

Research Article

## Effect of Mother Tongue-Based Education (Waray-Waray) in Teaching Mathematics Subjects Among Elementary Grade Pupils

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### ABSTRACT

This study evaluated the effect of Mother-Tongue language (Waray-Waray) to the Elementary Grade Pupils (EGP) in Mathematics. An experimental research design using pretest-posttest equivalent group design was utilized in this study. A teacher-made test was utilized to measure the students' achievement in Mathematics covering the topics Operations of Whole Numbers, Operations of Decimal Numbers, and Laws of Exponent. The results revealed that respondent's Mathematics achievement rose high for experimental group and very high for control after the posttest, with the control group more homogeneous in term of their scores in the posttest. Teaching Mathematics in English allowed the respondents to perform better than the respondents under the Mother-Tongue (Waray-Waray) mediated Mathematics instruction. Since Mother-Tongue in Samar College is English, pupils may encounter Waray-Waray mediated Mathematics instruction unfamiliar. Therefore, this recommended that English as the Mother-Tongue in Samar College Elementary Department must be utilized in Mathematics enhance the learner's understanding of the concept and teachers should explain the lessons in the learners' language, particularly when the teacher notices that the students are having difficulty in understanding the topic.

### Introduction

The Philippines' language atmosphere in almost all learner areas is using foreign tongue as a medium of instruction. The idea of having different language for schools and home was started by the European who colonized the Americans (Laurio, 2015). Thereby, Miller (2013) argues that Bilingualism and bilingual education are realities in the modern world, a social phenomenon. Bilingualism is one's ability to speak separately two languages or the constant oral use of two languages. In Philippine education, bilingual education is defined operationally as the separate use of Filipino and English (Laurio, 2015).

There are huge number of researches that cited that language proficiency affects Mathematics achievement for children. Hence, it is not surprising to find a vast volume of literature on the language learning relationship because language is believed to be the gateway for learning and the vehicle that facilitates acquisition of new knowledge through direct and indirect interaction with teachers and peers, as well as through the reflective processes of introspection (Francis & Rivera 2007).

Basic arithmetic operations (addition, subtraction, multiplication and division) are commonly used in occupational and educational settings where it is essential. Yet, the knowledge of arithmetic is not enough for the learners to think reflectively and creatively. There is a need for the mastery of mathematical language and verbal ability which might be helpful for spatially gifted learners in multiple domains (Lohman,2005).

In many international studies including the 2010 Third International Mathematical Science Study (TIMMS) reported that Filipino students excel in knowledge acquisition but fare considerably low in lessons requiring higher order thinking skills like in Mathematics and Sciences (Leongson, 2003).

Attwood (2014) argue that poor performance in Mathematics is attributed to parental attitude, interrupted teaching, poor teaching and dyscalculia. He added that appropriate teaching strategy must be employed to increase deep understanding in Mathematics.

Mother Tongue-Based Education is a new approach to teaching in the K to 12 Curriculum. According to the Department of Education, the purpose of a multilingual education program is to develop appropriate cognitive and reasoning skills, enabling children to operate equally in different languages - starting with the first language of the child.

Historically, as reported by DepEd (2016), Mother-Tongue improved achievement in various learning areas including Mathematics. The site cited that in the first Iloilo Experiment (1948-1954), experimental group of Grades 1 and 2 pupils were taught subject matter using Hiligaynon as the medium of instruction, while the control group received English instruction. Results showed that pupils in the experimental group were significantly superior in proficiency (language and reading tests) and subject matter (arithmetic and social studies tests) than their counterparts in the control group.

To align with international standards, Mateo (2015) cited in an article of Philippine Star that Mother Tongue-Based Education was not implemented until 2013. With the advent of Republic Act No. 10533 or K to 12 Law, Mother Tongue-Based Education was implemented in Kindergarten to Grade 3. However, in Samar College, the Mother-Tongue is still English though there is *Waray* as a subject. Hence, the Mathematics medium of instruction is English.

The achievement rate of Grade VI examinees in the NAT approximates a status quo performance for the past three School Years starting 2011-2012, 2012-2013, and 2013-2014. As reported by DepEd- Catbalogan City (2014), of the different learning areas included in the NAT, the examinees showed a slightly improved performance. In the most recent NAT, the Samar College showed varied and fluctuating performances of Grade VI pupils in the NAT for three consecutive School Years. In Samar College Elementary Department, NAT for Grade VI was 50% for School Year 2012-2013; 65.72% for 2013-2014; and 36.94% for 2014-2015. The stated results were below the DepEd requirement of 75 percent. This study determined the effect of Mother Tongue-Based Education (Waray-Waray) among Elementary Grade Pupils in Samar College.

## **Methodology**

### *Research Design*

This research used experimental research design using pretest-posttest equivalent group design. The subjects of the study were the Elementary Grade Pupils enrolled at Samar College for School Year 2016-2017.

### *Participants*

Two groups of ten students each were used; the control (English) group and the experimental (Waray-Waray) group. The control group was exposed to Mathematics instruction in English only, and the experimental group was exposed to Mathematics instruction in English supplemented with Waray-Waray.

### *Instrumentation*

A teacher-made test was utilized to measure the students' achievement in Mathematics. The lessons covered the topics on Operations of Whole Numbers, Operations of Decimal Numbers, and Laws of Exponent taken from the Mathematics textbooks published by Phoenix Book Store. These instruments were used for both pre-test and post-test. The scores of the students were scaled into low, average, high, and proficient adopted from Laurio (2015). Furthermore, the General Weighted Average (GWA) in Mathematics was used indicate the academic achievement of the pupils. This was taken from the first grading and second grading of the current school year. Students' answers were classified as: 1-2 (very low), 3-4 (low), 5-6 (average), 7-8 (high), and 9-10 (very high). This scale was adapted from Laurio (2015).

### *Validation of the Instrument*

A pilot test was conducted to determine the reliability of the instrument. The revised instrument was administered to 10 respondents who were from Grads 2, 4, and 6 levels but were not included in the subjects of the study. A high coefficient of correlation ( $r = 0.81$ ) was obtained using Pearson  $r$ , with coefficient of correlation at 0.05 level.

## Results and Discussion

### Level of Achievement in Pre-Test

**Table 1. Level of Achievement in Pre-Test of Grade Two Pupils**

Group	n	Mean	Description	SD
Experimental	10	2.1	Very Low	1.45
Control	10	2.3	Very Low	1.73
Total	20			

As presented from the table below, the experimental group earned a mean score of 2.1 which is very low and the control group posted a mean score of 2.3 which is very low. This data is backed by the findings of Espulgar (2013) who pointed out that high school students performed poorly in Mathematics. Both groups posted nearly similar standard deviation which means that both groups were homogeneous.

**Table 2. Level of Achievement in Pre-Test of Grade Four Pupils**

Group	n	Mean	Description	SD
Experimental	10	3.2	Very Low	1.08
Control	10	3.3	Very Low	1.00
Total	20			

As presented from the table below, the experimental group earned a mean score of 3.2 which is very low and the control group posted a mean score of 3.3 which is very low. This data is backed by the findings of Espulgar (2013) who pointed out that high school students performed poorly in Mathematics. Both groups posted nearly similar standard deviation which means that both groups were homogeneous.

**Table 3. Level of Achievement in Pre-Test of Grade Six Pupils**

Group	n	Mean	Description	SD
Experimental	10	2.3	Very Low	1.00
Control	10	2.5	Very Low	0.92
Total	20			

As presented from the table below, the experimental group earned a mean score of 2.3 which is very low and the control group posted a mean score of 2.5 which is very low. This data is backed by the findings of Espulgar (2013) who pointed out that high school students performed poorly in Mathematics. Both groups posted nearly similar standard deviation which means that both groups were homogeneous.

### Comparison of Math Achievement of Grade Two to Six Pupils in Pre-Test

**Table 4. Comparison of Math Achievement of Grade Two Pupils in Pre-Test**

Group	Mean	Diff	t	df	p
Experimental	2.1	-0.2	-0.69	8	0.51
Control	2.3				

$\alpha = 0.05$  level of significance

A t-test for dependent means was performed to compare the pre-test Mathematics achievements of the two groups. Based from the table below, it was found that there is no significant difference between the pre-test Mathematical achievements of the two groups. Thus, both groups reported very low performance in the pre-test.

**Table 5. Comparison of Math Achievement of Grade Four Pupils in Pre-Test**

Group	Mean	Diff	t	df	p
Experimental	3.2	-0.1	-1.0	8	0.34
Control	3.3				

$\alpha = 0.05$  level of significance

A t-test for independent means was performed to compare the pretest Mathematics achievements of the two groups. Based from the table below, it was found that there is no significant difference between the pre-test Mathematical achievements of the two groups. Thus, both groups reported very low performance in the pre-test.

**Table 6. Comparison of Math Achievement of Grade Six Pupils in Pre-Test**

Group	Mean	Diff	t	df	p
Experimental	2.3	-0.2	0.40	8	0.67
Control	2.5				

$\alpha = 0.05$  level of significance

A t-test for independent means was performed to compare the pre-test Mathematics achievements of the two groups. Based from the table below, it was found that there is no significant difference between the pre-test Mathematical achievements of the two groups. Thus, both groups reported very low performance in the pre-test.

#### Level of Achievement in Post-Test

##### Level of Achievement in Post-Test of Grade Two Pupils

As shown from the table, both experimental group and control posted a high score with mean score of 6.4 and 7.8, respectively. This result disagrees with the result of Laurio (2015) who noted that students subjected to English only teaching in Mathematics is performing low. This is because the Mother-Tongue Education in Samar College is English; hence, pupils are not acquainted to learning Mathematics in Waray-Waray Mother-Tongue mediated instruction.

**Table 7. Level of Achievement in Post-Test of Grade Two Pupils**

Group	n	Mean	Description	SD
Experimental	10	6.4	High	1.56
Control	10	7.8	High	1.08
Total	20			

##### Level of Achievement in Post-Test of Grade Four Pupils

As shown from the table, both experimental group and control posted a high score with mean score of 7.5 and 8.9, respectively. This result disagrees with the result of Laurio (2015) who noted that students subjected to English only teaching in Mathematics is performing low. This is because the Mother-Tongue Education in Samar College is English; hence, pupils are not acquainted to learning Mathematics in Waray-Waray Mother-Tongue mediated instruction.

**Table 8. Level of Achievement in Post-Test of Grade Four Pupils**

Group	n	Mean	Description	SD
Experimental	10	7.5	High	1.20
Control	10	8.9	High	0.83
Total	20			

##### Level of Achievement in Post-Test of Grade Six Pupils

As shown from the table, the experimental group posted a mean score of 7.4, which was noted as high. On the other hand, the control group marked a score of 9.3, which is very high. This result disagrees with the result of Laurio (2015) who noted that students subjected to English only teaching in Mathematics is performing low. This is because the Mother-Tongue Education in Samar College is English; hence, pupils are not acquainted to learning Mathematics in Waray-Waray Mother-Tongue mediated instruction.

**Table 9. Level of Achievement in Post-Test of Grade Six Pupils**

Group	n	Mean	Description	SD
Experimental	10	7.4	High	2.42
Control	10	9.3	Very High	0.78
Total	20			

*Comparison of Math Achievement of Grades Two, Four, and Six in Posttest*

**Table 10. Comparison of Math Achievement of Grade Two in Post-Test**

Group	Mean	Diff	t	Df	p
Experimental	6.4	-1.4	-3.10	8	0.013
Control	7.8				

$\alpha = 0.05$  level of significance

From the table above, the computed t value is -3.10 with p-value of 0.013. The p-value is lower than the 0.05 level of significance level; hence, there is a significant difference between the post-test results of experimental and control group. This further verifies that the control group is better performing than the Waray-Waray mediated Mother-Tongue teaching in Mathematics. This is due to higher mean score of control group compare to the experimental group.

**Table 11. Comparison of Math Achievement of Grade Four in Post-Test**

Group	Mean	Diff	t	df	p
Experimental	7.5	-1.4	3.5	8	0.007
Control	8.9				

$\alpha = 0.05$  level of significance

From the table above, the computed t value is 3.5 with p-value of 0.007. The p-value is lower than the 0.05 level of significance level; hence, there is a significant difference between the posttest results of experimental and control group. This further verifies that the control group is better performing than the Waray-Waray mediated Mother-Tongue teaching in Mathematics. This is due to higher mean score of control group compare to the experimental group.

**Table 12. Comparison of Math Achievement of Grade Six in Post-Test**

Group	Mean	Diff	t	df	p
Experimental	7.4	-1.9	2.24	8	0.038
Control	9.3				

$\alpha = 0.05$  level of significance

From the table above, the computed t value is 2.24 with p-value of 0.038. The p-value is lower than the 0.05 level of significance level; hence, there is a significant difference between the posttest results of experimental and control group. This further verifies that the control group is better performing than the Waray-Waray mediated Mother-Tongue teaching in Mathematics.

Moreover, the results made clear that though control group was better than the experimental group due to its higher results in the post-test, it cannot be denied that the experimental group has significant increase in its level of understanding the topics on Operations of Whole Numbers, Operations of Decimal Numbers, and Laws of Exponent.

### Conclusion and Recommendation

The following conclusions were drawn from the study:

1. The respondents' Mathematics performance at the start of the study was "very low."
2. The respondent's Mathematics achievement rose to high for experimental group and very high for control after the post-test, with the control group more homogeneous in term of their scores in the post-test.
3. The control group performed better than the control group in the post-test. Teaching Mathematics in English allowed the respondents to perform better than the respondents under the Waray-Waray mediated Mathematics instruction. Since

Mother-Tongue in Samar College is English, pupils may encounter Waray-Waray mediated Mathematics instruction unfamiliar.

4. However, this study proves that Mother-Tongue Based Mathematics instruction enhanced pupils' learning on Operations of Whole Numbers, Operations of Decimal Numbers, and Laws of Exponent due to significant increase in the post-test scores.
5. However, there is a significant increase in scores among the participants in the experimental group.

From the conclusion above, the following are the suggestions and recommendations:

1. Since English is the mother-tongue in Samar College Elementary Department, this language must be utilized in Mathematics enhance the learner's understanding of the concept.
2. Teachers should explain the lessons in the learners' language, particularly when the teacher notices that the students are having difficulty in understanding the topic.
3. School administrator must implement policies that English be used as the medium of instruction for Mathematics and other subjects. They must conduct seminar-workshop to enhance the level of proficiency of teachers in respect to English.
4. A similar study on the use of the English as Mother-Tongue may be conducted using different subjects and a larger number of participants to ascertain the validity of the results of this study.

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