

Development and Validation of Contextualized Learning Materials in Grade 5 Pupils' Math Word Problem- Solving in Selected Schools in North 2 District, Division of Gingoog City

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ABSTRACT

This study developed and validated contextualized learning materials to address the least learned mathematical word problem-solving competencies of Grade 5 learners in selected schools in the North 2 District, Division of Gingoog City. Employing a developmental research design guided by the Analysis, Design, Development, and Evaluation (ADDE) model, the study analyzed the consolidated Beginning-of-School-Year Rapid Mathematics Assessment (BoSY RMA) results of 39 Grade 5 learners from San Jose Elementary School and Malibud Central School. Findings revealed that the most difficult competencies involved adding dissimilar fractions including mixed numbers (79.5%), solving multi-step problems involving multiplication of decimals (79.5%), illustrating and describing solid figures and their nets (71.8%), and interpreting data presented in tables and line graphs (48.7%). Based on these identified learning gaps, a contextualized workbook entitled *Where Math Meets Life* was developed. The workbook integrated community-based situations, real-life applications, guided examples, visual representations, vocabulary support, and progressive learning activities aligned with the Grade 5 Most Essential Learning Competencies (MELCs). The developed materials were evaluated by mathematics and language experts using the Department of Education Learning Resources Management and Development System (LRMDS) evaluation tool. Results indicated very high validity in both content and language, confirming the instructional quality, curriculum alignment, readability, and suitability of the materials for Grade 5 learners. A clustered Learning Action Cell (LAC)-based implementation plan was likewise proposed to facilitate future utilization of the validated workbook.

KEYWORDS

Contextualized learning materials; mathematics education; word problem-solving; Grade 5 learners; developmental research; ADDE model; LRMDS validation; MELCs.

INTRODUCTION

Mathematics is considered a fundamental subject in elementary education, as it helps develop a child's ability to think logically, solve problems, and make decisions in their day-to-day lives. One of the most significant aspects of learning mathematics is word-based problem solving. In mathematics, word-based problem-solving requires computational skills and the ability to understand, analyze, and apply concepts learners

will eventually use in their daily lives. Critical thinking and problem solving are the two primary objectives of mathematics at the elementary level, according to the Department of Education's K–12 Mathematics Curriculum Guide (2016). For students to successfully complete more complex mathematics in later grades, it is crucial to support them in developing their problem-solving skills in the primary grades. According to the National Council of Teachers of Mathematics (2020), students who solve problems improve their comprehension of real-world scenarios, develop critical thinking skills, and connect mathematics to their experiences.

In addition to emphasizing mathematical proficiency, classroom evaluations and activities should give students the opportunity to reflect on problem-solving strategies and demonstrate their mathematical thought processes. By means of DepEd Order No. 8, s. 2015 has adopted the perspective that assessment tasks ought to measure students' knowledge and higher-order abilities, like as problem-solving. For students to think analytically and apply their knowledge to real-life situations, it is important to consider both the development of their thinking skills and the fundamental operations needed to solve mathematical word problems.

The importance of supporting the development of learners' ability to solve mathematical word problems is outlined in multiple national policies. The Constitution of the Philippines, created in 1987, emphasizes the provision of high-quality education, allowing learners to develop analytical skills. The Enhanced Basic Education Act of 2013 also specifically encourages the development of higher-order thinking skills and emphasizes the necessity for learners to demonstrate their understanding through problem-solving.

While these policies exist and have continued to be enforced over an extended period, disparities in learners' performance in mathematics still exist. This raises an important concern about how effectively these policies are translated into classroom practices and whether learners are receiving sufficient support in developing their problem-solving skills.

This concern is further bolstered by results from international assessments, which demonstrate that many Filipino students in the Philippines are still unable to achieve sufficient levels of success in mathematics. The 2019 Southeast Asia Primary Learning Metric (SEA-PLM 2019) reported that only 17% of Grade 5 students attain the level of proficiency as stated in the national curriculum goals, with all areas of the country demonstrating an extreme variation in the level of performance among Grade 5 students across the various regions of the country, and therefore also suggesting a degree of inequality among the learning experiences of students. Moreover, TIMSS 2019 has confirmed that Filipino Grade 4 students were among the lowest performing in mathematics when compared to 58 other countries, which illustrates that there are still significant deficiencies in basic math skills such as the ability to identify numbers and to conduct basic operations.

The results indicate that the continuing gap in foundational skills will affect these students for years to come; thus, they may not be able to develop the skills necessary to solve a mathematical word problem. Additionally, the data from PISA 2022 also affirms these findings; only 16% of Filipino learners demonstrate even the lowest level of proficiency in math according to these international standards. It follows, therefore, that those students who do not understand math at a basic level will be less able to apply that understanding to solve problems.

At the local level, the same pattern is reflected in the results of students in Misamis Oriental (Region X—which includes Gingoog City) on the National Achievement Test (NAT). An analysis of NAT results in Region X indicates that Mathematics and Science

consistently yielded the lowest achievement across all learning subject areas and divisions, suggesting that a relatively large number of students have not developed the prerequisite skills required to succeed in Mathematics. In addition to ongoing instructional difficulties, these trends are also evident when viewed through the lens of both national and international assessment methods.

Lastly, the most current assessment conducted in the school year 2024–2025 corroborates the above statements; there was a drop of approximately 11 percentage points between the Grade 3 proficiency level and the Grade 6 proficiency level—only 19.56% of the learners achieved “proficient” or “highly proficient” status upon completion of the curriculum at Grade 6. This evidence demonstrates that there are educational deficiencies that are not limited to just the lower grades but will continue to exist and develop in the higher grades as learners continue through school. There is now a clear and compelling need to provide appropriate interventions in the lower grades to help students develop a stronger foundation on which to continue building when they reach Grade 6, and to prepare them to perform well on the national and international assessments they will take in the future.

The Department of Education’s (DepEd) procedures for conducting, reporting, and interpreting the results of the NAT assessments are defined in DepEd Order No. 55, s. 2016. Therefore, the findings from the NAT can be used to make improvements in instruction at both the school and division levels. Taken together, the local, national, and international results emphasize the importance of enhancing instruction in mathematics and ensuring that all learners receive the appropriate interventions necessary for them to develop higher-level thinking skills, which are required to achieve success for a lifetime.

To address the challenges associated with mathematics education, DepEd has implemented the Rapid Math Assessment (RMA) as part of its National Learning Recovery Program (NLRP). The NLRP was created by DepEd at the direction of DepEd Order No. 013, s. 2023, to enhance the literacy and numeracy of students through various initiatives and support services. As part of the NLRP, the programs being initiated consist of multiple efforts designed to assist students in their efforts to recover from educational deficiencies and improve their overall academic success. The Rapid Mathematics Assessment (RMA) is administered by the Department of Education to all students enrolled in schools, as per DepEd Order No. 12, series of 2025. As such, schools administer the RMA to students at regular intervals, at the beginning and end of each school year, to give teachers an opportunity to assess students’ ability, monitor progress, and develop individualized interventions based on students’ specific needs.

The RMA was first administered to students in Grades 4, 5, and 6 in June 2025. This was the first time that this type of measure was used at the elementary level and was important in providing baseline data that could assist teachers in better understanding the mathematical abilities of their students.

The primary focus of this research study is on students currently enrolled in Grade 5, as this grade represents a major transition period in which students experience the shift from basic arithmetic to higher-order math skills. Mastery of the basic math skills that students need throughout elementary school is important because these skills will be the foundation on which they will build as they move through their elementary experience. If students do not fully master these skills, they will likely struggle with solving math problems, such as word problem-solving, where students need to be able to understand as well as compute.

A student’s access to appropriate math textbook resources is limited in many schools in the North 2 District. There have been instances when there are sufficient materials available to cover a topic, but the samples and scenarios presented may be too broad and

may not be easily related to a student's normal daily activities. Therefore, students may not have an easy time learning the math themselves or using math in a problem-solving manner when solving a word problem.

To aid in helping students learn the math material that they have difficulty with, this paper proposes the use of contextualized learning material instances to assist in bridging the gap caused by students' lack of understanding of the math material they are currently exposed to.

Contextualized learning materials connect a mathematical concept to situations that students can relate to in their own lives. Research to support the idea of contextualized learning, for example, the works of Dohinog et al. (2025), as well as Project CLMM (Contextualized Learning Materials in Mathematics), shows that when a mathematics lesson is connected to real-life experiences within the community, students have an easier time understanding the concept. When students participate in activities relating to or based on their community, they become more engaged with the activity, retain a greater amount of information, and apply those same mathematical concepts.

In the case of the North 2 District of the Division of Gingoog City, these findings point to the need for early intervention for instructional purposes (from the time students enter school until they graduate) to prevent the widening of the learning gap in mathematics due to the number of students struggling with their level of math proficiency. This study will develop and validate contextualized workbooks that will provide a resource for students based on the least learned competencies identified in the Beginning of School Year (BoSY) Rapid Mathematics Assessment (RMA), specifically in word problem-solving among Grade 5 students. The overall purpose of this study is to relate the mathematical concepts learned in the classroom to daily life instances that students experience firsthand, as well as to the community in which they live; therefore, demonstrating to students that math is not just learned and used in the classroom but is also used every day in their homes and communities.

Once the contextualized learning materials have been validated, they will be introduced during a clustered Learning Action Cell (LAC) session so that teachers may learn to use them effectively and meaningfully. During this session, teachers will have time to work with their peers to gain a practical understanding of how to use and incorporate the contextualized learning materials in classroom instruction, thereby assisting in their ability to help students develop an understanding of math and realize that math is not something they should be afraid of, as they will have already experienced and observed the concepts in their daily lives within their homes and communities prior to learning them in school.

This study aims to develop and validate contextualized learning materials to enhance the mathematical word-problem-solving skills of Grade 5 pupils at San Jose Elementary School and Malibud Central School in the Division of Gingoog City.

RESEARCH METHODS

Research Design

This study employed a developmental research design using the Analysis, Design, Development, and Evaluation (ADDE) model to develop and validate contextualized mathematics word-problem-solving materials for Grade 5 learners. The model provided a systematic framework for identifying learning needs, designing instructional interventions, developing contextualized learning resources, and evaluating the quality of these resources through expert validation. The study focused on the development and validation of instructional materials and did not include classroom implementation or effectiveness testing.

During the analysis phase, consolidated Beginning-of-School-Year Rapid Mathematics Assessment (BoSY RMA) results were examined to identify learners' least mastered problem-solving competencies. The design phase involved planning contextualized learning experiences grounded in the principles of Contextual Teaching and Learning (CTL). In the development phase, a contextualized mathematics workbook was produced, while the evaluation phase consisted of expert validation using the Department of Education Learning Resources Management and Development System (LRMDS) Evaluation Tool.

Research Locale and Participants

The study was conducted in San Jose Elementary School and Malibud Central School, two rural public elementary schools in the North II District, Division of Gingoog City, Misamis Oriental, Philippines. These schools were purposively selected based on their BoSY RMA performance, which indicated substantial learning gaps in solving mathematics word problems.

The study used secondary assessment data from 39 Grade 5 learners, comprising 11 from San Jose Elementary School and 28 from Malibud Central School. Expert validators consisted of a District RMA Coordinator, four Master Teachers, Education Program Supervisors in Mathematics and LRMDS, and language specialists from the Division of Gingoog City. Their expertise ensured a comprehensive evaluation of the developed instructional materials in terms of content, language, instructional quality, and usability.

Research Locale and Participants

Four instruments were utilized in the study:

1. **Beginning-of-School-Year Rapid Mathematics Assessment (BoSY RMA) Results**, which served as the primary source of diagnostic data for identifying the least mastered competencies;
2. **Researcher-Made Tally Sheet**, used to record and summarize incorrect responses for each assessment item;
3. **Grade 5 Mathematics Competency Matrix**, developed from the Most Essential Learning Competencies (MELCs) to ensure curricular alignment; and
4. **DepEd LRMDS Evaluation Tool** assessed the developed materials in terms of content accuracy, instructional design, assessment quality, readability, language appropriateness, and compliance with learning resource standards.

Research Locale and Participants

Following approval from the Schools Division Office and participating schools, the researcher obtained and consolidated the BoSY RMA results of Grade 5 learners. A researcher-made tally sheet was used to determine the frequency and percentage of incorrect responses for each problem-solving item. Items were subsequently ranked by difficulty level, and one least-mastered competency per quarter was identified. These competencies served as the foundation for developing contextualized mathematics word-problem-solving materials.

The developed workbook incorporated localized situations, culturally relevant examples, guided learning activities, assessments, answer keys, and teacher support materials. Upon completion, the materials underwent expert validation using the DepEd LRMDS Evaluation Tool. Recommendations from validators were incorporated to enhance the quality, accuracy, and instructional suitability of the materials. The finalized workbook

was accompanied by an implementation plan intended for future utilization through Learning Action Cell (LAC) sessions and classroom application.

Ethical Considerations

The study complied with the ethical standards of the Graduate School of Saint Joseph Institute of Technology and received the necessary ethical and administrative approvals prior to data collection. Because the study utilized existing assessment records, no direct interaction with learners occurred. All data were de-identified before analysis, and only aggregated results were reported to ensure confidentiality and privacy.

Expert validators participated voluntarily and provided informed consent prior to the evaluation process. Research records were securely stored in password-protected digital repositories and locked physical storage. Data would be retained for 3 years following study completion and subsequently disposed of through secure deletion and document shredding procedures. The study adhered to the principles of confidentiality, transparency, beneficence, and academic integrity throughout the research process.

Artificial Intelligence (AI) tools were used only for language enhancement, grammar checking, formatting assistance, and workbook illustration generation in accordance with DepEd Order No. 003, s. 2026. No AI applications were utilized in data collection, statistical analysis, interpretation of findings, or formulation of conclusions. All scholarly judgments and research decisions remained solely the responsibility of the researcher.

Statistical Treatment

Descriptive statistical techniques were employed to analyze the gathered data. Frequency counts, percentages, and rankings were used to identify the least-mastered mathematics problem-solving competencies based on learners' incorrect responses in the BoSY RMA. Frequency and percentage distributions were likewise utilized to summarize and interpret expert validation results obtained through the DepEd LRMSD Evaluation Tool, thereby determining the acceptability and readiness of the developed contextualized learning materials for instructional use.

RESULTS AND DISCUSSION

Common Least Learned Mathematical Problem-Solving Competencies Among Grade 5 Learners

The analysis of the Beginning-of-School-Year Rapid Mathematics Assessment (BoSY RMA) results revealed four common, least-learned mathematical problem-solving competencies among Grade 5 learners from Malibud Central School and San Jose Elementary School. The competency involving the addition of dissimilar fractions with mixed numbers recorded the highest combined percentage of incorrect responses at 79.5%. Similarly, solving multi-step problems involving multiplication of decimals, including money-related applications, also obtained a combined incorrect response rate of 79.5%. The competency in illustrating and describing solid figures and their corresponding nets registered 71.8% incorrect responses, while interpreting data presented in tables and line graphs recorded 48.7% incorrect responses. These findings indicate that learners experienced substantial difficulties in mathematical tasks requiring conceptual understanding, procedural fluency, spatial reasoning, and data interpretation.

The findings support the Department of Education's (2022) assertion that mathematical problem-solving remains one of the most challenging competencies among elementary learners because it requires integrating conceptual understanding, procedural knowledge,

and analytical reasoning. The high percentage of incorrect responses in fraction and decimal operations suggests that learners struggle to connect mathematical concepts with computational procedures, a concern likewise highlighted by the National Mathematics Program, which identified numeracy gaps among Filipino learners following learning disruptions and reduced classroom engagement.

The difficulties observed in adding dissimilar fractions and solving multi-step decimal problems are consistent with the findings of Pugosa et al. (2024), who reported that learners often experience difficulty in applying mathematical operations when problems are presented in contextualized or real-life situations. According to the author, many pupils can perform isolated computations but struggle to analyze situations, identify relevant information, and select appropriate solution strategies. This observation explains the high percentage of errors obtained in competencies requiring multi-step reasoning and application of mathematical concepts.

Similarly, the competency involving solid figures and their corresponding nets obtained a combined incorrect response rate of 71.8%, indicating challenges in visualization and spatial reasoning. This finding supports the study by Jison (2026), which emphasized that geometry-related competencies often pose difficulties for elementary learners due to limited opportunities for concrete manipulation and visual exploration of geometric concepts. Learners who are unable to visualize three-dimensional objects often have difficulty describing relationships between figures and their corresponding nets.

The competency on interpreting data presented in tables and line graphs recorded 48.7% incorrect responses. Although lower than the other identified competencies, the result still suggests substantial difficulty in data interpretation and mathematical literacy. According to OECD (2023), data interpretation tasks require learners to analyze information, draw conclusions, and communicate mathematical reasoning. These competencies are closely associated with higher-order thinking skills and remain among the areas in which learners perform more poorly on large-scale assessments.

The findings are further supported by the results of the Programme for International Student Assessment (PISA), which consistently indicate that Filipino learners encounter challenges in applying mathematical concepts to unfamiliar and real-world situations. PISA emphasizes that mathematical literacy extends beyond computation and includes reasoning, problem solving, interpretation, and communication of mathematical ideas. The difficulties observed among the Grade 5 learners in the present study, therefore, reflect broader concerns regarding mathematics achievement and problem-solving proficiency among Filipino learners.

Taken together, the findings suggest that learners require instructional interventions that strengthen conceptual understanding, mathematical reasoning, visualization skills, and contextual application of mathematical concepts. Since these least-learned competencies were consistently identified across the participating schools, they provide a strong empirical basis for developing contextualized learning materials specifically designed to address learners' identified mathematical difficulties.

Contextualized Design Features and Instructional Components of the Developed Learning Materials

The contextualized learning materials were developed based on the least learned competencies identified through the Beginning-of-School-Year Rapid Mathematics Assessment (BoSY RMA). The resulting workbook, entitled *Where Math Meets Life: A Contextualized Grade 5 Workbook*, was designed to address learners' difficulties with fractions, decimals, geometry, and data interpretation through contextualized learning

experiences, guided activities, visual representations, vocabulary-enhancement exercises, and reflective learning tasks. The workbook incorporated instructional components such as “Let’s Connect,” “Unlocking Math Words,” “Analyze and Learn,” “Let’s Practice,” “Math Summed Up,” “Let’s Go Beyond,” and “Valuing: Reflection and Application,” all of which were intentionally designed to facilitate conceptual understanding, engagement, and meaningful learning experiences.

The development of the workbook was grounded in the principle of contextualization, which emphasizes connecting academic content to learners’ real-life experiences. According to Johnson (2002), learning becomes more meaningful when concepts are presented within authentic situations familiar to learners. The workbook, therefore, utilized localized examples, community-based scenarios, and everyday experiences to enable learners to relate mathematical concepts to practical situations encountered in their environment. This design approach supports the findings of Berns and Erickson (2001), who argued that contextualized instruction increases learner engagement and facilitates deeper understanding by enabling students to connect new knowledge to existing experiences.

The inclusion of the “Let’s Connect” component was intended to activate learners’ prior knowledge before introducing new mathematical concepts. This instructional strategy aligns with Constructivist Theory, which posits that learning occurs when individuals actively build new knowledge on prior experience. According to Bruner (1996), meaningful learning is enhanced when learners are encouraged to connect new information with existing cognitive structures. By activating prior knowledge, the workbook prepares learners to engage more effectively with mathematical concepts and problem-solving tasks.

Similarly, the “Unlocking Math Words” section was designed to address language-related barriers that frequently hinder learners’ performance in mathematical word problems. Research has consistently shown that mathematical achievement is strongly influenced by reading comprehension and vocabulary knowledge. According to DepEd (2022), many learners struggle to solve mathematical problems not because of computational deficiencies but because they experience difficulty understanding the language used in problem statements. By explicitly teaching mathematical vocabulary and providing contextual clues, the workbook seeks to improve learners’ comprehension and interpretation of mathematical tasks.

The “Analyze and Learn” and “Let’s Practice” components provide guided instruction and scaffolded learning experiences that gradually transition learners from teacher-supported activities to independent problem solving. This approach reflects Vygotsky’s concept of the Zone of Proximal Development (ZPD), which emphasizes the importance of instructional support in helping learners accomplish tasks beyond their current level of competence. According to Vygotsky (1978), scaffolded learning experiences enable learners to develop higher levels of understanding and independent performance. Through carefully sequenced examples and practice exercises, the workbook provides opportunities for learners to develop both conceptual understanding and procedural fluency.

The incorporation of visual representations and contextualized illustrations also addresses the difficulties identified in geometry and data interpretation competencies. Jison (2026) emphasized that visualization plays a critical role in learners’ understanding of geometric concepts, particularly in topics involving spatial reasoning and three-dimensional figures. Likewise, OECD (2023) reported that learners perform better in mathematical literacy tasks when information is presented through multiple representations, including visual, graphical, and contextual formats. The workbook,

therefore, integrates diagrams, illustrations, and real-life representations to support learners' understanding of abstract mathematical concepts.

The “Valuing: Reflection and Application” component further distinguishes the workbook from traditional mathematics materials. This section encourages learners to reflect on the relevance of mathematics in everyday life and apply acquired knowledge to authentic situations. According to Dewey (1938), reflection is an essential component of meaningful learning because it enables learners to connect classroom experiences with real-world applications. Through reflective activities, learners are encouraged to recognize the practical usefulness of mathematics and develop positive attitudes toward learning.

The workbook also incorporated higher-order thinking activities through “Let’s Go Beyond,” which challenges learners to analyze situations, justify solutions, and apply mathematical concepts to unfamiliar contexts. This design feature aligns with the recommendations of the Programme for International Student Assessment (PISA), which emphasizes mathematical literacy, reasoning, and problem-solving as essential competencies for 21st-century learners. OECD (2023) noted that effective mathematics instruction should move beyond procedural computation and provide opportunities for learners to engage in reasoning, communication, and real-world problem solving.

Furthermore, the workbook's contextualized design is supported by local studies cited in the manuscript. Bautista (2023) reported that contextualized instructional materials significantly improve learner engagement and comprehension by allowing students to connect lessons to familiar experiences. Similarly, Reyes (2025) found that contextualized learning resources improve academic performance and learner motivation by making instruction more relevant and meaningful. Bosch et al. (2024) likewise concluded that contextualized materials promote active participation and deeper conceptual understanding among elementary learners.

Taken together, the contextualized design features and instructional components of Where Math Meets Life demonstrate strong alignment with contemporary theories of learning and evidence from previous studies. The workbook was intentionally designed not only to address the least learned competencies identified through the BoSY RMA results but also to promote learner engagement, mathematical reasoning, conceptual understanding, and meaningful learning. By integrating contextualization, scaffolding, vocabulary development, visualization, reflection, and higher-order thinking activities, the workbook provides a comprehensive instructional resource that supports the development of mathematical word-problem-solving skills among Grade 5 learners.

Developed Contextualized Learning Materials

The final output of the study was the development of Where Math Meets Life: A Contextualized Grade 5 Workbook, a supplementary instructional material specifically designed to address the least learned mathematical problem-solving competencies identified through the BoSY RMA analysis. The workbook consisted of four instructional units corresponding to the four least-learned competencies, namely: adding dissimilar fractions involving mixed numbers, solving multi-step problems involving the multiplication of decimals, illustrating and describing solid figures and their corresponding nets, and interpreting data presented in tables and line graphs. Each unit provided structured learning experiences through contextualized examples, guided instruction, independent practice activities, assessments, and reflective exercises.

The development of the workbook was guided by the principle that instructional materials should directly respond to learners' identified needs. The BoSY RMA results revealed that learners demonstrated substantial difficulty in competencies requiring

conceptual understanding, mathematical reasoning, visualization, and contextual application. Consequently, the workbook was intentionally designed to provide targeted interventions that address these specific learning gaps. According to Tomlinson (2013), effective instructional materials should be learner-centered and responsive to identified educational needs. By grounding the workbook content on actual assessment data, the developed material ensures relevance, appropriateness, and alignment with learners' demonstrated areas of difficulty.

The workbook was developed following a systematic process of analysis, design, development, and evaluation. Each lesson was aligned with the identified Grade 5 Mathematics competencies and organized to facilitate progression from concept acquisition to independent application. Such instructional sequencing supports Bruner's Spiral Curriculum Theory, which emphasizes that learners develop a deeper understanding when concepts are presented in a structured, progressive manner. Through carefully sequenced activities, learners are gradually guided from foundational understanding toward more complex applications and problem-solving tasks.

One of the workbook's distinguishing features is its use of contextualized scenarios and localized experiences. Mathematical concepts were presented through situations familiar to learners, including community activities, family experiences, market transactions, and everyday problem-solving situations. This design feature supports Johnson's Contextual Teaching and Learning Theory, which asserts that meaningful learning occurs when learners connect academic content to real-life experiences. Johnson (2002) emphasized that contextualized instruction increases learner engagement and improves knowledge retention because students perceive learning as relevant and useful.

The workbook also incorporated learner-friendly language, vocabulary-enhancement activities, and guided examples to address barriers to understanding mathematical word problems. According to DepEd (2022), reading comprehension difficulties significantly affect learners' mathematical performance, particularly in solving contextualized problems. The inclusion of "Unlocking Math Words" and guided instructional activities was therefore intended to strengthen both mathematical understanding and language comprehension. Similar findings were reported by Pugosa et al. (2024), who noted that learners often experience difficulties in mathematical problem solving because they struggle to understand the language and context embedded within mathematical tasks.

Furthermore, the workbook integrated visual representations and structured activities to support learners' understanding of geometry and data interpretation. Research by Jison (2026) emphasized that visual learning experiences improve learners' comprehension of geometric concepts and spatial relationships. Likewise, OECD (2023) reported that learners demonstrate improved mathematical literacy when concepts are presented using multiple representations, including diagrams, graphs, illustrations, and contextual examples. The incorporation of these elements within the workbook was intended to address the specific difficulties identified in geometry and data interpretation competencies.

The workbook also promotes active participation and independent learning through instructional components such as "Analyze and Learn," "Let's Practice," and "Let's Go Beyond." These sections encourage learners to engage in exploration, reflection, and application rather than passively receiving information. This instructional approach is consistent with Vygotsky's Sociocultural Theory, which emphasizes that learning occurs through active engagement and guided participation. Through scaffolded activities and structured learning experiences, learners are gradually supported in developing mathematical reasoning, critical thinking, and problem-solving skills.

The development of the workbook further supports the findings of previous studies cited in the manuscript. Bautista (2023) reported that contextualized instructional materials significantly improve learner engagement and comprehension by enabling learners to connect lessons to familiar experiences. Similarly, Reyes (2022) found that contextualized learning resources improve academic performance and learner motivation by making instruction more relevant and meaningful. Bosch et al. (2024) likewise concluded that contextualized materials promote active participation, deeper conceptual understanding, and improved learning outcomes among elementary learners. These studies provide empirical support for the design and development of the workbook.

Moreover, the workbook reflects current educational priorities emphasizing learner-centered instruction, contextualization, and 21st-century learning skills. The inclusion of reflective activities, real-life applications, collaborative learning opportunities, and higher-order thinking tasks aligns with the recommendations of the Programme for International Student Assessment (PISA), which emphasizes problem solving, reasoning, and mathematical literacy as essential competencies for modern learners. By integrating these elements, the workbook seeks not only to improve mathematical achievement but also to develop learners' capacity to apply mathematical knowledge in authentic situations.

Overall, the development of *Where Math Meets Life: A Contextualized Grade 5 Workbook* demonstrates how assessment-driven instructional design can be utilized to create responsive and meaningful learning resources. By grounding the content in learners' actual learning needs and incorporating contextualized, learner-centered, and research-based instructional strategies, the workbook provides a practical intervention that directly addresses identified gaps in learners' mathematical word-problem-solving competencies. Consequently, the workbook serves as a validated instructional resource that supports improved mathematical understanding, engagement, and performance among Grade 5 learners.

Level of Validity of the Developed Contextualized Learning Materials

The level of validity of the developed contextualized learning materials was assessed using the Department of Education Learning Resources Management and Development System (DepEd-LRMDS) Evaluation Tool. Results revealed consistently favorable ratings across all content validation dimensions, indicating a high degree of acceptability, instructional quality, and curriculum alignment. The overall findings demonstrate that the developed workbook possesses the essential characteristics of effective instructional materials and is suitable for classroom implementation among Grade 5 learners.

Intellectual Property Rights

Compliance with Intellectual Property Rights obtained an overall rating of 95%, interpreted as Very High. Three indicators, namely the absence of copyright violations, citation of copyrighted texts and visuals, and accurate citation of copyrighted materials, each received 100% ratings. Only the indicator concerning the citation of references in the bibliography obtained 80%, interpreted as High. Despite this minor observation, the overall findings indicate strong adherence to ethical standards and proper acknowledgment of source materials.

The result highlights the researcher's commitment to responsible instructional material development and compliance with intellectual property regulations. According to the Department of Education's Learning Resources Management and Development System guidelines, instructional materials must respect intellectual property rights to ensure academic integrity and the ethical use of educational resources. Proper attribution of

sources enhances the credibility, reliability, and professional quality of learning materials. Likewise, UNESCO (2021) emphasized that adherence to copyright and citation standards promotes responsible knowledge creation and protects the rights of content creators. The very high rating in this dimension, therefore, strengthens the workbook's overall acceptability as a legitimate educational resource.

Learning Competencies

Alignment with Learning Competencies received a perfect rating of 100%, interpreted as Very High, indicating that the workbook content is fully consistent with the targeted DepEd Learning Competencies intended for Grade 5 Mathematics. Validators unanimously agreed that the learning activities, instructional content, and assessment tasks directly support the achievement of the prescribed Most Essential Learning Competencies (MELCs).

This finding confirms that the developed material effectively addresses the curricular standards and learning outcomes established by the Department of Education. According to DepEd Order No. 35, s. In 2016, instructional materials should demonstrate clear alignment with curriculum standards to ensure that learners acquire the intended competencies and learning outcomes. Similarly, Tomlinson (2013) emphasized that effective instructional materials must be carefully aligned with curricular objectives to facilitate meaningful learning and academic achievement. The perfect rating in this dimension, therefore, provides strong evidence that the workbook can support curriculum implementation and learners' mastery of targeted competencies.

Intellectual Design and Organization

Intellectual Design and Organization obtained an overall rating of 88%, interpreted as Very High. Validators unanimously agreed that the workbook contributes to the achievement of learning objectives, reinforces targeted competencies, and presents content in a logical sequence from simple to complex concepts. Several indicators, including introductions and summaries, lesson integration, and instructional variety, received 80% ratings, while the indicator related to the development of higher-order thinking skills obtained 60%, interpreted as Moderate. Although these findings suggest opportunities for enhancement, the overall evaluation indicates that the workbook possesses strong organizational and instructional design qualities.

The very high rating obtained in this dimension suggests that the workbook effectively applies sound instructional design principles. According to Dick, Carey, and Carey (2015), effective instructional materials should present content in a logical progression, provide opportunities for reinforcement, and facilitate learner engagement through structured learning experiences. Likewise, Bruner's Spiral Curriculum Theory emphasizes the importance of organizing content from simple to complex concepts to promote cumulative learning and deeper understanding. The lower rating observed in higher-order thinking skills suggests that future revisions may include more analytical, evaluative, and problem-based activities to further strengthen critical thinking and mathematical reasoning. Nevertheless, the overall rating indicates that the workbook has a strong instructional framework that supports meaningful learning.

Instructional Quality

Instructional Quality achieved a perfect rating of 100%, interpreted as Very High. Validators unanimously confirmed that the workbook contains accurate, updated, and

error-free information and is free from social, factual, computational, and grammatical errors. These findings indicate a high degree of reliability and instructional soundness.

The perfect rating for instructional quality demonstrates that the workbook meets the standards for effective educational materials. According to the DepEd-LRMDS Evaluation Framework, instructional quality encompasses content accuracy, relevance, clarity, and appropriateness for the intended learners. Educational research further emphasizes that instructional materials must provide accurate, up-to-date information to ensure meaningful learning experiences and prevent misconceptions among learners. The result, therefore, indicates that the workbook is capable of supporting effective mathematics instruction while maintaining high standards of content quality and reliability.

Furthermore, the workbook's contextualized nature contributes significantly to its instructional quality. Studies by Bautista (2023), Reyes (2025), and Bosch et al. (2024) reported that contextualized instructional materials enhance learner engagement, comprehension, and academic achievement by making learning more relevant and meaningful. The perfect rating in this dimension, therefore, reflects not only content accuracy but also the effectiveness of the workbook's contextualized approach.

Assessment

The assessment received a perfect rating of 100%, interpreted as Very High. Validators agreed that the workbook provides assessment activities aligned with learning objectives, includes self-checks and review activities, offers varied assessment formats, and incorporates clear instructions and rubrics. These findings demonstrate that the workbook effectively supports learner evaluation and competency development.

Assessment is a critical component of instructional materials because it provides evidence of learner understanding and guides instructional decision-making. According to Black and Wiliam (2009), effective assessment practices contribute significantly to learning by providing timely feedback and opportunities for improvement. Similarly, DepEd assessment policies emphasize the importance of formative and summative assessment activities that are aligned with intended learning outcomes. The perfect rating in this dimension indicates that the workbook incorporates comprehensive assessment strategies that monitor learner progress and support mastery of mathematical competencies.

The inclusion of self-check activities, guided practice exercises, and performance-based tasks further reflects contemporary assessment practices that emphasize learner participation and continuous improvement. Such features enable learners to monitor their own progress while providing teachers with valuable information for instructional planning and intervention.

Table 1. Summary of Content Validity

Content Validation Dimension	Rating	Interpretation
Intellectual Property Rights	95%	Very High
Learning Competencies	100%	Very High
Intellectual Design and Organization	88%	Very High
Instructional Quality	100%	Very High
Assessment	100%	Very High
Overall Content Validity	96.60%	Very High

The overall content validity rating of **96.60%** demonstrates that the workbook is curriculum-aligned, instructionally appropriate, ethically developed, and suitable for

classroom implementation. The findings provide strong evidence that the developed learning material meets established standards for quality instructional resources and possesses the necessary characteristics to support effective mathematics instruction.

Language Validity

The developed workbook also underwent language validation using the Department of Education Learning Resources Management and Development System (DepEd-LRMDS) Evaluation Tool. The evaluation focused on coherence and clarity of thought, grammar and syntax, spelling and punctuation, consistency in style, and overall language appropriateness for Grade 5 learners. Results showed that expert validators found the workbook's language components highly acceptable and suitable for the intended users. The favorable evaluation indicates that the workbook effectively communicates mathematical concepts using clear, coherent, and learner-friendly language.

The positive language validation findings suggest that the workbook possesses the linguistic characteristics necessary for effective instructional communication. According to the DepEd-LRMDS standards, instructional materials should present information using language that is developmentally appropriate, grammatically accurate, coherent, and comprehensible to the intended learners. The favorable ratings for the workbook indicate that the language throughout the material aligns with the reading level and cognitive abilities of Grade 5 learners, thereby enhancing accessibility and comprehension.

The result is particularly significant because language plays a critical role in mathematics learning, especially in solving word problems. Research has consistently shown that difficulties in reading comprehension often contribute to poor performance in mathematics. According to DepEd (2022), many learners struggle with mathematical problem-solving, not because of deficiencies in computation but because they have difficulty understanding the language, vocabulary, and contextual information embedded in mathematical tasks. The workbook's strong language validity, therefore, addresses an important factor influencing learners' mathematical achievement.

Furthermore, the workbook incorporated learner-friendly vocabulary, contextualized expressions, guided explanations, and explicit vocabulary development activities through sections such as "Unlocking Math Words." These features were intentionally included to support learners' comprehension of mathematical concepts and terminology. According to Pugosa et al. (2024), language comprehension significantly influences learners' ability to identify relevant information, interpret problem statements, and formulate appropriate solution strategies. The use of clear and understandable language, therefore, contributes directly to improved mathematical problem-solving performance.

The favorable language validation results are likewise supported by contextualized learning literature. Johnson (2002) emphasized that learners acquire knowledge more effectively when instruction is presented using language and situations that are meaningful and familiar to them. By integrating localized examples, community-based contexts, and age-appropriate vocabulary, the workbook reduces cognitive barriers that may hinder comprehension and promotes meaningful engagement with mathematical concepts. Similarly, Berns and Erickson (2001) noted that contextualized instruction improves understanding because learners can connect academic content to familiar experiences and language structures.

The findings are also consistent with Constructivist Theory, which posits that learners construct knowledge through interaction with meaningful experiences and understandable information. Bruner (1996) argued that learning materials should be organized and presented in a manner that facilitates comprehension and knowledge construction. The

workbook's coherent structure, logical presentation of ideas, and learner-friendly language support this process by enabling learners to focus on understanding mathematical concepts rather than struggling with complex or unfamiliar language.

Moreover, the workbook's strong language validity supports the development of mathematical literacy, a competency emphasized in contemporary mathematics education. The Programme for International Student Assessment (PISA) identifies mathematical literacy as the ability to formulate, employ, and interpret mathematics in a variety of contexts. OECD (2023) emphasized that mathematical literacy depends not only on numerical competence but also on learners' ability to comprehend mathematical language and communicate mathematical ideas effectively. Consequently, the use of clear, coherent, and contextually appropriate language contributes significantly to learners' success in mathematical problem solving.

The positive evaluation further corroborates findings from local studies cited in the manuscript. Bautista (2023) reported that contextualized instructional materials improve learner comprehension because concepts are presented using familiar language and relatable experiences. Similarly, Reyes (2025) found that instructional resources written in learner-friendly language increase engagement, participation, and academic performance among elementary learners. Bosch et al. (2024) likewise concluded that contextualized learning materials support deeper understanding by reducing linguistic barriers and improving conceptual clarity. These studies provide empirical support for the favorable language validation results obtained in the present study.

Overall, the language validation findings demonstrate that the developed workbook effectively communicates mathematical concepts through coherent, accurate, and learner-centered language. The positive evaluation indicates that the material minimizes language barriers, promotes readability, and supports learners' comprehension of mathematical word problems. Consequently, the strong language validity of *Where Math Meets Life: A Contextualized Grade 5 Workbook* further strengthens its suitability for instructional utilization and supports its potential to improve mathematical understanding and problem-solving performance among Grade 5 learners.

Proposed Learning Action Cell (LAC)-Based Implementation Plan

Based on the highly favorable content and language validation results, a clustered Learning Action Cell (LAC)-Based Implementation Plan was developed to facilitate the utilization of *Where Math Meets Life: A Contextualized Grade 5 Workbook* in participating schools. The implementation plan includes teacher orientation, collaborative lesson planning, demonstration teaching, peer mentoring, monitoring activities, and evaluation mechanisms designed to support effective classroom integration of the contextualized learning materials. The proposed plan serves as a systematic framework for introducing, implementing, monitoring, and sustaining the use of the developed workbook among Grade 5 mathematics teachers.

The development of the implementation plan was based on the recognition that the effectiveness of instructional materials depends not only on the quality of the resource itself but also on the competence and preparedness of teachers who utilize it. Although the workbook obtained an overall content validity rating of 96.60% (Very High) and favorable language validation results, successful classroom implementation requires that teachers be adequately oriented to its objectives, instructional components, assessment procedures, and contextualized learning strategies. This observation supports the Department of Education's policy on Learning Action Cells, which identifies collaborative professional learning as an essential mechanism for improving instructional delivery and learner outcomes.

The inclusion of teacher orientation activities within the implementation plan is particularly important because contextualized learning materials often require instructional approaches that differ from traditional textbook-based teaching. According to DepEd Order No. 35, s. In 2016, Learning Action Cells provided teachers with opportunities to deepen content knowledge, strengthen pedagogical skills, and collaboratively address classroom challenges. Through orientation sessions and professional discussions, teachers become familiar with the workbook's structure, contextualized activities, and intended learning outcomes, thereby increasing implementation fidelity and instructional effectiveness.

Similarly, collaborative lesson planning and demonstration teaching activities were incorporated to encourage professional collaboration and shared instructional decision-making. Research has shown that collaborative planning enables teachers to exchange ideas, improve lesson design, and develop more effective teaching strategies. According to DuFour and Eaker (1998), professional learning communities promote continuous instructional improvement because teachers engage in collective reflection and collaborative problem solving. By integrating collaborative planning into the implementation plan, teachers are provided opportunities to adapt the workbook to their specific classroom contexts while maintaining alignment with intended learning objectives.

The peer mentoring component of the implementation plan further reflects contemporary approaches to teacher professional development. According to Vescio, Ross, and Adams (2008), collaborative professional learning environments positively influence instructional practices and student achievement because teachers continuously learn from one another through observation, discussion, and feedback. Through peer mentoring activities, experienced teachers can support colleagues in implementing contextualized learning strategies, thereby enhancing the overall effectiveness of workbook use.

The proposed monitoring and evaluation activities likewise play a crucial role in ensuring sustainability and continuous improvement. Effective implementation requires regular monitoring to determine whether instructional materials are being used as intended and contributing to improved learner performance. According to Guskey (2002), evaluation is an essential component of professional development because it provides evidence regarding implementation effectiveness and informs future improvements. The monitoring activities included in the implementation plan, therefore, enable school leaders and teachers to identify implementation strengths, address challenges, and refine instructional practices based on evidence gathered during classroom application.

Furthermore, the inclusion of feedback mechanisms reflects principles of continuous quality improvement in educational practice. Feedback from teachers and learners may be used to guide future revisions and enhancements to the workbook. This process aligns with the recommendations of Fullan (2007), who emphasized that educational innovations become sustainable when stakeholders actively participate in implementation, reflection, and improvement processes. By incorporating systematic feedback collection, the implementation plan ensures that the workbook remains responsive to learners' needs and evolving instructional requirements.

The proposed implementation plan is likewise supported by studies emphasizing the effectiveness of contextualized instructional materials when accompanied by teacher support and collaborative professional development. Bautista (2023) reported that contextualized learning resources achieve greater instructional impact when teachers receive adequate training and opportunities for collaborative implementation. Similarly, Reyes (2025) found that professional learning communities significantly contribute to the successful adoption of instructional innovations by enhancing teachers' confidence,

competence, and instructional consistency. Bosch et al. (2024) likewise emphasized that sustained professional support strengthens the effectiveness of contextualized learning interventions and promotes long-term instructional improvement.

The implementation plan also reflects the principles of Vygotsky's Sociocultural Theory, which emphasizes learning as a socially mediated process. Just as learners benefit from collaborative learning experiences, teachers likewise enhance professional competence through interaction, dialogue, mentoring, and shared practice. The Learning Action Cell, therefore, serves not only as an implementation mechanism but also as a professional learning community that promotes collective growth and instructional excellence.

Overall, the proposed Learning Action Cell (LAC)-Based Implementation Plan provides a practical and sustainable framework for maximizing the instructional benefits of the developed contextualized learning materials. Through teacher orientation, collaborative lesson planning, demonstration teaching, peer mentoring, monitoring, evaluation, and feedback mechanisms, the plan supports effective classroom implementation while promoting continuous professional growth among teachers. Consequently, the proposed implementation plan strengthens the potential of *Where Math Meets Life: A Contextualized Grade 5 Workbook* to improve mathematical problem-solving competencies, enhance learner engagement, and contribute to improved mathematics achievement among Grade 5 learners.

CONCLUSION

Based on the findings of the study, the following conclusions are drawn:

1. The BoSY RMA results confirmed that Grade 5 pupils experience significant difficulties in key mathematical word problem-solving competencies, particularly those requiring multi-step reasoning and deeper conceptual understanding.
2. The use of a data-driven approach in identifying least learned competencies provided a systematic and reliable basis for the design of instructional materials that are responsive to learners' actual needs.
3. The identified contextualized design features and instructional components—such as real-life contexts, structured lesson sequencing, guided examples, visual representations, and step-by-step progression—are appropriate and relevant for addressing learners' difficulties in mathematical word problem-solving.
4. The developed contextualized learning materials are valid, curriculum-aligned, and instructionally appropriate, as evidenced by very high ratings in content and language evaluation conducted by expert validators.
5. The integration of real-life and community-based contexts in the materials makes them meaningful and relevant to learners, with strong potential to support understanding and engagement in mathematical problem-solving tasks.
6. The proposed clustered Learning Action Cell (LAC) implementation plan provides a practical and structured approach for orienting and supporting teachers in the proper utilization of the validated materials in classroom instruction.

Recommendations

Based on the conclusions of the study, the following recommendations are offered:

Learners. They may use the developed contextualized workbook as a supplementary instructional resource to strengthen their understanding and skills in solving mathematical word problems through relatable and real-life learning situations.

Teachers. They are encouraged to integrate contextualized learning materials into mathematics instruction, particularly in schools with limited or insufficient textbook resources, to provide learners with more meaningful, relevant, and accessible learning materials.

School Heads and Instructional Leaders. They may support the use of the validated materials by organizing clustered Learning Action Cell (LAC) sessions, monitoring classroom integration, and providing instructional guidance to teachers on their effective use.

Department of Education and LRMSD Personnel. They may consider reviewing and endorsing the validated, contextualized learning materials for possible inclusion in the Learning Resources Management and Development System (LRMSD) portal, particularly to support schools with limited access to contextualized, printed mathematics resources.

Curriculum Developers and Material Writers. They may continue developing contextualized learning materials that address other least-learned competencies and grade levels, ensuring instruction remains responsive to learners' needs and local learning contexts.

Future Researchers. They may conduct follow-up studies focusing on the classroom implementation and effectiveness of the developed materials using experimental or quasi-experimental research designs.

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