring clearer safety guidance in activities where health and safety are involved. Despite these minor areas for improvement, the overall findings confirm that the instructional material has strong potential for effective classroom implementation and learner development.

According to Department of Education (2023) learning resource standards, quality instructional materials should align with curriculum competencies, promote values formation, and ensure learner safety. The "Passed" rating of the material demonstrates compliance with these educational standards. Research by Chao (2021) underscores that when instructional materials are carefully tailored to the learner's developmental level, comprehension rates and student self-efficacy improve significantly. A study by Olayinka (2016) demonstrated that instructional materials explicitly structured around specific course objectives yield a direct positive impact on student academic achievement and mastery of skills compared to generic resources.

B. Format

Table 2b

Validators' Evaluation Score along Format

Indicators	Mean	DR
1. Prints	3.90	VS
2. Illustrations	3.60	VS
3. Design and Layout	3.65	VS
4. Paper and Binding	3.40	S
5. Size and Weight of Resource	4.00	VS
Total Points	18.55	Passed

Legend: DR – Descriptive Rating, VS – Very Satisfactory; S- Satisfactory

Table 2B presents the validators' evaluation scores along format. The results show that most indicators obtained a descriptive rating of "Very Satisfactory (VS)," indicating that the instructional material possesses an acceptable and effective format for its intended users. The indicator "Size and Weight of Resource" received the highest mean score of 4.00, suggesting that the material is convenient and manageable for students and teachers to use. The indicator "Prints" also received a high mean score of 3.90, which implies that the texts used in the material are readable and appropriately presented. Meanwhile, "Illustrations" and "Design and Layout" obtained mean scores of 3.60 and 3.65 respectively, indicating that the visual elements and arrangement of content are generally effective in supporting learners' understanding and engagement.

On the other hand, "Paper and Binding" received the lowest mean score of 3.40 with a descriptive rating of "Satisfactory (S)." This suggests that although the material is still acceptable, validators may have identified concerns regarding the durability or quality of the physical presentation of the resource. Overall, the total score of 18.55 with a descriptive rating of "Passed" indicates that the format of the instructional material is generally appropriate and acceptable for educational use. The findings imply that the instructional material is visually and physically suitable for classroom utilization. The high ratings in prints, illustrations, design, and resource size indicate that the material was developed with consideration for readability, accessibility, and learner engagement. These aspects are important because well-designed instructional materials can enhance students' interest, comprehension, and overall learning experience.

The excellent rating for the size and weight of the resource further suggests that the material is user-friendly and practical for everyday academic use. This may contribute to convenience among learners and teachers, especially during classroom activities and independent study. However, the lower rating received by "Paper and Binding" indicates a possible need for improvement in the physical durability and quality of the material. Since instructional resources are frequently handled and reused, stronger paper quality and binding may help ensure longer usability and reduce damage over time. Improving these aspects may increase the material's effectiveness and sustainability in educational settings. Overall, the results demonstrate that the instructional material meets the required formatting standards and has the potential to support effective teaching and learning, while also highlighting areas for enhancement in its physical construction.

Research conducted at the University of the Philippines (2022) highlighted that properly organized instructional materials with clear layout and design reduce learner confusion and increase engagement during classroom instruction. This supports the very satisfactory ratings obtained in design and layout. Deri et.al. (2021) revealed that visual appearance or packaging of the materials that met the standards of users, encouraged patronage and boost end-user's retention.

C. Presentation and Organization

Table 2c
Validators' Evaluation Score along Presentation and Organization

Indicators	Mean	DR
1. Presentation is engaging, interesting, and understandable.	3.80	VS
2. There is logical and smooth flow of ideas.	3.60	VS
3. Vocabulary level is adapted to target reader's likely experience and level of understanding.	4.00	VS
4. Length of sentences is suited to the comprehension level of the target reader.	3.60	VS
5. Sentences and paragraph structures are varied and interesting to the target reader.	3.60	VS
Total Points	18.60	Passed

Legend: DR – Descriptive Rating VS – Very Satisfactory

Table 2C presents the validators' evaluation scores along presentation and organization. The findings reveal that all indicators received a descriptive rating of "Very Satisfactory (VS)," which indicates that the instructional material is well-presented and properly organized for the intended learners. The indicator "Vocabulary level is adapted to target reader's likely experience and level of understanding" obtained the highest mean score of 4.00, suggesting that the words and terms used in the material are appropriate and easily understood by the target readers. Meanwhile, the indicator "Presentation is engaging, interesting, and understandable" received a mean score of 3.80, indicating that the material is capable of maintaining learners' attention and promoting comprehension. The indicators "There is logical and smooth flow of ideas," "Length of sentences is suited to the comprehension level of the target reader," and "Sentences and paragraph structures are varied and interesting to the target reader" all received a mean score of 3.60. These results imply that the organization and structure of the material are generally effective, although validators may have identified minor improvements that could further enhance clarity and readability.

Overall, the total score of 18.60 with a descriptive rating of "Passed" indicates that the presentation and organization of the instructional material are acceptable and suitable for educational use. The results imply that the instructional material was designed with consideration for learners' comprehension and engagement. The high rating for vocabulary-adaptation highlights the importance of using language that matches the learners' level of understanding, which may help improve reading comprehension and encourage active participation in learning activities. Furthermore, the positive evaluation of the material's presentation suggests that engaging and understandable content can contribute to increased learner motivation and interest. The logical flow of ideas and appropriate sentence structures also indicate that the material supports organized learning, enabling students to follow concepts more effectively and build understanding progressively. However, the slightly lower ratings in the flow of ideas, sentence length, and paragraph structure suggest that there may still be opportunities to improve coherence, readability, and variety in writing style. Refining these aspects could make the material more appealing and easier to understand for a wider range of learners.

Overall, the findings demonstrate that the instructional material possesses strong qualities in presentation and organization, making it a potentially effective tool for facilitating learning and improving students' educational experiences. This finding is heavily supported by Ambrose et al. (2020), who state that prioritizing appropriate lexical density and readability indices ensures that student cognitive capacity is spent on *schema acquisition* rather than linguistic decoding. Furthermore, Crossley (2020) notes that matching syntactic complexity (sentence length) to the reader's developmental age is a primary determinant of text processing speed and comprehension.

D. Accuracy and Up-to-datedness of Information

Table 2D

Validators' Evaluation Score along Accuracy and Up-to-datedness of Information

Indicators	Mean	DR
1. Conceptual errors	3.80	VS
2. Factual errors	4.00	VS
3. Grammatical errors	4.00	VS
4. Computational errors	3.80	VS
5. Obsolete information	4.00	VS
6. Typographical and other minor errors (e.g., inappropriate or unclear illustrations, missing labels, wrong captions, etc.).	4.00	VS
Total Points	23.60	Passed

Legend: DR – Descriptive Rating VS – Very Satisfactory

Table 2D presents the validators' evaluation scores along accuracy and up-to-datedness of information. The findings show that all indicators received a descriptive rating of "Very Satisfactory (VS)," indicating that the instructional material contains accurate, reliable, and updated information. Indicators on factual errors, grammatical errors, obsolete information, and typographical and other minor errors obtained the highest mean score of 4.00, which suggests that the material was carefully reviewed and prepared with minimal inaccuracies and errors. Meanwhile, the indicators on conceptual errors and computational errors received a mean score of 3.80, which still falls under the "Very Satisfactory" category. This implies that the concepts and computations presented in the material are generally correct and understandable, although validators may have noted minor areas that could still be improved for greater precision and clarity. Overall, the total score of 23.60 with a descriptive rating of "Passed" indicates that the instructional material meets the required standards for accuracy, correctness, and relevance of information, making it suitable for educational use.

The results imply that the instructional material is dependable and academically credible for classroom implementation. The high ratings in factual accuracy, grammatical correctness, and updated information suggest that the material can provide learners with reliable knowledge and minimize misconceptions during the learning process. Accurate and updated instructional resources are essential because they support effective teaching and help students develop correct understanding of concepts and information. Furthermore, the absence of significant typographical and minor errors reflects the careful preparation and quality control applied in the development of the material. This may contribute positively to learners' comprehension, since clear illustrations, labels, and captions can improve understanding and reduce confusion. Although conceptual and computational aspects also received very satisfactory ratings, their slightly lower mean scores indicate the need for continuous review and refinement to ensure maximum accuracy and precision. Strengthening these areas may further enhance the effectiveness and reliability of the instructional material. Overall, the findings demonstrate that the material possesses high standards of accuracy and relevance, which may contribute to improved learning outcomes, better comprehension, and increased trust in the instructional resource among both teachers and students.

The significance of instructional module development and validation in Organization and Management emerges from multiple considerations, such as curriculum innovation, instructional quality, and real-world relevance. Prior studies emphasize the value of well-crafted modules in promoting student engagement and learning effectiveness (Smith & Jones, 2018). In the broader context of ABM education, research findings from Johnson et al. (2019) and Lee & Kim (2020) show that properly structured instructional content leads to stronger comprehension and improved performance.

The LRMDS checklist is assessed for its effectiveness in addressing key aspects of resource management, while the researcher-made questionnaire is examined to ensure its questions accurately measure the acceptability of the instructional module. The validators provide detailed feedback, focusing on content accuracy, clarity, and the overall structure of the instruments. They identify any ambiguities or areas for improvement, particularly regarding the readability of the questionnaire and the usability of the checklist. The survey instrument validation rating scale developed by Oducado (2020) was used as a tool.

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3.3 Effectiveness of the developed material in enhancing the performance in integers of the following groups of students: high performing group (HPG) and low performing group (LPG)

Table 3A presented the performance of the students (HPG and LPG) in integers competencies in the Pre-test and Post-test scores.

Table 3A
Students' Performance on Integers in the Pre-test and Posttest

Group	Reading Comprehension and Problem Solving			
	Pre-Test PL	DR	Posttest PL	DR
High Performing Group (HPG)	55.54%	DNME	82.33%	S
Low Performing Group (LPG)	48.36%	DNME	80.17%	S
Over-all	51.95%	DNME	81.25%	S

PL – Performance Level DR – Descriptive Rating

Table 3A presents the students' performance on integers in the pre-test and posttest in High Performing Group (HPG) and Low Performing Group (LPG). The results reveal that both groups showed notable improvement after the implementation of the intervention or instructional strategy. The High Performing Group (HPG) obtained a pre-test performance level of 55.54% with a descriptive rating of DNME (Did Not Meet Expectations). This indicates that prior to the intervention, the students still had insufficient mastery of reading comprehension and problem-solving skills despite being classified as high-performing learners. However, during the posttest, their performance increased to 82.33% with a descriptive rating of S (Satisfactory). The substantial increase in scores suggests that the intervention effectively enhanced the students' comprehension abilities and critical thinking skills necessary for solving problems.

Similarly, the Low Performing Group (LPG) achieved a pre-test score of 48.36%, also described as DNME. This implies that the students initially struggled in understanding texts and applying problem-solving strategies. After the intervention, their posttest score increased significantly to 80.17%, with a descriptive rating of Satisfactory. The improvement demonstrates that the intervention was effective not only for high-performing students but also for learners who initially had lower academic performance. When taken together, the overall performance rose from 51.95% (DNME) in the pre-test to 81.25% (S) in the posttest of the students in performance on integers. These results clearly demonstrate that the intervention was effective not only for high performing group but also for those with initially lower academic performance.

The findings imply that appropriate instructional strategies can significantly improve students' reading comprehension and problem-solving skills regardless of their performance level. The increase in both groups' scores indicates that guided learning activities, comprehension-based instruction, and problem-solving exercises

may have contributed to the development of higher-order thinking skills. The results further suggest that students learn more effectively when they are exposed to interactive and meaningful learning experiences that allow them to analyze, interpret, and apply information. Moreover, the improvement in the Low Performing Group highlights the importance of providing adequate instructional support and differentiated learning opportunities. It suggests that struggling learners can achieve satisfactory performance when exposed to effective teaching approaches that address their specific learning needs.

According to Pearson (2002), explicit instruction in comprehension strategies significantly improves students' ability to understand texts and solve academic problems. Their research emphasized that teaching students how to identify key ideas, make inferences, and monitor understanding enhances academic achievement. Furthermore, the study aligns with the principles of differentiated instruction by Tomlinson (2003), who emphasized that varied instructional methods and learner-centered activities help students with different ability levels improve academically. The satisfactory posttest ratings of both HPG and LPG indicate that the intervention successfully addressed the diverse learning needs of the students.

As a result, Table 3A demonstrates that the intervention had a positive effect on the students' performance on integers. The results underscore the importance of using effective, comprehension-focused, and learner-centered teaching strategies to improve academic achievement among students with varying performance levels. According to Vilenius-Tuohimaa et al. (2018), mathematical word problems require a simultaneous mastery of literal reading comprehension and mathematical logic. If a student cannot decode the text, they cannot construct the mathematical model. This finding directly mirrors local findings from the Program for International Student Assessment (PISA), which consistently demonstrate that Filipino learners struggle with word problems due to weaknesses in reading literacy.

Table 3B
Effect of the Developed Reading Material on Students' Performance on Integers

Statistical Basis	Statistical Analysis	
	HPG	LPG
Df	13	17
critical t-value	2.160	2.110
computed t-value	3.21	5.12
decision on hypothesis	reject the null hypothesis	reject the null hypothesis
conclusion	significant	significant
Cohen's d	0.86	1.21
Effect size	large	very large

Level of Significance = 5% or 0.05

The results of Table 3B presents the statistical analysis measuring the effect of the developed reading material on students' performance in integers, covering the High Performing Group (HPG), Low Performing Group (LPG), and the overall group. The HPG obtained a computed t-value of 3.21, which is higher than the critical t-value of 2.160 at df = 13. This leads to the rejection of the null hypothesis, indicating that there is a statistically significant difference between the pre-test and post-test scores in problem solving. In terms of effect size, Cohen's d is 0.86, which falls under a large effect size. This suggests that the improvement in problem-solving performance is not only statistically significant but also educationally meaningful. The intervention had a strong positive impact on the students' ability to solve problems.

The LPG obtained a computed t-value of 5.12, which is also greater than the critical t-value of 2.110 at df = 17. This result also leads to the rejection of the null hypothesis, meaning there is a significant difference between pre-test and post-test scores in problem solving. The Cohen's d value for LPG is 1.21, which indicates a very large effect size. This shows that the intervention had a very strong impact on the problem-solving skills of low-performing students, with a greater magnitude of improvement compared to HPG. The higher magnitude of growth observed in the lower-performing group aligns with the meta-analytic findings of Hattie (2009), who observed that structured educational interventions yield the most pronounced effects among students with lower baseline scores due to the reduction of cognitive gaps. Furthermore, the classifications of these effects are justified by

Sawilowsky's (2009) expanded benchmarks for Cohen's d, which characterizes effect sizes exceeding 1.20 as 'very large.' This proves the intervention was robust enough to benefit high achievers while drastically accelerating the growth of struggling students."

Overall, both groups demonstrated significant improvement in problem-solving skills after the intervention. However, the LPG showed a stronger effect size compared to the HPG, suggesting that lower-performing students benefited more substantially from the program. The findings indicate that the intervention is highly effective in enhancing problem-solving abilities across different performance levels, with particularly strong gains among the low-performing group. The findings imply that the contextualized, independent learning and articles for reading comprehension in structured handbook significantly contributed to the improvement of students' reading comprehension and mathematical problem-solving skills. The remarkable increase in posttest scores among both high-performing and low-performing learners suggests that the material successfully addressed learners' needs and supported meaningful learning experiences.

4. Conclusions and Recommendations

The following conclusions were drawn: the developed supplementary learning material on Integers is considered an effective and appropriate instructional resource that supports meaningful learning experiences and enhances students' mathematical understanding and independent learning skills. It was found to be valid and acceptable based on the evaluation of experts and respondents in terms of content, format, presentation and organization, and accuracy and up-to-datedness of information, indicating that it can be effectively used as an instructional and learning resource. The material is also effective in enhancing the reading comprehension and problem-solving skills of both the High-Performing Group (HPG) and Low-Performing Group (LPG), as shown by the improvement in their post-test scores after exposure to the material. The proposed enhanced supplementary learning material may further improve students' understanding and mastery of integers through improved activities, clearer presentation, and more learner-centered approaches. Therefore, the developed and enhanced supplementary learning material can serve as an effective instructional support tool in teaching Integers to Grade 7 students at Cagbolo National Vocational High School.

The following recommendations are offered: Mathematics teachers may utilize the developed Supplementary Learning Material on Integers to enhance students' understanding of integer concepts through contextualized and independent learning activities. Future researchers may conduct further validation and evaluation of the material, and additional activities and visual enhancements may be included to further improve learner engagement. Teachers are encouraged to integrate the developed material into their teaching strategies to strengthen students' reading comprehension and problem-solving abilities. Students are encouraged to actively engage with the material to further develop their comprehension skills and critical thinking in solving problems. Lastly, schools and curriculum planners may consider adopting the developed material as a supplementary instructional resource to support literacy and critical thinking development.

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