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Determining the level of understanding on the basic steps of scientific method using mother tongue: Cebuano-English VS pure English

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Abstract
This study aims to determine the level of understanding on the basic steps of scientific method using mother tongue of the grade 4 pupils of Minolos Elementary School and Maria Montessori School. The pupils of MES are purely Cebuano who communicate Visaya or Cebuano at home while the pupils of MMIS are a mix of Cebuano, American, and Korean. Majority of the pupils in MMIS use English at home. Post-test design is used as indicated in the methodology. The questions focus on hypothesis making, data gathering, data interpretation and conclusion formulation. The questions are constructed in English. Paired sample T-test is used to determine the relationship of the types of language used. The result of the study showed that the mean score of MES is greater than MMIS. Moreover, it showed that there is no significant difference between the Cebuano-English and Pure English medium of instruction in understanding the steps of the Scientific Method. This means that although language plays a role in the classroom, pupils should be given opportunity to actually experience learning especially in a subject that requires investigation. Effective communication and student interaction are important in a Science class.

Keywords: mother tongue, scientific method, hypothesis making, data gathering, data interpretation, conclusion formulation

1. Introduction

One of the toughest subjects to teach is Science. The subject entails a lot of concepts, processes, and skills that are composed of terms that are sometimes unfamiliar to the students. Because of this, students may have difficulty in comprehending the meaning of these terms since they may seem too technical to them. To address this issue, DepEd has decided to implement the Mother Tongue-Based Multilingual Education because it is believed that the usage of the first language in implementing instruction will make the students learn and perform better in the classroom.

Science entails investigation. It is essential then that part of the competencies that should be discussed first to the graders is the Scientific Method and the basic process skills needed in investigating. Understanding how to perceive and deal problems through scientific method will help learners come up with solutions to challenges that they may encounter outside the classroom and be able to accept the consequences (Catchen, 2014) [2]. The scientific method is a tool in science that will help the graders explain a certain event as simple as possible since the steps are structured in a way that young learners could easily understand their application (Watson and James, 2004) [17]. However, in the Philippines, the language to be used is still a big issue in the academe especially to subjects that deal with a lot of technical terms like Science. Based on the study conducted by Dr. Leonora F. de Jesus of Bulacan State University, Philippines, entitled " Difficulties and Challenges in Teaching Science: The Aftermath of MTB – MLE," Science teachers find it difficult to teach the subject since they still have to translate difficult technical terms to their mother tongue. Instruction is focused more on the translation of terms rather than in actual teaching. In this case, Science teacher should find more creative and innovative ways on how to teach these technical terms to encourage interaction and learning.

As what Albert Bandura and Lev Vygotsyky emphasized in the Social Learning Theory, the acquisition of knowledge and skills is dependent on the way the children experienced it in the classroom. Direct experience plays an important role in making learning successful thus the effective usage of language in the classroom through activities that allow the children to interact with the others enable them to understand the concept better. From this, application of the science processes and skills is effectively carried out through modelling and direct interaction. Effective usage of a particular language in delivering instruction is integral for the students to have the desired response in the class. If the language used in school is entirely different from home, this could create a learning gap. According to the Threshold Theory proposed by Cummins, as cited by Rolstad and MacSwan 2014 [11], it is not that the students cannot comprehend during the teaching-learning process using the second language, it is just that the level of competence of the first language was not strengthened. The child's competence on the second language is highly dependent on the level of competence achieved in the first language. With this, the practice of using the first language in classroom instruction should be intensified.

As cited by Eslit, 2017 [5], Malone stressed that MTB-MLE has a significant role to those students who are comfortable using mother tongue when communicating since interacting using the first language can make them more involved in the classroom thus increasing learning. Having a good foundation of the first language enables the students to easily bridge to other school languages hence allowing them to widen their vocabulary and have more understanding of other's culture.

Since the K-12 Curriculum Program was implemented last 2012 [5], the use of the Mother Tongue Based Multilingual

Education (MTB - MLE) as a subject and as a medium of instruction, has been its main highlight. It was DepEd, which said that learners learn effectively and understand best if the language they used at home – mother tongue – is used in instruction. Based from an article by Rosalina Villaneza, chief of teaching and learning division of Department of Education, the purpose of a multilingual education program is to develop cognitive and reasoning skills enabling children to operate equally in different languages – starting in the mother tongue, which is the first language of the child.

The poor performance of Filipino students in national and international Science achievement test (Dela Cruz, 2017) [3] is attributed to the fact that the students do not understand the meaning and the usage of scientific terms. Application of learning will not be evident if in the first place, the students do not understand the definition of the terms at all. Meaningful learning will be achieved if students are given the opportunity to unravel the meaning of certain scientific words through effective usage of language. Language is important since it enables students to explore their ideas and formulate thinking as mentioned by Mccomas, 2017 [8].

In the K-12 Curriculum, the usage of Mother Tongue is strongly emphasized. However, there are private schools in the Philippines that are given leeway especially if the guideline is not practical for a particular group of students (Padilla, 2013) [9]. These private schools make use of English as the language of instruction since majority of the students utilize English as the primary means of information and communication at home. As cited by Seidlhofer 2003 [12], Greenbaum mentioned that even though English is an international and a global language, it does not include a description of the use by its largest group of speakers.

The role of the private school teachers then in using English language when implementing instruction is crucial since teachers do not only teach the content but the mechanics of the language as well. Still, it does not mean that if the students can speak English well, then they can also translate their learning through writing effectively especially when answering tests in Science. Philippines is ranked 67th of 140 countries in the quality of Math and Science education in the 2015 – 2016 of Global Competitiveness Report and 79th of 138 in the 2016 – 2017 data (Dela Cruz, 2017) [3]. This means that using English as the medium of instruction in teaching technical subjects like Science does not guarantee quality assimilation of learning.

Considering all these notions, the researchers have decided to conduct this study in order to: 1) determine the level of understanding on the steps of Scientific Method in terms of hypothesis-making, observation through data gathering and interpretation and conclusion formulation to those pupils who are exposed to Cebuano-English and English medium of instruction; 2) correlate the language used and the result of the pupil's level of understanding on the steps of scientific method in order to determine if there is a significant difference on the type of medium used when implementing instruction or when conducting laboratory activity. This study would definitely build more understanding on how to effectively teach using the right medium in order to help the pupils to be scientifically literate.

2. Methods and Materials

Since the study gave focus on the degree or level of understanding of the learners on the steps of the Scientific Method of the Grade 4 pupils who were exposed to Cebuano-English and pure English languages, the researchers utilized the post-test design. The questions were focused on hypothesis-making, data gathering, data interpretation, and conclusion formulation. The questions that were used were from the book "Conquer Science for Primary Levels, 1st Edition, 2018" which was published by Singapore Asia Publishers Pte, Ltd. The researchers saw to it that the questions were parallel to the competencies intended for the lesson "Characteristics of Plants and their Habitats" as indicated in the Department of Education Science curriculum guide. Both schools have the same competencies. The post-test was administered to the Grade 4 pupils of Minolos Elementary School in Toledo City and Maria Montessori International School in Cebu City.

The main source of data for this study was the result of the post-test answered by the Grade 4 pupils in Minolos Elementary School (Toledo City) who are exposed to Cebuano-English medium of instruction and the Grade 4 pupils of Maria Montessori International School (Cebu City) whose pupils are exposed purely to English language. Although MMIS is an international school, majority of its pupils are Cebuano who speak English at home. Few of the pupils have two nationalities. On the other hand, the grade 4 pupils of Minolos Elementary School are purely Cebuano and they speak Visaya or Cebuano at home. Before the post-test was administered, similar teaching-learning process was implemented in the selected group of participants using English as medium of instructions for MMIS while MES utilized Cebuano-English. To know the significance of the result of the post-test, paired sample t-test is used.

To determine the sample size in each school, the researchers used the simple random sampling, specifically the lottery technique. There would be 48 participants in this study. Twenty-four (24) Grade 4 pupils in Minolos Elementary School and Maria Montessori International School were randomly selected. There were two (2) sections in MES and 3 sections in MMIS. Twelve (12) pupils were selected from each section in MES while eight (8) were selected from each section in MMIS. The Science subject teacher in each respective school delivered the instruction.

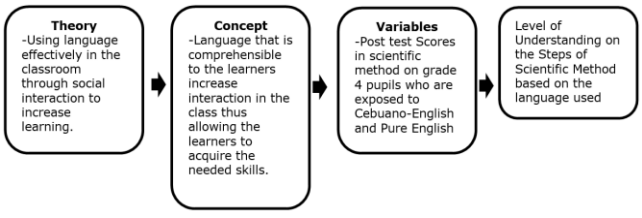

Fig 1: Schematic Diagram of the Study

2.1 Ethical Consideration

This study was conducted on the basis of the principles of ethical theory postulated by Murphy and Dingwall (2011), as cited by Almeida, *et al*, 2016 [1] which are beneficence, autonomy, and justice. These principles serve as the basis for this study in order to ensure that the target group would benefit from the study without compromising confidentiality and safety.

Before conducting the study, the researchers asked permission from the school's principal and submitted a letter emphasizing the purpose of the study and its relevance

to the learning of the pupils. Once approved, the researchers then discussed to the grade 4 Science teacher on the nature of the testing and its importance. It was clearly explained that both schools, Minolos Elementary School and Maria Montessori School would be experiencing the same teaching-learning cycle however, the Science teacher of MES would be using the Cebuano-English medium while the MMIS Science teacher would utilize pure English in delivering instruction. MES grade 4 pupils were exposed to pure Cebuano teaching from grade 1 to 3 since Cebuano was the identified mother tongue of the learners of the school. From grade 4 to high school, learners of MES would experience switching of codes (Cebuano to English or vice versa). MMIS learners on the other hand were exposed to pure English language from pre-school to high school since English was identified as the mother tongue of the school based on the learners' profiles.

The subject teachers and the pupils were made to understand the purpose of this study and its consequences. It was also explained that the test that would be conducted was embedded on the teaching-learning process in order to establish continuity of learning.

The researchers ensured that the participants were safe during testing. The participants stayed in their respective classroom with the subject teacher and the researcher. The researchers also assured that the profile of the pupils would be kept confidential. Each participant was also treated independently and fairly in order to avoid biases and to keep the validity of the result.

The result of the study would help the subject teacher in Science to come up with creative teaching strategy in order to make the pupils acquire the Science process skills needed for them to perform well in the subject with the use of the appropriate medium in implementing instruction. This will also enable the teachers to come up with language strategies that they can use to encourage interactive and meaningful learning especially that Science is a subject that requires manipulation of materials during learning experience.

3. Results

This chapter included the presentation of data. The presentation of data was arranged according to the levels of progression of the steps in the scientific method namely hypothesis making, data gathering, data interpretation, and conclusion making. The process skills needed to conduct each step are acquired and developed in the classroom through laboratory activities.

The mean scores, standard deviation and the P value from the post test result of the two groups based on the language used in the classroom, Cebuano-English (control = Grade 4 pupils of Minolos Elementary School) and Pure English (experimental = Grade 4 pupils Maria Montessori International School), were computed, analyzed and interpreted. T

Table 1: on the Result for Hypothesis Making Questions

	Mean	SD	t	df	P value	Decision	Interpretation
Scores of a Cebuano-English Class	3.3333	1.34056	.609	23	.548	Do not reject the null hypothesis	No significant difference
Scores of Pure English Class	3.1677						

Table 2: on the Result for Gathering Data Questions

	Mean	SD	t	df	P value	Decision	Interpretation
Scores of a Cebuano-English Class	2.7917	1.48840	.960	23	.347	Do not reject the null hypothesis	No significant difference
Scores of Pure English Class	2.5000						

Table 3: on the Result for Interpreting Data Questions

	Mean	SD	t	df	P value	Decision	Interpretation
Scores of a Cebuano-English Class	2.8750	1.69344	1.567	23	.131	Do not reject the null hypothesis	No significant difference
Scores of Pure English Class	2.3333						

Table 4: on the Result for Conclusion Making Questions

	Mean	SD	t	df	P value	Decision	Interpretation
Scores of a Cebuano-English Class	2.2083	1.04170	.196	23	.846	Do not reject the null hypothesis	No significant difference
Scores of Pure English Class	2.1667						

As shown in figure 1 to 4, the mean scores of both schools were close however the control group or the pupils who used Cebuano-English had a greater mean score. Furthermore, the results showed that there was no significant difference or there was no relationship between the type of language used when understanding the application of the steps in the scientific method.

4. Discussion

As the data implied, the mean score of the control group or grade 4 pupils who used Cebuano-English language in the classroom was greater in terms of hypothesis-making, data gathering, data interpretation, and conclusion making. These pupils were exposed to pure Cebuano from grade 1 to grade 3 since this language was identified as their mother tongue. The pupils were well acquainted on their first language, thus it was easy for them to understand the English terms or words used in the test that are related to hypothesis making, data gathering, data intepretation, and conclusion formulation (Tove and bSkutnabb-Kangas, 2000) [14]. Learning the first language enabled the pupils to understand the second language because foundation was already established through communication and interaction in the classroom (The Curriculum Journal, 2017).

Acquisition and application of science process skills has been a challenge in the classroom. Acquiring these basic science process skills cannot be done solely by teaching the concepts of scientific method (Lederman, *et al*, 2014) [6]. If a child does not comprehend the content then this will result to misconception. The child will be unable then to grasp the

meaning and the use of the basic process skills if in the beginning, the foundation of the language used is not established according to Bolton, 1977, as cited by Prophet and Dow, 2015 in their study entitled 'Mother-Tongue and Concept Development in Science: A Botswana Case Study.' Language is a major key in teaching Science. The delivery and effectivity of the language used when implementing instruction will depend on the skills of the teacher as implied in the Social Learning Theory of Albert Bandura and Lev Vygotsky.

It is indicated in the result that there is no significant difference between the languages used in understanding and applying the steps of scientific method. This means that, language is not only the key factor in achieving learning in a science class. Science is a subject that focuses on solving problems or conducting investigations in order to understand a particular scientific concept. Development of knowledge and skills happens when learners are given the chance to discover the lesson through inquiry according to Hakkarainen, 2003, as cited by Song and Kong 2014. Even if the child is well acquainted with his first and second language, learning will not be meaningful if it is not experiential and interactive as emphasized in Social Interaction or Learning Theory.

5. Conclusion

The results showed that the pupils of MES have better understanding on the application of the steps of the Scientific Method due to their code-switching (Cebuano-English or English-Cebuano) since the pupils are well-acquainted of the first language thus learning the second language is easy for them. However, teaching should not be entirely focused on translating terms. Learners need to actually experience learning in a Science class. On the other hand, the grade 4 pupils of MMIS is a mix of different culture. Using English as a medium of instruction for Science should still be practiced however, a program that will cater the pupils who do not speak the language well should be developed since learning technical terms and concepts in Science is difficult for them. Science teachers should venture or come up with language strategies to be used in teaching concepts that will enable the learners to comprehend the meaning of the technical or non-technical terms in Science. Whether the medium of instruction used is Cebuano-English or pure English, meaningful learning will be achieved if instruction is done creatively and innovatively. Science teachers should let the pupils experience learning by letting them conduct investigations or letting them actually apply the steps of scientific method. Since Science is an innovative subject, innovative teaching strategies should be utilized in the classroom. A science teacher should not only be proficient in a particular language, her teaching skills must be proficient as well.

6. References

1. Almeida, Gaerlan, and Manly. Research Fundamentals, From Concept to Output: A Guide for Researchers and Thesis Writers. Chapter 3: Ethical Guidelines and Considerations in Research, 2016, 28-31.
2. Catchen. The Importance of Scientific Method for Learning Life, 2014. Retrieved from https://ruthcatchen.wordpress.com/2014/04/10/the-importance-of-the-scientific-method-for-learning-and-life/.
3. Dela Cruz. The Philippine Daily Inquirer. Science ed and a thinking society, 2017.
4. de Jesus. Difficulties and Challenges in Teaching Science: The Aftermath of MTB-MLE, 2019. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3412898.pdf
5. Eslit. Mother Tongue Based Multilingual Education Challenges: A Case Study, 2017. Retrieved from https://pdfs.semanticscholar.org/c95e/1d32d85b16f99e2c5aad8118b5c6d7691ea9.pdf
6. Lederman-Lederman, Antink. Nature of Science and Scientific Inquiry as Contexts for the Learning of Science and Achievement of Scientific Literacy, 2013. Retrieved from https://files.eric.ed.gov/fulltext/ED543992.pdf
7. Mata. Pedagogical Competencies of Mother – Tongue Teacher Eduaction, 2014. Retrieved from https://files.eric.ed.gov/fulltext/EJ1038700.pdf
8. Mccomas. Understanding how science work: The nature of science as they foundation for science teaching and learning, 2017. Retrieved from https://www.researchgate.net/publication/318912990_Understanding_how_science_work_The_nature_of_science_as_they_foundation_for_science_teaching_and_learning.pdf
9. Padilla. Private schools have more leeway with new curriculum, 2013. Retrieved from https://newsinfo.inquirer.net/420069.
10. Prophet, Dow. Mother-Tongue and Concept Development in Science: A Botswana Case Study, 2015. Retrieved from https://www.tandfonline.com/doi/abs/10.1080/07908319409525178.pdf
11. Rolstad, Macswan. Frontiers in Psychology. The Facilitation Effect of Language and Thresholds, 2014. Retrieved from https://www.researchgate.net/publication/268450201_The_Facilitation_Effect_and_Language_Thresholds.pdf
12. Seidlhofer. A Concept of International English and Related Issues: From 'Real English' to 'Realistic English, 2003. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.475.6022&rep=rep1&type=pdf
13. Shodhganga. Chapter 4: Theoretical Background, 2014. Retrieved from https://shodhganga.inflibnet.ac.in/bitstream/10603/116425/14/14_chapter%203.pdf
14. Skutnabb-Kangas, Mccarty. Key Concepts In Bilingual Education: Ideological, Historical, Epistemological, And Empirical Foundations. Volume 5, Bilingual Education, eds Jim Cummins & Nancy Hornberger. Encyclopedia of Language and Education, 2nd edition, 2000, 3-17.
15. Song, Kong. Going beyond textbooks: a study on seamless science inquiry in an upper primary class, 2014. Retrieved from https://www.researchgate.net/publication/269286012.pdf
16. The Curriculum Journal. Language and Education. 2017; 28(4):443-445. Retrieved from https://doi.org/10.1080/09585176.2017.1378463.
17. Watson, James. NSTA WebNews Digest The Scientific Method: Is It Still Useful, 2004. Retrieved from https://www.nsta.org/publications/news/story.aspx?id=

49922.