

THE USE OF MOTHER TONGUE IN TEACHING MATHEMATICS

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Abstract: *Mathematical skills are often hard to acquire and master in a language unfamiliar to the learners. Oftentimes, students fail to master mathematical concepts and skills when they can hardly comprehend the medium of instruction thus, this study explored the use of Mother Tongue in teaching Mathematics to selected Grade 9 students. The purpose was to examine the effectiveness of mother tongue-based instruction in teaching Mathematics. The study involved 60 grade 9 students of Bagong Barrio National High School. The research employed the experimental method which involved two groups, the experimental group and the control group, which were both given a pre-test and a post-test. The instrument used in the study is a written 30-item test which contains lessons about variations. Based on the findings, it is concluded that the use of mother tongue as a medium of instruction is more effective than the English language. Moreover, students who were taught using their native language showed a higher learning gain compared to those who were taught using English.*

Keywords: *Mother Tongue, Mathematics, Teaching, Native Language, Learning Gain*

Introduction

Mathematics serves a vital role in everyday life. It is an area of knowledge which can never be easily acquired and quickly learned; instead it requires full attention, hard work and proper attitude.

In TIMSS 2003, the Philippines ranked 36th in Mathematics among 38 participating countries. Topnotchers hailed from the Asian countries are Hong Kong, Japan, Singapore, and South Korea—countries which practice a common virtue of nationalism. With the practice of such, they said countries were among those citizens who exemplify the vicarious use of their respective national languages. Thus, needless to say, there was an apparent reason behind the excellent performance of the TIMSS topnotchers—the use of their national language as a medium of instruction.

In the Philippines, the medium of instruction for Mathematics is English, a language that serves as a second or even third or fourth language for multilingual Filipino speakers. The Filipino learners then have to grapple with several skills and to master two areas, the Mathematical skills and the English language at the same time.

Johnstone (2011) revealed that grammar and reading comprehension are both primary activities that are possible determinants of success in acquiring mathematical skills. However, to master the basic mathematical skills, English proficiency is a must. One of the changes in Basic Education Curriculum brought about by the new K-12 program of the Philippines is the introduction of Mother Tongue-Based Multilingual Education (MTB-MLE). Mother Tongue-Based Multilingual Education (MTB-MLE) refers to *first-language first* education that is, schooling begins in the mother tongue then transitions to additional languages particularly Filipino and English. It is meant to address the high functional illiteracy of Filipinos where language plays a significant factor. This program heeds the call for a Mother Tongue-based teaching. Filipinos appear to have poor performance in Mathematics because they are not well-versed with the English language which is the medium of instruction.

Based on the aforementioned realities cited, the researcher conducted this experimental study on the use of mother tongue as a medium of instruction in teaching Mathematics to find out if language has a key role in Mathematical skills of the learners.

Literature Review

Importance of Language in Teaching

Barnes (2013), a noted educator, gave his idea that student should first master the rules of the use of the instructional language before they can work well with their learning task. According to him, when a teacher is engaged in conveying the content and the discipline of an academic subject, then the process should involve the functional use of speech in various ways. Teacher and pupil should be caught up in a continuous dialogue in which ideas are assimilated by means of talk and listening, questioning and answering on the pupil's part. This points to the fact that in teaching a subject, language is important. It is not possible to achieve the goal of the teaching and learning process if the student does not possess a better command of the language. When the students grasped and assimilated the concepts taught by the teacher, there will be a complete transfer or learning.

Macnab (2010) said that language is clearly essential in the learning process both in its spoken and written form. However, they added that the language of the pupil is as important as the language of the teacher. They added that time is needed for ideas and techniques to acquire real meaning for pupils; the ideas and techniques may be needed to be seen from more than one viewpoint by appropriate analogies. This accretion of meaning according to them can be considerably aided by the use of language readily used by the pupils. The precision of mathematics language which allows concentration on mathematical essentials, leave pupils with a less clear understanding than if a more formal level of language is given.

On the other hand, Johnson (2011) revealed that grammar and reading comprehension are both primary activities that are possible determinants of success in acquiring mathematical skills. In relation with this, Hite (2012) stated that students who intend to enter in various fields with competency in technology need a thorough knowledge of mathematics as prerequisite. However, to master the basic mathematical skills, English proficiency is a must.

In Papua New Guinea, a common reason which has been given in the past as to why students have difficulty in learning mathematics is that they are being taught in English, their second language. From the early 1960's, the official language of Papua New Guinea is English. This policy was also followed by the newly independent government in 1975. There was some softening of the policy in the 1980's when teachers were allowed some freedom to choose whichever language they preferred to teach in. However, in 1985 the traditional English-only policy was reinforced. Thus, for nearly the whole life of the governmental education system, non-English language is discouraged. In 1989, it became a policy that teachers should use the mother tongue of their students in the first six months of schooling, and then revert to an English-only teaching environment. If it is not possible to use the mother tongue because the teacher did not have command of it, then a common lingua franca should be used if possible. (Malone and Paraide, 2011)

In her article, Stanley (2012) said that the use of first language and foreign language in classrooms or learning environment is one of the on-going debates. Generally, few instructors feel that the primary language of instruction should be the first language. However, there is a wide range of opinions on the degree of the use of the first language. One end of this spectrum favours banning then the first language from the classroom totally; the remainder proposes various types of first language use or limitation. Factors which affect these decisions include such things as, social and cultural norms, student motivation and goals, age and proficiency of the students, and the linguistic makeup of the class.

A study by Johnstone and Selepeng (2011) revealed that students struggling to learn science in a second language lose 20 percent of their capacity to reason and understand in the process. This study has implications for countries which teach their students through the medium of a foreign language rather than in native language. They claim that basic proficiency is not adequate to perform the more demanding task required in academic courses since students do not have exposure to, or lack an understanding of the vocabulary and context-specific language.

Studies by Cassels and Johnstone (2011), Pollnick and Rutherford (2010) revealed that learning academic courses through the medium of English poses problems for students whose mother tongue is not English. The explanations given for these problems are linguistic and psychological. Studies exploring and underlying psychological problems indicate that second language learners are frustrated by failure to see meaning in texts and start to have a tendency toward rote-learning. Therefore, not much is stored in memory since what is learned by rote is easily forgotten. Linguistic effects are a result of one's lack of knowledge of grammar, rules of syntax, as well as meanings of words used in different context. Poor knowledge of these rules puts second-language learners at a disadvantage, being less able to see meaning in texts, when compared with first language counterparts who have been exposed to inherent and informal methods of learning their language at an early stage.

The results of the study investigating the effect of language on performance of second language students in science examinations by Bird and Welford (2012) also showed the effect was significant. There were significant differences in performance of modified forms of the questions between British school pupils and pupils for whom English was the second language. The study gave a clear indication that the wording of questions in science examinations was a real influence on the performance of second language students.

In 2012, a study was conducted by Esapada which was entitled *The Native Language in Teaching Kindergarten Mathematics*. The study examined the effect of using the native language in teaching kindergarten mathematics. A total of thirty-four five to six-year-old-children went through a pretest-posttest, quasi-experimental study with seventeen participants in each of the control or English group and the native language (Waray) or experimental group. The result revealed that the kindergarten pupils exposed to the native language performed better in mathematics than those who were exposed to English. Gorgonio (2011) conducted a study on the use of Filipino and English in learning Social Studies among students in University of San Carlos during the school year 2010-2011. In this study, he found that the use of Filipino or English as a medium of instruction had improved the academic performance of the students. Descriptively, the use of English as a medium of instruction showed better learning in Social Studies.

A study conducted by George (2013) revealed that there is a significant relationship between language of instruction and academic performance of the subject's studies. This suggests that as language of instruction increases, so does academic success. These findings support the views of researchers that there is correlation between proficiency in the language of instructions and overall academic achievement of learners.

In the article of Acuña on the language of instruction in Science Education, as cited by Vela (2012), she said that language has many functions. The most obvious of its functions is communication. These cannot develop unless the language is sufficiently mastered. Furthermore, she said that using a medium of instruction that is foreign would delay the development of thinking. If the oral language is not developed prior to the written, attainment of functional literacy will be slowed. If the strong language is not used to teach the weak, learning the nuances of both languages that can encode relations and logic needed for science will be delayed. Clear and critical thinking needed for rational decision making will then suffer. She also believes that borrowing English terms for science concepts are the immediate solution to the problem of translating terms of science concepts from English to Filipino. It is also an answer to an argument that using Filipino may act as a barrier to access technology. According to her, teachers can just use the scientific concepts in English, then explain and teach these in Filipino. Translation of terms will just follow as scientist suggests words in a mixture of Philippine languages to create compound words that express science concepts. The widespread use of these terms will take time, but Filipino children must be taught science in a language they understand.

The studies and articles cited herein are similar to this study for both have a similar main goal which is to determine what medium of instruction is most effective in the teaching-learning process. However, some studies mentioned above were different from this study for they have tested the effectiveness of using Foreign Language as a medium of instruction in teaching. Some studies mentioned above conferred the effectiveness of using mother tongue as a medium of instruction both in the Philippines and in another country.

Theoretical Framework

This study is based on the Theory of Language Proficiency by Professor Jim Cummins (1979). He postulated two distinct types of language proficiency—the BICS or Basic Interpersonal Communicative Skills, and the CALP or Cognitive Academic Language Proficiency.

Basic Interpersonal Communicative Skills refers to the basic communicative fluency achieved by all normal native speakers of a language. It is cognitively undemanding and contextual and is better understood as the language used by students in informal settings.

On the other hand, Cognitive Academic Language Proficiency refers to the ability to manipulate language using abstractions in a sophisticated manner. CALP is used while performing in an academic setting. CALP is the ability to think in and use a language as a tool for learning. Cummins’s research suggests that K-12 students need five to seven years to acquire CALP in the second language, if the learner has native language literacy. Learners who do not have strong native language literacy often need 7 – 10 years to acquire CALP in the second language.

Purpose of the Study

The study aimed to test the effectiveness of using Mother Tongue as the medium of instruction in teaching Mathematics. Specifically, it sought to answer the following questions:

1. Is there a significant difference in the pre-test and post-test of the control group and the experimental group?
2. Is there a significant difference in the learning gain of the control group and the experimental group?

Design and Methodology

This study used experimental research since it sought to prove the effectiveness of using mother tongue as a medium of instruction in teaching mathematics. The pre-test and post-test design of the Experimental method was used. The study involved two groups, the experimental group and the control group which were given a pre-test at the beginning of the lesson. The respondents of the study were the selected grade 9 students of Bagong Barrio National High School, during the school year 2017-2018. The respondents were chosen because both groups belong to heterogeneous class, and both groups were handled by the researcher in his class. There were thirty respondents from 9-Nickel (Experimental Group) and 9-Rubidium (Control Group). These thirty students from each class were those students whose mother tongue are Tagalog. The experimental group will be treated using the mother tongue as a medium of instruction while the controlled group will be treated with the use of English language. The table below presents the matrix of the different phase of the study.

Table 1 Matrix of the Different Phases of the Study

Phase	Activity	Time Frame
1	Planning and Development of learning activities	1 week
2	Actual Gathering of Data-Eliciting students’ prior knowledge (Pre-test) Tallying	1 day
3	Control group and Experimental groups exposure to respective activities	9 days
4	Conducting of the Post-test	1 day
5	Analysis of data and start of writing the analysis and interpretation of data	1 week

The instrument used in this study was a written 30-item test that explored the students' participation in the study by considering the students' results in the pre-test and post-test. The tests contain items involving variations. The test considered the minimum competencies as given in the curriculum guide in Mathematics 9. The data gathered were statistically analyzed using dependent (correlated) and independent t-test.

Analysis and Findings

Table 2. Significant Difference Between the Pre-Test and Post-Test Results of The Control Group

Control Group	Mean	S D	Difference	Tabular t-value (0.05)	Computed t-value	Decision	Interpretation
Pre-Test	9.67	2.72	5.26	2.045	5.484	Reject Ho	Significant
Post-Test	14.93	4.99					

Table 2 presents the significant difference between the pre-test and post-test of the control group. As presented on the table, the computed value of 5.484 was greater than the tabular value of 2.045. Then at 5% level of significance, the null hypothesis was rejected. This means that there is a significant difference between the pre-test and post-test result of the control group. This shows that using English as a medium of instruction is effective.

Table 3. Significant Difference Between the Pre-Test and Post-Test of The Experimental Group

Experimental Group	Mean	SD	Difference	Tabular t-value (0.05)	Computed t-value	Decision	Interpretation
Pre-Test	7.70	3.03	11.1	2.045	14.323	Reject Ho	Significant
Post-Test	18.80	4.27					

Table 3 shows the significant difference between the pre-test and post-test of the experimental group. As shown on the table, the computed value of 14.323 was greater than the tabular value of 2.045. Then at 5% level of significance, the null hypothesis was rejected. This means that there is a significant difference between the pre-test and post-test result of the experimental group. This also reveals that the use of mother tongue as a medium of instruction is more effective than using English.

Table 4. Learning Gains of the Control and the Experimental Group

Group	Pre-test Mean Score	Post-test Mean Score	Learning Gain	Difference
Control	9.67	14.93	24.814	25.077
Experimental	7.70	18.80	49.891	

Table 4 reveals the learning gains of the control and experimental group. As revealed on the table, the learning gain of the experimental group was 49.891 while the control group was

24.814. This means that the experimental group gained more learning as revealed on the table with a difference of 25.077. Moreover, since the learning gain of the experimental group is comparatively higher than the learning gain of the control group, it could be asserted that the use of mother tongue as a medium of instruction is more effective than using English as a medium of instruction.

Conclusions and Recommendations

Students who were taught using their mother tongue showed a remarkable learning gain than the students who are exposed in English instruction. The use of mother tongue as a medium of instruction is more effective than the use of English language. Students should use their mother tongue language when speaking in the class or in recitations to boost their self-esteem and stimulate their confidence. Teachers should use the results of this study for developing academic interventions in mathematics for students who are low achievers.

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