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Medium of instructions and its relationship on pupils' learning outcomes in Mathematics

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Abstract

This study determined the relationships between medium of instruction and learning outcomes in Mathematics. Using the mixed methods of research with 44 Grade 3 teachers and 36 Grade 4 teachers as respondents of the study, findings showed that Grade 3 teachers agreed that they perceived Kapampangan as effective medium of instruction in teaching Mathematics. Meanwhile, these teacher respondents moderately agreed that they encountered some difficulties or barriers in using Kapampangan in teaching Mathematics. Further, these teachers agreed that they frequently used Kapampangan as medium of instruction in teaching Mathematics. Grade 4 teacher respondents agreed that they perceived English as effective medium of instruction in teaching Mathematics. On the other hand, these teacher respondents moderately agreed that they encountered some difficulties or barriers in using English in teaching Mathematics. Meanwhile, these teachers agreed that they frequently used English as medium of instruction in teaching Mathematics. Based on the findings of the study, the following conclusions were drawn: There is a significant relationship between medium of instruction and pupils' learning outcomes in Mathematics. Kapampangan and English were found positively correlated to pupils' performance in Mathematics. Kapampangan was found more effective than English as medium of instruction in teaching Mathematics.

Keywords: Medium of instruction; Mother Tongue-Based Multilingual Education; English-based instruction; Pupils' learning outcomes; Mathematics Education

1. Introduction

The Language plays an important role in teaching and learning in Mathematics because it is the means to which mathematical concepts are communicated between learner and teacher. When learners do not understand what their teacher is trying to say then there is a problem in the use of communication. They do not understand the language being used as a medium of instruction in the classroom.

Language of instruction plays a significant role in students' academic performance and a good number of studies have been conducted worldwide on this topic. For example, Komba Kafanabo, Njabili, and Kira (2012) conducted a study which sought to compare medium of instruction and learning outcomes of students in Tanzania. The findings indicated a significant positive relationship between the medium of instruction and the learning outcomes of the students.

Many studies have already revealed that teaching using the mother tongue in the early grades enhances children's ability to learn better compared to the use of a second or foreign language. It has also been reported that if children are taught in languages which are different from their home language or mother tongue, they dropped out from school, have low academic performance, and repeated classes due to a high failure rate. Specifically, in the stands of Rai, et al., (2011), it was shown that children are quicker to learn, to read, and to acquire other academic skills when instructed in the language that they speak at home rather than taught in an unfamiliar language.

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Section 16 of Republic Act No. 10533, enhances the Philippine basic education system by strengthening its curriculum and increasing the number of years for basic education, appropriating funds. This is known as the Enhanced Basic Education Act of 2013, (Republic Act 10533, 2013). In view of this above Act, the Department of Education, the Commission on Higher Education, and the Technical Education and Skills Development Authority issued rules and regulations to implement the provisions of the Act.

Students are able to learn best through their first language, their mother tongue. Twelve languages have been introduced for SY 2012-2013: Bahasa Sug, Bikol, Cebuano, Chabacano, Hiligaynon, Iloko, Kapampangan, Maguindanoan, Maranao, Pangasinense, Tagalog and Waray. It is expected that other local laguages will be added in the succeeding school years. Aside from the Mother Tongue, English and Filipino are taught as subjects starting Grade 1, with a focus on oral fluency. From Grades 4 to 6, English and Filipino are gradually introduced as languages of instruction in Junior High School and Senior High School (Mahboob and Cruz, 2013).

The K-12 curriculum shall develop proficiency in Filipino and English, provided that the first and dominant language of the learners shall serve as the fundamental language of education. For Kindergarten and first three years of elementary education, instruction, teaching materials and assessment shall be in regional or native language of learners. DepEd shall formulate a mother language transition program the mother/first language to the subsequent languages of the curriculum that is appropriate to the language capacity and needs of learners from Grade 4 to Grade 6. Consequently, Filipino and English shall be gradually introduced as languages and can become the primary languages of instruction at the secondary level (Sanchez, 2013).

In addition, the curriculum shall adhere to the principles and framework of Mother Tongue – Based Multilingual Education (MTB-MLE) which starts from where the learners are and from what they already know proceeding from the known to the unknown; instructional materials and capable teachers to implement the MTB-MLE curriculum shall be available. For this purpose, MTB-MLE refers to formal or non-formal education in which in the classroom the learner's mother tongue and additional languages are used (Dio and Jamora, 2014).

Mother tongue-based bilingual programs use the learner's first language, to teach beginning reading and writing skills along with academic content. The second or foreign language, should be taught systematically so that learners can gradually transfer skills from the familiar language to the unfamiliar one. Bilingual models and practices vary as to their results, but what they have in common is the use of the mother tongue at least in early years so that students can acquire and develop literacy skills in addition to understanding and participating in the classroom. Bilingual as opposed to monolingual schooling offers significant pedagogical advantages which have been reported consistently in the academic literature (Gacheche, 2010).

Still, another concern in the implementation of MTB-MLE is the problem of lack of uniformity of assessment practices in primary education. For example, the study of Dio and Jamora (2014) found that the difficulty of translating technical terms in mathematics, which came about from the teachers' inability to translate technical terms to the dialect, resulted in confusion and weak results in standard tests which use English as the medium. This situation happened in using technical terms in mathematics and science subjects. There are instances where no equivalent words in the mother tongue exist for a particular term in the subject. These cases may create confusion in the translation of the word into the mother tongue, which may eventually create difficulty for the students during standardized examinations that use the English language.

In view of the premise presented above, this study aimed to determine the effects on the learning outcomes of pupils in terms of medium of instructions transition from mother-tongue based multilingual education (MTB-MLE) to English in the subject Mathematics.

1.1. Statement of the Problem

This study determined the relationships between medium of instruction and pupil's learning outcomes in Mathematics. Specifically, this research sought answers to the following questions:

- How may the medium of instruction in teaching Mathematics be described in terms of:
    - Mother Tongue:
        - Teachers' Perception about using Mother Tongue as a medium of instruction in Mathematics
        - Perceived Barriers to the use of Mother Tongue as a medium of instruction in Mathematics
        - Frequency of using Mother Tongue in teaching Mathematics
    - English:
        - Teachers' Perception about using English as a medium of instruction in Mathematics

    - Perceived Barriers to the use of English as a medium of instruction in Mathematics
    - Frequency of using English in teaching Mathematics
- How may the pupils' learning outcomes in Mathematics be described in terms of their average grades?
- Is there a significant relationship between medium of instruction and the pupils' learning outcomes in Mathematics?
- Is there a significant difference between the learning outcomes of the pupils in Mother Tongue-Based and English-Based medium of instruction?
- What are the challenges faced by the teachers in teaching Mathematics using Mother Tongue-Based Multilingual Education?
- What are the best practices of the teachers in applying the Mother-Tongue Based Multilingual Education?

1.2 Hypotheses

This study was guided by the hypotheses:

- There is no significant relationship between medium of instruction and pupils' learning outcomes in Mathematics.
- There is no significant difference between the learning outcomes of the pupils in Mother Tongue-Based and English-Based medium of instruction.

1.2. Conceptual Framework

This study was anchored to Noam Chomsky's Language Acquisition Theory. Asserting that language is innate. Chomsky have written in his book Language of the Mind that in studying human language, we are approaching what some might call human essence, the distinctive qualities of mind that are, so far as we know, unique to man. According to Chomsky, language is one characteristic that is unique to humans among all other living beings. Chomsky's theories have made it easier to understand the evolution and development of the languages. Chomsky's theories on language are based upon the importance of linguistics in modern sciences. According to him, to study languages, it is important study human nature that lies in human mind (Singhal, 2020).

The linguistic and cultural diversity in the Philippines brings much complexity to the issue of language policy in education. The Philippines offers a challenging environment for implementing a language policy that can serve the whole country. And one of the latest development in the Philippine educational system is the Mother Tongue – Based Multilingual Education. MTB-MLE refers to the use of students' mother tongue and two or more additional languages as Languages of Instruction in school. English is the secondary language used in teaching mathematics in later years (Medilo, 2017).

The language-in-education policy is more complex in a multilingual country like Nepal than in a country having only a few languages. The debate of the selection of the medium of instruction in school is the most dominant issue in language planning and policy. There are mainly two conflicting views in this regard. By supporting the importance of a dominant (e.g. Filipino in the Philippines) and global languages like English (in wider socio-economic contexts), a majority of people argue that children should be taught in national and international languages. On the other hand, there is another view that argues for the use of children's mother tongue as the medium of instruction in schools to help children develop cognitively and linguistically. Educationists and scholars who are in favor of the later claim that learning through mother tongue fosters children's overall educational achievement. This debate indicates that there is need of an appropriate approach in language-in-education planning which ensures the use of both mother tongues and dominant languages in schools. To this end, there is a growing trend of countries adopting the MTB-MLE with aims to address linguistic diversity, ensure linguistic rights of children enshrined in various international declarations and national constitutions, promote access and equity in basic education, and enhance quality of education (Bucang and Cammagay, 2014).

In the Philippines, the Department of Education through the Republic Act 10533 or the Basic Education Act of 2013 implemented the K+12 curriculum, which included the use of mother tongue in the instruction from pre-elementary to Grade III. It explicitly states that "the curriculum shall adhere to the principles and framework of MTB-MLE, which starts from where the learners are and from what they already knew proceeding from the known to the unknown; instructional materials and capable teachers to implement the MTB-MLE curriculum shall be available". Mother Tongue-Based Multi-Lingual Education in the Philippines is the use of more than two languages for literacy and instruction in subjects like mathematics, science, health and social studies. This program seeks to address the "high functional illiteracy of Filipinos" where language plays a significant factor (Nolasco, 2009).

Walter (2011) argued that the use of mother tongue education is essential because it is "capable of producing proficient readers in 2-3 years" and can benefit learners who have an average ability and potential. Walter warned, however, that not all sociolinguistic patterns are suitable for the use of mother tongue education.

This study was also anchored to Spolsky's theory of language policy. Spolsky (2011) proposed a theory of language policy in his book Language Management. He argued that —the goal of a theory of language policy is to account for the choices made by individual speakers on the basis of rule-governed patterns recognized by the speech community (or communities) of which they are members. His theory is encompassed by three assumptions which must be tested and adapted. The first assumption is that language policy is a social phenomenon constructed in a variety of domains, including homes and schools. A second assumption, as presented in his book, assumes the presence of three separate but interrelated components: beliefs, practices, and management. The third assumption focuses on the influence of internal and external forces on language choice. Spolsky suggested that these may come from within or outside of the domain and may be language-related or not.

Educational theories linked to the mother tongue-based multilingual education suggest that children learn best from a familiar starting point. Learning should begin with what a child knows and understands. Thus, children learn best when using a language they speak and understand well. Mother tongue-based MLE programmes enable learners to begin their education in the language they know best. As they use their own language for learning, they are introduced to the new (official) language and begin learning to communicate in that language. At the same time, teachers help the learners develop their academic vocabulary in the new language so they can understand and talk about more abstract concepts. In the best programmes, learners continue to develop their ability to communicate and to learn in both languages throughout primary school (Zavala, 2014).

Mahboob and Cruz (2013) noted that the mother tongue of most Filipino children is neither Filipino nor English at home nor to play with his/ her friends, English are totally a foreign Language. Listening to strange sound and accent of the word may at first enchant the child but as the lesson becomes cognitively demanding, he begins to feel disillusioned. The language barrier consequently stores up episodes of communication breakdowns between the teacher and the child; between the child unknown concept.

Various studies have identified that children's overall educational attainment can be enhanced if they are taught in their mother tongue in early grades. In the study of Espada (2012), he examined the effect of using the native language in teaching Kindergarten Mathematics employing two groups; control or English group and the native language (Waray) or experimental group. His findings revealed a highly significant difference between the mean gain of the control and experimental groups which indicated that the level of Mathematics performance of the experimental group was significantly higher than that of the control group. The result implies that the Kindergarten pupils exposed to the native language performed better in Mathematics than those who were exposed to English.

Sario,et al. (2013) experimented on using Iluko as an intervention language in English, Math and Science in two phases of instruction, one in which English was the sole medium of instruction and the other in which Iluko was used as an intervention language. The proficiency level of the class in relation to the results of the formative tests in the first and second phase was compared to determine if there is a significant difference between the two phases of instruction. Results showed that pupils in the Iluko-English class had better academic performance as shown in the passing rates for English (90.3%), Math (87.1%) and Science (90.32%). In classes in which English only was used, 51.87%, 52.17% and 74.07% of the pupils were able to pass the English, Science and Mathematics tests respectively. There was a significant difference between the performance of the pupils taught in Iluko-English and those taught in English only.

In addition, Lartec, J., Belisario, A., Bendanillo, J., Binas-o, H., Bucang, N. and Cammagay, J. (2014) dealt on the achievement of the learners in MTB. The result of the study indicated that there was a high level of participation among the learners, and the teachers themselves started to use the first language orally to foster a more dynamic learning environment. Further, the national Achievement Test in 2006 for Grade III Reading, Lubungan pupils outperformed all other schools in the province by up to 30 percent for both Filipino and English. Additionally, in 2007, first to third grade pupils from Lubungan consistently outperformed the other schools in all subjects including Math, Filipino, and English by over 20 percent.

The study conducted by He (2012), revealed that mother tongue influences the students' poor performance in English language in Junior School Certificate examination and that there are other factors contributing to students' poor performance in English language.

Thus, Hasselbring (2015), a leading scholar in the field of bi/multilingual education, claims that worldwide, children's L1 has been established as the most efficient language for early literacy and content area instruction. Late transition to education in L2 is more effective than early transition. Furthermore, while the effectiveness of "early exit" programs is not well supported by research, children in these programs have better outcomes than children in submersion programs.

Furthermore, regarding the acceptance of the teachers in the implementation of the language policy Gorio, Galino, Morales and Palileng (2014), revealed in their findings that 100 percent of the teachers as the primary implementers of the MTB-MLE is not attained because of the transition period from the bilingual education to the mother-tongue based education as part of the K to 12 curriculum reform of the government.

This result supports the statement of Obiero (2010) who said in an interview that not all teachers will abreast the implementation of the MTB – MLE on its first and second year of implementation particularly to those teachers who experience difficulties in adjusting and don't want to change their traditional ways of teaching.

Additionally, Rosekrans, Sherris and Chatry-Komarek (2012) mentioned that teachers play a major role in the success of the language policy. Their positive viewpoint towards the implementation of the MTB-MLE drastically affects the implementation.

According to the research of Constantinides (2015), teachers are into the trainings with two distinct viewpoints about mother tongue instruction; some were positive towards it and others were negative about it. After a series of trainings, teachers were not at all more positive about using the mother tongue as the language of instruction. Teacher interviews revealed that 1) spending time learning about their own language increased teachers' confidence in their ability to teach it, 2) when a significant amount of time was spent creating mother tongue teaching and learning materials, teachers were much more positive about the prospect of teaching in the mother tongue, 3) having the chance to reflect back on their own learning experiences and to experience what it is like to learn in a language which is not familiar also was important in helping teachers become more positive about mother tongue-based instruction.

Furthermore, a study presented by Ricablanca (2014) revealed that there is very limited data of the documentation of the experiences of the teachers in MTB-MLE. His paper documented the experiences of 10 teachers in MTB-MLE in Southern Leyte, Philippines by determining the meaning of teaching in MTB-MLE as far as the teachers are concerned, including the successes and problems in the implementation. The data gathered generated 5 themes, which included the use of more than one vernacular as a medium of instruction in communication development, commitment to being globally competitive, limited applicability due to the superiority of English and insufficient materials, burden caused by the complexity of the vernacular, and optimism to accept the responsibility. The study concluded that the MTB-MLE curriculum is a welcomed addition to the ever-challenging tasks of the teachers. Additionally, teacher understood their role and saw the challenge given by the addition of MTB-MLE in the curriculum but accepted the challenge by realizing their importance to the success of the MTB-MLE.

Additionally, Kosonen and Young (2009) analyzed the strategies of teachers in implementing Mother Tongue - Based Instruction in a Multilingual Classroom and identified some problems that teachers encounter in implementing them. The study used qualitative analysis with interview as the main data gathering tool. The respondents were teachers purposively selected from the suggested pilot schools of Mother Tongue - Based Multilingual Education (MTB-MLE). From the phenomenological analysis of the data, the findings showed that the teachers used strategies such as translation of target language to mother tongue, utilization of multilingual teaching, utilization of lingua-franca, improvisation of instructional materials written in mother tongue, remediation of instruction, and utilization of literary piece written in mother tongue as motivation. Some problems encountered by the teachers in implementing mother tongue - based instruction include absence of books written in mother tongue, lack of vocabulary, and lack of teacher-training. Nevertheless, the study indicated that major attention and effort are still necessary to be given to the approach.

Pedagogically speaking, upon the implementation of the new curriculum, Filipino teachers and learners from different linguistic backgrounds and from varied cultural communities of the country are continuously facing the challenges of mother tongue based education to keep in pace with the demands of education on both countrywide level and international level. In view of the discussions made, this research is geared towards determining the relationships between medium of instruction and pupils' learning outcomes in Mathematics.

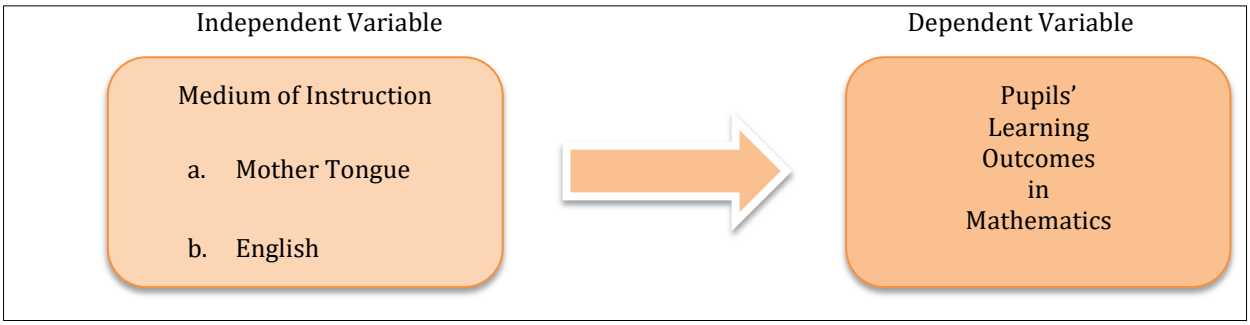

Figure 1 Paradigm of the Study

The conduct of the study was guided by the paradigm which is illustrated in Figure 1. It can be noted from the figure that the independent variable of the study is medium of instruction. Meanwhile, the dependent variable is the pupils' learning outcomes in Mathematics. It is expected that the independent variables would have a significant effect (as implied by the arrowhead) on the dependent variable.

1.3. Significance of the Study

Findings of this study will be beneficial to the following:

- The Department of Education. This study will help them focus first on considering the effects of MTB-MLE on Math and also in different academic areas. The Department of Education might view this study, as the best instrument to consider in implementing strategic materials for MTB-MLE since this study will show the positive and negative effects of MTB-MLE towards learning.
- School Principal. Findings of the study may motivate the principals to encourage and support the utilization of mother tongue based multilingual Education in their respective schools.
- Teachers. The experience shared by the teachers may serve as feedback for the learner's development. Their insight would necessary strengthen the instructional preparation and opportunities to improve the pupils' performance in Math by the used of mother tongue as a first language.
- Parents. They may be able to have a broader understanding on how MTB-MLE affects their children's performance in different subject areas especially Mathematics and Science. It would also be the way to point out some factors to consider in practicing MTB-MLE at home.
- Pupils. They will be aware about the effects of MTB-MLE on their educational development especially in Math. They might consider the positive and negative outcomes of MTB-MLE when it is used as medium of instruction.
- Other Researchers. Findings of the study maybe used as reference by other researchers who have the same interest in the topic of concern.

1.4. Scope and Limitation of the Study

This study focused on the medium of instruction in terms of Mother Tongue-Based Multilingual Education and English and its impact on pupils' learning outcomes in Mathematics.

The medium of instruction in teaching mathematics was limited only to teachers' perception about using mother tongue/English as a medium of instruction, perceived barriers to the use of mother tongue/English as a medium of instruction and frequency of using mother tongue/English.

The dependent variable which is the pupils' performance was limited only to subject Mathematics. Their performance in this subject was measured in terms of their average grade in Grade 3 (third and fourth grading periods) Grade 4 (first and second grading periods).

The respondents of the study were the Grades 3 and 4 teachers of Apalit District, Pampanga. This was conducted on the third to fourth grading periods of School Year 2019-2020.

1.5. Location of the Study

This study was conducted in all public elementary schools in Apalit District, Pampanga namely: Alauli Elementary School, Balucuc Elementary School, Banag Elementary School, Cansinala Elementary School, Fausto Gonzales Sioco Memorial School, Galang Elementary Memorial School, Jose Escaler Memorial School, Macario Arnedo Elementary,

Paligui Elementary School, Sampaga Elementary School, Sampaloc Elementary School, San Vicente Elementary School, Sto. Rosario Elementary School, Sucad Elementary School, and Sulipan Elementary School.

Source:https://www.researchgate.net/publication/313404437_A_LiDARbased_flood_modelling_approach_for_mapping_rice_cultivation_areas_in_Apalit_Pampanga/figures?lo=1

Figure 2 Location map of the study

1.6. Definition of Terms

The following terms were used throughout the proposal, and were operationally defined as follows:

Average Grades. The term refers to the average grades of pupils during third and fourth grading periods for SY 2018-2019 and during the first and second grading periods for SY 2019-2020.

Challenges to the use of English/Mother Tongue. This refers to the common problems met by the teacher in teaching Mathematics in relation to utilization of English/Mother tongue.

English. It refers to as a foreign language or a second language learned at school for educational purposes.

Learning outcomes. The term refers to statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course or program. In other words, learning outcomes identify what the learner will know and be able to do by the end of a course or program.

Mathematics. It refers to the science of numbers and their operations, interrelations, combinations, generalizations, and abstractions and of space configurations and their structure, measurement, transformations, and generalizations. It is one of the basic subjects in elementary education.

Medium of Instruction. It refers to the language used by the teachers in teaching Mathematics.

Mother Tongue. It refers to the language which the pupil respondent has grown up speaking from early childhood.

Mother Tongue – Based Multilingual Education (MTB-MLE). It refers to the first language used in a particular place. It is the native language of the pupil respondents.

Teachers' Perception. It refers to the thoughts or mental images which teachers have about their professional activities and their students, which are shaped by their background knowledge and life experiences and influence their professional behavior.

2. Material and methods

The information about the research and sampling procedures that were utilized by the researcher are provided in this chapter. The research design that was employed, as well as the data gathering techniques, and data analysis scheme are also discussed in this chapter.

2.1. Research Design

In this study, the researcher utilized the mixed method which employs a combination of quantitative and qualitative data in the study.

The quantitative phase of the study explored on the medium of instruction in terms of Mother Tongue and English, the pupils' learning outcomes in Mathematics and the relationship of these two variables.

Meanwhile, the qualitative phase focused on the challenges encountered by the teachers as well as their best practices in using Mother Tongue in teaching Mathematics.

Finally, the quantitative and qualitative findings of the study were integrated to arrive at a more in-depth analysis and comprehensive findings for the study.

2.2. Data Gathering Techniques

Prior to the conduct of the study, the researcher sought permission from the Schools Division Superintendent of Pampanga. After receiving the approved permit, coordination with the principal of the school respondents was done. The researcher personally administered the questionnaire and conducted the semi-structured interview so that if clarifications as regards the questions are needed, he can easily explain everything about it.

Data collection was done in two distinct phases. The first phase which is quantitative in nature utilized survey questionnaires in collecting the necessary data. Parts I and II of the questionnaire were adapted from Kaphesi, E. S. (2001) which were used to gather the perceptions of teachers about using medium of instruction in Mathematics and the perceived barriers to the use of medium of instruction in Mathematics. Meanwhile, Part III was adapted from Umar, F.A. (2014). This part of the questionnaire was used to determine the frequency of using the medium of instruction in teaching Mathematics.

In the second phase which is qualitative, data were collected through a semi-structured interview. The questions which were personally made by the researcher were asked to selected respondents during the interview. The data gathered in this phase were used to further explain and support the quantitative findings of the study. This was done to arrive at a more comprehensive explanation and analysis of all the quantitative results of the study.

2.3. Sampling Procedures

Purposive sampling was applied in selecting the school respondents for this study. Only schools in Apalit District, Pampanga were requested to participate in the study. The same sampling procedure was utilized in choosing the teacher respondents of the study. Only those teachers in Grade 3 and 4 were chosen to participate as subjects of this research. Grade 3 and 4 teachers were selected since they are in the transition of language of teaching from mother tongue education to English.

Table 1 shows that a total of 44 Grade 3 teachers and 36 Grade 4 teachers constitute the population for this research.

On the qualitative part of the study, one teacher in each grade level was chosen for the semi-structured interview. In total, 30 teachers were interviewed. According to Dworkin (2012), it is recommended that 25-30 participants is the minimum required sample size for in-depth interviews. As such, the researcher interviewed one teacher in each grade level from each school. Before the interview, these teachers were given prior information about the topics to be discussed during the said interview for them to be ready for the questions to be asked.

Table 1 Distribution of Teacher Respondents

Schools in Apalit District	Teachers	
	Grade III	Grade IV
Alauli Elementary School	1	1
Balucuc Elementary School	4	3
Banag Elementary School	1	1
Cansinala Elementary School	4	4
Fausto Gonzales Sioco Memorial School	6	5
Galang Elementary Memorial School	2	1
Jose Escaler Memorial School	3	4
Macario Arnedo Elementary	2	2
Paligui Elementary School	1	1
Sampaga Elementary School	4	3
Sampaloc Elementary School	3	3
San Vicente Elementary School	8	8
Sto. Rosario Elementary School	4	5
Sucad Elementary School	3	3
Sulipan Elementary School	3	3
Total	44	36
Grand Total	80	

2.4. Data Analysis Scheme

After collecting all the data, these were tabulated, organized, tallied and analyzed using some statistical tools.

Descriptive statistics such as weighted mean was computed to describe the teachers' perceptions about the of use of mother tongue and English, barriers in using mother tongue and English, and frequency of using mother tongue and English. In addition to this, range, mean and standard deviation were computed to describe the pupil respondents' academic outcomes in Mathematics.

Pearson Product-Moment Correlation Coefficient was applied to determine if significant correlations existed between the teachers' perceptions, barrier and frequency of use of mother tongue and English, and the pupils' learning outcomes in Mathematics.

t-test for independent samples was used to determine if significant difference existed between pupils' performance in Mathematics when exposed to mother tongue and English.

For the qualitative data, coding was utilized to properly interpret the said data.

3. Results and discussion

This chapter deals with the presentation, analysis and interpretation of the data collected and the results of the statistical treatment employed in the study with the purpose of determining the effects on the learning outcomes of pupils in terms of medium of instructions transition from mother-tongue based multilingual education (MTB-MLE) to English in the subject Mathematics.

3.1. The Medium of Instruction in Teaching Mathematics

The need to connect with students is necessary to successfully transfer learning. Thus, the medium of instruction plays a role. Success in mathematics is also influenced by the medium of instruction used inside the class.

3.1.1. Mother Tongue

Mother Tongue refers to the first language, home language, native language or vernacular used by every individual at home. Mother Tongue-based Instruction (MTBI) refers to the language spoken by the pupils in their homes and used as a medium of instruction in school. The utilization of this medium is one of the effective interventions of DepEd which aimed at improving the quality of Philippine education to better prepare individuals to live a successful life after school.

The Grade 3 teachers' perceptions with regard to the use of mother tongue as a medium of instruction in Mathematics, the perceived barriers and the frequency of its use are presented in Tables 2 to 5.

3.1.2. Teachers' Perception about using Mother Tongue as a Medium of Instruction in Mathematics

Grade 3 teachers' perception about using mother tongue as a medium of instruction provide teacher's thoughts about their teaching and about their pupil's behavior towards mother tongue as their medium of communication in teaching and learning Mathematics. By realizing their perceptions, it can influence the performance of pupils inside the classroom. The frequency and descriptive measure of the Grade 3 teachers' perceptions as regards the use of mother tongue as medium of instructions in teaching Mathematics is shown in Table 2.

It is important to note that all items indicated in the table, including the computed overall mean of 3.66 garnered the same verbal description of "agree". A closer look at the table reveals that item "when I use mother tongue in teaching Mathematics the content of the lesson is enriched by drawing example from everyday life" received the highest computed weighted mean of 4.16. Meanwhile, item "when I use mother tongue in teaching Mathematics my pupils do not take seriously the lessons taught in Mother Tongue" received the lowest computed weighted mean of 2.73. This is due to the fact that this item is expressed in negative form.

These findings imply that teacher respondents combined Mother tongue with innovative strategies such as utilization of representational models to improve teaching and learning Mathematics. Moreover, respondents agreed that through the use of mother tongue, communications between teacher and pupils became easier and clearer. Additionally, respondents agreed that Mother Tongue is appropriate for use because it makes pupils comfortable and they easily understand the lessons well.

Table 2 Teachers' Perception about using Mother Tongue as a Medium of Instruction in Mathematics

Item Statement ***When I use Mother Tongue in teaching Mathematics…***	**Responses (N=44)**					**Mean**	**VD**
	5	4	3	2	1		
1. my pupils are motivated throughout the lesson.	12	17	13	2	0	3.89	A
2. a greater number of pupils are reached equally at the same time.	10	19	10	5	0	3.77	A
3. individual pupils learning needs are supported.	13	16	11	4	0	3.86	A
4. my instructional effectiveness is increased.	11	19	12	2	0	3.89	A
5. misconceptions about certain concepts which would be difficult for me to explain is reduced.	5	22	13	3	1	3.61	A
6. misconceptions about certain concepts which would be difficult for the pupils to understand is reduced.	8	21	14	1	0	3.82	A
7. my pupils are helped relate mathematics to their daily experiences.	13	20	9	2	0	4.00	A
8. communication problems between me and my pupils made easy.	15	18	7	4	0	4.00	A

9. an effective way of evaluating pupils learning is provided.	13	18	11	2	0	3.95	A
10. the content of the lesson is enriched by drawing example from everyday life.	13	25	6	0	0	4.16	A
11. the degree of interaction is reduced.	5	17	13	5	4	3.32	A
12. for some lessons the use of Mother Tongue instruction is NOT conducive to effective learning.	7	21	12	4	0	3.70	A
13. time is wasted because my pupils tend to dominate the classroom talk.	2	11	13	17	1	2.91	A
14. my pupils do not take seriously the lessons taught in Mother Tongue.	3	8	12	16	5	2.73	A
15. my pupils sometimes experience difficulties in understanding the message expressed in Mother Tongue because of cultural irrelevance of the content.	10	13	17	4	0	3.66	A
16. textbooks prepared in Mother Tongue provide distorted information about mathematics and in so doing confuses my pupils.	7	10	19	8	0	3.36	A
Overall Mean						3.66	A

Legend: Scale: Verbal Description; 4.21 – 5.00: Strongly Agree (SA); 3.41 – 4.20: Agree (A); 2.61 – 3.40: Moderately Agree (MA); 1.81 – 2.60: Disagree (D); 1.00 – 1.80: Strongly Disagree (SD)

This study is supported by the concept of Ball (2010) which states that children who are taught using their first language usually achieve better in school and life than children who are forced to learn in an unknown, strange language. They gain a better self-concept and have a strong sense of their own identity when they are taught with their familiar language.

In the same way, Malone (2010) ascertained that MTB-MLE plays an important role when most students who enter MLE programs are already comfortable using their mother tongue for daily communication. It is a language education program that helps build a strong educational foundation, then bridge successfully into one or more school languages, and then use both.

Accordingly, Krawec (2010) reported that when students are able to represent a problem or mathematical situation in a way that is meaningful to them, the problem or situation becomes more accessible. Further, he added that using representations—whether drawings, mental images, concrete materials, or equations—helps students organize their thinking and try various approaches that may lead to a clearer understanding and a solution.

In the same vein, Boonen et al., (2014) opined that the problem comprehension phase typically includes strategies for understanding the problem text (e.g., by paraphrasing the text and underlying relevant information) and strategies for identifying and representing the underlying problem structure by means of a visual representation. The assumption is that a visual representation should clarify the problem structure by making the numerical, linguistic and spatial relations between solution-relevant elements visible, which consequently facilitates understanding of the problem and identification of the computations to be performed. Thus, using visual representations during problem comprehension could be an effective way to support word problem solving.

3.1.3. Perceived Barriers on the use of Mother Tongue as a Medium of Instruction in Mathematics

The perceived barriers on the use of mother tongue as a medium of instruction in Mathematics stated on the table are some of the challenges experienced by Grade 3 teachers and pupils. Instruction with difficulties in communication because of the language used during discussion often causes struggle in teaching and learning process. Table 3 shows the perceptions of the Grade 3 teacher respondents with regard to some barriers that they encountered in utilizing mother tongue in teaching Mathematics.

Table 3 Teachers' Perception about Barriers on the use of Mother Tongue as a Medium of Instruction in Mathematics

Item Statement	Responses (N=44)					Mean	VD
	5	4	3	2	1		
1. Mathematical vocabulary in Mother Tongue is usually not available for use during classroom instruction.	8	14	14	6	2	3.45	A
2. Mother Tongue is imposed upon the teacher.	2	19	16	6	1	3.34	MA
3. There are no teaching/learning aids prepared in Mother Tongue.	7	15	15	6	1	3.48	A
4. There are fewer number of textbooks for mathematics written in Mother Tongue.	4	15	11	9	5	3.09	MA
5. Most teachers do not speak more than one local language.	5	12	14	8	5	3.09	MA
6. Most teachers do not speak Mother Tongue.	0	5	16	16	7	2.43	D
7. Most pupils do not speak Mother Tongue.	4	11	9	17	3	2.91	MA
8. Teaching several lessons makes it difficult to prepare for use of Mother Tongue as medium of instruction.	1	17	21	4	1	3.30	MA
9. In most cases it is difficult to understand mathematical concepts because Pupil's Book is written in Mother Tongue while Teacher's Guide is in English.	11	19	8	4	2	3.75	A
10. The long syllabi and short time makes it difficult to teach mathematics in Mother Tongue.	3	21	16	4	0	3.52	A
11. Because of inadequate knowledge of the subject area, it is difficult to identify the appropriate vocabulary for the lessons.	3	13	17	8	3	3.11	MA
12. Using Mother Tongue distorts the meaning of mathematical concepts.	1	19	14	8	2	3.20	MA
13. There is no mathematical vocabulary that I know which could best be explained in Mother Tongue.	2	16	18	6	2	3.23	MA
14. There are no reference books for mathematics that could help teachers to mathematics using Mother Tongue.	6	15	12	8	3	3.30	MA
Overall Mean						3.23	MA

Legend: Scale: Verbal Description; 4.21 – 5.00: Strongly Agree (SA); 3.41 – 4.20: Agree (A); 2.61 – 3.40: Moderately Agree (MA); 1.81 – 2.60: Disagree (D); 1.00 – 1.80: Strongly Disagree (SD)

It can be noted from the table that item "In most cases it is difficult to understand mathematical concepts because Pupil's book is written in Mother Tongue while Teacher's Guide is in English" yielded the highest computed weighted mean of 3.75 with a verbal description of "agree". Meanwhile, item "Most teachers do not speak Mother Tongue" obtained the lowest computed weighted mean of 2.43 with a verbal interpretation of "disagree". The overall mean was registered at 3.23 which is verbally interpreted as "moderately agree".

These results imply that teachers who used mother tongue encountered problems about reference instructional materials written in kapampangan. This could be attributed to lack of available books and other resources in the internet written in the Mother Tongue that could be used by the teacher in teaching Mathematics.

In accordance to the present findings, Burton (2013) reported that some of the problems that teachers encountered in using mother tongue are a lack of educational resources and competent teachers, translation of academic language; a multilingual environment, lack of incentives for teachers, lack of lexical capacity to express authenticities of science and technology, and inadequacy of vocabulary and writing system.

Another challenge according to Benson and Kosonen (2012) is on linguistic and materials development. She says that special attention should be given to time and resources in the implementation of mother tongue- education. Educators and people in the community should have time to work together with linguists to be able to produce materials in the L1. Benson stressed that there are problems in the implementation sometimes because people who are involved in the implementation fail to reach a consensus on the allocation of resources.

Results of the conducted interview with the Grade 3 teacher respondents are in conformity with the quantitative findings of the study. When these respondents were asked about the challenges that they encountered in using Mother Tongue as a medium of instruction in teaching Mathematics, they answered that they had difficulties in translating some mathematical words into Kapampangan language. Further, they stated that they lack references written in mother tongue. They also said that the LM (Learners' Material) is written totally in Mother tongue, but the TG (teachers' guide) is in English.

3.1.4. Frequency of Using Mother Tongue in Teaching Mathematics

The frequency of using mother tongue in teaching Mathematics describe the extent to which teachers use mother tongue in teaching different concepts in mathematics. The use of mother tongue in teaching Mathematics is common among teachers specifically in explaining difficult concepts and giving instruction. Grade 3 teacher respondents therefore were asked regarding the frequency of use of Mother tongue in discussing lessons in Mathematics summarized in Table 4.

Apparently, all items indicated in the table including the computed overall mean of 3.68 registered the same verbal description of "agree". Further perusal of the table shows that item "I always use Mother Tongue in teaching continuous and repeating patterns" got the highest computed weighted mean of 3.91. On the other hand, item "I always use Mother Tongue in teaching similar, dissimilar, and equivalent fractions" received the lowest computed weighted mean of 3.50.

Table 4 Frequency of Using Mother Tongue in Teaching Mathematics

Item Statement ***I always use Mother Tongue in teaching…***	**Responses (N=44)**					**Mean**	**VD**
	5	4	3	2	1		
1. numbers and number sense (whole numbers up to 10 000; ordinal numbers up to 100th; money up to PhP1 000).	10	15	15	4	0	3.70	A
2. addition of whole numbers.	9	23	8	3	1	3.82	A
3. subtraction of whole numbers.	8	22	9	4	1	3.73	A
4. multiplication of whole numbers.	8	19	11	5	1	3.64	A
5. division of whole numbers.	8	19	11	5	1	3.64	A
6. proper and improper fraction.	8	16	14	5	1	3.57	A
7. similar, dissimilar, and equivalent fractions.	6	17	15	5	1	3.50	A
8. tessellations.	7	19	15	3	0	3.68	A
9. lines.	7	18	17	2	0	3.68	A
10. symmetry.	8	19	16	1	0	3.77	A
11. continuous and repeating patterns.	9	23	11	1	0	3.91	A
12. number sentences.	7	19	15	2	1	3.66	A
13. area of square and rectangle.	6	22	10	5	1	3.61	A
14. conversion of time, length, mass and capacity.	6	22	11	5	0	3.66	A
15. representations of data using tables and bar graphs.	6	25	10	3	0	3.77	A
16. outcomes of an event using the terms sure, likely, likely, equally unlikely and impossible to happen.	5	20	15	3	1	3.57	A
Overall Mean						3.68	A

Legend: Scale: Verbal Description; 4.21 – 5.00: Strongly Agree (SA); 3.41 – 4.20: Agree (A); 2.61 – 3.40: Moderately Agree (MA); 1.81 – 2.60: Disagree (D); 1.00 – 1.80: Strongly Disagree (SD)

These findings imply that teacher respondents constantly utilize Mother tongue because they believe that by doing this, their pupils attain a higher level of comprehension and acquire Mathematics concepts rapidly.

In the same vein, Kosonen (2010) explains that by using the first language as the medium of instruction, students can easily learn and acquire academic skills. Moreover, he added that with the use of mother tongue as instructional medium the students could easily learn and there is a high possibility that the students could understand better and it results to a high performance.

3.2. English

The country's laws require students to be taught in their first language or mother tongue until Grade 3 and English is introduced as a medium of instruction starting in Grade 4.

3.2.1. Teachers' Perception about using English as a Medium of Instruction in Mathematic

Mathematics textbooks in Grade 4 were written in English and it require teachers to use English as their medium of instruction in teaching Mathematics. But most of the pupils have limited English language proficiency. Therefore, it is important to explore the use of English as language of instruction in Mathematics as perceived by Grade 4 teachers.

Table 5 reveals the perceptions of the teacher respondents regarding the use of English as a medium of instruction in teaching Mathematics to Grade 4 pupils.

It can be examined from the table that item "When I use English in teaching Mathematics the content of the lesson is enriched by drawing example from everyday life" obtained the highest computed weighted mean of 3.89 with a verbal description of "agree". On the other hand, item "When I use English in teaching Mathematics time is wasted because my pupils tend to dominate the classroom talk" received the lowest computed weighted mean of 3.00 with a verbal interpretation of "moderately agree". The overall mean was computed at 3.41 which is verbally described as "agree".

These results imply that teacher respondents agreed that English is appropriate to use in teaching Grade 4 pupils. Further, these teachers were able to provide assistance to pupils and explain concepts better by utilizing effective teaching strategies.

Table 5 Teachers' Perception about using English as a Medium of Instruction in Mathematics

Item Statement ***When I use English in teaching Mathematics…***	**Responses (N=36)**					**Mean**	**VD**
	5	4	3	2	1		
1. my pupils are motivated throughout the lesson.	3	12	19	2	0	3.44	A
2. a greater number of pupils are reached equally at the same time.	2	11	19	4	0	3.31	MA
3. individual pupils learning needs are supported.	5	10	18	3	0	3.47	A
4. my instructional effectiveness is increased.	3	16	15	2	0	3.56	A
5. misconceptions about certain concepts which would be difficult for me to explain is reduced.	2	15	16	2	1	3.42	A
6. misconceptions about certain concepts which would be difficult for the pupils to understand is reduced.	3	12	17	3	1	3.36	MA
7. my pupils are helped relate mathematics to their daily experiences.	3	18	14	1	0	3.64	A
8. communication problems between me and my pupils is made easy.	4	9	20	3	0	3.39	MA
9. an effective way of evaluating pupils learning is provided.	3	15	16	2	0	3.53	A
10. the content of the lesson is enriched by drawing example from everyday life.	8	16	12	0	0	3.89	A
11. the degree of interaction is reduced.	2	18	12	3	1	3.47	A

12. for some lessons the use of English instruction is NOT conducive to effective learning.	3	12	17	3	1	3.36	MA
13. time is wasted because my pupils tend to dominate the classroom talk.	3	6	18	6	3	3.00	MA
14. my pupils do not take seriously the lessons taught in English.	3	9	16	6	2	3.14	MA
15. my pupils sometimes experience difficulties in understanding the message expressed in English because of cultural irrelevance of the content.	8	7	17	4	0	3.53	A
16. textbooks prepared in English provide distorted information about mathematics and in so doing confuses my pupils.	0	11	19	5	1	3.11	MA
Overall Mean						3.41	A

Legend: Scale: Verbal Description; 4.21 – 5.00: Strongly Agree (SA); 3.41 – 4.20: Agree (A); 2.61 – 3.40: Moderately Agree (MA); 1.81 – 2.60: Disagree (D); 1.00 – 1.80: Strongly Disagree (SD)

In conjunction to the present findings, Ahmed, Zaif and Tehseen (2013) ascertained that teachers are aware of many advantages to students in learning in English as against following classes in mother tongue. Particularly, all the students in the English medium classes feel that their prospects for higher education and career after elementary school are far greater when studies are undertaken in English as against studying in their mother tongue.

3.2.2. Perceived Barriers on the Use of English as a Medium of Instruction in Mathematics

Teaching in English medium in non-English speaking country can always be challenging. Table 6 shows the perceptions of the Grade 4 teacher respondents with regard to the barriers that they encountered in using English as medium in teaching Mathematics.

Table 6 Teachers' Perception about Barriers on the Use of English as a Medium of Instruction in Mathematics

Item Statement	**Responses (N=36)**					**Mean**	**VD**
	5	4	3	2	1		
1. Mathematical vocabulary in English is usually not available for use during classroom instruction.	0	12	15	7	2	3.03	MA
2. English is imposed upon the teacher.	4	16	13	2	1	3.56	A
3. There are no teaching/learning aids prepared in English.	0	10	12	11	3	2.81	MA
4. There are fewer number of textbooks for mathematics written in English.	1	9	9	12	5	2.69	MA
5. Most teachers do not speak more than one local language.	3	7	15	9	2	3.00	MA
6. Most teachers do not speak English.	0	7	11	10	8	2.47	D
7. Most pupils do not speak English.	6	12	15	2	1	3.56	A
8. Teaching several lessons makes it difficult to prepare for use of English as medium of instruction.	0	11	15	10	0	3.03	MA
9. In most cases it is difficult to understand mathematical concepts because Pupil's Book and Teacher's Guide are written in English.	0	11	9	13	3	2.78	MA
10. The long syllabi and short time makes it difficult to teach mathematics in English.	1	13	12	10	0	3.14	MA
11. Because of inadequate knowledge of the subject area, it is difficult to identify the appropriate vocabulary for the lessons.	1	7	17	8	3	2.86	MA

12. Using English distorts the meaning of mathematical concepts.	1	6	16	11	2	2.81	MA
13. There is no mathematical vocabulary that I know which could best be explained in English.	0	10	12	13	1	2.86	MA
14. There are no reference books for mathematics that could help teachers to mathematics using English.	0	8	11	14	3	2.67	MA
Overall Mean						2.95	MA

Legend: Scale: Verbal Description; 4.21 – 5.00: Strongly Agree (SA); 3.41 – 4.20: Agree (A); 2.61 – 3.40: Moderately Agree (MA); 1.81 – 2.60: Disagree (D); 1.00 – 1.80: Strongly Disagree (SD)

It can be noticed from the table that item "English is imposed upon the teacher" and "Most pupils do not speak English" obtained the highest computed weighted mean of 3.56 with a verbal description of "agree". On the other hand, item "Most teachers do not speak English" received the lowest computed weighted mean of 2.47 with a verbal interpretation of "disagree". The overall mean was calculated at 2.95 which is verbally interpreted as "moderately agree".

These results imply that teacher respondents considered the pupils' difficulties in expressing themselves in English as one of the obstacles in using this language as medium of instruction in teaching Mathematics.

Accordingly, Bernardo (2009) opined that students do not learn as well in English and that, in some cases, they do not learn at all; using English as the medium of instruction in some learning areas prevents students from learning as much as they could as compared to mother tongue instructions, and that sometimes specific obstacles to learning are associated with English-language difficulties and those who benefit most from education in the English language are those with good levels of proficiency in English to start with and/or those who grow up in environments that abound with English language inputs, materials, and resources.

The qualitative findings supported the quantitative results of the study. When the Grade 4 teachers were asked about the challenges that they encountered in using English as a medium of instruction in teaching Mathematics, they said that their pupils were not able to adjust to the medium of instruction in Grade 4 which is English, which resulted to their poor performance in the subject.

On the follow-up question, Grade 4 teacher respondents were asked "If you are to recommend which medium of instruction must be used in teaching Mathematics, will it be Mother Tongue or English? Why?" These respondents replied that if they will be given the chance to recommend, they will prefer to use English from the very start. They also said that pupils' exposure to English will be of great advantage since no more adjustment to medium will happen.

These Grade 4 teachers were also asked about their best practices in utilizing English as medium of instruction in teaching Mathematics. Grade 4 teachers answered that they used some strategies such as A Problem a Day, Learning Barkada, Cooperative Learning and Differentiated Instruction, etc. so that pupils would be able to adjust to English as medium in teaching Mathematics.

3.2.3. Frequency of Using English in teaching Mathematics

Grade 4 teachers often uses the teaching of Mathematics in a mixture of both English and mother tongue because most of the pupils have limited English language proficiency and some Mathematics terms do not have translation in mother tongue. The Grade 4 teacher respondents' perceptions with regard to frequency of using English as medium of instructions in teaching Mathematics are manifested in Table 7.

A noteworthy result is that all items indicated in the table, including the computed overall mean of 3.99 registered the same verbal description of "agree". Further examination of the table reveals that item "I always use English in teaching whole numbers up to 100 000" garnered the highest computed weighted mean of 4.19. Meanwhile, item "I always use English in teaching describing outcomes in simple experiments" yielded the lowest computed weighted mean of 3.78.

Table 7 Frequency of Using English in Teaching Mathematics

Item Statement *I always use English in teaching…*	**Responses (N=36)**					**Mean**	**VD**
	5	4	3	2	1		
1. whole numbers up to 100 000.	13	17	6	0	0	4.19	A
2. multiplication and division of whole numbers.	10	17	9	0	0	4.03	A
3. order of operations.	12	16	8	0	0	4.11	A
4. factors and multiples.	10	17	9	0	0	4.03	A
5. addition and subtraction of fractions.	10	17	9	0	0	4.03	A
6. basic concepts of decimals including money.	10	15	11	0	0	3.97	A
7. lines and angles.	10	20	6	0	0	4.11	A
8. triangles and quadrilaterals.	11	15	10	0	0	4.03	A
9. continuous and repeating patterns.	11	13	11	1	0	3.94	A
10. number sentences.	8	19	9	0	0	3.97	A
11. time.	9	18	9	0	0	4.00	A
12. perimeter.	10	17	8	1	0	4.00	A
13. area.	8	21	6	1	0	4.00	A
14. volume.	5	21	9	1	0	3.83	A
15. representations of data using tables and bar graphs.	9	14	12	1	0	3.86	A
16. describe outcomes in simple experiments.	5	18	13	0	0	3.78	A
Overall Mean						3.99	A

Legend: Scale: Verbal Description; 4.21 – 5.00: Strongly Agree (SA); 3.41 – 4.20: Agree (A); 2.61 – 3.40: Moderately Agree (MA); 1.81 – 2.60: Disagree (D); 1.00 – 1.80: Strongly Disagree (SD)

These results imply that teacher respondents are aware that it is difficult to raise a multilingual child, but the benefits of learning English at an early age are certainly worth the struggle. Additionally, these teachers agreed that children who are exposed in English learn faster and easier, have improved problem solving skills and creativity, and have more career opportunities in adulthood. Most importantly, it's much easier to learn a second language at an early age.

In accordance to the present findings, Dawe (2014) asserted that children who learned English at an early age grow up to be expert problem-solvers and creative thinkers. The teachers also finding convenience and comfort in explaining ideas and concepts in English and they also further noted that English is an "intellectualized language" and a valuable tool to Mathematics, Science and information technology. However, on the other hand, parents preferred to the use of the Filipino language or mother tongue for it is the "language in which they can think and express themselves".

Results of the conducted interview are in conformity with quantitative findings of the study. When the Grade 4 teachers were asked about the importance of using English in teaching Mathematics, they answered that pupils will benefit a lot in English. Pupils Math vocabulary will be widened at their young age that will be beneficial in the district, division, regional and national math competitions. Further, they added that exposing young children in English will be very useful when they enter in junior and senior high school as well as in college.

3.2.4. The Pupils' Learning Outcomes in Mathematics (Medium - Mother Tongue)

Table 8 presents the academic performance of the pupils in Mathematics when they were exposed to mother tongue as medium of instruction. In this part of the study, the average grade in Mathematics of all the pupils were obtained.

Table 8 Pupils' Learning Outcomes in Mathematics (Medium - Mother Tongue)

Grade	F (N=44)	Percent	Verbal Description
90 – 100	0	0.00	Outstanding
85 – 89	6	13.64	Very Satisfactory
80 – 84	35	79.55	Satisfactory
75 – 79	3	6.82	Fairly Satisfactory
74 and below	0	0.00	Did Not Meet Expectations
Range	78 – 88		
Mean	82.45		
Standard Deviation	2.20		

It can be seen from the table that almost four-fifths or 79.55 percent of the teachers had pupils that obtained grades within the bracket of 80 to 84 with a verbal description of "satisfactory". Meanwhile, 13.64 percent of the teachers had pupils who got grades from 85 to 89 with a verbal interpretation of "very satisfactory". The remaining 6.82 percent of the teachers had pupils who registered grades within the bracket of 75 to 79 with a verbal interpretation of "fairly satisfactory".

A closer examination of the table shows that the grades of the pupils in Mathematics ranged from 78 to 88. The mean was computed at 82.45 (satisfactory) while the standard deviation which measures the spread of the pupils' grades from the mean was recorded at 2.20. These results implied that approximately, 30 teachers had pupils who received grades from 80.25 to 84.65.

The result implies that the performance of the grade pupils provides the teachers the base line data on the utilization of mother tongue as teaching tool for Mathematics subject. Teachers must practice flexibility in teaching young learners when it comes to the use of mother tongue. The result of this study will prepare them on the utilization of some other instructional materials written in mother tongue to further improve the young learners' performance in Mathematics.

The findings of the present study corroborate with the results of the research conducted by Kavaliauskiene (2009). He found that in order to fully achieved the effectiveness of mother tongue as medium of instructions, translation of all instructional materials is really needed. It is very beneficial to learning when it comes to learning through the use of the students' mother tongue because it serves as a bridge to connect students to the lesson.

In the same manner, Quijano (2012) affirmed that the use of mother tongue encouraged high level of participation among students. Likewise, he added that the problem in poor mathematics performance of learners in the basic education is the term which demands mathematics to be taught in a language that is not the pupils' mother tongue. A problem that is common to a number of developing countries such as the Philippines in which the language of instruction is influenced by the language of its colonizers and at the same time local languages exist.

The data collected from the semi-structured interviews are also parallel to the quantitative results of the study. When the Grade 3 teachers were asked if mother tongue affects their pupils' performance in Mathematics, most of them answered "yes". Further, they added that it is easier for the pupils to learn concepts in Mathematics when they understand the language that is being used by the teacher during the discussions. Additionally, they said that pupils can easily connect to the teachers and they can express their ideas if they are using mother tongue. On the contrary, there are some teachers who answered that language used as medium of instruction is not that important. These respondents believed that as long as there are Curriculum Guide, Teachers' Manual and Teaching Guide that they can use as reference and guide and through the use of their creativity and resourcefulness, they can effectively and efficiently manage lessons in Mathematics.

On the follow-up question the same respondents were asked "If you are to recommend which medium of instruction must be used in teaching Mathematics, will it be Mother Tongue or English? Why?" Most of the Grade 3 teacher respondents replied that they will recommend English as medium because they firmly believed that young learners must be exposed to such language for them to be prepared in higher grade level. They also said that though they found

it effective to teach young learners using their mother tongue, they would still suggest that these learners be taught using English for them to build strong foundations for school achievement and future success in Mathematics and other subjects as well.

On the follow-up question with these Grade 3 teacher respondents, they were asked about their best practices in utilizing Mother Tongue as medium of instruction in teaching Mathematics. These teachers replied that they simplified the explanations of those Mathematical terms which cannot be translated into Kapampangan. Moreover, they added that most of the time they used collaborative learning so that slow learner pupils could gain knowledge from the fast learner pupils. They also said that they relate math problems in daily experiences using mother tongue for the pupils to easily comprehend and understand the concepts implied in the given problem.

On the last question, these respondents were also asked about the importance of using Mother-Tongue in teaching Mathematics. These teachers answered that through the use of mother tongue, pupils can easily understand the lesson, and realize the importance of their native language. On their part as the teachers, they stated that mother tongue utilization made them explain further the lessons in math easier.

This implies that the use of mother tongue as medium of instruction can enhance pupils' understanding of the lessons.

3.2.5. The Pupils' Learning Outcomes in Mathematics (Medium-English)

Table 9 indicates the academic performance of the pupils in Mathematics when they were exposed to English as medium of instruction. In this part of the study, the average grade of all the pupils of the teacher respondents in Mathematics were obtained.

Table 9 Pupils' Learning Outcomes in Mathematics (Medium - English)

Grade	**F (N=36)**	**Percent**	**Verbal Description**
90 – 100	0	0.00	Outstanding
85 – 89	0	0.00	Very Satisfactory
80 – 84	26	72.22	Satisfactory
75 – 79	10	27.78	Fairly Satisfactory
74 and below	0	0.00	Did Not Meet Expectations
Range	77 – 84		
Mean	81.14		
Standard Deviation	1.93		

It can be observed from the table that almost three-fourths or 72.22 percent of the teachers had pupils that obtained grades within the bracket of 80 to 84 with a verbal description of "satisfactory". On the other hand, more than one-fourth or 27.78 percent of the teachers had pupils who got grades from 75 to 79 with a verbal interpretation of "fairly satisfactory".

Further observation of the table reveals that the average grades of the pupils in Mathematics ranged from 77 to 84. The mean was computed at 81.14 (satisfactory) while the standard deviation which measures the spread of the pupils' grades from the mean was recorded at 1.93. These results implied that approximately, 24 teachers had pupils who obtained grades from 79.21 to 83.07.

These findings imply that pupils encountered difficulties in understanding concepts in mathematics when the teachers used English as medium of instructions. This could be attributed to the fact that references and sources in Mathematics are expressed in English which is not the first language of every Filipino learner.

The findings of the present study are also in consonance with the work of Launio (2015) who found that using English language in teaching of mathematics is quite a problem to some classroom teachers. Based on the semi-structured interviews, complaints are heard among classroom mathematics teachers that students could hardly understand simple

pure English as a medium of instruction in mathematics lessons. This may be one of the reasons for the poor performance of the students in mathematics.

3.3. Relationship between Medium of Instruction and the Pupils' Learning

3.3.1. Outcomes in Mathematics

In this part of the study, the results of the correlation analysis which was performed to determine the relationship between medium of instruction and the pupils' learning outcomes in Mathematics are presented in Table 10.

Table 10 Relationship between Medium of Instruction and the Pupils' Learning Outcomes in Mathematics

Medium of Instruction	**Learning Outcomes**	
Mother Tongue		
Perception about using Mother Tongue	0.330 *	0.042
Barriers to the use of Mother Tongue	-0.126 ns	0.416
Frequency of using Mother Tongue	0.615**	0.000
English		
Perception about using English	0.290 *	0.048
Barriers to the use of English	-0.152 ns	0.377
Frequency of using English	0.526**	0.001

Legend: ** =highly significant ($p \leq 0.01$); * = significant ($p \leq 0.05$); ns = Not Significant ($p>0.05$)

It can be gleaned from the table that significant correlation existed between teachers' perceptions about using mother tongue and pupils' performance in Mathematics (p=0.042). Likewise, highly significant correlation was found between teachers' frequency of use of mother tongue in teaching Math and pupils' performance in the subject (p=0.000). However, no significant correlation was found between barriers in using mother tongue and pupils' performance in the aforementioned subject (p=0.416).

Further perusal of the tabulated results reveals that direct correlations existed between teachers' perceptions about the use and frequency of use of mother tongue and pupils' performance in Mathematics as manifested by the positive sign of the computed r-values of 0.330 and 0.615.

These results disclose that as the level of teachers' perceptions about utilization of mother tongue in teaching Mathematics increases, the level of pupils' performance in the subject also increases. In the same manner, as the level of frequency of the use of mother tongue increases, the level of pupils' performance in the subject also increases.

A close examination of the same table shows that significant and direct correlations were found between teachers' perceptions about English as medium of instruction and pupils' performance in mathematics (p=0.048); and highly significant direct correlations were found between teachers' frequency of use of English in teaching Mathematics and pupils' performance in the said subject (p=0.001).

These findings indicate that as the level of the teachers' perceptions on the use of English in teaching Mathematics increases, the level of pupils' performance in the subject also increases. In the same way, as the level of teachers' frequency of use of English as medium of instruction in teaching Mathematics increases, the level of pupils' performance in the subject also increases.

These results mean that mother tongue is suited to the Mathematics learning abilities of the Grade 3 pupils. In the same manner, pupils learned the lessons in Mathematics when the teacher utilized English as medium of instruction in teaching the subject. Though the pupils encountered some difficulties in learning Math with English as medium of instructions, the teachers were able to attain their objectives.

These findings appear to be consistent with the results of the study conducted by Mallareddy (2012). He emphasized the importance of the mother tongue education in early learning. In his study, he found that neglected language skills development in the mother tongue resulted in the failure of the education system especially in the primary level, which

highlighted the need for the implementation of MTB-MLE in the educational system. Likewise, the study of Mbaleka (2014) revealed that teaching in the mother tongue would result in better performance in Math suggesting that the everyday language of the learners is an active medium of instruction.

However, Walter (2011) proposed that the impacts of English as medium of instruction in teaching Mathematics are substantial and are measurable both in the short term and in the long term via more global measures such as access to higher education and more advanced career opportunities with greatest benefits to those of average ability and potential.

Results of the conducted interview support the findings of the present study. When the Grade 4 teachers were asked if they believed that medium of instruction affects the pupils' performance in Mathematics, all of them answered "yes". Additionally, they said that because of the abrupt change of the medium of instruction from Kapampangan to English, pupils were not able to perform and showed poor comprehension.

On the follow-up question they were asked "Based from your own experience, in which medium of instruction do your students learn best in Mathematics, Mother tongue or English? Why did you say so?" These respondents answered that it is better when pupils exposed to English from the very start so that they will be familiar with Mathematical terms at their young age and no more adjustments will happen in Grade 4. However, there are some respondents who replied that pupils should be taught using Kapampangan as medium so that they can easily understand the lessons and can freely express themselves.

3.3.2. The Difference between the Pupils' Performance in Mathematics

In this part of the study, the pupils' grades in Mathematics when taught using the mother tongue and English were compared using the t-test for independent samples. This was done to determine which is more effective between the two media, mother tongue or English, in teaching Math.

Table 11 t-test Results on the Difference between the Perceptions of the Respondents

Medium of Instructions	Mean	SD	Mean Diff.	t-value	p-value
Mother Tongue	82.45	2.20	1.31	2.807*	0.006
English	81.14	1.93			

Legend: ** = highly significant ($p \leq 0.001$); * = significant ($p \leq 0.05$); ns = Not Significant ($p>0.05$)

It can be noted from the table that significant difference was found between the mean grades of the pupils in Mathematics when they were exposed to mother tongue and English. This significant difference was brought about by the fact that the computed probability value of 0.006 is less than the 0.01 level of significance.

These results reveal that pupils performed well in Mathematics when the teacher used mother tongue as medium of instruction in teaching the subject. Further, this only showed that mother tongue is more effective than English in so far as Mathematics performance of the pupils is concerned.

This result is supported by the idea of Cortez et al., (2016) which states that Mathematics process skills or thinking skills cannot be sharpened unless pupils use their mother tongue. If Filipino children will keep on using a foreign language to understand Mathematics concepts, then, they can only be at the low level of cognition.

However, findings of the present study are quite different with that of previous research done by Jimeno et al., (2017) who found that learners perform well when the medium of instruction used in teaching science and mathematics is in English. Learners who are taught in mathematics and science using the English language have better performance than those pupils who were taught using Cebuano. Since learners are more exposed in English, they preferred to be taught in English in their science and mathematics subjects. Therefore, teaching Science and Mathematics subjects using Cebuano is not encouraged to learners who are more exposed to English language.

Results of the conducted interview supported the assertion that Mother tongue is more effective than English as medium of instruction in teaching Mathematics. When the Grade 3 teachers were asked "Based from your own experience, in which medium of instruction do your students learn best in Mathematics, Mother tongue or English? Why did you say so?" they answered that mother tongue is more effective than English. Moreover, they opined that mother tongue reduced the pupils' difficulties in comprehension and that they can easily understand Mathematics problems. However,

there are some teachers who stated that English is better than mother tongue. These respondents argued that pupils as well as the teachers themselves were not able to translate some Mathematical terms written in English into Kapampangan which is their mother tongue.

3.3.3. The Challenges Faced by the Teachers in Teaching Mathematics using Mother-Tongue Based Multilingual Education

Results of the interview revealed that lack of references written in Kapampangan is one the problems that teachers encountered in using mother tongue as medium of instruction in teaching Mathematics. The respondents' emphasized that absence of books written in mother tongue affects their teaching specifically in translating because teachers are not that literate in the language thus it is necessary to have mother tongue textbooks. Further, they stated that there are some mathematical terms which cannot be translated into Kapampangan. The teacher respondents are experiencing difficulties in teaching their pupils because they cannot think of the exact word that is equivalent to the English term in Mathematics that put the pupils into confusion. Additionally, they lamented that they found it so hard to look for teaching strategies because the language that is being used in the internet is generally English.

3.3.4. The Best Practices of the Teachers in Applying the Mother-Tongue Based Multilingual Education

In the conducted semi-structured interviews with the Grade 3 teacher respondents, they opined that their best practices for Mother-Tongue Based Multilingual Education are using collaborative learning so that pupils who are knowledgeable in applying mother tongue in solving problems in Mathematics would be able to share this to their slow learner classmates. Teacher respondents stated that when pupils are placed in groups, they are less dependent on their teacher and relaxed because they are comfortable in terms of communication and they can work better. Moreover, teachers related Math problems to what is really happening in their everyday lives for the pupils to easily understand the said problems. Teacher respondents explained that pupils participate and interact well if there is applicability of mathematics knowledge in everyday life. In addition, it provides the pupils a meaningful learning because they are familiar with the culture integrate in teaching mathematics.

3.3.5. Conclusion

This chapter presents the summary of the major findings, the conclusions arrived at based on the findings, and the recommendations given in accordance with the conclusions.

3.4. Findings

This study determined the relationships between medium of instruction and learning outcomes in Mathematics of pupils in public elementary schools in Apalit District, Pampanga during the School Year 2019-2020. Using the procedures described in the preceding chapter, the answers to the problems raised in this study were ascertained and summarized as follows:

Findings revealed that Grade 3 teachers agreed that they perceived Kapampangan as effective medium of instruction in teaching Mathematics. Meanwhile, these teacher respondents moderately agreed that they encountered some difficulties or barriers in using Kapampangan in teaching Mathematics. Further, these teachers agreed that they frequently used Kapampangan as medium of instruction in teaching Mathematics.

Grade 4 teacher respondents agreed that they perceived English as effective medium of instruction in teaching Mathematics. On the other hand, these teacher respondents moderately agreed that they encountered some difficulties or barriers in using English in teaching Mathematics. Meanwhile, these teachers agreed that they frequently used English as medium of instruction in teaching Mathematics.

The mean grade of the Grade 3 teacher respondents' pupils was computed at 82.45 (satisfactory) while the standard deviation was recorded at 2.20. On the other hand, the mean grade of the pupils of Grade 4 teachers was registered at 81.14 (satisfactory) while the standard deviation was calculated at 1.93.

Significant correlation was found between teachers' perceptions about using mother tongue and pupils' performance in Mathematics. Meanwhile, highly significant correlation was found between teachers' frequency of use of mother tongue in teaching Math and pupils' performance in the subject. However, no significant correlation was found between barriers in using mother tongue and pupils' performance in the aforementioned subject.

Significant correlation was found between teachers' perceptions about English as medium of instruction and pupils' performance in mathematics. On the other hand, highly significant correlation was found between teachers' frequency

of use of English in teaching Mathematics and pupils' performance in the said subject. However, no significant correlation was found between barriers in using English and pupils' performance in the aforementioned subject.

Significant difference was found between the mean grades of the pupils in Mathematics when they were exposed to mother tongue and English.

Lack of references written in Kapampangan is one the problems that teachers encountered in using mother tongue as medium of instruction in teaching Mathematics. Mathematical terms which cannot be translated into Kapampangan was also a problem for mother tongue teaching.

The best practices for Mother-Tongue Based Multilingual Education are using collaborative learning and relating Math problems to what is really happening in everyday life.

4. Conclusions

Based on the findings of the study, the following conclusions were drawn: There is a significant relationship between medium of instruction and pupils' learning outcomes in Mathematics. Kapampangan and English were found positively correlated to pupils' performance in Mathematics. Kapampangan was found more effective than English as medium of instruction in teaching Mathematics.

Recommendations

In light of the findings and conclusions of the study, the following recommendations were drawn:

- Though pupils performed better in Kapampangan than in English in terms of pupils' Mathematics achievement, teachers still suggested that pupils at their young age must be exposed to English. In this case, the researcher suggested that Kapampangan and English could be combined in teaching Mathematics.
- For Grade 4 teachers, they could explain the Mathematics lessons in the learners' language even though the prescribed medium is English, particularly when the teacher notices that the pupils are having difficulty in understanding the topic.
- For Grade 3 teachers, they could develop culturally relevant materials for teaching-learning. This is because one of the factors hindering the use of mother tongue in teaching was lack of culturally relevant materials
- For the school administrators, they could recommend to their teachers to use other teaching and learning strategies to help learners improve their skills in both Mother Tongue and English and aid the acquisition of English at the very beginning of their transition stage.
- For future researchers, further research along this line could be conducted. Experimental research could be considered to test the effectiveness of mother tongue in teaching Mathematics.

Compliance with ethical standards

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Statement of informed consent

Informed consent was obtained from all individual respondents included in the study

References

[1] Ahmed, A., Zarif, T. and Tehseen. (2013) *The role of medium of instruction used in Pakistani classrooms,* Interdisciplinary Journal of Contemporary Research in Business, Vol 4, No12

[2] Ball, J. (2010). Enhancing learning of children from diverse language backgrounds: Mother tongue-based bilingual or multilingual education in the early years. *New York, NY: UNESCO Basic Education Division.*

[3] Benson, Karol & Kosonen, & Kimmo (2012) A critical comparison of language-in- education policy and practice in four Southeast Asian countries and Ethiopia. In Skutnabb-Kangas, Tove & Heugh, Kathleen (eds). *Multilingual Education and Sustainable Diversity Work from Periphery to Centre*, 111–137. London: Routledge.

[4] Bernardo, Allan B.I. (2009). *"English in Philippine Education: Solution or Problem?"* in

[5] Philippine English) Linguistic and Literary Perspectives (Edited by Ma. Lourdes S. Bautista and Kingsley Bolton). Hong Kong: Hong Kong University Press

[6] Boonen, A. J. H., van Wesel, F., Jolles, J., & van der Schoot, M. (2014). The role of visual representation type, spatial ability, and reading comprehension in word problem solving: An item-level analysis in elementary school children. *International Journal of Educational Research*, *68*, 15–26. https://doi.org/10.1016/j.ijer.2014.08.001

[7] Bucang, N. & Cammagay, J. (2014). *Strategies and problems encountered by teachers in implementing mother tongue – base instruction in a multilingual classroom*. Retrieved, November 14, 2017, from http://iafor.org/archives/journals/iafor-journal-of-language-learning/10.22492.ijll.1.1.04.pdf

[8] Burton, L. A. (2013). *Mother tongue-based multilingual education in the Philippines: Studying top-down policy implementation from the bottom up*. University of Minnesota.

[9] Constantinides, M. (2015). *Eight steps to becoming a more creative teacher*. Retrieved October 3, 2017, from https://www.britishcouncil.org/voices-magazine/eight-steps-becoming-more-creative-teacher

[10] Daymiel, V. L. and Mirafuentes, E. V. (2018). Strategies and problems encountered by teachers in using mother tongue based multi-lingual education as the medium of instruction. https://www.academia.edu/22983758/

[11] Dawe, C. J. (2014). *Language governmentality in Philippine education policy.* Working papers in Educational Linguistics, 29(1), 61-77.

[12] Dio, R. V., & Jamora, M. J. A. (2014). Variations of Sorsogon dialects as mother tongue-based medium of instruction in grade school Mathematics. *Asia Pacific Journal of Education, Arts and Sciences, 1*(4), 119-116. Retrieved from http://apjeas.apjmr.com/wp-content/uploads/2014/09/APJEAS-2014-1-070.pdf

[13] Dworkin, H. (2012). Sample size policy qualitative studies using in-depth interviews. Retrieved from https://link.springer.com/article/10.1007/s10508-012-0016-6

[14] Espada, J. P. (2012). The native language in teaching kindergarten mathematics. *Journal of International Education Research* (JIER), 8(4), 359-366

[15] Gacheche, K. (2010). Challenges in implementing a mother tongue-based language-in-education policy: Policy and practice in Kenya. *POLIS Journal*, 4, 1-45.

[16] Gorio, D., Galino, A., Morales, J., & Palileng, J. (2014). *Factors affecting the implementation of the mother tongued–based multilingual education as perceived by teachers in Baguio and Benguet*. Retrieved, November 14, 2017, from https://sites.google.com/site/languageandmothertongue/home/research-on-mtb-mle-implementation

[17] Hasselbring, S. (2015). Tboli leaders decide and plan the way ahead for Tboli multilingual education. In *The Thirteenth International Conference on Austronesian Linguistics* (13-ICAL).

[18] He, A. E. (2012). Systematic use of mother tongue as learning/teaching resources in target language instruction. *Multilingual Education*, 2(1), 1.

[19] Jimeno, R. N., Sumbalan, E.B., Caterial, MZ., & Balane, C.T. (2017). The Utilization of Mother Tongue in Teaching Young Learners: Its Implications to Pre-Service Teachers.

[20] Kaphesi, E. S. (1997). Mathematical vocabulary in Chichewa and in Chiyao languages in

[21] Malawi. In Nherere, Charles M., Machakanja, Pamela and Mamimine, Patrick (eds.) (1999). *Capacity Building in Educational Research in Southern Africa: Empirical Insights into Qualitative Research.* Harare: Human Resources Centre.

[22] Kavaliauskienė, G. (2009). Role of mother-tongue in learning English for specific purposes. *ESP World*, Issue 1 (22)

[23] Komba, S., Kafanabo, E., Njabili, A., & Kira, E. (2012). Comparison between students' academic performance and their abilities in written English language skills: A Tanzanian perspective. *International Journal of Development and Sustainability*, *1*

[24] Kosonen, K., & Young, C. (2009). *Mother tongue as bridge language of instruction: Policies and experiences in Southeast Asia.* Bangkok: Southeast Asian Ministers of Education Organisation (SEAMEO).

[25] Krawec, J. (January 2010). The Development of Measures of Problem Representation: A Pilot Study. *International Academy for Research in Learning Disabilities*, Miami, FL.

[26] Lartec, J., Belisario, A., Bendanillo, J., Binas-o, H., Bucang, N. & Cammagay, J. (2014).

[27] Strategies and problems encountered by teachers in implementing mother tongue–base instruction in a multilingual classroom. Retrieved, November 14, 2017, from http://iafor.org/archives/journals/iafor-journal-of-language learning/10.pdf

[28] Mahboob, A., & Cruz, P. (2013). English and Mother-Tongue-Based Multilingual Education: Language attitudes in the Philippines. *Asian Journal of English Language Studies, 1*, 1-19.

[29] Mallareddy, K. (2012). *Poor Performance of Communicative Skills in Mother Tongue Resulted in Failure of Under Graduate Students in Indian University Examinations*. International Journal of Social Science and Humanity, 2(6), 539

[30] Malone, Susan E., Ph.D., SIL International, *Mother tongue-based multilingual education current challenges and some strategies for moving forward*, Multilingual Education Conference Jomo Kenyatta University, Nairobi, Kenya, 22-23 July 2010

[31] Mbaleka, S. W.-. (2014). Two Proposed Perspectives on Mother Tongue-Based Education in the Philippines. *International Journal of Academic Research in Progressive Education and Development*, *3*(4), 304. https://doi.org/10.6007/ijarped/v3-i4/1295

[32] Medilo, C. Jr. (2017). *The experience of mother tongue – based multilingual education teachers in Southern Leyte, Philippines*. Retrieved, November 14, 2017, from http://ojs.aiias.edu/index.php/ojs/article/view/186

[33] Nolasco, R. M. (2009). *21 reasons why Filipino children learn better while using their mother tongue: A primer on mother tongue-based multilingual education (MLE) and other issues on language and learning in the philippines.* Presented at the Guro Formation Forum, Quezon City, Philippines.

[34] Obiero, O. J. (2010). A Case of a Mother Tongue and another Mother Tongue in School: Efforts at Revitalization of Olusuba Language of Kenya. *Journal of Third World Studies*, 27(2), 267.

[35] Quijano, C. A. (2012). Philippines: The Role of Language and Education in Globalization. *Online Submission*.

[36] Rai, V., Rai, M., Phyak, P., Rai, N. (2011). *Multilingual education in Nepal: Hearsay and reality?* Kathmandu: United Nations Educational, Scientific and Cultural Organization Office.

[37] Republic Act 10533 (2013). Congress of the Philippines. Retrieved September 2016 formwww.gov.ph/2013/05/15/republic-act-no-10533.html

[38] Republic Act 1033 or the Basic Education Act of 2013. (2013). Retrieved July 11, 2016 from http://www.gov.ph.

[39] Ricablanca, J. D. (2014). Effectiveness of Mother Tongue – Based Instruction on Pupils' Achievement. *The Philippine Journal of Linguistics* 31(2), 93-105.

[40] Rosekrans, K., Sherris, A., & Chatry-Komarek, M. (2012). Education reform for the expansion of mother-tongue education in Ghana. *International Review of Education*, *58*(5), 593-618. doi:10.1007/s11159-012-9312-6

[41] Sanchez, A. S. Q. (2013). Literacy instruction in the mother tongue: The case of pupils using mixed vocabularies. *Journal of International Education Research*, *9*(3), 235. doi:10.19030/jier.v9i3.7880

[42] Sario, M. L. P., Guiab, M. R., & Palting, J. D. (2014). Behavior Manifestations of Pupils Using Mother Tongue in the Classroom. *Researchers World*, 5(3), 90.

[43] Singhal, V. (2020). Noam Chomsky Language Acquisition Explained. Retrieved from https://www.brighthubeducation.com/language-learning-tips/71728-noam-chomsky-language-acquisition-theories/

[44] Spolsky, B. (2011). Towards a theory of language policy. *Working Papers in Educational Linguistics*, 22 (1), 1–14.

[45] Umar, F. A. (2014). Teacher factors influencing use of mother tongue in teaching of mathematics. *International Electronics Journal of Mathematics Education*, 7(2), 62-79.

[46] Walter, S. L. (2011). *Mother tongue-based education in developing countries: Some emerging insights.* Retrieved from https://goo.gl/O5Vkl4

[47] Zavala, V. (2014). An ancestral language to speak with the ''other'': Closing down ideological spaces of a language policy in the Peruvian Andes. *Language Policy*, 13 (1), 1–20.