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Design and Development of Instructional Resources In Mathematics 6

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Abstract

This study designed and developed instructional resources in Mathematics 6 and determined their effectiveness in improving the problem-solving performance of Grade 6 learners. Specifically, it assessed learners' performance before and after the utilization of the developed instructional resources and evaluated the quality of the materials through expert validation. The study employed a descriptive-developmental research design involving 48 Grade 6 learners of Antongalon Elementary School during School Year 2026–2027. A researcher-made 30-item multiple-choice Problem-Solving Test served as both the pretest and posttest, while the instructional resources were evaluated by five expert validators using the Department of Education Learning Resources Management and Development System (LRMDS) criteria. Data were analyzed using frequency, percentage, weighted mean, standard deviation, and paired-samples t-test. Results showed that prior to the intervention, most learners (52.08%) demonstrated Low Mastery in problem-solving performance. The instructional resources were systematically developed using the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) Model and received favorable ratings from expert validators. The materials were rated Very Satisfactory and High Quality in terms of content (WM = 3.97), format (WM = 3.90), presentation and organization (WM = 4.00), and accuracy and currency of information (WM = 3.90). After implementation, learners' performance improved considerably, with 79.16% achieving the Mastered level and none remaining under the Low Mastery or No Mastery categories. Moreover, the paired-samples t-test revealed a significant difference between the pretest and posttest scores ($t = -15.359$, $p = .000$). The findings indicate that the developed instructional resources effectively enhanced learners' problem-solving performance. The study concludes that the instructional resources are valid, effective, and suitable for classroom use.

Keywords: ADDIE Model, Instructional Resources, Mathematics 6, Problem-Solving Performance, Grade 6 Learners, LRMDS Validation

Introduction

Mathematics plays a vital role in developing learners' critical thinking, logical reasoning, and problem-solving skills necessary for academic success and everyday life. However, Mathematics remains a challenging subject for many learners worldwide. According to the Programme for International Student Assessment

(PISA) 2022, Filipino learners obtained an average Mathematics score of 355, which is significantly lower than the OECD average of 472. Moreover, only 16% of Filipino learners reached at least Level 2 proficiency, indicating that a large number of learners continue to struggle with basic mathematical reasoning and problem-solving skills.

At the local level, Grade 6 learners of Antongalon Elementary School during School Year 2024-2025 recorded Mean Percentage Scores (MPS) ranging from 45% to 55% in Mathematics, which remained below the expected proficiency level. Results of the Rapid Mathematics Assessment (RMA) likewise revealed that many learners were classified as Not Proficient and Low Proficient. Classroom observations further showed that learners often lacked confidence and had difficulty solving non-routine mathematical problems, highlighting the need for appropriate instructional support.

Recognizing these concerns, the Department of Education (DepEd) continues to strengthen numeracy development through the MATATAG Agenda, which prioritizes foundational literacy and numeracy skills. This initiative emphasizes the use of learner-centered and effective instructional interventions to address learning gaps and improve educational outcomes among Filipino learners.

The conduct of this study is supported by several legal and policy frameworks. Article XIV, Section 1 of the 1987 Philippine Constitution guarantees every Filipino learner's right to quality education, while Republic Act No. 10533 or the Enhanced Basic Education Act of 2013 promotes learner-centered and competency-based instruction that develops critical and analytical thinking skills. Similarly, Republic Act No. 12028 and the Academic Recovery and Accessible Learning (ARAL) Program encourage schools to implement interventions that strengthen foundational literacy and numeracy competencies.

In response to the identified learning gaps, the development of instructional resources in Mathematics 6 offers a practical and responsive intervention. Well-designed instructional materials can provide learners with meaningful learning experiences, guided practice opportunities, and contextualized activities that support the development of problem-solving skills and mathematical understanding.

Given the persistent challenges in Mathematics performance among Grade 6 learners, this study focused on the design and development of instructional resources in Mathematics 6 and examined their effectiveness in enhancing learners' problem-solving performance. Through expert validation and assessment of learners' performance before and after the utilization of the developed materials, the study aimed to contribute to improved Mathematics achievement and support ongoing efforts to strengthen numeracy education among elementary learners.

Review of Related Studies

This chapter presents a review of related literature and studies relevant to the design and development of instructional materials and their role in enhancing learners' problem-solving performance in Mathematics.

The development and utilization of instructional resources have been recognized as essential components in improving learners' Mathematical understanding and academic achievement. Instructional resources provide structured learning experiences that facilitate concept acquisition, skill development, and meaningful engagement in the learning process. In the Philippines, Albento (2023), in the study *Development and Validation of Remediated Learning Material in Mathematics 6* conducted at Calongbuyan Elementary School, found that Grade 6 learners experienced difficulties in solving problems involving decimals and other least-mastered competencies. To address these challenges, remediated learning materials were developed and validated. Findings revealed that the developed materials obtained high validity ratings and were considered useful in improving learners' Mathematical proficiency. The study emphasized that carefully designed instructional materials can effectively address specific learning gaps and improve learner performance.

Similarly, Niño and Lomibao (2026), in their study entitled *A Systematic Review on the Development and Validation of Instructional Materials Utilized in the Philippine Mathematics Classroom* conducted at the University of Science and Technology of Southern Philippines, reported that instructional materials significantly enhance learner engagement, comprehension, and academic performance when they are properly designed and validated. The review further highlighted the importance of contextual relevance, content accuracy, and systematic validation in ensuring the effectiveness of instructional materials used in Mathematics classrooms.

Internationally, Rommise (2025) conducted the study *Development of Interactive Mathematics Teaching Materials Based on the ADDIE Model to Improve Numeracy Literacy of Elementary School Students* in West Kalimantan, Indonesia. The findings revealed that instructional materials developed through a systematic framework improved learners' conceptual understanding, reasoning skills, and motivation. The study concluded that structured instructional resources promote active learning and enhance numeracy development among elementary learners.

These studies suggest that instructional resources play a crucial role in supporting Mathematics learning and improving learners' performance. They further highlight the importance of developing quality materials that address learners' specific needs and learning difficulties.

Problem-solving is considered one of the most important competencies in Mathematics because it enables learners to apply concepts and skills to real-life situations. However, numerous studies have consistently reported difficulties among learners in solving mathematical problems, particularly word problems requiring critical thinking and analysis.

In the Philippines, Hijada Jr. and Dela Cruz (2022) conducted the study *The Gap Between Comprehension Level and Problem-Solving Skills in Learning Mathematics* among Grades 4 to 6 learners at Kang-Iras Elementary School in Leyte. The study revealed that most learners were classified as non-proficient in solving mathematical word problems and demonstrated difficulties in interpreting problem situations and determining appropriate solution strategies. The researchers emphasized the need for effective instructional interventions and learning materials that can strengthen learners' problem-solving abilities.

Likewise, Cambaya and Tan (2022), in their study *Enhancing Students' Problem-Solving Skills and Engagement in Mathematics Learning Through Contextualized Instruction* conducted in Bukidnon, Philippines, found that learners exhibited very low levels of problem-solving skills prior to the intervention. After exposure to contextualized instructional strategies, significant improvements were observed in both problem-solving performance and learner engagement. The researchers concluded that meaningful and relevant learning experiences positively influence learners' mathematical achievement.

Similarly, Enriquez et.al (2024), in the study *Enhancing Problem-Solving Skills in Mathematics Education: A Study on Realistic Mathematics Education in the Philippines* conducted in Cebu, reported that learners demonstrated improved problem-solving performance when Mathematics lessons were presented through realistic and meaningful contexts. The study further noted that active learner participation and contextualized learning experiences lead to deeper conceptual understanding and better mathematical reasoning.

The foregoing studies indicate that learners continue to face challenges in mathematical problem-solving and that instructional interventions designed to promote active learning and meaningful engagement can significantly improve learner performance.

The systematic development of instructional resources is greatly influenced by instructional design models that ensure the quality, relevance, and effectiveness of educational materials. One of the most widely used frameworks is the ADDIE Model, which consists of Analysis, Design, Development, Implementation, and Evaluation.

The study of Luzano (2023), entitled *An ADDIE Model Analysis on the Engineering of Contextualized Intervention Materials (CIMs) and Students' Achievement in Mathematics*, was conducted in Pagadian City, Philippines. The researcher developed contextualized intervention materials using the ADDIE framework and found that the materials were rated highly by validators and significantly improved students' Mathematics achievement. The study concluded that the systematic development process ensured the effectiveness and quality of the instructional materials.

Similarly, Rommise (2025) reported that the ADDIE Model provided a systematic approach to developing Mathematics instructional materials that were aligned with learners' needs, learning objectives, and assessment requirements. The study found that ADDIE-based instructional resources improved numeracy literacy, conceptual understanding, and learner motivation among elementary school learners.

These studies support the use of the ADDIE Model in the present investigation, as it provides a systematic and research-based approach to designing, developing, validating, implementing, and evaluating instructional resources in Mathematics 6.

Validation is an essential component in instructional material development because it ensures that learning materials are accurate, appropriate, and aligned with curricular standards. Expert validation also determines whether instructional resources effectively support learning objectives and learner needs.

According to Albento (2023), the developed Mathematics 6 learning materials were subjected to expert validation and were found to possess high levels of adequacy, coherence, usefulness, and appropriateness. The findings demonstrated that validation contributes significantly to the quality and usability of instructional materials intended for classroom implementation.

Likewise, Niño and Lomibao (2026) emphasized that instructional materials become more effective when subjected to rigorous validation procedures. Their systematic review revealed that validated materials were more likely to improve learner engagement and academic performance because they met quality standards in content, organization, presentation, and instructional effectiveness.

The reviewed literature highlights the importance of expert validation in ensuring the effectiveness of instructional resources, which supports the present study's evaluation of the developed materials in terms of content, format, presentation and organization, and accuracy and currency of information.

Numerous studies have demonstrated the positive impact of instructional resources on learners' Mathematics achievement and problem-solving performance. Effective instructional resources provide opportunities for learners to explore concepts, practice skills, and apply mathematical ideas in meaningful contexts.

In Leyte, Philippines, Amistoso (2024) conducted the study *Effectiveness of Contextualized Problem-Based Learning in Improving the Performance of Grade 6 Learners in Math*. Using a pretest-posttest design, the study found a significant improvement in learners' Mathematics performance after exposure to contextualized problem-based learning activities. The findings confirmed that instructional interventions can effectively address learners' difficulties and improve achievement in Mathematics.

Similarly, Linaza et.al (2025), in the study *Enhancing Grade 4 Students' Mathematical Problem-Solving Skills Using Manipulatives* conducted at San Rafael Integrated School in Davao Oriental, found that learners who used manipulatives significantly outperformed those who received traditional instruction. The researchers concluded that instructional resources that provide concrete and interactive learning experiences positively influence learners' mathematical understanding and problem-solving performance.

Collectively, these studies indicate that instructional resources play a significant role in improving Mathematics achievement and problem-solving skills. They provide empirical support for the development and utilization of instructional resources as interventions to address learners' difficulties in Mathematics.

The reviewed literature and studies consistently demonstrate that problem-solving remains a significant challenge among Mathematics learners. Both local and foreign studies revealed that learners often

struggle with understanding mathematical concepts, interpreting word problems, and applying appropriate solution strategies. Research likewise highlights the effectiveness of instructional resources in addressing these difficulties by providing meaningful, structured, and learner-centered learning experiences.

Furthermore, studies support the use of the ADDIE Model as an effective framework for the systematic design and development of instructional resources and emphasize the importance of expert validation in ensuring instructional quality. While numerous studies have examined instructional materials and Mathematics interventions, limited research has focused specifically on the design and development of instructional resources in Mathematics 6 intended to enhance learners' problem-solving performance in decimal operations. Hence, the present study seeks to fill this gap by developing, validating, implementing, and enhancing instructional resources in Mathematics 6 and determining their effectiveness in improving the problem-solving performance of Grade 6 learners.

Theoretical/Conceptual Framework

This study is anchored on the Constructivist Learning Theory of Jean Piaget, which emphasizes that learners actively construct knowledge through meaningful experiences and interactions with their environment. According to Piaget, learning occurs when individuals build new understanding by connecting new information with their existing knowledge and experiences. Rather than passively receiving information, learners become active participants in the learning process through exploration, discovery, and problem-solving.

Piaget argued that cognitive development takes place when learners encounter situations that challenge their existing understanding, prompting them to adapt through the processes of assimilation and accommodation. Assimilation occurs when learners incorporate new information into their existing cognitive structures, while accommodation involves modifying those structures to accommodate new experiences. Through these processes, learners develop deeper understanding and more sophisticated ways of thinking.

In Mathematics education, the Constructivist Learning Theory highlights the importance of engaging learners in activities that require them to think critically, analyze situations, and construct solutions independently. Learners develop mathematical understanding not merely by memorizing rules and procedures but by actively applying concepts to solve meaningful and authentic problems. Problem-solving activities allow learners to explore relationships among mathematical ideas, test possible solutions, and refine their understanding through experience.

The instructional resources developed in this study are grounded on these constructivist principles. Through the Decimal Dash Challenge activities, learners are provided with opportunities to actively engage in solving word problems involving decimal operations. As learners move through different stations, they encounter diverse problem-solving situations that require them to analyze information, apply previously learned concepts, and formulate appropriate solutions. These experiences enable learners to construct mathematical understanding through active participation rather than passive learning.

Furthermore, the instructional resource encourages learners to discuss ideas, justify their answers, and learn from their experiences while completing the tasks at each station. The structured sequence of problem-solving activities allows learners to progressively strengthen their understanding of decimal operations and develop effective problem-solving strategies. Through repeated exposure to meaningful mathematical tasks, learners become more confident and proficient in applying mathematical concepts to real-life situations.

Anchored on Piaget's Constructivist Learning Theory, this study assumes that when learners actively engage in well-designed instructional activities, they are more likely to develop deeper conceptual understanding and improved problem-solving skills. Consequently, the use of the developed instructional

resources in Mathematics 6 is expected to enhance the problem-solving performance of Grade 6 learners, as evidenced by improved posttest results after the utilization of the instructional materials.

The study adopted the Input-Process-Output (IPO) Model integrated with the ADDIE Model as its conceptual framework. The framework illustrates the systematic process involved in designing, developing, validating, implementing, and enhancing the instructional resources in Mathematics 6. It is anchored on Jean Piaget's Constructivist Learning Theory, which emphasizes that learners construct knowledge through active engagement, meaningful experiences, and problem-solving activities.

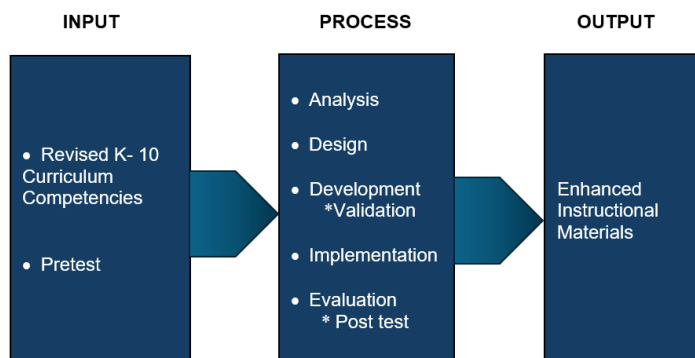
The input of the study consists of the Revised K to 10 Mathematics 6 competencies, the pretest results on the problem-solving performance of Grade 6 learners, identified learning gaps and difficulties in mathematical problem-solving, and Piaget's Constructivist Learning Theory, which served as the theoretical foundation for the development of the instructional resources.

The process employs the ADDIE Model, which includes Analysis, Design, Development, Implementation, and Evaluation. During the analysis phase, learners' needs, learning gaps, and curriculum requirements are examined. The design phase focuses on planning the instructional resources, learning activities, and assessment tasks. During development, the instructional resources are created and prepared for utilization. The implementation phase involves the actual use of the developed instructional resources by Grade 6 learners. Finally, the evaluation phase includes expert validation of the materials in terms of content, format, presentation and organization, and accuracy and currency of information, as well as the administration of the posttest and analysis of learners' performance. The instructional resources are subsequently enhanced based on the findings.

The output of the study consists of validated and enhanced instructional resources in Mathematics 6 and improved problem-solving performance among Grade 6 learners. Consistent with Piaget's Constructivist Learning Theory, the instructional resources provide opportunities for active participation and meaningful learning experiences, enabling learners to construct mathematical understanding and develop their problem-solving skills. This framework demonstrates how the systematic application of the ADDIE Model contributes to the development of quality instructional resources and the improvement of learners' Mathematics achievement.

The concept of the study are illustrated in Figure 1.

Figure 1. The Research Paradigm Showing the Flow of the Study



Objectives of the Study

This study aimed to design and develop instructional resources in Mathematics 6 and determine their effectiveness in enhancing the problem-solving performance of learners. Specifically, it sought to: (1)

determine the level of problem-solving performance of Grade 6 learners based on the pretest results; (2) design and develop instructional resources in Mathematics 6; (3) determine the evaluation of experts on the developed instructional resources in terms of content, format, presentation and organization, and accuracy and currency of information; (4) determine the level of problem-solving performance of Grade 6 learners based on the posttest results; (5) determine whether a significant difference exists between the pretest and posttest levels of problem-solving performance of Grade 6 learners after the utilization of the instructional resources; and (6) propose enhancements to the developed instructional resources based on the findings of the study.

Methodology

This study employed a descriptive-developmental research design to design, develop, and determine the effectiveness of instructional resources in Mathematics 6 in enhancing the problem-solving performance of Grade 6 learners. The study was conducted at Antongalon Elementary School, Butuan City, and involved all 54 Grade 6 learners from the Roxas and Quezon sections through complete enumeration using an intact group sampling design. Data were gathered using a researcher-made 30-item Problem-Solving Test, which served as both the pretest and posttest, and the developed instructional resources, which were evaluated by experts in terms of content, format, presentation and organization, and accuracy and currency of information. The research instruments underwent expert validation, preparation of a Table of Specifications (TOS), pilot testing, and item analysis to establish their validity and reliability. Following the necessary approvals and ethical procedures, the pretest was administered, the developed instructional resources were implemented during Mathematics instruction, and the posttest was subsequently conducted to measure changes in learners' problem-solving performance. Data were analyzed using frequency and percentage to determine learners' levels of problem-solving performance, weighted mean to determine the experts' evaluation of the developed instructional resources, and the paired-samples t-test to determine whether a significant difference existed between the pretest and posttest scores. The findings served as the basis for enhancing the developed instructional resources.

Results and Discussion

Problem 1. What is the level of problem-solving performance of Grade 6 learners based on the pretest results?

Table 1 presents the pretest level of problem-solving performance of the Grade 6 learners in Mathematics.

Table 1. The Level of Problem-Solving Performance of Grade 6 Learners Based on the Pre-Test

Score Range	Pre-test		Mastery Level
	frequency	percent	
23-30	1	2.08	Mastered
16-22	12	25	Nearing Mastery
9-15	25	52.08	Low Mastery
1-8	10	20.83	No Mastery
Total	48	100	

The data in Table 1 present the level of problem-solving performance of 48 Grade 6 learners based on the pre-test result. As can be seen, the results show that the learners had varied levels of mastery. It indicates that only one learner (2.08%) obtained a score within the 23–30 range, which corresponds to the Mastered level. This shows that only a very small proportion of the learners illustrate a satisfactory command of the problem-solving skills assessed in the pre-test. The low percentage of learners in the mastered category suggests that most learners still needed further development and instructional support in solving Mathematical problems. Several learners, ($f=12$, 25%) scored the 16-22 range, classified as Nearing Mastery. The finding implies that although several learners had acquired some of the necessary problem-solving skills, their performance was not yet sufficient to reach the mastery level. The majority of the learners, ($f=25$, 52.08%) scored within the 9-15 range, classified as Low Mastery also implied that their performance had not yet reached the mastery level. Furthermore, a considerable number of learners ($f=10$, 20.83%) are within the 1–8 range, categorizing them under the No Mastery level. This means that more than three-fourths of the learners manifest inadequate performance in the problem-solving competencies measured by the pre-test. This implies that learners may require more intensive and systematic assistance, particularly in understanding problem situations, identifying relevant information, determining appropriate operations or strategies, and arriving at correct solutions.

Problem 2. How may instructional resources in Mathematics 6 be designed and developed to enhance the problem-solving performance of learners?

The instructional resources in Mathematics 6 were designed and developed using the ADDIE Model, which served as the framework for ensuring a systematic, learner-centered, and research-based instructional design process. The model consists of five phases: Analysis, Design, Development, Implementation, and Evaluation. Through these phases, the instructional resources were carefully developed to address the identified learning needs of Grade 6 learners and enhance their problem-solving performance in Mathematics.

During the Analysis Phase, the researcher examined the Mathematics performance of Grade 6 learners, particularly in solving multi-step word problems involving decimal operations. Classroom observations, assessment records, and pretest results revealed that a considerable number of learners experienced difficulties in understanding problem situations, identifying relevant information, selecting appropriate mathematical operations, and applying effective solution strategies. These findings served as the basis for the development of instructional resources designed to address the identified learning gaps and improve learners' problem-solving performance.

The Design Phase involved the identification of learning objectives based on the Mathematics 6 competencies prescribed in the Revised K–10 Curriculum. Learning activities, instructional strategies, assessment tasks, and enrichment exercises were systematically planned to ensure alignment with the intended learning outcomes.

During the Development Phase, the instructional resources were created and organized to support the development of learners' problem-solving skills. The materials included guided activities, practice exercises, station-based learning tasks, word problems, and assessment activities centered on decimal operations. Specifically, the instructional resource incorporated the Decimal Dash activity, which allowed learners to engage in collaborative and active problem-solving through a station-rotation approach. The design of the activities was anchored on Jean Piaget's Constructivist Learning Theory, which posits that learners construct knowledge through active engagement and meaningful learning experiences. Through participation in hands-on activities and problem-solving tasks, learners were provided opportunities to build mathematical understanding and apply concepts in meaningful contexts. This supports the findings of Albento (2023), who reported that well-designed Mathematics learning materials improved learners' understanding of difficult

competencies and addressed specific learning gaps. Likewise, Cambaya and Tan (2022) found that learner-centered instructional interventions contributed significantly to the improvement of mathematical problem-solving skills among learners.

The Implementation Phase involved the utilization of the developed instructional resources among the Grade 6 learners. The materials were integrated into regular Mathematics instruction, particularly in lessons involving addition, subtraction, and multiplication of decimals in problem-solving situations. Learners actively participated in guided and collaborative activities, completed problem-solving tasks, and engaged in station-based exercises designed to strengthen their understanding and application of mathematical concepts.

Finally, the Evaluation Phase involved both formative and summative evaluation procedures. The instructional resources were subjected to expert validation to determine their quality in terms of content, format, presentation and organization, and accuracy and currency of information.

In addition, the effectiveness of the instructional resources was evaluated through the administration of a posttest and the comparison of learners' pretest and posttest scores. The results of these evaluations served as the basis for enhancing the instructional resources and determining their effectiveness in improving the problem-solving performance of Grade 6 learners. Through the systematic application of the ADDIE Model and the principles of Constructivist Learning Theory, the developed instructional resources were designed to provide meaningful learning experiences that support the development of mathematical understanding and problem-solving skills.

Problem 3. How do experts evaluate the developed instructional resources in terms of content, format, presentation and organization, and accuracy and currency of information?

Five experts have evaluated this material. The evaluation results are indicated in the following Tables :

Table 2. The Experts' Evaluation of the Instructional Materials in terms of Content Quality

Indicators	wtdmn	SD	Verbal description	Interpretation
1.Content is suitable to the student's level of development.	4.00	.000	Very satisfactory	
2.Material contributes to the achievement of specific objectives of the subject area and grade/year level for which is intended.	4.00	.000	Very satisfactory	High quality
3.Material provides for the development of higher cognitive skills such as critical thinking, creativity, learning by doing inquiry, problem solving, etc.	4.00	.000	Very satisfactory	
4.Material is free of ideological, cultural, religious, racial, gender biases and prejudices.	4.00	.000	Very satisfactory	High quality
5.Material enhances the development of desirable value and traits	4.00	.000	Very satisfactory	
6.Material has the potential to arouse interest of target readers	3.80	.447	Very satisfactory	High quality
7. Adequate warning/cautionary notes are provided into and activities where safety and health are of concern.	3.80	.447	Very satisfactory	
Average weighted mean	3.97		Very satisfactory	High quality

Legend : (1) 1.0-1.49 poor /very poor quality (2) 1.5-2.49 unsatisfactory / poor quality (3) 2.50 -3.49 satisfactory/good quality (4) 3.50-4.00 very satisfactory/high quality

Table 2 presents the experts' evaluation of the instructional materials in terms of content quality. The findings reveal an average weighted mean of 3.97, verbally described as Very Satisfactory and interpreted as High Quality.

The table shows that five indicators obtained a perfect weighted mean of 4.00, namely suitability to learners' developmental level, contribution to the achievement of learning objectives, promotion of higher-order thinking skills, absence of bias, and enhancement of desirable values and traits. Meanwhile, the indicators on arousing learners' interest and providing adequate cautionary notes obtained a weighted mean of 3.80, which still falls within the very satisfactory category.

The findings indicate that the developed instructional resources possess relevant, accurate, and curriculum-aligned content that effectively addresses the intended Mathematics 6 competencies. Moreover, the activities incorporated in the materials promote critical thinking, problem-solving, and active learner engagement, which are essential in developing meaningful mathematical understanding and improving learners' ability to apply concepts in real-life situations.

The result is consistent with the findings of Albento (2023) in the study Development and Validation of Remediated Learning Material in Mathematics 6, which revealed that well-designed and validated instructional materials obtained high ratings in terms of adequacy, coherence, appropriateness, and usefulness, making them effective tools for improving learners' mathematical proficiency. Likewise, Niño and Lomibao (2026) emphasized that instructional materials become more effective when they contain relevant, accurate, and well-organized content that aligns with curriculum standards and learners' needs. Furthermore, Rommise (2025) found that instructional resources developed through a systematic instructional design process significantly enhanced learners' conceptual understanding, reasoning skills, and motivation in Mathematics. These studies support the high content evaluation obtained by the developed instructional resources and affirm their potential to facilitate meaningful learning and improve learners' problem-solving performance.

Table 3.2 below presents the experts' evaluation of the instructional materials in terms of format. The overall weighted mean of 3.90 is verbally described as Very Satisfactory and interpreted as High Quality.

The results reveal that the illustrations component garnered a perfect average weighted mean of 4.00, indicating that the evaluators found the illustrations simple, attractive, culturally relevant, and supportive of learning. The prints category obtained an average weighted mean of 3.85, while paper and binding, as well as size and weight, were likewise rated highly by the evaluators. On the other hand, the design and layout category obtained an average weighted mean of 3.35, interpreted as satisfactory.

These findings suggest that the material is visually appealing, readable, and suitable for Grade 6 learners. The use of well-designed illustrations, readable fonts, and appropriate layout contributes to better comprehension and learner engagement. Visual elements help learners focus on important information and enhance their understanding of mathematical concepts and procedures.

Table 3. The Experts' Evaluation of the Instructional Materials in terms of Format

Indicators		Wtd mn	SD	Verbal Description	Interpretation
1. Prints					
1.1.	Size of letters is appropriate to the intended user.	3.80	.447	Very satisfactory	High quality
1.2.	Spaces between letters and words facilitate reading.	3.80	.447	Very satisfactory	
1.3.	Font is easy to read.	3.80	.447	Very satisfactory	

1.4. Printing is of good quality (i.e., no broken letters, placed screen registration).	4.00	.000	Very satisfactory	
Average weighted mean	3.85		Very satisfactory	High quality
2. Illustrations				
2.1. Simple and easily recognizable.	4.00	.000	Very satisfactory	
2.2. Clarify and supplement the text.	4.00	.000	Very satisfactory	High quality
2.3. Properly labelled or captioned (if applicable) .	4.00	.000	Very satisfactory	
2.4. Realistic / appropriate colors.	4.00	.000	Very satisfactory	high quality
2.5. Attractive and appealing.	4.00	.000	Very satisfactory	
2.6. Culturally relevant.	4.00	.000	Very satisfactory	
Average weighted mean	4.00		Very satisfactory	High Quality
3. Design and Layout				
3.1. Attractive and pleasing to look at.	3.60	.548	Very satisfactory	High quality
3.2. Simple (i.e., does not distract the attention of the reader).	3.20	.837	satisfactory	Good quality
3.3. Adequate illustration in relation to text.	3.40	.548	satisfactory	Good quality
3.4. Harmonious blending of elements (e.g., illustrations and text).	3.20	.837	satisfactory	good quality
Average weighted mean	3.35		satisfactory	Good quality
4. Paper and Binding : indicators				
4.1. Paper used contributes to easy reading.	3.80	.447	Very satisfactory	High quality
4.2. Durable binding to withstand frequent use.	3.80	.447	Very satisfactory	high quality
5. Size and Weight of Resource				High quality
5.1. Easy to handle.	4.00	.000	Very satisfactory	
5.2. Relatively light.	4.00	.000	Very satisfactory	
Overall weighted mean	3.90		Very satisfactory	High quality

Legend : (1) 1.0-1.49 poor /very poor quality (2) 1.5-2.49 unsatisfactory / poor quality (3) 2.50 -3.49 satisfactory/good quality (4) 3.50-4.00 very satisfactory/high quality

The findings support Piaget's Constructivist Learning Theory, which emphasizes that learners construct knowledge actively through meaningful interactions with learning materials and experiences. An organized and learner-friendly format facilitates active engagement and allows learners to interact effectively with the activities and problem-solving tasks embedded in the instructional resources. Consequently, a well-structured format creates an environment that supports knowledge construction and deeper understanding of mathematical concepts.

The results are consistent with the findings of Albento (2023), whose study revealed that Mathematics learning materials possessing appropriate format, coherence, and usability were highly acceptable to validators and effective in supporting learners' mathematical proficiency. Likewise, Niño and Lomibao (2026) emphasized that properly organized and well-presented instructional materials significantly enhance learner

engagement, comprehension, and academic performance. Similarly, Rommise (2025) found that instructional materials developed through a systematic instructional design process improved learners' conceptual understanding and motivation, partly because of their clear organization and learner-centered presentation. These studies support the high ratings obtained by the developed instructional resources and highlight the importance of quality format in promoting effective Mathematics instruction and meaningful learning experiences.

Table 4 presents the experts' evaluation of the instructional materials in terms of presentation and organization. The overall average weighted mean of 4.00 indicates a verbal description of Very Satisfactory and an interpretation of High Quality.

Table 4. The Experts' Evaluation of the Instructional Materials in terms of Presentation and Organization

Indicators	Wtd mn	SD	Verbal Description	Interpretation
1. Presentation is engaging, interesting, and understandable.	4.00	.000	Very satisfactory	
2. There is a logical and smooth flow of ideas.	4.00	.000	Very satisfactory	
3. Vocabulary level is adapted to target reader's likely experience and level of understanding.	4.00	.000	Very satisfactory	High quality
4. Length of sentences is suited to the comprehension level of the target reader.	4.00	.000	Very satisfactory	
5. Sentences and paragraph structures are varied and interesting to the target reader.	4.00	.000	Very satisfactory	High quality
Average weighted mean	4.00		Very satisfactory	High quality

Legend : (1) 1.0-1.49 poor /very poor quality (2) 1.5-2.49 unsatisfactory / poor quality (3) 2.50 -3.49 satisfactory/good quality (4) 3.50-4.00 very satisfactory/high quality

All indicators received a perfect weighted mean of 4.00, indicating complete agreement among the evaluators regarding the quality of the material's presentation and organization. The evaluators affirmed that the material is engaging, logically organized, easy to understand, and suited to the intended users.

The findings imply that ideas were presented in a clear and systematic manner, allowing learners to follow lessons and activities with ease. The organization of content, progression of tasks, and use of learner-friendly language contribute to effective instruction and facilitate learners' understanding of mathematical concepts and procedures.

The findings support Piaget's Constructivist Learning Theory, which emphasizes that learners construct knowledge more effectively when learning experiences are organized in a manner that allows them to actively engage with concepts and progressively build understanding. Well-organized instructional resources provide a structured environment that supports learners in connecting prior knowledge with new learning experiences, thereby enhancing conceptual understanding and problem-solving abilities.

The results are consistent with the findings of Niño and Lomibao (2026), who reported that instructional materials with well-organized content, clear presentation, and logical sequencing significantly improve learner engagement, comprehension, and academic performance. Similarly, Albento (2023) found

that Mathematics learning materials that exhibited coherence, appropriateness, and usability were highly acceptable to experts and effective in supporting learners' mathematical understanding. Moreover, Rommise (2025) emphasized that systematically designed instructional materials contribute to improved conceptual understanding and learner motivation by presenting content in a clear and organized manner. These studies support the present findings and suggest that the presentation and organization of the developed instructional resources effectively facilitate learning and enhance learners' understanding of Mathematics.

Table 4 presents the experts' evaluation of the instructional materials in terms of accuracy and currency of information. The overall average weighted mean of 3.90, interpreted as No Errors Present and High Quality, indicates that the material possesses a high degree of accuracy and reliability.

The findings reveal that conceptual errors, factual errors, grammatical errors, computational errors, and obsolete information all received perfect ratings. The indicator on typographical and minor errors obtained a weighted mean of 3.60, which likewise falls within the highest descriptive category.

Table 5. The Experts' Evaluation of the Instructional Materials in terms of Accuracy and Currency of Information

Indicators	Wtd mn	SD	Verbal Description	Interpretation
1. Conceptual errors.	4.00	.447	No errors present	High quality
2. Factual errors.	4.00	.447	No errors present	High quality
3. Grammatical errors.	4.00	.447	No errors present	High quality
4. Computational errors.	4.00	.447	No errors present	High quality
5. Obsolete information.	4.003	.000	No errors present	High quality
6. Typographical and other minor errors	.60	.548	No errors present	High quality
Average weighted mean	3.90		No errors present	High quality

Legend : (1) 1.0-1.49 poor /very poor quality (2) 1.5-2.49 unsatisfactory / poor quality (3) 2.50 -3.49 satisfactory/good quality (4) 3.50-4.00 very satisfactory/high quality

These findings suggest that the material contains correct Mathematical concepts, accurate information, appropriate language usage, and reliable computational procedures. This is important because errors in instructional materials may lead to misconceptions and negatively affect learners' understanding.

The results are consistent with the findings of Albento (2023), who reported that Mathematics learning materials possessing high levels of adequacy, coherence, appropriateness, and usefulness were considered effective instructional tools for improving learners' mathematical proficiency. Likewise, Niño and Lomibao (2026) emphasized that instructional materials must undergo rigorous validation to ensure content accuracy, reliability, and alignment with curriculum standards. Their review highlighted that accurate and well-validated instructional materials contribute significantly to learner comprehension, engagement, and academic achievement. Furthermore, Rommise (2025) found that instructional materials developed through a systematic instructional design framework promote effective learning when they provide accurate content and align with learners' needs and instructional objectives. These studies support the present findings and affirm that the developed instructional resources possess the accuracy and reliability necessary for effective classroom implementation and mathematics instruction.

Problem 4. What is the level of problem-solving performance of Grade 6 learners based on the posttest results?

Table 6. The Level of Problem-Solving Performance of Grade 6 learners based on the Post- Test

Score range	Post-test		Mastery level
	frequency	percent	
23-30	38	79.16	Mastered
16-22	10	20.83	Nearing Mastery
9-15	0	0	Low Mastery
1-8	0	0	No Mastery
Total	48	100.00	

Table 6 presents the frequency and percentage distribution of the level of problem-solving performance of Grade 6 learners based on their post-test scores.

As reflected in the Table, 38 out of 48 learners, (79.16 %), obtain scores ranging from 23–30, categorized as on the Mastered level. This indicates that the vast majority of the learners illustrate a strong ability to understand, analyze, and solve the mathematical problems included in the post-test. This means that they are able to apply appropriate problem-solving strategies and arrive at correct solutions with a considerable degree of proficiency. The high percentage of learners who reached the mastered level implies that the learning experiences provided with the utilization of the instructional material may have effectively addressed difficulties encountered by the learners and strengthened their problem-solving skills.

On the other hand, the remaining learners ($f=10$, 20.83 %) obtain scores ranging from 16–22, classified as Nearing Mastery. Although these learners did not yet reach the highest mastery category, their scores indicate that they had acquired a substantial portion of the expected problem-solving competencies. Their performance suggests that they are already developing the necessary knowledge and skills but may still require additional practice, reinforcement, and guidance to consistently demonstrate mastery. The absence of learners in the low and no-mastery category indicates that the learners applied with the instructional material generally developed sufficient understanding and problem-solving ability.

In general, the post-test findings reveal that the Grade 6 learners exhibit a substantially improved level of problem-solving performance, as evidenced by the concentration of scores in the mastered category and the complete absence of learners in the low and no-mastery category. This implies that the learners are able to attain the expected problem-solving competencies following the implementation of the learning intervention using the designed and developed instructional material for Grade 6 learners.

The results are consistent with the findings of Cambaya and Tan (2022), who reported that learners exposed to contextualized instructional strategies demonstrated significant improvements in problem-solving performance and engagement in Mathematics. Similarly, Enriquez et al. (2024) found that meaningful and learner-centered learning experiences enhanced learners' mathematical reasoning and problem-solving abilities. Likewise, Amistoso (2024) revealed that the use of contextualized instructional interventions resulted in significant improvements in the Mathematics performance of Grade 6 learners. Furthermore, Linaza, Gultiano, and Susada (2025) concluded that instructional resources providing concrete and interactive learning experiences significantly improved learners' mathematical understanding and problem-solving skills.

These studies support the present findings and suggest that well-designed instructional resources can effectively improve learners' mathematical understanding, engagement, and problem-solving performance. Consequently, the substantial improvement observed in the posttest results demonstrates the effectiveness of

the developed instructional resources in helping Grade 6 learners attain the desired Mathematics competencies.

Problem 5. Is there a significant difference between the pretest and posttest levels of problem-solving performance of Grade 6 learners after the utilization of the instructional resources?

Table 7 presents the test of significant difference in the problem-solving performance of the Grade 6 learners between the pretest and posttest scores.

Table 7. Test of Significant Difference Between the Pre-test and Post-test Scores of Grade 6 Learners in Problem-Solving Performance

Pair	Mean Difference	SD	t	df	Sig. tailed)	(2- Decision	Interpretation
Pre-test Post-test	-12.875	5.808	-15.359	47	.000	Reject Ho	Significant

.05 significance level

Table 7 presents the test of significant difference between the pre-test and post-test scores of the Grade 6 learners in problem-solving using a paired-samples t-test. The results show a mean difference of -12.875 (SD=5.808). The negative mean difference indicates that the learners obtained considerably higher scores in the post-test than in the pre-test. In other words, the learners' performance improved after the application of gamified learning material. The result indicates that the learners' problem-solving performance significantly improved following the intervention. Evidence is illustrated in the significance value (sig=.000) where it is lesser than 0.05 level of significance set for statistical analysis. Hence , the null hypothesis which states that , “ there is no significant difference between the pre-test and the post test scores of the problem - solving performance of Grade 6 learners “ is rejected. Thus , there is a significant difference between the pre-test and post-test scores of the learners. This implies that the findings provides statistical evidence that the substantial increase in their scores shows that the application of the gamified learning material is effective in enhancing their ability to solve mathematical problems.

Problem 6. Based on the findings of the study, how may the developed instructional resources be enhanced?

The improvement in the learners' problem-solving performance may be attributed to the systematic utilization of the developed instructional resources throughout the intervention period.

Initially, the learners were administered a pretest to determine their baseline level of problem-solving performance in Mathematics. The results enabled the researcher to identify specific learning gaps and areas where learners experienced difficulties, particularly in solving multi-step word problems involving decimal operations. The information gathered served as the basis for the implementation of the instructional resources designed to address these identified needs.

Throughout the intervention period, learners engaged in a series of structured learning activities, guided exercises, and problem-solving tasks embedded in the instructional resources. These activities provided opportunities for learners to practice mathematical concepts, apply appropriate problem-solving strategies, and strengthen their understanding of decimal operations. Through continuous participation in the

learning activities, learners were able to develop their analytical and critical-thinking skills while gaining greater familiarity with various problem-solving procedures.

The instructional resources incorporated learner-centered and collaborative activities, such as the Decimal Dash station-rotation tasks, which encouraged active participation and meaningful engagement. These activities allowed learners to analyze given situations, identify relevant information, devise solution strategies, perform mathematical operations, and evaluate their answers. The progressive nature of the activities enabled learners to build their understanding gradually while developing confidence and persistence in solving mathematical problems.

The findings supports the study of Amistoso (2024), entitled Effectiveness of Contextualized Problem-Based Learning in Improving the Performance of Grade 6 Learners in Math, which found a significant improvement in learners' Mathematics performance following exposure to contextualized learning activities. Similarly, Linaza, Gultiano, and Susada (2025) reported that learners who utilized instructional resources such as manipulatives demonstrated better problem-solving performance than those exposed to traditional instruction. Likewise, Cambaya and Tan (2022) revealed that meaningful and learner-centered instructional experiences contributed significantly to the improvement of learners' problem-solving skills and engagement in Mathematics. These studies suggest that appropriately designed instructional resources can effectively enhance learners' mathematical understanding, participation, and problem-solving performance.

At the end of the intervention, the administration of the posttest revealed a substantial increase in learners' problem-solving performance. The results showed a significant shift from the lower mastery levels during the pretest to the Mastered and Nearing Mastery levels in the posttest. This improvement suggests that the instructional resources effectively enhanced learners' mathematical understanding and problem-solving skills by providing meaningful learning experiences, structured practice, and opportunities for active engagement. The findings further support Piaget's Constructivist Learning Theory, which asserts that learners construct knowledge through active participation and meaningful interactions with learning tasks and experiences. Consequently, the developed instructional resources served as an effective instructional intervention in improving the problem-solving performance of Grade 6 learners in Mathematics 6.

Conclusions

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

1. The infographics for visual learning of historical events were successfully designed and developed using the ADDIE Model. The development process resulted in instructional materials that were aligned with the Grade 6 Araling Panlipunan competencies and incorporated appropriate visual and textual elements for the topic *Tungo sa Kalayaan ng Pilipinas*.
2. The developed infographics met the established standards for quality instructional materials, as evidenced by the very satisfactory ratings obtained in terms of content, format, and presentation and organization, as well as the absence of errors in the accuracy and currency of information.
3. The learners exhibited a very favorable reaction toward the developed infographics, indicating that the materials were well-received and positively perceived as visual learning resources for Araling Panlipunan 6.
4. Despite the favorable evaluations received by the infographics, certain aspects of the materials, particularly color consistency, design simplicity, visual-text integration, information flow, and physical durability, may still be enhanced to further improve their quality and usability.

Recommendations

Based on the study, the following recommendations were offered:

Araling Panlipunan teachers may utilize the developed infographics as supplementary instructional materials in teaching historical events, particularly the topic Tungo sa Kalayaan ng Pilipinas, to provide learners with visually organized and engaging learning resources.

Teachers and learning resource developers may consider adopting the design features and development process used in this study, particularly the integration of timelines, illustrations, symbols, color coding, and concise textual information, in creating instructional materials for other learning competencies and subject areas.

School administrators may support the use and reproduction of infographic-based learning materials as part of instructional resource enhancement initiatives, considering the favorable evaluations received from both experts and learners.

The developed infographics may be further enhanced by improving color consistency, simplifying certain design elements, strengthening the integration of illustrations and text, improving the logical flow of information, and increasing the durability of the materials for regular classroom use.

These recommendations aim to maximize the use of infographics as effective visual learning tools that can enhance comprehension, engagement, and learning outcomes among elementary learners. Based on the findings of the study, the following conclusions were drawn:

The Grade 6 learners demonstrated a low level of problem-solving performance prior to the utilization of the instructional resources, indicating the need for an intervention to address their difficulties in solving mathematical word problems involving decimal operations.

The instructional resources in Mathematics 6 were successfully designed and developed using the ADDIE Model. The systematic development process ensured that the materials were aligned with the prescribed learning competencies and responsive to the identified learning needs of the learners.

The developed instructional resources were found to be of high quality as evidenced by the very satisfactory ratings given by the expert validators in terms of content, format, presentation and organization, and accuracy and currency of information.

The problem-solving performance of the Grade 6 learners improved considerably after the utilization of the instructional resources, as shown by the increase in the number of learners who attained the Mastered level and the absence of learners in the Low Mastery and No Mastery categories.

The utilization of the developed instructional resources resulted in a significant improvement in the problem-solving performance of the learners, as evidenced by the significant difference between their pretest and posttest scores. Hence, the instructional resources were effective in enhancing learners' mathematical problem-solving skills.

The instructional resources may be further improved through continuous refinement of activities, incorporation of additional contextualized problem-solving tasks, and consideration of the suggestions provided by expert validators to further strengthen their instructional effectiveness.

Recommendations

In view of the findings and the significance of the study, the following recommendations are offered:

Learners are encouraged to actively use instructional materials to strengthen their problem-solving skills, increase their confidence, and develop a more positive attitude toward Mathematics.

Mathematics teachers are encouraged to integrate instructional materials into classroom instruction to make lessons more engaging, interactive, and effective in improving learners' problem-solving performance.

School administrators are encouraged to support the development and utilization of instructional resources through the provision of training, instructional support, and learning materials that promote innovative teaching practices.

Future researchers may conduct similar studies involving larger groups of participants, different grade levels, or other Mathematics competencies to further validate and extend the findings of this study.

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