Pupils' Performance in Mathematics Word Problem Writtenin Mother Tongue and English

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Abstract
The study used a descriptive-comparative approach, where the grade 4 pupils' performance in mathematics word problems written in their mother tongue and English were compared. The participants were n = 100, and only those who had grades below 79 had a description of being fairly satisfactory. The performance of the pupils in word problems written in their mother tongue was approaching proficiency, while word problems written in English were only developing. Thus, it found that the differences between each group were significant. This further explains, based on their respective means, that pupils perform better in mathematics when the word problem is written in their mother tongue. It was then suggested that, despite the fact that the mother tongue is taught only from grades 1 to 3, the teaching of mathematics through these mediums is recommended, especially since the competencies covered in this topic are quite difficult and need to be understood very well to enrich fundamentals in the subject.

Keywords: grade 4 mathematics , mother tongue, problem written in mother tongueword problem

1. Introduction

In the human domain, language is essential or ubiquitous. Our perspective is shaped by language, which also serves as the foundation for whatever social cohesiveness we may achieve. Language creates a close connection between the past and the present as well as the future. Even when we remain silent, its effects cannot be avoided. To understand things intellectually and to influence others to do the same, humans need language. Humanity is largely defined by language. Language is without a doubt one of the most crucial subjects included in the curriculum, according to David (2006). It gives a youngster the means of communication while also playing a crucial role in the creative process that arises from that communication. Students develop linguistic proficiency and self-confidence when language arts are taught with awareness and enthusiasm.

One of the many obstacles that Filipino learners have in their educational journey is starting their education in a language that they are unable to understand. They are unable to comprehend the educational language that is being utilized in the classroom as a medium of teaching (Deped, 2011).

In order to support the goal of "Every Child A-Reader and A-Writer by Grade 1," mother tongue-based multilingual education will be implemented in all public schools beginning with the 2012–2013 school year. This includes kindergarten, grades 1, 2, and 3. This directive is stated in Department of Education Order No. 16 s. February 17, 2012.

Mathematics is one of the tool disciplines in school. This course starts with teaching students basic mathematics and progresses to a more advanced grasp of numbers. Despite the fact that mathematics instruction receives a lot of attention, national and international assessments reveal that many students' mathematical knowledge and abilities fall short of expectations after completing their basic education (UNESCO, 2012). Furthermore, many evaluations in mathematics revealed that the Philippines' performance in the subject is subpar at best. Evidence from a 2003 Science and Mathematics exam given by the Trends in

International Mathematics and Science Study (TIMSS) indicated that students in Grades 4 and 8 from sample schools had poor accomplishment levels. According to Mullis et al., the Philippines ranked 23rd out of 25 nations in Grade 4 science and math. The statistics were quite concerning, and they now represent a critical problem that must be addressed in the way scienceand math are taught.

In response, the K–12 Reform Curriculum was unveiled by the Department of Education in 2012 with the goal of bringing exceptional innovations and excellence to the provision of high-quality education. The use of the mother language in the teaching of major and minor topics, including mathematics, is one of the characteristics of this curriculum (DepEd Order No. 16, 2012). In order to help learners better comprehend mathematical ideas in their early years, it is taught in the mother language in the first three grade levels. This will close the communication gap between the learner's native tongue and the language used in the classroom. After learning arithmetic in the native language till Grade 4, students will be taught math in English.

The issue of low mathematics performance among students in basic education was examined by UNESCO (2012), which calls for teaching mathematics in a language different than the students' native tongue. There is a dilemma in many nations, such as the Philippines, where native languages are spoken alongside the language of colonists, which influences and forms the basis of education (Yonson, 2017).

According to the researcher, one area in mathematics instruction where language is crucial to obtaining a certain level of knowledge is word problems. Carteciano (2005) cites the results of the Philippine Executive Report on the TIMSS, which show that language issues might contribute to subpar mathematical performance. This can be because word puzzles in the Philippines are often written in English, even though not all Filipino learners speak English as their first language. This motivates the researcher to find out whether Grade 4 students do better on word problems in the English language, which is their current medium of teaching, or if they can respond more in their home tongue (Cebuano), as they did in prior years.

2. Framework

Speaking and studying English become more common in the Philippines. In reality, to encourage students to practice their English, a Speak English policy was created and put into effect a few years ago for all levels. On the international market, this language is the most widely accepted. Strong English communication skills, often known as English competence, are a typical characteristic among college students, with practice beginning in elementary school. But according to the K–12 Curriculum Guide (2013), mathematics is thought of as a language unto itself, replete with its own symbols, notations, and "grammar" norms that allow ideas and concepts to be represented clearly. As a result, teaching mathematics in English is similar to teaching two foreign languages at the same time.

This is undoubtedly challenging and often causes anxiety related to maths. Conversely, using the native tongue might aid students in improving their knowledge and understanding. The K-12 Reform Curriculum includes Mother Tongue Based Multi-Lingual school (MTB-MLE) teaching in the first three primary school levels as a response to this understanding. Students would learn more quickly and effectively if material were given in a language they could understand, according to the reasoning behind the use of mother tongue as a medium of education, which is thought to facilitate numerical accomplishment and growth (Mufanechiya and Mufanechiya, 2011).

MTB-MLE stands for "first-language-first" education, or instruction that starts in the student's native tongue and moves on to other languages, mainly English and Filipino. It is intended to alleviate the high level of functional illiteracy among Filipinos, where language is a major barrier. The youngster has no fear of making errors since they can express themselves

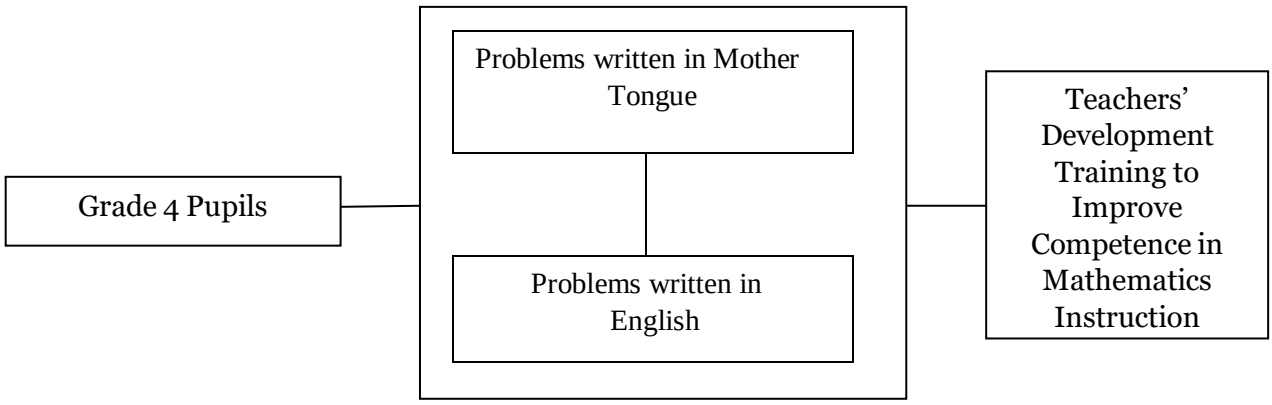
with ease because to their native tongue. Children are encouraged to actively participate in the learning process because they comprehend the topics being covered and the expectations placed on them. They can quickly create and describe their reality, express their ideas, and incorporate new ideas into what they already know using their mother language. There are now twelve (12) main languages, often known as lingua franca, that are used as the medium of teaching. According to Capitol University (2017), the main languages include Tagalog, Kapampangan, Pangasinense, Iloko, Bikol, Cebuano, Hiligaynon, Waray, Maguindanaoan, Maranao, and Chavacano.

According to DepEd Order No. 74 (2009), learners who are taught in their first language are more likely to acquire competencies in a variety of academic areas. This is one of the reasons for using MTB-MLE in the teaching of mathematics and other subject areas. The findings of projects like the Lingua Franca Project and Lubuagan First Language Component support this idea. However, as mathematics is a language unto itself (Esty, 2014), care must be taken in how students acquire the subject. It is crucial to see their approach to a particular word issue that incorporates both linguistic and mathematical concepts. Even when they comprehend every word in an issue, children might find it challenging when key abilities are lacking. When students come across word difficulties, they should thus be permitted to reason through any potential solution using any potential representation and medium.

Barnes (2013) proposed that before students can effectively complete their learning assignment, they need first acquire the norms governing the usage of the instructional language.He believes that a teacher should employ a variety of functional speaking techniques while teaching academic subjects in order to effectively communicate both the discipline and the topic. A constant conversation between the teacher and the student is necessary for the assimilation of information. This discussion should include the student asking questions and providing answers. This emphasizes how crucial language is while teaching a topic. If the learner does not have a stronger command of the language, the teaching and learning process will not be able to accomplish its aim. There will be a full transfer of learning after the pupils have understood and internalized the principles that the instructor has taught them.

Furthermore, the study was anchored on the theory of mathematical learning theory by RC Atkitson. In his 1972 work, Tkinson addresses the issue of instruction optimization. He listed four potential approaches: (1) increase the class mean performance; (2) reduce the class mean variation in performance; (3) increase the percentage of students who get grade-level results; or
(4) increase the class mean performance for each student. According to Atkinson, option (1) widens the gap between the most and least successful pupils, therefore although it generates the highest gain scores, it also generates the most variation. Option (4) results in a gain overall but not in more variability. This is achieved by allocating different amounts of time to each student based on their performance.

Figure 1: The Conceptual Framework



3. Objectives of the Study

This study aimed to determine the effect of mathematics instruction on pupils' performance in mathematics, with the following objectives: (1) To determine the performance of the three groups of participants in answering word problems written in mother tongue. (2). To determine the performance of the three groups of participants in answering word problems written in English, (3). To determine the significant difference between the scores from the word problems written in mother tongue and in English, and (4) To reject or not reject the null hypothesis of the significant difference between the scores from the word problems written in mother tongue and in English by group.

4. Methodology

4.1. Research Participants

The researcher used non-probability sampling, specifically purposive sampling, in selecting the participants and only those who had fairly satisfactory performance; thus, they are still considered the sample of the entire grade 4 population. Since the researcher is a teacher of mathematics at Polanco Central School, she utilized her three classes as participants in the study. Participants of the study were the one hundred three (100) Grade 4 pupils in Polanco Central School who are officially enrolled in the academic year 2018-2019. These were: thirty-six
(34) pupils in section Saturn; thirty (30) pupils in section Earth; and thirty-seven (36) pupils in section Mercury. The participants had been taught mathematics in their mother tongue in their primary years as recipients of the K–12 program implemented in the school year 2012–2013. Presently, these pupils are using English as a medium of instruction and learning in mathematics.

4.2. Data Collection

A researcher-made test specifically designed for the study will be used. Two (2) problem- solving tests will be made: a word problem test written in the mother tongue (Cebuano) and a translated version of the test in English. Set A questionnaires will consist of five (5) word problems expressed in the mother tongue (Cebuano), and Set B questionnaires will also consist of five (5) translated word problems expressed in English. No choices are provided for each question; instead, pupils are allowed to use any possible strategy to answer the problems. Each item is scored from 1 (lowest) to 4 (highest) points for a maximum score of 20 points. Rubrics are to be used in giving points for the solution of each item. To determine the performance of the grade 4 pupils and their corresponding proficiency level based on the DepEd standard, the following scale will be used.

4.3. The Statistical Treatment of the Data

The study's design was descriptive-comparative, and the statistical treatment was greatly anchored on this approach. For the presentation of scores, frequency and percentage were used with the corresponding mean of each participant's group. For the comparative analysis, the t- test for independent samples was used.

5. Results and Discussions

This part of the study presents the results and discussions with their corresponding analyses.

Objective 1: To determine the performance of the three groups of participants in answering word problems written in mother tongue

Table 1 presents the performance of the participants in word problems written in their mother tongue. In Group 1, most participants obtained a score ranging from 12 to 14, with a frequency of 21 (70%) and a proficiency level of approaching proficiency. The group 1 mean is 12.63, with the proficiency level approaching proficiency.

For group 2, the majority of the participants had a score ranging from 12 to 14, with the approaching efficiency level having a frequency of 21 (61.76%). The mean of this group is 12.50, with the description of "approaching efficiency".

And in group 3, among the score interval, scores ranging from 12 to 14 had the most participants' scores, with the responses' frequency of 22 (61.11%). The mean's group is 12.44 with an "approaching proficiency level".

This table shows the overall performance of the participants in the word problems written in mother tongue of 12.52 and is described as "approaching proficiency". This indicates that there is a need for this group of participants to improve their mathematics performance, specifically in the word problem, as depicted only below proficiency level.

The department has a problem in providing high-quality education in Philippine public elementary schools because teaching mathematics in basic grades is required to take place in the students' mother language. Furthermore, there are still issues with the implementation of using mother tongue as a medium of instruction in mathematics, and students appear to be having trouble understanding the terms used (Tupas & Martin, 2017; Aliñab, Aguja, & Prudente, 2018; Cruz & Mahboob, 2018; Mendezabal & Tindowen, 2018), despite the numerous workshops and trainings for teachers on the subject.

Table 1: The Performance of the Participants in Word Problems Written in Mother Tongue

Group	Score Interval	Frequency (f)	Percentage (%)	Proficiency Level
Group 1	5 – 8	2	6.67	Beginning
	9 – 11	4	13.33	Developing
	12 – 14	21	70.00	Approaching Proficiency
	15 – 17	3	10.00	Proficient
	Total	30	100	
	Mean= 12.63, Approaching Proficiency, SD=3.45			
Group 2	5 – 8	2	5.88	Beginning
	9 – 11	7	20.59	Developing
	12 – 14	21	61.76	Approaching Proficiency
	15 – 17	4	11.76	Proficient
	Total	34	100	
	Mean =12.5, Approaching Proficiency, SD=2.18			
Group 3	5 – 8	2	5.56	Beginning
	9 – 11	8	22.22	Developing
	12 – 14	22	61.11	Approaching Proficiency
	15 – 17	4	11.11	Proficient
	TOTAL	36	100	

Mean = 12.44, Approaching Proficiency, SD=3.83

Overall Mean ($\bar{X}$=12.52 Standard Deviation (SD): 2.67
Proficiency Level: Approaching Proficiency

Objective 2: To determine the performance of the three groups of participants in answeringword problems written in English.

Table 2 shows the performance of the participants in mathematics word problems written in English. Group 1 scores fell in the interval 12–14, with a frequency of 14 (46.67%) considered concentrated in these ranges with an "approaching proficiency" level. The mean's group is 11.23 with "developing level".

Group 2 mostly had a similar picture to what group 1 performed; scores from 12–14 were recorded higher than the other scores, and they obtained 16 (47.06%). The group's 2 mean is 11.20 with the developing level.

Group 3 presents scores of 12–14 with more responses than the other scores, with a frequency of 16 (44.44%). The group's mean score is 11.08 and is described as "developinglevel".

The level of performance of the participants is 11.15, which is below the developing level.

Table 2: The Performance of the Participants in Word Problems Written in English

Group	Score Interval	Frequency (f)	Percentage (%)	Proficiency Level
Group 1	5 – 8	3	10.00	Beginning
	9 – 11	12	40.00	Developing
	12 – 14	14	46.67	Approaching Proficiency
	15 – 17	1	3.33	Proficient
	TOTAL	30	100	
	Mean=11.23, Developing; SD= 3.56			
Group 2	5 – 8	4	11.76	Beginning
	9 – 11	13	38.24	Developing
	12 – 14	16	47.06	Approaching Proficiency
	15 – 17	1	2.94	Proficient
	TOTAL	34	100	
	Mean=11.20, Developing; SD= 4.03			
Group 3	5 – 8	4	11.11	Beginning
	9 – 11	15	41.67	Developing
	12 – 14	16	44.44	Approaching Proficiency
	15 – 17	1	2.78	Proficient
	TOTAL	36	100	
	Mean=11.08, Developing; SD= 2.34			

Overall Mean ($\bar{X}$=11.17 Standard Deviation (SD): 3.56Proficiency Level: Developing

Objective 3: To determine the significant difference between the scores from the wordproblems written in mother tongue and in English.

Table 3 presents the difference between the word problem scores of the pariticpant written in the mother tongue and in English. Group 1 has sufficient evidence to suggest that the word problem scores written in the mother tongue (M = 12.63, SD = 3.45) are different from those written in English t(98) = 2.782, p<.05. This indicates that the difference is significant, and the Ho is rejected.

For group 2, it suggests that the word problem scores of the participants written in the mother tongue (M = 12.5, SD = 2.18) are different from those written in English t(98) = 2.720, p<.05. This indicates that H0 is rejected, and the difference is significant.

And for group 3, it shows sufficient evidence to suggest that the scores of the participants in the word problem written in mother tongue (M = 12.44, SD = 3.83) are different from those written in English t(98) = 3.022, p<.05. This implies that the test rejected the H0 and concludes that the difference is significant.

Pillos, et al., (2020) described that teachers, principals, and parents of students enrolled in the program have generally observed that students who start learning in their native tongue exhibit higher levels of self-assurance, engage more actively in class discussions, ask more questions, and show a deeper comprehension of the material being covered. They also learn the school language, both oral and written, more readily and with greater comprehension.

Table 3: The Difference Between the Word Problem Scores Written in Mother Tongue and inEnglish

Group	Medium of Instruction	Mean	Mean Difference	t	p-value
Group 1	Mother Tongue	12.63			
	English	11.23	1.40	2.782	.037*
Group 2	Mother Tongue	12.50			
	English	11.20	1.30	2.720	.042*
Group 3	Mother Tongue	12.44			
	English	11.08	1.32	3.022	.002*

*Significant, p<.05

6. Conclusion

The teaching of mathematics is one of the most challenging parts of being a teacher since the subject is quite complex. The pupils must have a strong foundation in its fundamentals, and once they fail to comprehend their applications and principles, difficulties in solving will be experienced. Thus, the researcher initiated a comparative analysis on the impact of teaching word problems written in the mother tongue and English. The groups of learners performed better when the word problems were written in their mother tongue, English. In this effect, it is recommended that the teaching of these competencies in grade 4 and the integration of mother tongue in the word problems be given consideration since the low performance was seen and served as a gap for the study to investigate.

7. Recommendations

Two recommendations are formulated which are based on the findings of the study, and probably encourage the proper authorities to implement them to improve pupils' school performance in mathematics.

1. The school heads should discuss with the teachers the necessary points to be improve in instructional delivery in order to be more effective as it is found to influence the pupils' performance.
2. The school administrators should provide more instructional materials in addition to localized instructional materials created by teachers to engage pupils in learning activities to improve their performance.

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