International Journal of Research in Social Science and Humanities (IJRSS)

E-ISSN : 2582-6220

DOI: 10.47505/IJRSS.2026.1.6

Vol. 7 (1) January - 2026

Activity Sheets on the Application of the Four Fundamental Operations of Integers for Grade 7 Learners Using Open Approach

Robie B. Ellare[1], Douglas A. Salazar[2], & Ariel O. Ellare[3]

[1, 2, 3] College of Education

Mindanao State University-Iligan Institute of Technology

Philippines

ABSTRACT

Low numeracy skills among learners, particularly in the difficulties with four fundamental operations of integers, remain a pressing issue in mathematics education. This action research aimed to develop and evaluate the effectiveness of activity sheets using an open approach in enhancing the numeracy skills of Grade 7 learners. The study employed a quantitative research design with qualitative support involving 38 grade 7 learners. The intervention implemented activity sheets was developed using the ADDIE model, which integrated the open approach to promote a deeper understanding of integer operations. Analysis of the quantitative data revealed a significant increase in the mean scores from the pre-test to the post-test, supported by the high engagement scores and qualitative data indicating a comprehensive collaborative learning experience. This reveals that implementing open approach activity sheets is an effective intervention that significantly enhances mathematical skills and engagement, thus supporting the use of learner-centered methodologies to better prepare students for advanced topics.

Key Words: Activity Sheets, ADDIE Model, Open Approach, Collaboration, Numeracy Skills.

1. INTRODUCTION

Mathematics education's crucial focus is enhancing learners' numeracy skills, which is essential for learners to successfully solve and overcome various problems encountered in their daily lives and could develop their problem-solving and critical thinking. A prevalent issue among students today is their lack of mathematical literacy, they are unable to learn basic four fundamental operations. In the study of (Oco & Pitogo, 2023), in order for students to perform better in Mathematics, they must master their numeracy skills as it is one of the important parts of the basic foundations of the subject.

In this context, numeracy involves utilizing mathematical knowledge to analyze phenomena and make informed decisions (Wijaya & Dewayani, 2021, as cited by Astuti, E.P. et al. 2024), and encompasses the necessary knowledge, skills, and behaviors that learners need to use mathematics in various situations (H. Forgasz et al., 2017, as cited in the study of Machromah I. U. et al. (2021).)

Furthermore, given the low level of numerical abilities in the Philippines, as evidenced by PISA results (Layug et al., 2021). With the wider challenge, the mastery of the concepts specifically in one of the foundations of mathematics which is the four fundamental operations of integers, presents a significant obstacle in grade 7 learners, which act as a prerequisite for more advanced algebraic concepts. This learning gaps needs the exploration of innovative and effective teaching methodologies.

This study focuses on addressing the specific problem by developing, validating, and implementing a set of activity sheets that integrate the open approach methodology to enhance the proficiency and problem-solving skills of the learners.

This research study aimed to:

1. Develop an open approach activity sheet in Four Fundamental Operations of Integers.
2. Investigate the significant increase in the scores of grade 7 learners after implementing an open approach activity sheet.

2. METHODOLOGY

2.1 Research Design

This study used the quantitative research design with qualitative support. The quantitative data was obtained from the scores of the learners before and after implementing the learning activity sheets. While the qualitative data was collected from the triangulation of learners' test scores, from the pre-test and post-test, interview or open-ended questions, and teacher's observations on the open approach activity.

2.2 Participants and Sampling

This study was conducted to the 38 grade 7 learners in one of the public schools in the Schools Division of Iligan City. The utilization of a small sample size consisting of 38 grade 7 learners (15 male and 23 female) is methodologically appropriate in an action research study. The average age of the learners is 11 years old. The respondents of this study were purposively selected. This purposive sampling method was carried out by the school head and the subject teacher to ensure that participants possessed the characteristics necessary to provide informative data.

2.3 Research Instruments

In the process of gathering data needed for the study, the following research instruments were used:

2.3.1 Survey Sheet

This identifies the least learned and difficult competencies in mathematics 7. The grade 7 teachers ranked the competencies from 1 as the top most difficult. Based on the result, four fundamental operations of integers is one of the least learned competencies for third quarter (MELCs-based). As it is one of the competencies to be discussed during National Math Program (NMP).

2.3.2 Interview Guide

These are the list of interview questions that is being asked to the respondents after the implementation of the study.

2.3.3 Teacher's Guide

This lesson guide for the teachers is designed to align to the activity sheets; this guide includes detailed description of the lesson "Four Fundamental Operations of Integers". This guide includes discussions of the lessons which encourages teachers to adopt a learner-centered practices. This is composed of various activities with answer keys.

2.3.4 Pre-test and Post-test

This is a 20-item test, and content is based on the four fundamental operation of integers. This includes 5-item each operation. The test scores for this will be one (1) point each correct answer. This test was validated by the panel of validators in the field of mathematics.

2.3.5 Rating Scale for Panel of Evaluators

This evaluation tool was adapted from Simbulan (2001), Paragas (2011), and also used in the study of Jackaria (2018) eliciting both numerical data and qualitative comments from the panel of evaluators. The rating scale was modified to use the purpose of the study. The panel of evaluators are from the field of mathematics education.

DOI: 10.47505/IJRSS.2026.1.6

2.3.6 Numeracy Rating Scale

This is a researcher-made rating scale to help assess the level of understanding, mastery and numeracy skills of the fundamental operations of integers. This is composed of score ranges from 0-4 not proficient, 5-9 low proficiency, 10-14 nearly proficient, 15-17 proficient, and 18-20 highly proficient. With its corresponding description. This was validated by the panel of evaluators in the field on mathematics education.

2.4 Data Gathering Procedure

The data gathering procedures in this action research unfolds three phases: preparation (Analysis), design, develop**,** and implementation and Evaluation.

2.4.1 Preparation Phase: In this phase, formally requesting permission from the Schools Division Superintendent of the Division of Iligan City and the school head where the research participants are enrolled. Once permission is secured, the next step involves identifying least learned and difficult competencies through a structured survey instrument administered to mathematics teachers of grade 7. After collecting data for the least learned and difficult competencies, the researcher analyzed and identify the specific competencies that are least learned and difficult for learners. Common areas of difficulty include "*Four Fundamental Operations of Integers"*, many grade 7 learners struggle with understanding on how to perform fundamental operations on integers. It was stated in the survey that learners have poor retention on this competency. With the areas of concerns, this competency was chosen to be implemented based on the competency to be tackled during National Math Program.

2.4.2 Design and Develop: in this phase, the researcher focusses on designing developing the activity sheets which aimed at addressing the identified least learned competency in mathematics for grade 7 learners. Additionally, after developing and designing the activity sheets. The validation of the research instruments and editing the validated instruments were done in this phase.

2.4.3 Implementation and Evaluation Phase: In this phase, the researcher conducted a try-out of a 40-item pre-test. 131 learners from the said school participated in the pilot testing. It was administered for 45 minutes. At the end of 45 minutes, other participants didn't able to complete the test. Some learners struggle with solving problems that involve different signs. Based on the item analysis of the pilot test, 20 items were discarded. After implementing the changes, the researcher moved forward on administering the final pre-test to assess the respondents baseline knowledge and skills related to the subject matter. Following the pre-test, the researcher engages the respondents in the subject matter which includes variety of exercises. Followed by the implementation of the activity sheets, designed to facilitate hands-on learning, and encourage critical thinking and application of knowledge. After completing the activities, the respondents took a post-test to evaluate their progress and understanding of the competency.

3. RESULTS AND DISCUSSIONS

3.1 Developed Open Approach Activity Sheet in Four Fundamental Operations of Integers

Table 1 shows the structured approach using the ADDIE model and Open Approach ensures a comprehensive and engaging learning experience for learners in mastering the addition, subtraction, multiplication, and division of integers. This was supported in the study of Kwakye (2022) that highlights the combination of conceptual understanding, active engagement, innovative teaching strategies, and effective assessment methods is essential for mastering integer operations.

DOI: 10.47505/IJRSS.2026.1.6

Table 1. Development Of Activity Sheet

ADDIE MODEL

1. Analysis

Identify the target learners, prior knowledge, and learning environment. The researcher surveyed the least learned competencies on the participating school. This identifies the least learned and difficult competencies in mathematics 7. The grade 7 teachers ranked the competencies from 1 as the top most difficult. Based on the result, four fundamental operations of integers is one of the least learned competencies for third quarter (MELCs-based). As it is one of the competencies to be discussed during National Math Program (NMP).

Target Learners: 7th-grade learners (ages 10-11).

Prior Knowledge: Basic understanding of whole numbers and the concept of positive and negative integers.

Learning Environment: A classroom with access to whiteboards, markers, and number line posters.

2. Design

Design the learning objectives, format of the activity, and the components of the activity.

Learning Objectives:

- At the end of the lesson, the learners will be able to add, subtract, multiply, and divide integers with real-world scenarios using number line and algorithm.
- Learners will demonstrate the ability to use number lines and follow the rules in adding, subtracting, multiplying and dividing integers for visualizing integer addition, subtraction, multiplication, and division.

Activity Format:

Introduction: Briefly explain integers and their significance.

Interactive Lecture: Use a whiteboard/illustration to explain rules for adding, subtracting, multiplying and dividing integers, including:

Activity Components:

Visual Aid: Provide a number line poster for reference.

Learning Activity Sheet: Develop an activity sheet with the following sections:

- **Collaborative Group Activity**: A mix of problems, including simple and complex integer addition, subtraction, multiplication, and division.
- **Exploration and Representation.** Encourage learners to represent their findings.
- **Class Presentation/Reflection Questions**: Encourage learners to think about the strategies they used.
- **Conclusion**. The learners will make a conclusion based on their mathematical ideas

3. Development

Create the content, layout of the activity sheets

Activity Sheet Layout:

- **Titles**: "Integer Addition Scenarios", "Integer Subtraction Challenge", "Integer Multiplication Exploration", "Integer Division Exploration"
- **Section 1**: Collaborative Group Activity (Problem Posting)
- **Section 2**: Exploration and Representation (Learners Self-Learning)
- **Section 3**: Class Presentation (Discussion about Learners Ideas)
- **Section 4**: Conclusion (How the class made a conclusion based on their mathematical ideas)

DOI: 10.47505/IJRSS.2026.1.6

4. Implementation

In this phase, implementation of learning activity sheets will be administered.

- **Classroom Setup**: Arrange desks for group work and ensure materials are accessible.
- **Introduction**
  - Introduce the concept of integers and addition, subtraction, multiplication, division rules.
  - Use a number line to demonstrate and give examples.
- **Collaborative Group Activity**
  - Divide learners into small groups.
  - Distribute the activity sheets.
  - Instruct groups to work collaboratively to solve problems.
  - Encourage the use of the number line as a visual aid.
  - **Whole-Class Discussion/Presentation**
  - Each group will present/share their answers and strategies.
  - Discuss any misconceptions or difficulties they encountered.
  - **Conclusion**
  - Share your experiences and ideas on how you come up with the solution.

5. Evaluation

In this phase, learners' interaction will be observed, and follow-up interview will be administered by the researcher

Formative Assessment:

Observe learners' participation during group work.

- Check answers on the activity sheets as learners complete them.
- Provide immediate feedback and support after each group presentation.

3.2 Evaluation of the Significant Increase in the Mean Scores of Grades 7 Learners After Implementing an Open Approach Activity Sheet

The data was analyzed using PSPP Software. In order to calculate the normal distribution of the data, Shapiro-Wilk test was used. the findings shows that the data is not normally distributed as shown in table 2. The fact that the paired difference result of pre- and the post-test is .001 less than $\alpha = 0.05$ was evidence of a not normally distributed data.

Table 2. Normality Test Findings

Dimension	Shapiro-Wilk		
	Statistics	*df*	*p*
Pretest-Posttest	.887	38	.001

DOI: 10.47505/IJRSS.2026.1.6

Due to its not normally distributed result, the nonparametric related-samples Wilcoxon Signed Rank Test was applied. The related-samples Wilcoxon Signed Rank Test findings applied to determine the significant difference of the mean scores of grades 7 learners after implementing an open approach activity sheet is presented in table 2. In addition to this, (Gonzales, M., et al, 2024) highlighted that teacher-made learning activity sheets significantly improved learners' numeracy skills. The study demonstrated that these customized sheets effectively engaged learners and facilitated better understanding and retention of mathematical concepts compared to traditional methods.

Table 3. Pre-Test and Post-Test Result of the Learners on Related-Samples Wilcoxon Signed Rank Test

Dimension		N	Mean Ranks	Sum of Ranks	Z	*p**
Pretest-Posttest	Negative Ranks	0	.00	.00	-5.391	.001
	Positive Ranks	38	19.50	741.00		
	Ties	0				
	Total	38				

**Significance at p < 0.05*

Table 3 shows that, since p=.001, which is less than α=0.05. We reject the null hypothesis. This means that there is significant increase in the score of grade 7 learners before and after implementation of the activity sheets. Furthermore, results also suggest that integrating open approach in the developed activity sheets can be very effective among learners through hands-on activity Hirça, N. (2013), Kibga, et al., (2021) through hands-on activities, students acquire knowledge, apply the taught concept, and may develop a feasible solution to the problem and collaborative activity Loes, C. N., (2022) collaborative learning exerted a statistically significant and positive influence on students' academic motivation levels.

Interview was administered immediately during collaborative group activity and after the completion of the collaborative group activity to capture fresh impressions. Transcripts of learners' responses during the interview were analyzed alongside with the result of both quantitative (pre-test and post-test scores) qualitative (interview and observations).

Learners' improved scores on the post-test after the intervention show that the activity sheets integrating open approach implementation has produced a noticeably good perception among learners. With few mistakes seen in their group work and during the interview, especially when it comes to adding and subtracting different signs of integers. Learners expressed their confidence in their mathematical skills. Supported this claim is the study of Yuniarti, Y., et al., (2020)**,** this study examined on the impact of open-ended problems on learners' mathematical creative thinking abilities, the findings revealed that learners' who engaged with open-ended problems demonstrated significantly better creative thinking skills compared to those taught through conventional methods. During the interview, learners were enthusiastic on the practical aspect of the activity, saying they were interesting. They could relate to the activities as it was related to their everyday life situation. Additionally, classroom observations showed a cooperative environment where all learners actively engaged in group discussions and cooperated to find the solutions on the problem scenarios given to them. Learners' collaborative efforts foster a sense of communication and social skills which helped enhance their learning experience, as they were able to share strategies and support one another in finding solutions to the given problem set. Overall, the combination of high post-test scores, positive interview feedback, and active collaboration during class highlights the effectiveness of the activity sheets in promoting both understanding and engagement among learners which developed their numeracy skills. Reference to Zarate, E.C., Fernandez, B.B., & Dorias, L.E., (2022) justified this claim that learners who utilized activity sheets not only achieved higher post-test

DOI: 10.47505/IJRSS.2026.1.6

scores but also reported increased engagement during lessons. The study concluded that a well-structured activity sheets effectively enhance both understanding and active participation, leading to improved numeracy skills among learners.

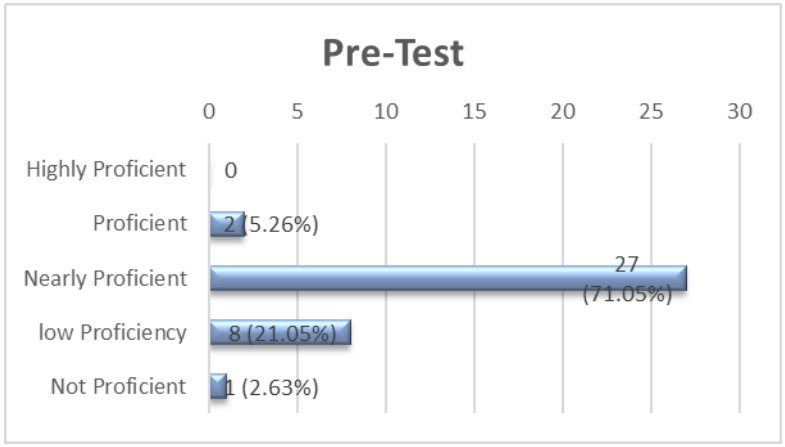

Figure 1. Pre-Test Result

As shown in figure 1, pre-test results of the respondents. Only 1 or 2.63% of the respondent has a score ranges from 0-4 (Not Proficient) which indicates that this respondent has a limited understanding of integer operations. May struggle with basic concepts and make frequent errors across all operations. Additional practice is needed to build foundational skills. 8 or 21.05% of the respondents has a score ranges from 5-9 (Low Proficiency). Which indicates that the respondents have basic understanding of integer operations, but make several errors in their calculations. They should focus on reinforcing their knowledge through targeted practice across all operations. 27 or 71.05% of the respondents have a score ranges from 10-14 (Nearly Proficient) which indicates that the respondents have good understanding of integer operations but with occasional errors. They are encouraged to refine their skills to achieve greater accuracy in all operations. 2 or 5.26% of the respondents have a score ranges from 15-17 (Proficient) demonstrated solid understanding of integer operations, but with minimal errors. They can perform tasks accurately and efficiently across all four operations, indicating readiness for more complex problems. And no respondents got a score of 18-20 (Highly Proficient)

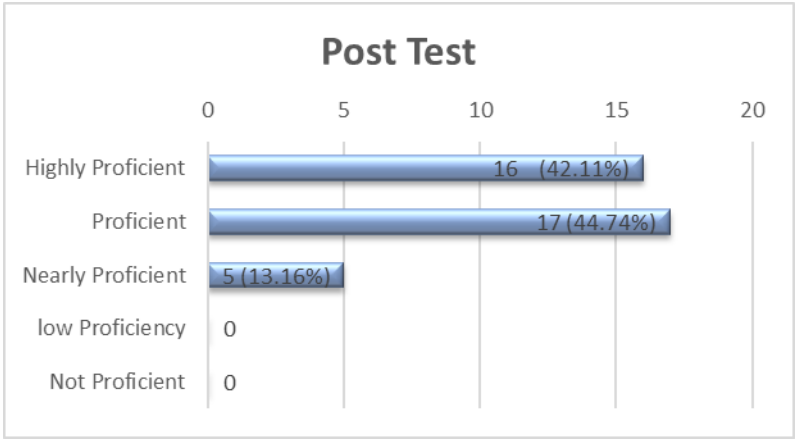

Figure 2. Post-Test Result

As shown in figure 2, post-test results of the respondents. No respondent has a score ranges from 0-4 (Not Proficient) and 5-9 (Low Proficiency). 5 or 13.16% of the respondents have a score ranges from 10-14 (Nearly Proficient) which indicates that the respondents have good understanding of integer operations but with occasional errors. They are encouraged to refine their skills to achieve greater accuracy in all operations. 17 or 44.74% of the respondents have a score ranges from 15-17 (Proficient) demonstrated solid understanding of integer operations, but with minimal errors. They can perform tasks accurately and efficiently across all four operations, indicating readiness

DOI: 10.47505/IJRSS.2026.1.6

for more complex problems. 16 or 42.11% of the respondents have a score of 18-20 (Highly Proficient) which indicates an excellent mastery of integer operations. Demonstrates deep understanding and can explain concepts clearly. They can solve problems accurately and explain their reasoning clearly, indicating preparedness for advanced topics that build on these foundational skills.

The results of the pre-test and post-test of the respondents indicates a significant increase in the score of grade 7 learners before and after implementation of open approach.

A survey on least learned and difficult competencies revealed that four fundamental operations of integers is one of the competencies that needs clearer understanding. Analysis of learners' prior knowledge is one of the most important aspects to be considered before designing and developing an activity sheet that will connect new content to what learners already understand.

The high engagement and relevance scores in the learner's post-test indicated that the open approach activity sheets can effectively foster collaborative learning environments that will develop learners' numeracy skills. This research underscores the effectiveness of using activity sheets that promote active participation and collaboration, ultimately fostering a more engaging and motivating learning environment for learners. The findings from this study indicate that the implementation of activity sheets has significantly enhanced learners' mathematical skills and overall engagement. The improved scores on the post-test reflect a positive perception among learners regarding the effectiveness of the intervention. Despite a few mistakes observed in their group work, particularly in adding and subtracting integers with different signs, learners demonstrated increased confidence in their mathematical abilities. In addition, the findings suggest that learners had a positive perception of the open approach activity sheets, However, there are some learners that are confused when adding and subtracting integers with different signs. But with the series of examples and activities given to them, they come up with the right answers. Moreover, the researcher's observation that the learners are more encouraged to answer when one of their groupmates provides a correct response highlights a collaborative learning and peer influence in the classroom. This creates opportunities for rich discussions and various perceptions within the group. When one learner answers correctly, it can prompt other learners to think critically about their own understanding. This implies that learners' comprehension enhances numerical and critical thinking skills as learners evaluate different approaches to the same question.

5. RECOMMENDATIONS

Mathematics educators must create a more supportive learning environment that addresses the challenges that learners face. This could lead to learners improved academic outcomes.

Mathematics educators are highly encouraged to regularly implement open approach activities to continuously adapt and improve teaching and learning strategies that could develop learners' numeracy skills. In addition, mathematics educators can better support learners in overcoming confusion related to adding and subtracting integers with different signs while continuing to influence the positive aspects of the open approach activity sheets. This strategy will enhance learners' understanding, boost their confidence, and ultimately improve their overall mathematical competence. Moreover, open approach activity sheets help create a more responsive learning environment that meets learners' needs effectively. Furthermore, incorporate more open-ended questions in classroom discussions that allow multiple correct answers. Besides designing structured group activities that encourage learners to participate will ensure that each learner has an opportunity to contribute and engage with their peers.

ACKNOWLEDGMENT

This research would not be possible without the help of the people who had countless impact in making this study possible. Foremost, Praises and Thanks to the Almighty God, for giving us strength, wisdom, courage, and ability to undertake this research proposal. For every opportunity and blessings throughout this research study.

DOI: 10.47505/IJRSS.2026.1.6

REFERENCES

Astuti, E. P. et al., Characteristics of Junior High School Teachers' Beliefs in Developing Students' Numeracy Skills through Ethnomathematics-Based Numeracy Learning, Retrieved July 2, 2024 from https://files.eric.ed.gov/fulltext/EJ1417782.pdf

Cotares, J.M.C., & Monding, V.A., "Effectiveness of Developed Worksheets to the Academic Achievement of Students in Science 9 Concepts," International Journal for Innovation Education and Research, 9(4), 210-214, 2021.

Forgasz, H., Leder, G., & Hall, J. (2017). Numeracy Across the Curriculum in Australian Schools: Teacher Education Students' and Practicing Teachers' Views and Understandings of Numeracy. *Numeracy: Advancing Education in Quantitative Literacy*, 10(2). https://doi.org/10.5038/1936-4660.10.2.2

Gonzales, M., et al., "Utilization of Teacher-Made Learning Activity Sheets as a Tool in Improving Numeracy Skills," International Journal of Mathematics and Applied Research, 2024.

Hirça, N. (2013). The Influence of Hands-on Physics Experiments on Scientific Process Skills According to Prospective Teachers' Experiences. European Journal of Physics Education. 4(1). https://files.eric.ed.gov/fulltext/EJ1052287.pdf

Kibga, et al., "Effectiveness of Hands-On Activities to Develop Chemistry Learners' Curiosity in Community Secondary Schools in Tanzania," DOI: 10.36681/tused.2021.93, 2021.

Kwakye, "The Teaching and Learning of Integer Operations: The Case of Number Rule and Conventional Method," DOI: 10.7176/JEP/13-27-01, 2022.

Layug, G., et al., "Teachers' Interventions in Improving Numeracy Skills of Grade 7 Students in Baguio City National High School," in 4th International Conference on Advanced Research in Teaching and Education, Retrieved July 2, 2024 from https://www.dpublication.com/wp-content/uploads/2021/08/22-4022.pdf, 2021.

Loes, C. N., "The Effect of Collaborative Learning on Academic Motivation," Teaching & Learning Inquiry, 10, 2022. https://doi.org/10.20343/teachlearninqu.10.4

Machromah I. U., et al., "Minimum Competency Assessment: Designing Tasks to Support Students' Numeracy," Turkish Journal of Computer and Mathematics Education, Retrieved July 2, 2024 from https://turcomat.org, 2021.

Oco, R., and Pitogo S., "Pupils' Numeracy Skills and Mathematics Performance," Retrieved July 2, 2024 from https://www.researchgate.net/publication/373110905_Pupils'_Numeracy_Skills_and_Mathematics_Performance, 2023.

Pirttimaa, M., Husu, J., & Metsa¨rinne, M. (2015). Uncovering procedural knowledge in craft, design, and technology education: A case of hands-on activities in electronics. Springer. https://doi.org/10.1007/s10798-015-9345-9

Wijaya, A., & Dewayani, S. (2021). *Minimum competency assessment framework. Ministry of Education and Culture.*

Yuniarti, Y., et al., "The Effectiveness of Open-Ended Problems Based Analytic-Synthetic Learning on the Mathematical Creative Thinking Ability of Pre-Service Elementary School Teachers," International Electronic Journal of Mathematics Education, 15(3), 661-675, 2020.

Zarate, E.C., Fernandez, B.B., & Dorias, L.E., "Downloaded Worksheets: A Learning Activity to Enhance Mathematical Competencies," Universal Journal of Educational Research, 10(3), 58-66, 2022.

DOI: 10.47505/IJRSS.2026.1.6