

MOTHER TONGUE IN TEACHING MATHEMATICS: IT'S EFFECT ON THE MATHEMATICAL SKILLS OF GRADE 4 PUPILS OF BLISS COMMUNITY SCHOOL OF CATBALOGAN, CITY

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ABSTRACT

This research study investigated the usage of the mother tongue in teaching mathematics and its relative effect on the mathematical skills of 4th grader pupils of Bliss Community School of Catbalogan City. The study incorporated a pre-post quasi-experimental design. Two groups from 72 pupil-respondents matched according to previously established variables included in the study: age, sex and general weighted average (GWA). After the study, the findings revealed that the usage of the mother tongue in teaching mathematics has no effect on pupil-respondents' mathematical skills. The researchers identified that the pupil-respondents exposed to English as a medium of instruction performed better than those exposed to their mother tongue. Furthermore, this study recommends that the English language be utilized in teaching the mathematics subject. Learners must have profound knowledge in acquiring English terminologies since it is necessary and significant to the success of understanding mathematics.

Keywords: *mother tongue, medium of instruction, relative effect, mathematical skills.*

1. INTRODUCTION

For over two thousand years, mathematics has been a significant part of the human search for understanding [16]. The teaching and learning process became essential to contribute significantly to every individual's daily life. As the famous quotation says, "Mathematics is everywhere"; therefore, acquiring basic and foundational skills in mathematics is relevant and necessary. It is vital in the social-economic development of a nation, and thus, society and community have seen this as the foundation of scientific-technological knowledge [9]. As Andaya said, mathematics is a subject recognized as the mother of all learning, with other subjects deriving their concepts from it, both arts and sciences [2]. It is essential in almost every field: measurement in fashion, angles in sports, technology and economics. Yes, it is about numbers, but Andaya further added, "It is not just computation, but a tool for understanding structures, relationships and patterns to produce complex real-life problems" [2]. Unameh also added that mathematics is intimately connected to daily life and everybody's life-long planning [28]. Therefore, mathematics is a subject that education and human life cannot function effectively without it. However,

acquiring mathematical skills thus faces barriers with different factors contributing to it. According to many kinds of research and studies conducted before, some of the predictable factors were environment, learning styles, attitude towards the discipline, language, et al. Thus, this study will focus on the language factor in connection to learners' development of mathematical skills.

Language is the one that connects ideas or feelings to people. It is the medium for people to communicate, socialize, and learn everywhere, especially at school. The Philippines is a country where many languages are spoken. There are 12 major languages or lingua franca used in communication by Filipinos, including the Waray-waray language of the province of Samar. Since a person is born, s/he already uses language her/him to express their emotions and ideas. A child will automatically adapt to the language s/he is exposed to, which is the foundation of learning. Language is related to Mathematics. There is a strong relationship between learning mathematics and the language utilized.

Through an interactive relationship between the teacher and the student, education is a permanent and constantly evolving procedure of influencing teaching and learning, aiming for the best possible result. True, education constantly changes to cope with what best suits the learners' needs. It neither innovates, changes, nor revises some aspects to provide the best educational institution. In the Philippines, its curriculum is revised every ten years. However, due to the swift phases of changes in education and the global demand of Filipino society, Valerio said that it was made to update the curriculum responsive to the emerging demands of 21st-century learners. Because of the emerging demands of this modern technological world, Philippine educational institutions responded to these global trends [29]. Thus, in 2012, the country initiated a mother Tongue-Based Multilingual Education (MTB-MLE) program, which was a vital part of the K to 12 Basic Education Program. This program was in line with the passing of the Republic Act of 10523, otherwise known as the "Enhanced Basic Education Act of 2013" [22]. According to the research journal of Valerio, during the past ten decades, only three (3) countries in the world do not have the K to 12 Curriculum. Some of these are Djibouti, Angola and the Philippines. Finally, it has been adopted and implemented in the Philippines in all its educational institutions [29].

MTB-MLE emphasizes the usage of the mother tongue as a medium of instruction in the early childhood classrooms of Kindergarten and grades 1 to 3. Ricardo supported the usage of the mother tongue as a medium of instruction. He added that through it, learners could express their thoughts freely without fear of making grammar mistakes [24]. Thus, it is the foundation to further their learning into more complex ones. Awopetu, in her study on "Impact of Mother Tongue on Children's Learning Abilities in Early Childhood Classroom," found out that it is adequate to use mother tongue teaching language as a medium of instruction on the development of the learning abilities of pre-school learners of Nigeria. At a young age, learners must be exposed to instruction where they can quickly learn that will serve as their foundational knowledge and skills. Mother tongue in K to 12 curriculum was used as the medium of instruction in all learning areas with the exemption of Filipino and English [3]. Thus, the instruction also in teaching mathematics which is an English subject would be the mother tongue. Therefore, the researchers further studied the mother tongue as a medium for teaching mathematics.

Mother tongue is the first language that a person learns. The child's mother tongue is seen with utmost importance, for it significantly contributes to how they acquire, perceive and store knowledge at a young age, in line with Crystal's point of view that language is seen as one of the most significant aspects of the curriculum. It provides learners with a tool for communication, which is a vital part of the teaching and learning process [7]. For one thing, it categorizes a large part of the child's environment; that is, it has names for most of the objects, actions, ideas, attributes, and so on that are crucial to him [20]. There are many barriers that learners face in mathematics, and according to DepEd, one of these is that our learners begin their schooling in a language they do not comprehend. Omonoyi, et al. further added that "it was recommended, among other things, that mother tongue should be employed in teaching mathematics at primary school level to internalize mathematics language and make the pupils mathematics friendly at their tender age" [21]. This note was also supported by Israel and Thomas, who further added that children learn better when taught using their mother tongue. By starting with the language that young learners speak at home, the gap in understanding can be bridged better and easier [12]. Hence, elementary students can better absorb lessons well [11]. Niesche also has seen a need to embed children's culture in mathematics education's teaching and learning process. His research in Western Australia revealed that children performed better when the native language (Kriol) was used instead of English to teach mathematics to the children. He realized that using children's mother tongue in teaching mathematics can become a powerful tool for learning [19]. These findings were also in line with Matang's; he added that to gain interest in mathematics and make

meaning out of what children are learning, their culture needs to be embedded in mathematics. He further emphasized that instructional materials used in teaching and learning must be from children's cultural backgrounds. Therefore, the curriculum needs to be culturally inclusive in all aspects [18].

In the journal article of Wearne and Hiebert, they further concluded a theory concerning mathematics acquisition that students develop competence in written [math] symbols through cumulative and sequential mastery of different cognitive processes that were adopted in their study. Since mastery is necessary for mathematics acquisition, language also utilized plays a significant role [30]. Every learner has unique skills, background knowledge, culture, and interests. These aspects can affect learning and teaching mathematics because instructional strategies should be modified accordingly [5]. This was also supported by Al-amarat in his study; he further concluded that one of the problems encountered in the classroom and schools, in general, is language. This finding is one aspect that could threaten the whole educational process if not appropriately utilized in order to improve students' acquisition of knowledge and concepts [1]. Indeed, when instructions are given in the mother tongue, young learners can easily comprehend and understand. Furthermore, thus, it is conducive; also in teaching basic skills in mathematics. However, there are also factors in the learning process that were affected by using this medium of instruction.

Mathematics is considered an English subject since English is the medium of instruction for teaching it. Terms and concepts were all in the English language. Studies conducted before found a high correlation between mathematics achievement and reading ability that a variety of language skills greatly influenced the learner's ability to comprehend and read mathematics. Therefore, a student must acquire the terms and grammatical patterns and develop linguistic skills in the English language to understand mathematical problems early for practising and developing the skills for the foundation of higher mathematics. Valerio's study, "Current Perspectives on Mother-Tongue Based Instruction in the Newly Implemented K TO 12 Curriculum of the Philippines", further concluded that using mother-tongue-based instruction cannot elevate the learners' academic performances. It was recommended that, since language is the tool for academic development and the core of cultural identity and intercultural sustenance, the mother tongue-based instruction needs to be given investigation and assessment [29].

Hence, this further study was conducted on the effect of the mother tongue as a medium of instruction on the development and acquisition of learners' mathematical skills. This study focused on its relative effect on learners undergoing transitions in the medium of instruction in mathematics subject (from their Mother Tongue to English).

1.1 Research Objectives

This study investigated the effect of mother tongue in teaching mathematics and its effect on the mathematical skills of Grade 4 students of Bliss Community School, Catbalogan, City, Samar specifically it sought to achieve the following objectives:

1. Determine the significant difference in the pre-test mean scores between the experimental and control group.
2. Determine the significant difference between the pre-test and post-test mean scores of both the control group and experimental group.
3. Determine the significant difference in the post-test mean scores between the experimental and controlled groups.

1.2 Hypothesis

1. There is no significant difference in the pre-test mean scores between the experimental and control group of respondents.
2. There is no significant difference between the pre-test and post-test mean scores of both the control and experimental group.
3. There is no significant difference in the post-test mean scores of the experimental and control group.

2. THEORETICAL AND CONCEPTUAL FRAMEWORK

2.1 Theoretical Framework

This study of the effect of Mother-tongue instruction on the academic performance of students is anchored with the theory of cognitivism proposed by Vygotsky, a psychologist, where he emphasizes the mental cognitive aspects and abilities of the human mind [17].

Learning is concerned not only with what learners do but with what they know and how they acquire it [13]. Well-known individuals proposed many theories; however, these were broken down into two major classifications: Cognitive and Behavioural Theories. The cognitive approach focuses on the mental activities of the learner that lead up to response and acknowledges the processes of mental planning, goal-setting, and organizational strategies [25]. Cognitivism is somewhat related to behaviorism. Behaviourism emphasizes the environmental factors that could affect or facilitate learning and the experiential situations where learners are engaged. Similarly, the cognitivist perspective also emphasizes the significant role of practice and application of learning in the teaching and learning process. From here, we can establish the slight difference between the two, where the aspects of learning were taken quite differently. According to Ertmer and Newby, cognitive theories stress the acquisition of knowledge and internal mental structures- they focus on the conceptualization of students' learning process and address the issues of how information is received, organized, stored, and retrieved by the mind. Therefore, predictable factors can affect learners' metacognition regarding how they receive and store information for long-term purposes [10]. Thus, this study focuses on the effect of the language used on the learner's acquisition of mathematical skills. It is irrefutable that the success of learning the subject is contingent on a myriad of factors [9].

In addition, Piaget's theory on mathematical acquisition suggests that it is the teacher's role to establish a mathematical environment for the learners to construct mathematical knowledge. From other research on factors affecting students learning, the environment significantly contributes to how learners learn. This means that a teacher, who serves as the facilitator of learning, must guide the direction of students' inquiry and encourage their new patterns of thinking. With this, the theory of Vygotsky on socio-culturalism, highlights the development of a student's intelligence "results from social interaction in the world and that speech, social interaction, and cooperative activity are all important aspects of this social world" [26]. The language used, its role is to build cognitive tools for learning.

According to the Summary Research, Theories and Practice in Mathematics Education by Thomson, "communication plays a significant role in helping students construct links between their formal and intuitive notions and the abstract language and symbolism of mathematics " [27]. Hence, how learners acquire and express knowledge in mathematics is relatively predicted as to the successfulness of communication. He added that when communication strategies are made explicit through class discussions, modeling, and assessment feedback, students will eventually develop active listening, paraphrasing, and questioning techniques within their mathematical conversations.

Cobb, in his research, argued that the goal of instruction "is or should be to help students build [mental structures that are more complex, powerful, and abstract than those that they possess when instruction commences [4]. Thus, his statement only implies a pedagogical problem in different classroom settings that must be conditioned to create and develop complex and powerful mental structures in the students.

Psychological studies provide seemingly obvious evidence that students with struggles in learning language will also have trouble learning mathematics, as "there is evidence that dyslexic children experience problems with mathematics and lag behind their peers" [8]. King further added that this quote implies that language directly influences mathematics education. However, questions arise as to "whether there are differences in learning and development as a function of a particular language or languages employed" [15]. The language learning theory, as stated by Postman, reiterates that language is a mediating tool in any learning and teaching process. Language learning is not a discrete discipline unconnected from all other learning. Hence, language learning in school is crucial for academic growth toward the pedestal of pedagogical hierarchy. The language of academic discourses and the knowledge content of any subject are closely interconnected [23].

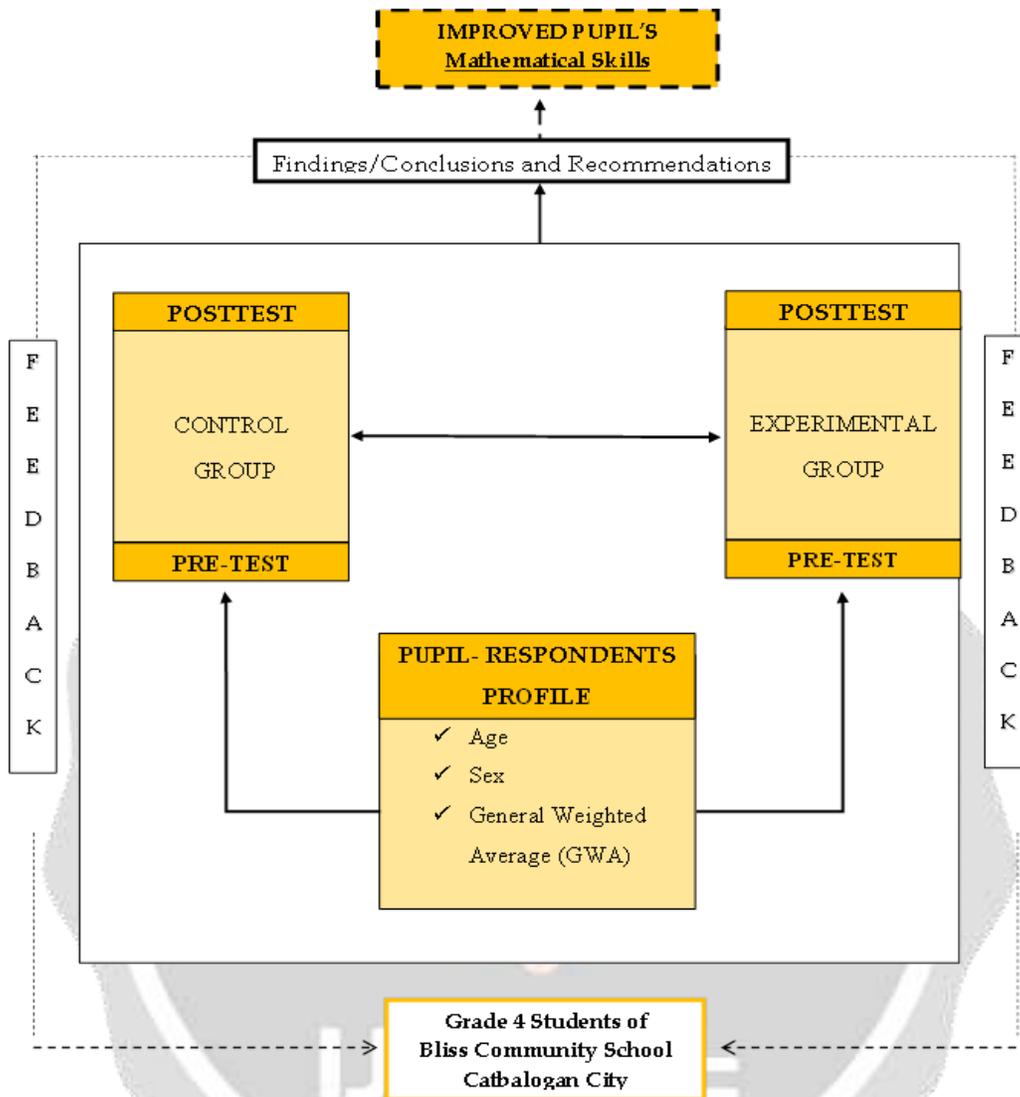


Fig- 1: The Conceptual Framework of the Study

2.2 The Conceptual Framework of the Study

This study focused on the effect of Mother Tongue teaching instruction on the Mathematical skill of Grade 4 pupils of Bliss Community School, who will serve as the respondents as shown in the lowest portion of the diagram. Respondents' profile was taken into account in making controlled and experimental groups, as shown in the box above, which is the locale and participants of the study.

Since this is experimental research, the researchers made two groups (controlled and experimental) shown in the two boxes. The arrow between these two boxes represents the intervention between the two groups. These groups will undergo pre-test and post-test as an assessment after the intervention.

Moreover, the findings/conclusions and recommendations served as a feedback mechanism in providing pupils with effective teaching instruction that would best yield their successful learning in mathematics.

3. METHODOLOGY

3.1 Research Design

This is a quantitative study that incorporates a quasi-experimental research design. The researchers will establish controlled and experimental groups considering all variables that affect it. These variables mentioned are the GWA, Age, and Sex. Therefore, the researchers considered certain variables in the grouping of respondents to eliminate discriminatory treatment. In this study, the participants have the same chance of being assigned to the control or experimental groups. If the result after treatment differs significantly from the result prior to treatment, it is considered that the treatment caused it.

3.2 Research Locale

The researchers conducted the study in Bliss Community School in the locality of Catbalogan, City, Samar, Philippines.

3.3 Subjects of the Study

The researchers determined a total number of 72 Grade 4 pupils of Bliss Community of Catbalogan. Since this study incorporates a quasi-experimental design, the researchers established controlled and experimental groups. All variables that could affect must be considered. The researchers got the respondents' profiles, such as age, sex, and GWA (General Weighted Average). The respondents are grouped accordingly and equally based on these variables to eliminate discriminatory treatment.

The study subjects are the 4th grader pupils of Bliss Community School. Based on the K to 12 program, only grades 1 to 3 undergo a mother tongue language instruction. Thus, grade 4 pupils were the ones experiencing the transition of instruction from Mother-tongue to English. Therefore, the researchers wanted to investigate the effect of mother-tongue language instruction on the mathematical skills of the 4th grader pupils.

3.4 Research Procedures

The researchers underwent 3 phases in the conduct of the study. Firstly, the researchers administered a pre-test examination using a questionnaire as the primary instrument of data gathering procedure; this questionnaire consisted of 20 items with multiple choices and was distributed accordingly to the two groups of respondents. Second, the researchers exposed the two groups to different treatments, wherein the researchers were the ones who taught the respondents. The control group was exposed to teaching mathematics using English as a medium of instruction. In the experimental group, Mother-tongue was used as a medium of instruction. Third, the researchers administered a post-test to the control and experimental group. After conducting these three (3) phases, the results were then analyzed, interpreted, and evaluated to determine the significant differences between the pre-tests and post-tests of the two groups.

3.5 Data Gathering Instrument

The researchers administered a pre-test and post-test examination using a questionnaire as the primary instrument of data gathering procedure; this questionnaire consisted of 20 items with multiple choices and was distributed to the two groups of respondents. The teacher-made questionnaire contains questions from the book *Mathematics for a better life* by Carmelita C. Coronel et. Al [6]. The researchers selected questions from this book according to the competency levels and ensured that every lesson must have a representative in the questionnaire. To establish the instrument's content validity, the researchers came up with a Table of Specifications (TOS) and underwent validation by the experts.

3.6 Statistical Tools

The data and information gathered after this quasi-experimental study were then treated confidentially. The computation, analysis, and interpretation of these were made using the following descriptive and inferential statistical tools:

Mean – this tool was used in presenting the mean and averages of the pre and post-tests of the controlled and experimental groups.

Standard Deviation- this tool was used to determine how the scores are dispersed from the mean.

T-test for Independent and Dependent Samples – this tool was used to measure the significant difference in the scores acquired after the pre-test and post-test examinations in the conduct of the quasi-experimental study.

Shapiro-Wilk test- this tool was used to test the data's normality to follow the assumptions in using t-test for independent and dependent samples.

4. RESULTS AND DISCUSSION

4.1 Results

This chapter contains the findings about the “The effect of mother tongue in teaching mathematics on the mathematical skills of fourth graders of Bliss Community School”. This also presents the collected data, analysis as well as the interpretations of the data.

The table 1.0 shown below shows the normality of data collected from the study of both pre-test and post-test where in Shapiro-Wilk test was used as a tool for testing the normality of the data gathered. For the data analysis and making inference from it, t-test for independent and dependent samples was used.

Table-1: Testing the Normality of the Data Gathered

	Shapiro-Wilk			
	Statistic	Df	Sig.	Interpretation
Pre-test Control Grp	.945	22	.254	NORMAL
Posttest Control Grp	.967	22	.645	NORMAL
Pre-test Experimental Grp	.920	22	.074	NORMAL
Posttest Experimental Grp	.927	22	.109	NORMAL

Normality Test (Sig. <0.05)

The table 2, 3, 4 and 5 shown below shows the mean scores of the Control and Experimental group in their pre-test and post-test scores.

Table-2: Result of the mean scores of Pre-tests of Control and Experimental Group

Groups	n	\bar{x}	SD	t-cal	Df	P value	Decision	Interpretation
Control	22	5.77	2.39	0	42	1	Accept H_0	NS
Experimental	22	5.77	2.33					

Level of significance at 0.05

Table-3: Result of the mean scores of Pre-test and Post-test of Control Group

Control Group	n	\bar{x}	SD	t-cal	Df	P value	Decision	Interpretation
Pre-test	22	5.77	2.39	-2.88	21	0.009	Reject H ₀	S
Posttest	22	7.73	2.33					

Level of significance at 0.05

Table-4: Result of the mean scores of Pre-test and Post-test of Experimental Group

Experimental Group	n	\bar{x}	SD	t-cal	Df	P value	Decision	Interpretation
Pre-test	22	5.77	2.39	-1.82	21	0.08	Accept H ₀	NS
Posttest	22	7	2.33					

Level of significance at 0.05

Table-5: Result of the mean scores of Post-tests of Control And Experimental Group

Groups	N	\bar{x}	SD	t-cal	Df	P value	Decision	Interpretation
Control	22	7.73	2.78	0.81	42	0.42	Accept H ₀	NS
Experimental	22	7	3.13					

Level of significance at 0.05

4.2 Discussions

Based on the pre-test mean scores of the controlled and experimental group and the shown in table 2 above, it was proved that the p-value of 1 is greater than the significance level of 0.05 using the two-tailed test. Hence, the researchers accept the null hypothesis (H₀) "There is no significant difference between the pre-test scores of the control group and experimental group." We also infer that the pre-test mean scores of the two groups are equal and not statistically significant by the result of the t stat, which is 0. This result is essential to ensure the elimination of bias treatment in the study and that the samples were equally grouped before treatment.

Table 3 reveals that the p-value of 0.009 is proved to be lesser than the level of significance of 0.05. Therefore, the null hypothesis is rejected; this implies a significant difference between the control group's pre-test and post-test mean scores. By implication, the performance of the students exposed to teaching mathematics using the English language after treatment is more significant than before treatment, and the English language influences their performances in mathematics positively.

Table 4 shows that the p-value of 0.08 is proved to be greater than the level of significance of 0.05. Therefore, the null hypothesis is accepted; this implies no significant difference between the experimental group's pre-test and post-test mean scores. Although there is a difference in their mean scores, they are not statistically significant. Hence, teaching mathematics using Mother-tongue language does not influence their performances in mathematics.

Table 5 shows that the p-value of 0.42 is proved to be greater than the level of significance of 0.05. Therefore the null hypothesis is accepted; this implies no significant difference between the post-tests means scores of the control and experimental group after treatment. This means that the performances of the two groups of students after treatment have no difference.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

With the above findings, the following conclusions were made from the statements of the hypothesis. Firstly, the null hypothesis (H01) is accepted, implying that there is no significant difference between the pre-test scores of the control and experimental groups. Second, the null hypothesis (H02) is rejected; implying a significant difference between the pre-test and post-test mean scores of the control group. Third, the null hypothesis (H03) is accepted, implying that there is no significant difference between the experimental group's pre-test and post-test mean scores. Fourth, the null hypothesis (H01) is accepted, implying that there is no significant difference between the post-tests mean scores of the control and experimental groups. Therefore, the researchers concluded that the performance of the control group or the group exposed to teaching mathematics with English as the medium of instruction is much higher than the experimental group or the group exposed to teaching mathematics with Mother-tongue as the medium of instruction. In conclusion, using Mother-tongue in teaching mathematics does not affect the mathematical skills of the grade four students of Bliss Community School of Catbalogan, City. This conclusion is supported by the study of Omoniyi et al., on the study "Effect of Mother Tongue and Mathematical Language on Primary Schools Pupils Performance in Mathematics," which found that there is no significant difference in the performance of the students exposed to the use of mother tongue in mathematics [21].

5.2 Recommendations

In this modern era, the Philippine government empowers the DepEd to improve our educational system. The new curriculum now challenges modern educators and traditional educators that the DepEd implemented to secure the development and enhancement to attain a better quality of education. However, unfortunately, many researchers tried to determine the new curriculum's effectiveness.

With the findings above, it is recommended that teachers utilize English as a medium of instruction in teaching mathematics in the educational system. Based on the research article, "Effectiveness of Mother Tongue-Based Instruction on Pupils' Achievement in Mathematics," it is recommended that there is a need for diligently monitoring the use of mother tongue-based instruction as the key to securing appropriateness in the implementation of the curriculum. Moreover, the mother tongue significantly impacts dealing with and expressing ideas in the same users of our language.

Learning is the reason why educational institutions were built. It is the primary concern and the utmost goal of why education is constantly changing to meet the learning needs of every learner. It is undoubtedly a

collaboration between various aspects, such as; the learner, the teachers, the parents, stakeholders, and policymakers. The following recommendations were made based on the finding revealed in this research study:

Students, who serve as the center of the teaching and learning process, must be proficient in English to comprehend mathematics easily.

Teachers who serve as the facilitator of learning in different educational institutions must develop in the students a more profound knowledge of English that will later serve as their basic foundation in understanding mathematics. Teachers must use English as a medium of instruction in mathematics education; thus, this will lead learners' success in acquiring basic foundational skills in math to more complex ones.

Parents, who serve as the secondary teacher of learners at home, must know that the child's progress in learning goes hand in hand. They must collaborate with the school on how they can improve the academic performance of the learner. At home, they provide the basic foundations for further learning at educational institutions. Therefore, to improve the acquisition of mathematical skills of learners, it is recommended that parents must introduce the English language at home, not limited, thus, enabling them to comprehend and understand mathematics successfully.

Findings from this research study also aim to serve as a source for future researchers who want to study further the relative effect of using Mother-Tongue on mathematical skills acquisition.

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