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English Vis-A-Vis Mother Tongue As Used In Teaching Mathematics: Effects On Pupil's Performance

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Abstract — The study aimed to find out the effects on pupil performance with the use of English vis a vis mother tongue in teaching mathematics. The study utilized the experimental method of research. It is experimental insofar as study used Quasi-Experimental Design 10 or the Pretest-Posttest Control and Experimental Group Design. The statistical methods used were arithmetic mean, t –test for independent samples, and t-test for correlated samples. The study revealed that the strategy used in teaching mathematics to the grade one pupils in the experimental group is more effective compared to the strategy used in teaching the control group.

Keywords — Readiness; HUMSS Students; Ex-post-Facto; Performance; Career Goal; Potential Challenges

I. Introduction

Mother tongue instruction is considered to be an important component of quality education particularly in the early years. The expert view is that mother tongue instruction should cover both the teaching of and the teaching through this language. Mother tongue may refer to the language that one has learnt first and is the tool to become identified as a native speaker by others. Studies have shown that in many cases, instruction in the mother tongue is beneficial to language competencies in the first language, achievement in other subject areas, and second language learning.

In the postcolonial era, this American legacy of English shaped the landscape in which national language and bilingual education policies were debated on and carried out. Whatever the form and substance of language debates at any given point, the language in the Philippines always featured the tension between English on the one hand and the vernacular languages on the other hand. English would represent colonial oppression and ideological superiority, as well as democracy and modernity. The vernacular languages would represent barbarism, tribalism and anti-Americanism, as well as freedom and social justice.

To support the existing tensions on language use, it is observed that pupils learn best through the primary or home languages that they bring to school. Apart from being backed by international research (UNESCO, 1953) and by a history of vernacular education in the country, the DepEd order is also supported by past and recent local research showing that learning among

Filipino children in school is facilitated best through the mother tongues (Dekker & Young, 2005; Nolasco, Datar & Azurin, 2010).

Studies in country after country bear this out. Teaching in an official school language that is not the mother tongue is a major barrier in the child's learning. In the Philippines, the experiment was conducted in Kalinga, where teachers use the mother tongue to teach children from Grades 1 to 3 to read and write. It is also the medium of instruction for teaching other subjects. Out of the 10 districts in the Kalinga division, the Lubuagan district topped the 2006 national achievement test with mean scores of 76.55% and 76.45 respectively which indicates mastery. The Tinglayan district came in a far second registered only 63.89% and 53.58%.

DepEd Order No. 74, s. 2009 further explained that the preponderance of local and international research consistent with the Basic Education Sector Reform Agenda (BESRA) recommendations affirms the benefits and relevance of MLE. Notable empirical studies like the Lingua Project and Lubuagan First Language Component show that:

1. First, learners learn to read more quickly when in their first language.
2. Second, pupils who have learned to read and write in their first language, learn to speak, read and write in a second language and third language more quickly than those who are taught in the second or third language.
3. Third, in terms of cognitive development and its effect in other academic areas, pupils taught to write in their first language acquire such competencies more quickly.

Relatedly, the study of DepEd Region IV-B (MIMAROPA) entitled; "Double Exposure in Mathematics: A Glimpse of Mother- Tongue First" has provided the local validation of the fundamental observation that top performing countries in the Trends in International Mathematics and Science Studies (TIMSS), are those that teach and test students in Science and Math in their own language.

Literature

As a profession, teaching is taken as a mission among teachers to mold the young. It may be regarded as a teacher's role in educating children. Others are prepared to assume certain defined duties and responsibilities. According to Aquino (1996) as mentioned by Baguinat (2011) in the book: Principles and Methods of Teaching, it is the teachers' responsibility to understand the needs, interests and capacities of the learners. With this, he will be successful in engaging students in activities that will enable them to acquire knowledge and skills, and at the same time develop worthwhile values and attitudes.

Teaching consists of organized aimed at inducing learning. Learning is the ultimate goal. In the teaching and learning process as noted by Baguinat (2011), teachers and students endeavor to achieve something and both benefit by it. Most teachers find it more enjoyable and much more rewarding if the students are involved in and excited about what they are learning. This is achieved by stimulating positive interactions among them as the teacher utilizes a well-planned step-by-step procedure that is directed towards desired learning results. The systematized actions end with the development of competence in applying the knowledge and skills acquired and practicing the moral standards gained (Salandanan, 2006).

As quoted by Lasco (2004), the teacher conducts the learning process. Therefore, the teacher should know appropriate teaching approaches to encourage students to use deep level approaches to learning. Teachers should encourage students to actively participate in the learning process. The learning approach of students will strongly influence the quality of their learning.

In school, Mathematics is an essential course of study. It provides the students with the principles of numeration and with problem solving skills. It is an avenue for the development of analytical and higher order thinking skills. Students' proficiency in Mathematics is therefore fundamental not only to school success but also the students' success in meeting real life situations outside school.

Knowing how important Mathematics is to the people, educators should try to improve Mathematics instruction wherever possible. Since teachers play a vital role in mathematics teaching, they need to provide a favorable environment in which students can feel free to explore mathematical ideas, to ask questions, to discuss ideas, to make mistakes and to make conjectures. Students should be actively involved in the learning processes, investigating and exploring individually and in groups. The difficulties of learning and teaching at all levels lie in the ability of teachers to enable the students, and for the students themselves, to grasp new concepts and to make learning more lasting to those whose rate of assimilation is not fast as expected (Obguia, 1993) as stated by Baguinat (2011).

Adverse attitudes of students towards math are one of the reasons why these young people are behind in math proficiency. Either they fear the subject or they have little interest or poor motivation for the subject. Whatever the reasons may be, we have to understand that there are many factors influencing poor performance of students in math.

A positive attitude to Mathematics, according to Grant and Searl as cited by Forrester (2000) as noted by Baguinat (2011) can be developed since Mathematics is seen as a human activity and not merely as a solitary book–bound subject consisting of the acquisition of techniques and procedures. Students' attitudes towards Mathematics are extremely important and play a large part in determining students' motivation towards instruction and performance (Gilroy, 2002).

Martha Tapia's Attitudes toward Mathematics Inventory (ATMI) was designed to investigate the underlying dimensions of attitudes towards mathematics. The ATMI contains 40

items measuring student confidence, value, enjoyment, and motivation. The items are constructed using a Likert-scale format with the anchors: 1 – strongly disagree, 2 – disagree, 3 – neutral, 4 – agree, and 5 – strongly agree. The ATMI is subdivided into four (4) subscales, namely: Self-Confidence, Value, Enjoyment, and Motivation.

Leongson & Limjap (2001) declared that there are many remedial efforts that seek to improve Mathematics performance of the students. Various paradigms have been developed in many researches to student school mathematics teaching and learning. These efforts have been focused on teacher and students factors that will improve students' achievement in specific topic of Mathematics and will develop positive attitudes towards the subject.

One of the main premises of the most current reform efforts in Mathematics teaching is that educators want to empower students mathematically to ensure that they are confident and successful in exploring and engaging in significant mathematical endeavor (Allsopp, 2003 as cited by Parreño, 2008). The challenge is to somehow motivate the students to take responsibilities of their own learning. This goal is most effectively accomplished if students convince themselves that math is interesting and useful (Deitte and Howe, 2003 as cited by Parreño, 2008).

Based on national reports on student learning, teacher should advocate and actively engage students in learning through the use of a variety of teaching strategies in the classroom (Mishra, 2007). Strategies in Mathematics teaching include discussion, practical work, practice and consolidation, problem solving, mathematical investigation and cooperative learning (Operations Handbook in Mathematics, 2002).

Alns (1985) as cited by Parreño (2008) pointed out that the students appear to do the best with teachers who are well-trained and knowledgeable about the subject matters, interested in students and are not concerned only with their own problems. Some teachers encourage students to participate actively in the learning process. In contrast, a teacher who had optional academic and personal growth and who is hostile and unresponsive to student needs and is poorly prepared in teaching methods will not be interesting to the learners.

Bassler (1994) as cited by Baguinat (2011) added that students consider teachers to be competent and effective if they are proficient in all instructional aspects of learning such as guiding skills, instructional skills and evaluation skills. Effective and efficient teachers provide a positive environment for learning, in which trust and mutual respect exist among all the participants (Henderson, 1992). Each student should enter the classroom with expectations of success and leave it with a feeling of satisfaction and accomplishment.

Current reforms in Mathematics teaching concentrate on the role of language in the teaching and learning of Mathematics. Language is a very powerful tool for transmitting information, representing thought, shaping ideas and, generally, as a medium of communication.

The problem of language has become a pressing issue recently. In schools, language is both the instrument and the vehicle of teacher-student interaction (Smith & Ennis, 1961 cited by Garegae, 2008) and thus the conduct of classroom instruction is inescapably involved in the use and interpretation of language written, printed, and above all, spoken. The reason why the language factor needs special attention these days is the fact that many students are currently learning mathematics in their second or third language, not their first language (Davidenko, 2000).

For students who are acquiring a language of instruction as well as learning mathematics in the new language, the language of mathematics is another source of difficulty and confusion. Setati (2002) asserted that the use of language, which is just second tongue of the students, third, and so on, as a medium of instruction, impedes effective mathematics teaching and learning. In a school where the students' first language is different from the predominant language of instruction, students tend to benefit more if mathematics is taught in their first language.

Another argument brought forward in the Philippines, relates to situations, where students are incapable to express themselves well in English.

Studies

a. Foreign Studies

Many studies have been carried out and are currently being carried out to determine the level of difficulty that language has been causing students in their achievement and understanding of Mathematics. These studies have indicated that the language problem is one of the major factors contributing toward the poor performance of many students in mathematics; especially those who are bilingual and multilingual (Barton & Barton, 2003). Studies have shown that students that are found to be very weak in the language of instruction have the tendency toward ill comprehension as well as poor participation in classroom discourse (Setati, 2003). Consequently, they cannot meet the desired objectives of their studies due to lack of communication skills. This puts teachers in a big dilemma on how to correctly assess the sources of student difficulty: is it mathematics or language? (Secada & Cruz, 2000).

In Germany, German, which is the mother tongue of the great majority of students, is used for instruction. Students from families which speak German have been shown to perform better at school than those who speak their native tongue (Dekker, 1995). Dekker (1995) also revealed that students, whose mother tongue is not German, stand less chance of success at school, since in their case the principle of education in one's mother tongue cannot be applied.

The findings of the study conducted by Kocakulah, Ustunluoglu and Kocakulah (2005) in Turkey, Akinwumi and Olarewaju (cited in Makinde & Olabode, 2006) in Africa, among others, also revealed that students who were taught in a foreign language had more misconceptions than those taught in the mother tongue.

Stretching this concept further, Akinwumi and Olarewaju (cited in Makinde & Olabode, 2006) report that instruction in mother tongue facilitates more meaningful learning than instruction received in a foreign language. They conducted a research where they exposed some Junior Secondary School (JSS) students to a treatment of teaching Integrated Science in Yoruba and English languages. The students in the experimental group (yoruba language) significantly performed better than those in the control group (English language).

Dekker (1995) and Makinde & Olabode (2006) are supported by Blake and Van Sickle (2001), cited in Vizconde, (2006) who explained that in the United States of America several studies had shown that the language of instruction is a predicament.

The study conducted by Rollnick and Rutherford (1996) in Setati et al. (2002), found, that the use of students' first language was a powerful means of exploring ideas.

Probyn (2001)'s "Teachers' Voices: Teachers' Reflection on Learning and Teaching through the Medium of English as an Additional Language in South Africa", teachers noted that students were confused and embarrassed when English was used for teaching.

Yushau & Bokhari (2005) investigated all students of Math 001. The setup of the experiment was not designed for a comparison with another group of students, but data was collected both qualitatively and quantitatively. The quantitative data was collected from the teacher survey and also from students' achievement in their exams. On the other hand, qualitative data was collected from both students and teachers via informal interviews. Also, during the period of the experiment, the course instructors regularly met to monitor the progress of the experiment. In the meetings, teachers freely expressed their views and also those of their students about the experiment. The study revealed that all the teachers found that the insertion of an Arabic translation of key words and concepts on the transparencies helped most of the students recall the concepts they had learnt at high school level. Teachers regularly observed the "*Aha, now I've got it!*" expression on the faces of students after reading the Arabic translation. The insertion of the Arabic translation was found to be very helpful in minimizing student language difficulty in learning mathematics evidence by an increased teacher-student interaction in the classroom.

The study of Planas & Setati (2009) tackled how immigrant bilingual students in Catalonia, Spain, who arrived at a young age from a South American country, use their language in the learning of mathematics. It used a critical sociolinguistic approach, which draws on social theory in the analysis of how language is involved in the construction of teaching and learning opportunities. Their data pointed to the differences in the ways that the Spanish dominant bilingual students use their two languages during their engagement in mathematical activity. The shifts from Catalan to Spanish, and from Spanish to Catalan, coincided with shifts in the complexity of the students' mathematical practices. The students tended to use the two languages for different purposes, depending on the complexity of the mathematical practices, and in relation to different social settings that coexist within the classroom.

Kocakulah, Ustunluoglu and Kocakulah (2005) conducted an investigation in Turkey, which indicated that students who were taught in a foreign language had more misconceptions than those taught in the Turkish-medium of instruction. Thus, this led to the contention that mother tongue language for learning seemed to be more effective in comprehension and application of science concepts than a foreign language.

The OECD Programmed for International Student Assessment (PISA) studies in Europe as well showed time and again, that countries with a homogenous population speaking the same language that is used for instruction in school (such as Finland) constantly achieve better results than countries who force their students to learn in a different language than their mother tongue (such as Switzerland) or have a high proportion of foreign-language immigrants (such as Germany).

b. Local Studies

Only few researches on the use of first language in teaching were conducted in the Philippines, but numerous studies determining the attitudes of Mathematics learners are documented.

The study of Suarez (2010) determined, how effective the Cebuano-Visayan (CV) Language is as medium of instruction in teaching literature subjects to first level tertiary students, whose native language is Cebuano-Visayan or Binisaya. It is an experimental descriptive-correlation study involving fifty students utilizing a Pretest-posttest control group design. The study looked into the academic performance of students in the three learning domains: cognitive (comprehension), affective (reading appreciation) and psychomotor (writing).

Toquero's (2009) paper entitled "Using Ilokano in Teaching Basic Number Concepts and Operations in Arithmetic", on the other hand, explored what primary school teachers can possibly do to make use of the children's indigenous culture and the richness of their mother tongue as an effective medium in teaching mathematics following the MLE framework of Listening, Speaking/counting, Reading and Writing/Solving. It attempted to show how the mother tongue can be used as a bridge, not only to learn the language of mathematics, but to build a strong mathematical foundation that can be used for lifelong learning in mathematics. It demonstrated how cognitive development in mathematics is based on the language the child understands best – his/her mother tongue. This was done by making use of the mother tongue as a medium in building useful mathematical concepts that run through from arithmetic to algebra. Concepts such as grouping by tens, place value, exponents, addition, subtraction, multiplication, and division, combination of similar terms and other mathematical concepts and operations are derived from the way children count in their mother tongue. It provides a forum for practicalising the theoretical knowledge gained in the classroom and for demonstrating the psychomotor skills of the teacher and learner who performed the experimentation (Luza-Tabiolo, 2018).

Daligdig (2000) in his study: "A Comparison of the Mathematics Achievement and Attitude of Fourth Year High School Students under the Free and Controlled – Grouping Schemes" concluded, that although the attitudes of the free group did not significantly differ from those of the control group, the free group had gained a more positive attitude towards Mathematics as the students in this group felt more comfortable in dealing with group members of their choice. He added, that free grouping should be used alternately with controlled-grouping, if teachers wished that their students get a more positive attitude towards Mathematics.

A study conducted by Galia (1999), which focused on "Quasi-Constructivist Based Approach; Effects on Student's Achievement in and Attitude Towards Mathematics", revealed that the quasi-constructivist based approach had significant effect on the students' achievement based on the achievement schools after partialling out initial difference due to the covariate. It also had a significant effect on the students' attitudes towards Mathematics. However, the improvement in the attitude of the experimental group did not differ significantly from that of the control group.

II. Methodology

Methods Used

In this study, the researcher utilized the experimental method of research. It is experimental insofar as study used Quasi-Experimental Design 10 or the Pretest-Posttest Control and Experimental Group Design in order to test the hypotheses. This design is similar to the Pretest-Posttest Control and Experimental Group Design which contains two groups: one receives and experimental treatment and the others do not. According to Imenda and Muyangwa (2006), this design has some deficiencies that can seriously threaten the internal validity as a result of non-randominization of subjects (pupils) to the experimental and control groups. To deal with this threat, initial observation and preliminary scores were measured to determine statistical equivalence.

III. Results and Discussion

This chapter presents the summary of the study together with the findings, the conclusions drawn and recommendations offered.

Findings

The following findings were revealed:

1. The pretest performance of the pupils in both the control and experimental group were said to be "developing".

2. There was no significant difference on the pretest performance of the pupils from the control and experimental group.

3. Pupils in the control groups' posttest performance was said to be "approaching proficiency" while pupils in the experimental group were said to be "proficient".

4. There was a significant difference on the pupils' performance in the posttest on topics relative to the Philippine money, however, no significant difference existed between the two groups' performance on the rest of the topics.

5. There was a significant difference between the control and experimental groups' pre-post mean gain performance.

IV. Conclusion

Based on the findings of the study, the researcher hereby concludes that the strategy used in teaching mathematics to the grade one pupils in the experimental group is more effective compared to the strategy used in teaching the control group.

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