**Effectiveness of Ilocano Worksheets**

 in Teaching Mathematics III of Malama Integrated School

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ABSTRACT

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| One of the goals in learning is that pupils can understand the concepts of learning material being delivered. The teacher must be able to prepare teaching materials appropriately so that the learning process can improve pupils creative thinking. One of them is by providing student worksheets. This study was conducted to assess the effectiveness of Ilocano worksheets in teaching Mathematics among the Grade III pupils of Malama Integrated School in Conner, Apayao. Experimental research approach using pretest and posttest in two-group design, mean, T-test and thematic analysis was used to gather data. Based on the findings, the use of Ilocano worksheets as localized instructional materials significantly improves the academic performance of Grade 3 learners in Mathematics. While English worksheets yielded only marginal gains, the Ilocano worksheets enabled learners to better grasp mathematical concepts by leveraging their mother tongue. This confirms the effectiveness of mother tongue-based instruction in enhancing understanding, retention, and academic achievement in a multilingual learning environment. It is recommended that schools may consider integrating localized instructional materials, like Ilocano worksheets, in various subjects to enhance student comprehension and retention, especially in mathematics where understanding the language is crucial for grasping concepts. |

*Keywords: Ilocano worksheets, teaching, Mathematics*

1. INTRODUCTION

In everyday life, people often have to solve personal problems they experience. Problems are useful for training one's thinking skills. One of the subjects that cannot be separated from problems was mathematics. Mathematics is the basis of all branches of knowledge needed to solve problems. Problem-solving ability is one of the standard processes in mathematics learning.

Mathematics is one of the subjects that has an important role in education (Eviyanti et. al, 2017). Mathematics takes an important role as a tool to regulate our daily lives in society (Risdiyantin & Prahmana, 2017). The most important thing in learning mathematics is understanding the concepts of the material presented. To understand mathematical concepts pupils must have special competencies, the competence in question is creative thinking (Puspitasari & Wiryanto, 2019).

Creative thinking is one of the important abilities in solving problems. Increasing the ability to think creatively, student achievement is also expected to increase (Umriani et. al, 2020). Creative thinking skills need to be improved through teaching materials. Good and innovative teaching materials can increase pupils’ creativity (Rahmawati et. al, 2017). Learning resources or teaching materials that can help students learn independently are one of the important roles in the learning process.

Learning resources or teaching materials that can help students learn independently are one of the important roles in the learning process (Pratiwi, 2019). One of the goals in learning is that pupils can understand the concepts of learning material being delivered. The teacher must be able to prepare teaching materials appropriately so that the learning process can improve pupils creative thinking. One of them is by providing student worksheets.

Student worksheets are created to help students relate problems with the subject matter to everyday life (Yaden, 2017). Students need worksheets as teaching material that can make them actively and creatively participate in learning mathematics and can help them find learning concepts through solving everyday problems (İnan & Erkus, 2017). Pupils’ worksheets are guides used by pupil to conduct learning activities. pupils’ worksheets in school have not included clear indicators, all fonts are the same, there are no differentiated, there are no instructions for using the worksheets of pupils and the material illustrations are absent, the layout colors are less attractive (İnan & Erkus, 2017). Teachers need to design pupil worksheets that are innovative and can make pupils able to improve their creative thinking abilities.

 Learning with pupil worksheets allows students to learn faster in completing one or more basic competencies because students can learn them first, and pupil worksheets that are developed contain material and are rich in practical questions that will guide students in finding concepts so that the pupil worksheets provided can direct students to solve mathematical problems related to real-life (Nasution & Sinaga, 2017).

 Based on observations made, many teachers have not designed teaching materials in the form of Mathematics Worksheets in the learning process in the classroom. Most teachers still use questions that come from textbooks or books published (DepEd Order, No. 16, 2012). Though it should be the ones who know the cognitive abilities of the pupil they teach are the teachers concerned. Seeing the many educational problems encountered in teaching and learning Mathematics, teachers must minimize them.

 The Dep-ed Order no. 16 s. February 17, 2012, stated that the starting of the school year 2012-2013, the Ilocano or mother tongue-based multilingual education was implemented in all public schools especially in Grade I, II, III as part of K-12 curriculum. Therefore, literacy and as medium of instruction inside the classroom. President Aquino also includes the nationalization of the medium of instruction in his Agenda. According to him we should learn English to connect ourselves to the whole world and to our country but teachers are using their own dialect to interpret very well the lesson. It should need time relevance, manifestation will be developed and strengthen the schools to adequate learning by using Ilocano worksheets in instruction (Deped Learning Portal, 2024)

Therefore, the researcher is prompted to assess the academic performance of grade 3 learners in Mathematics using Ilocano worksheets. An Ilocano worksheet is an educational resource designed to help learners practice and improve their skills in the Ilocano language

(Fauzi et. al, 2019). These worksheets can cover a variety of topics, including reading, writing, vocabulary, and grammar. They are often used in educational settings, particularly in regions where Ilocano is spoken, to support the development of language proficiency among pupils.

 Through the would-be results of this study, it is expected to be able to assist teachers in designing their own teaching materials properly and correctly and test the effectiveness of their learning. In addition, students can improve their problem-solving skills specifically on number problems which the researcher would like to ascertain in this study.

2. STATEMENT OF THE PROBLEM

Generally, this study sought to assess the effectiveness of Ilocano worksheets in teaching Mathematics among the Grade III pupils of Malama Integrated School in Conner, Apayao.

 Specifically, this paper delved more into the following:

1. What are the pretest scores of the control and experimental group in Mathematics III?
2. What are the post-test scores of the control and experimental group in Mathematics III?
3. Is there a significant difference in the pre-test and post-test scores of the control group and experimental group in Mathematics III?
4. What is the mathematics performance of the Grade III learners before using the Ilocano worksheets in Mathematics?
5. What is the mathematics performance of the Grade III learners after using the Ilocano worksheets in Mathematics?
6. Is there a significant difference in the mathematics performance of the Grade III learners before and after using the Ilocano worksheets in Mathematics?
7. What are the challenges faced by teachers and pupils in using the Ilocano worksheets in Mathematics?

**2.1 Conceptual Framework**

The framework of the study shows how effective Ilocano worksheets are in teaching Mathematics. As part of the process, a series of pretest and posttest is to be conducted using conventional methods in teaching Mathematics and after using Ilocano Worksheets to measure the pupil’s academic performance in Mathematics. This will measure the effectiveness of the mediums of instruction in the delivery of Mathematics among the Grade III pupils.

 **Input Process Output**

Use of Ilocano Worksheet in Teaching Mathematics and English as Medium of instruction.

Conduct of pretest and post test

Academic Performance/Achievements of pupils in Mathematics

*Feedback*

**Figure 1: Paradigm of the study**

3. METHODOLOGY

**3.1. Research Design**

 This study was employed an experimental research approach, specifically a pretest, posttest, two-group design. This is a design where one group of participants undergo a pre-test and post-test after the treatment condition has been administered.

The researchers gathered the data through the following procedures.

1. The researchers prepared the lesson using Ilocano worksheets and using English as based instruction to be taught to the Grade III pupils.
2. The researchers selected 30 pupils to participate in the study.
3. The pretest and posttest were administered to the respondents during their vacant time.
4. The scores of the respondents in the test was recorded for statistical treatment.
5. The use of the mean scores was first used to compute the weight mean.

**3.2. Locale of the Study**

 This study was conducted at Malama Integrated School in Malama, Conner, Apayao. This is the old Conner Central School located in the Northern Conner District.

**3.3 Respondents of the Study**

The respondents of this study were the Grade III learners of Malama Integrated School. Total population sampling was utilized**.**

**Table 1. Distribution of the respondents**

|  |  |
| --- | --- |
| **Grade III** | **Number of pupils** |
| Male | **14** |
| Female | **16** |

**3.4. Research Instrumentation**

The researcher's pre-test and post-test assessments served as the primary instruments in the study to collect the necessary data. The researcher had constructed 20-item worksheets written in English and Ilocano. The pre-test was administered before and after the start of the data collection, while the post-test took place after. The pre-test and post-test statistical tools were used in the study as basis to determine whether the respondents' performance improved.

**3.5. Data Gathering Procedures**

 First, the researcher sought permission from the principal, adviser, and the parents of the pupils before conducting the study to make sure that research ethics in seeking consent is observed. Second, was the administration of pre-tests to the pupils before the use of the interventions. Third, was the implementation of the Ilocano Worksheets in their daily Mathematics tasks. Lastly, was the administration of the post-test.

**3.6. Statistical Analysis**

Mean. This was used to analyze the data regarding the performance of the learners in their Mathematics subjects. In the interpretation of the mean of academic performance, the given scale was used based on the grading system provided on the form-138 issued by the DepEd:

**Table 2. Grade Range from DepEd**

|  |  |
| --- | --- |
| **Grade Range** | **Interpretation** |
| 93% and above | Excellent |
| 87% to 92% | Very good |
| 81% to 86% | Good |
| 75% to 80% | Fair |
| 74% and below | Poor |

 T-Test. This was employed to determine the significant difference between the mean gain scores of the learners in the pretest and post-test.

 Thematic Analysis**.** This was used to analyze the challenges encountered by the pupils and teachers with the use of Ilocano Worksheets in teaching Mathematics.

4. RESULTS AND DISCUSSION

4.1. Pretest And Posttest Results

**Table 3. Pre-test and Post-test Scores of the Control Group in Mathematics III**

|  |
| --- |
| **Control Group** |
| **Respondents** | **Pre-test Scores** English Worksheets(20 points) | **Post-test Scores** English Worksheets(20 points) |
| 1 | 11 | 14 |
| 2 | 12 | 12 |
| 3 | 15 | 15 |
| 4 | 8 | 9 |
| 5 | 10 | 9 |
| 6 | 14 | 12 |
| 7 | 15 | 14 |
| 8 | 11 | 13 |
| 9 | 14 | 13 |
| 10 | 12 | 10 |
| 11 | 9 | 11 |
| 12 | 7 | 8 |
| 13 | 14 | 15 |
| 14 | 12 | 14 |
| 15 | 11 | 10 |
| **Mean Score = 11.67** | **Mean Score = 11.93** |
| **Standard Deviation = 2.47** | **Standard Deviation = 2.31** |

Table 3 shows pre-test and post-test results of the control group using English worksheets in Mathematics 3 show a slight increase in the mean score from 11.67 to 11.93, with a small decrease in standard deviation from 2.47 to 2.31. This indicates a minimal improvement in performance and a slightly more consistent range of scores among learners. The marginal gain suggests that while English worksheets may support learning, they may not be highly effective in significantly improving students' mathematical performance. This implies that alternative teaching materials—such as localized Ilocano worksheets—may be worth exploring to enhance comprehension and engagement, especially for learners whose first language is not English.

**Table 4. Pre-test and Post-test Scores of the Experimental Group in Mathematics III**

|  |
| --- |
| **Experimental Group** |
| **Respondents** | **Pre-test Scores** English Worksheets(20 points) | **Post-test Scores** Ilocano Worksheets(20 points) |
| 16 | 11 | 14 |
| 17 | 12 | 12 |
| 18 | 15 | 15 |
| 19 | 8 | 9 |
| 20 | 10 | 9 |
| 21 | 14 | 12 |
| 22 | 15 | 14 |
| 23 | 11 | 13 |
| 24 | 14 | 13 |
| 25 | 12 | 10 |
| 26 | 9 | 11 |
| 27 | 7 | 8 |
| 28 | 14 | 15 |
| 29 | 12 | 14 |
| 30 | 11 | 10 |
| **Mean Score = 11.00** | **Mean Score = 16.67** |
| **Standard Deviation = 2.67** | **Standard Deviation = 1.63** |

Table 4 shows a noticeable improvement in the mathematics III performance of the experimental group after using Ilocano worksheets. The mean score increased from 11.00 in the pre-test (with English worksheets) to 16.67 in the post-test (with Ilocano worksheets), while the standard deviation decreased from 2.67 to 1.63. This suggests not only higher scores but also more consistent performance among the students. The results indicate that using Ilocano worksheets helped students better understand mathematical concepts, likely due to improved comprehension in their native language. This implies that incorporating mother tongue-based instructional materials can enhance learning outcomes, especially in subjects like mathematics where understanding instructions is crucial.

**Table 5. Comparison between Pre-test and Post-test Score of the Control Group**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variables** | **Mean** | **Standard Deviation** | **t-value** | **p-value** | **Decision at** $α=0.05$ |
| Pre-test Score | 11.67 | 2.47 | -0.65 | 0.524 | Accept Ho |
| Post-test Score | 11.93 | 2.31 |

Table 5 shows that the control group’s mean score slightly increased from 11.67 in the pre-test to 11.93 in the post-test, with standard deviations of 2.47 and 2.31, respectively. However, the t-value of -0.65 and a p-value of 0.524 indicate that this difference is not statistically significant at the 0.05 level. Therefore, the null hypothesis is accepted, suggesting that there is no significant improvement in the students' performance without the use of Ilocano worksheets. This implies that English worksheet may not be sufficient to significantly enhance pupils’ understanding of Mathematics 3, highlighting the potential need for culturally relevant and language-specific materials to support learning.

**Table 6. Comparison between Pre-test and Post-test Score of the Experimental Group**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variables** | **Mean** | **Standard Deviation** | **t-value** | **p-value** | **Decision at** $α=0.05$ |
| Pre-test Score | 11.00 | 2.67 | -8.16 | <0.001 | Reject Ho |
| Post-test Score | 16.67 | 1.63 |

Table 6 shows a significant increase in the mean scores from the pre-test (M = 11.00, SD = 2.67) to the post-test (M = 16.67, SD = 1.63) of the experimental group, with a t-value of -8.16 and a p-value less than 0.001. Since the p-value is less than the significance level of 0.05, the null hypothesis is rejected. This indicates that the use of Ilocano worksheets in teaching Mathematics 3 significantly improved the students' performance. These implies that integrating local language materials, such as Ilocano worksheets, can be an effective strategy in enhancing learners' comprehension and engagement in mathematics, particularly in multicultural and multilingual learning environments like Malama Integrated School.

**Table 7. Comparison of Post-test Score between the Control Group and Experimental Group**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variables** | **Mean** | **Standard Deviation** | **t-value** | **p-value** | **Decision at** $α=0.05$ |
| Post-test Score(Control Group) | 11.00 | 2.31 | -6.47 | <0.001 | Reject Ho |
| Post-test Score(Experimental Group) | 16.67 | 1.63 |

Table 7 shows a significant difference in the post-test scores between the control group (M = 11.00, SD = 2.31) and the experimental group (M = 16.67, SD = 1.63), with a t-value of -6.47 and a p-value less than 0.001. Since the p-value is below the significance level of 0.05, the null hypothesis is rejected. This indicates that the use of Ilocano worksheets had a statistically significant positive effect on pupils' performance in Mathematics 3. These implies that integrating localized materials, such as Ilocano worksheets, can enhance comprehension and learning outcomes among students by making the content more relatable and accessible.

**Table 8. Mathematics Performance of Grade 3 Learners Before Using Ilocano Worksheets in Teaching Mathematics**

|  |  |  |  |
| --- | --- | --- | --- |
| **Respondents** | **Mathematics Performance** | **Respondents** | **Mathematics Performance** |
| 1 | 82 | 16 | 86 |
| 2 | 83 | 17 | 84 |
| 3 | 87 | 18 | 82 |
| 4 | 80 | 19 | 88 |
| 5 | 82 | 20 | 82 |
| 6 | 85 | 21 | 85 |
| 7 | 87 | 22 | 81 |
| 8 | 85 | 23 | 83 |
| 9 | 85 | 24 | 86 |
| 10 | 83 | 25 | 85 |
| 11 | 84 | 26 | 86 |
| 12 | 88 | 27 | 90 |
| 13 | 85 | 28 | 84 |
| 14 | 84 | 29 | 82 |
| 15 | 83 | 30 | 84 |
| **Mathematics Mean Performance = 84.37** |
| **Interpretation = Good** |
| **Standard Deviation = 2.27** |

Table 8 shows that the Grade III learners of Malama Integrated School had a mean mathematics performance score of 84.37 before using Ilocano worksheets, with a standard deviation of 2.27. This indicates that the students generally performed well, falling under the "Good" interpretation category, and their scores were fairly consistent, as reflected by the low standard deviation. The relatively small spread in scores suggests that most students had similar levels of understanding prior to the intervention. This baseline performance serves as a valuable reference point in evaluating the effectiveness of using Ilocano worksheets. If post-intervention results show significant improvement, it would imply that integrating local language into instruction could be a meaningful tool in enhancing mathematics learning outcomes for early-grade learners.

**Table 9. Mathematics Performance of Grade III Learners After Using Ilocano Worksheets in Teaching Mathematics**

|  |  |  |  |
| --- | --- | --- | --- |
| **Respondents** | **Mathematics Performance** | **Respondents** | **Mathematics Performance** |
| 1 | 91 | 16 | 94 |
| 2 | 93 | 17 | 89 |
| 3 | 91 | 18 | 94 |
| 4 | 90 | 19 | 92 |
| 5 | 92 | 20 | 87 |
| 6 | 86 | 21 | 94 |
| 7 | 90 | 22 | 92 |
| 8 | 91 | 23 | 93 |
| 9 | 89 | 24 | 94 |
| 10 | 90 | 25 | 90 |
| 11 | 90 | 26 | 92 |
| 12 | 89 | 27 | 94 |
| 13 | 95 | 28 | 92 |
| 14 | 94 | 29 | 90 |
| 15 | 89 | 30 | 95 |
| **Mathematics Mean Performance = 91.40** |
| **Interpretation = Very Good** |
| **Standard Deviation = 2.33** |

Table 10 shows that the use of Ilocano worksheets in teaching Mathematics to Grade III learners at Malama Integrated School led to a strong academic performance, with a mean score of 91.40, interpreted as "Very Good." The standard deviation of 2.33 indicates that learners' scores were consistently high, with only slight variations. This suggests that most students benefited similarly from the intervention. The implication of this result is that integrating localized learning materials, such as Ilocano worksheets, can significantly enhance understanding and performance in mathematics by making lessons more relatable and easier to grasp for young learners. This approach supports the value of mother tongue-based instruction in improving educational outcomes.

**Table 10. Comparison of Grade 3 Learners' Mathematics Performance Before and After Using Ilocano Worksheets**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variables** | **Mean** | **Standard Deviation** | **t-value** | **p-value** | **Decision at** $α=0.05$ |
| Before Using Ilocano Worksheet | 84.37 | 2.27 | -12.79 | <0.001 | Reject Ho |
| After Using Ilocano Worksheet | 91.40 | 2.33 |

Table 11 shows a significant improvement in the mathematics performance of Grade III learners at Malama Integrated School after using Ilocano worksheets. The mean score increased from 84.37 before the intervention to 91.40 after, with a t-value of -12.79 and a p-value less than 0.001, indicating that the difference is statistically significant. This means that the use of Ilocano worksheets had a positive effect on students’ learning outcomes. The implication of this result is that integrating mother tongue-based instructional materials, such as Ilocano worksheets, can enhance understanding and performance in mathematics among young learners, especially in regions where Ilocano is the primary language.

**4.2. Challenges Faced by Teachers and Pupils in Using Ilocano Worksheets in Mathematics**

 **Table 11. Challenges faced by Pupils in using Ilocano worksheets n Mathematics**

|  |  |  |
| --- | --- | --- |
| Challenge | Description |  Insight |
| Language comprehension Difficulties  | Struggling to understand instruction or content in Ilocano | There are words are hard to understand, so the pupils get confused |
| Limited Vocabulary | Not knowing enough Ilocano words to complete activities | Many words needed in the worksheets |
| Reading Skills  | Difficulties in reading Ilocano texts or questions  | There are several words that the pupils are hard to read sentences clearly |
| Lack of Confidence | Feeling unsure about their Ilocano language skills | Pupils are afraid if they answered wrong, because not everyone are good in Ilocano |
| Engagement and Motivation  | Losing interest due to difficulty or boredom  | There are pupils get bored because they did not understand the Ilocano |
| Cultural Relevance | Content not relatable to their experiences or background | There are things about the questions that pupils donot familiarized |
| Time management | Struggling to finish within the allotted time | The pupils consume much time in answering questions because they do not understand some parts |
| Accessibility issues | Physical or cognitive challenges affecting worksheet tasks | There 2 pupils have trouble in writing. |

**Table 12. Challenges faced by Teachers in using Ilocano worksheets n Mathematics**

|  |  |  |
| --- | --- | --- |
| Challenge  | Description | Sample/Insight |
| Language Nuances | Difficulty in accurately translating concepts into Ilocano | “Some technical terms are hard to explain in Ilocano.” |
| Limited Resources | Lack of supplementary Ilocano teaching materials | “We have few additional materials besides the worksheets.” |
| Student Language Proficiency | Variations in students’ fluency in Ilocano | “Some students are not fluent, making comprehension harder.” |
| Engagement and Motivation | Maintaining student interest using worksheets on Ilocano | “Some students find the worksheets boring or repetitive.” |
| Cultural Relevance | Ensuring content is culturally appropriate and relatable | “Some topics don’t connect well with students’ daily lives.” |
| Time Constraints | Limited class time to fully utilize the worksheets | “We can’t finish all activities within the allotted time.” |
| Teacher Training | Lack of training on effectively using Ilocano worksheets | “I need more guidance on how to incorporate these materials.” |

1. CONCLUSION

Based on the findings, the use of Ilocano worksheets as localized instructional materials significantly improves the academic performance of Grade 3 learners in Mathematics. While English worksheets yielded only marginal gains, the Ilocano worksheets enabled learners to better grasp mathematical concepts by leveraging their mother tongue. This confirms the effectiveness of mother tongue-based instruction in enhancing understanding, retention, and academic achievement in a multilingual learning environment.

The study supports the premise that when students are taught in a language, they understand best—particularly in a cognitively demanding subject like mathematics—they are more likely to perform better. Furthermore, the results affirm the value of DepEd’s MTB-MLE (Mother Tongue-Based Multilingual Education) policy, particularly when reinforced with well-developed and culturally relevant materials. Despite its effectiveness, the use of Ilocano worksheets also presents challenges, including the need for teacher training, the development of quality materials, and strategies to boost learner and parental engagement. Addressing these areas is essential to maximize the benefits of localized instruction.

Consent (where ever applicable)

I affirm that the respondents voluntarily agreed to participate after being fully informed about the purpose, nature, and potential implications of the study. Their responses have been collected with utmost respect for their privacy and confidentiality, in accordance with ethical research guidelines.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

I acknowledge that I have not used Copilot for only refining some of the sections in the document.

Ethical approval (where ever applicable)

The study was conducted with the approval and in accordance with the standards of the college. No ethical approval was required, as the research followed all applicable ethical guidelines, ensuring respect for the respondents' privacy and confidentiality

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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