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MOTHER TONGUE-BASED BILINGUAL EDUCATION PRACTICE FOR TEACHING PRIMARY MATHEMATICS IN RURAL SCHOOL

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Abstract

In an ethnically diverse country like Malaysia, educators often argue about the best medium of instruction to be used in teaching mathematics especially in primary school. Therefore, the aim of this study was to investigate the effectiveness of teaching mathematics employing the pupils' mother tongue as the medium of instruction in a rural primary school. Specifically, this quasi-experimental study was conducted to compare the effect of two treatments: using Bahasa Malaysia as the medium of instruction and using the pupils' mother tongue as the medium of instruction in teaching a mathematics lesson on the topic of 'Money up to RM1000'. The samples of this study consisted of two classes of Year 3 pupils from two rural schools in Kapit, Sarawak. Each class consisted of 16 pupils whose mother tongue was Bahasa Iban . Iban is one of the major ethnic groups in Sarawak. The class from the first school employed Bahasa Malaysia as the medium of instruction while the class from the second school employed Bahasa Iban as the medium of instruction. A pre-test and a post-test were administered to both classes before and after the study. The main finding from this study suggested a higher positive impact in learning mathematics for pupils using their own mother tongue as the medium of instruction. Thus, the incorporation of mother tongue in the primary mathematics classroom provides a better solution to aid rural pupils' understanding and development of basic mathematical concepts. Moreover, this could be considered as a crucial platform in knowledge acquisition in a country with diverse ethnic groups.

Introduction

Malaysia is widely known as a multi-racial country with a unique background of culture and traditional diversity. Findings by Hirschman (1987) depicted a list of ethnic classifications in the census of British-Malaya that consists of more than 80 different ethnics residing in Malaysia including all the native residents. This abundant variety of ethnic calls for a broad diversity of languages, and according to Lewis et.al (2013), there are 140 languages in Malaysia including 2 extinct languages.

The variety in languages thus affected the early stages of education in Malaysia, which had been through several changes in terms of medium of instruction used in imparting knowledge in schools. Before the nation obtained its independence in 1957, there was no clear uniformity and policy over the provision of education in Malaysia. Education system was conducted based on the needs of every ethnic focused by the British. Sugimura (n.d.) described the educational policy in the British colonial era as '*divide and rule*' which regarded as a cause of social economic differences among the three major ethnics.

The education system imposed included teaching in four different languages, emerging from the local ethnicity condition namely Malay, Chinese, English and Tamil. Hirschman (1972) stated that Malay, Chinese, and Indian vernacular schools were usually only attended by students whose mother tongue was the same as the language of instruction. Without a clear uniformity and syllabus in the provision of education, the focus of education forayed without guidelines and standards. Khoo and Fadzil (1980) stated that during the colonial era, most of these vernacular schools were located in the rural areas where they were taught to be a better fisherman and farmers.

The reformation of education policy began after the inter-communal Alliance Party government won the first general election in 1955 (Rudner, 1977). The needs of achieving the objectives under the perspectives of education were addressed with great importance by the education minister, which led to a written proposal in 1956 called the Razak Report. The proposed policy included the main objectives of incorporating National Language as the medium of instruction in standard primary school while preserving *Kuo Yu* and *Tamil* as the medium in standard type school (Ministry of Education, 1956).

The 1956 education policy was reviewed later by the next minister of education, Abdul Rahman bin Haji Talib in 1960 which became the basis of Education Act 1961. The report emphasized in making the National Language as a compulsory subject in primary school and gradually converting all the English medium school into a Malay medium school (Ministry of Education, 1960). Although in primary level, all national type schools were allowed to be operational using their mother tongue as the language of instruction, however in secondary level, Rahman Talib recommended that only Malay and English medium schools would continue to exist (Sugimura, n.d.).

However, in discussing the importance of the first language in primary school, it should be noted that Malaysia doesn't only comprise the three major ethnics in the country namely Malay, Chinese and Tamil but also many indigenous people. Many rural schools in Malaysia hold a unique value of being attended by indigenous people with a wide range of ethnic diversity. In Sarawak, these natives namely Penan, Iban, Bisaya etc populated areas that stretched along the north coast of Borneo. According to Collins and Ahmad (1999), first language speakers of Malayo-Polynesian languages other than Malay comprised 17.3 per cent of all Malayo-Polynesian speakers in Malaysia. This number suggested a numerous linguistic differences that can affect the effectiveness of education and knowledge conduit as Malay instructional language is to be used in these rural parts. The fluency of Malay language in these remote areas and inland parts is not to be ignored as these ethnics are not widely exposed to the national language, and thus creates challenges in providing an education tunnel by teachers.

Rationale

Among many rural societies, cultures and traditions encircle around their ways of life and survival in order to adapt to the physical environment. Since early childhood, people in rural society are taught about their collection of beliefs and understandings that allow them to continue their coexistence as part of the society. In accordance with the development of primary schools in rural areas, sudden changes in the aspect of instructional language within the classroom have created difficulties in the knowledge acquisition process, and somehow becoming a threat to their cultural identity. As stated by Cummins (2001), instructional language practice in school can unintentionally destroy the children language and their connection to the culture, which are contradicting the very essence of education. This study encompassed a small part of that cultural preservation by promoting a mother tongue-based bilingual practice in Mathematics education. Laying the importance of mother tongue practice in early Mathematics education can be a foundation of language preservation and knowledge achievement in Mathematics (Begi, 2014).

This study also aimed to provide a proper education channel for rural school pupils to gain access to knowledge in Mathematics. Several discussions had been done in highlighting the

gaps between rural and urban education to reduce the differences in education performance, as outlined by Osman and Rajah (2011). Beside cultural preservation, mother tongue-based bilingual practice also provides a link between education and the communities' lifestyle for several benefits. While learning in mother tongue-based bilingual, pupils are given an opportunity to develop proficiency in the second language and at the same time gain deeper understandings in the learning outcomes (Ball, 2013).

Rationale of the study is to bring pupils in rural area closer to Mathematics concepts, with the education itself being flexible and contextual. As described by Gacheche (2010), in most ethnically homogenous school, the national language is often not the main language at home. Consequently, the unfamiliarity to the language can affect the knowledge acquisition in school, thus affecting pupils performance. Hence, by using mother tongue-based education practice in a classroom, it could provide an opportunity to bring a proper and culturally integrated education that is digestible by the locals.

The null hypotheses for this research were as follows:

1. There is no significant difference in the pre-test mean score for the group using bilingual instructional language and Bahasa Malaysia instructional language.
2. There is no significant difference in the mean score for the group using Bahasa Malaysia instructional language in the pre-test and post-test.
3. There is no significant difference in the mean score for the group using bilingual instructional language in the pre-test and post-test.
4. There is no significant difference in the post-test mean score for the group using bilingual instructional language and Bahasa Malaysia instructional language.

The study

This research was conducted in two primary schools in rural area of Kapit, Sarawak. The first school and the second school are attended by 126 and 156 pupils respectively. For the first primary school which consists of 126 pupils, 97 percent of the pupils are Iban, whereby only 3 percent are Kenyah. The figure is almost the same for the second school which comprises 94 percent Iban and 6 percent Kenyah. Table 1 depicts concise information regarding the ethnicity of pupils within both schools.

Table 1 *Ethnicity of pupils attending both schools*

	Total	**Iban**	**Kenyah**
School 1	126	97 %	3 %
School 2	156	94 %	6 %

There were 2 classes involved in the research with a sample size of 16 and 19 respectively. The class from the first school was assigned as the treatment group (N=16), whereby the class from the second school was assigned as the control group (N=16). The groups were selected according to their respective teacher's recommendation. The treatment group (N=16) was taught by an Iban teacher, who is also proficient in Bahasa Malaysia, whereby the control group (N=16) was taught by a Malay teacher. This was to ensure the smoothness of the lesson that conducted by both teachers. Table 2 and Table 3 show the details in both of the groups involved in the research.

Table 2*Number of participants in each group*

	Sample size (N)	
School 1	N=16	*Treatment Group*
School 2	N=16	*Control Group*

Table 3*Ethnicity and gender by groups*

	Ethnicity		Gender	
	Iban	Others	Male	Female
Treatment Group	100%	-	56%	44%
Control Group	100%	-	63%	37%

The procedure of collecting data for the study was divided into 3 stages, namely *1)collecting pre-test data from all the participants, 2) 5 days of treatment and lessons in both schools and 3)collecting post-test data from all the participants.* During the first stage, the pre-test session was conducted after all the parental consent forms were collected from all of the participants to gain permission from every parent for pupils' participation in the study. The time given for the pre-test was 1 hour. The pre-test scores for participants were recorded as **pre-test data**.

In the second stage of the research, treatment was conducted for 5 days in each classroom involved. The duration of each lesson was 1 hour daily. In the first school, which was selected as the treatment group, the lesson was conducted bilingually that integrated Bahasa Iban with Bahasa Malaysia. Discussion was made between the researcher and the teacher to determine the amount of time for the incorporation of Bahasa Iban in the lessons.

As for the control group, the teacher in the second school conducted the lesson for the same duration as the treatment group. However, the lessons were conducted fully in Bahasa Malaysia.

The final stage of data collection involved the post-test session which were conducted a week after the second stage was completed. The post-test questions were almost identical to pre-test questions with some minor changes. The time allocated for the test was the same as the pre-test which was 1 hour. The scores for every participant were recorded as **post-test data.** Table 4 depicts an overview of the data collection process for every stage involved.

Table 4 *Data collection process*

	Group	Before		After
School 1	Treatment Group	Pre test	→Lesson in Bahasa Malaysia	Post test
School 2	Control Group	Pre test	→Lesson in Bilingual Language instruction	Post test

Pre-test analysis

In order to determine the effect of mother tongue-based bilingual education practice in teaching Mathematics, pre test analysis was done using an independent T-Test analysis to find any significant difference between the scores of the 2 groups involved, namely control and treatment groups.

Table 5 *Independent Samples Test (Pre Test)*

		Levene's Test		T-test for Equality of Means		
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**
Pre-test	**Equal variances assumed**	0.04	0.85	0.14	30	0.89
	Equal variances not assumed			0.13	31.22	0.89

As shown in Table 5, result from the Levene's Test suggested a p-value of 0.85 which gave the assumption of equality of variances between control group and treatment group. From the assumption, the first row which assumed the variances between both groups to be equal was used to determine any significant differences in pre test result between both groups. As can be seen from the result, the *p*-value was given as 0.89, which suggested the null hypothesis should not be rejected. Hence, it can be concluded that there was no significant statistical difference between the control group and the treatment group at 5 percent significant level as far as the pre-test data was concerned.

Pre Test and Post Test Analysis for Treatment Group

The paired T-Test was used to analyze the treatment group which used bilingual instructional language that incorporated the mother tongue language in teaching and learning processes. The analysis was done to determine whether any differences in pupils performance existed after the intervention was implemented, as indicated in the third hypothesis.

Table 7 *Paired Samples Test (Pre Post Test for Treatment Group)*

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pre_Test - Post_test	-12.50	12.38	3.09	-19.10	-5.90	-4.04	15	.00

Table 7 represents an inferential analysis for the pre test and post test scores for the treatment group of 16 pupils which were taught using mother tongue-based bilingual practice. As indicated in Table 4.10, mean difference between the tests was -12.50 that suggested the mean pre test score was cumulatively less than the mean post test score. Also, it was indicated that the *p*-value for the treatment group was 0.00 ($p < 0.05$). Then, $t(15) = -4.04$, $p = 0.00$ suggested that the null hypothesis was rejected and there was a significant difference between mean pre test and mean post test scores after the intervention at a 5% level of significance. The pupils seemed to score higher after the intervention of using mother tongue-based bilingual with a mean difference of -12.50.

Post Test Analysis

An independent T-test analysis was implemented to find any significant difference between the mean post test scores from both treatment and control groups.

Table 8 *Independent Samples Test (Post Test)*

		Levene's Test		T-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Post-test	Equal variances assumed	0.59	0.45	0.98	30	0.33
	Equal variances not assumed			0.99	31.99	0.33

As indicated in Table 8, the analysis gave a *p*-value of 0.45 ($p < 0.05$). Hence, the variances were assumed to be equal between the control group and the treatment group. The upper row within table 4.12 showed the result if the variances were assumed to be equal and from the result, the *p*-value was 0.33 ($p < 0.05$), which suggested that the null hypothesis should not be rejected. Hence, it can be concluded that there was no significant difference between the post-test scores for the treatment and control group at 5% level of significance.

Discussion

Several factors affected the researcher's interest in measuring the effect of using mother tongue-based bilingual education practice in teaching early primary mathematics in rural school. Findings in a study by UNICEF (2011) described better learning outcomes of mathematical based assessment with the implementation of mother tongue bilingualism approach in teaching. This was further supported by Espada (2012), Muke (2005), Niesche (2009) in their study that discussed the positive effect of using mother tongue-based multilingualism in mathematics classroom. However, serious recommendation and study regarding the language of the minority ethnics residing in rural areas in many regions in Malaysia has not been considered as a stepping stone of closing the gap between rural and urban pupils; academic performances. This study by the researcher attempted to highlight the potential of acquiring a better academic performance in mathematics for pupils in rural Kapit by exposing them to a mathematics instruction incorporating their mother tongue, specifically Bahasa Iban alongside the proper medium of instruction, Bahasa Malaysia

Referring to pre test analysis, the initial performances of pupils from both groups were statistically proven to have no significant difference. This meant that they had almost the same ability as suggested by the mean pre-test scores of 39.47 for the control group and of 40.63 for the treatment group. However, looking at the post test analyses of the study, the result suggested that there was no significant difference between both groups involved in the study.

However, as mentioned previously, it seemed that both groups improved their performances which were statistically significant after both interventions were implemented. However, as seen in Figure 1, the changes made by the intervention of using mother tongue-based bilingual lesson showed a higher positive impact towards the post test scores as compared to the group using solely Bahasa Malaysia. The outcome was supported by evidence from UNESCO (1953) that suggested the best medium for teaching a child is in his mother tongue, which would give the best learning environment than through an unfamiliar linguistic medium.

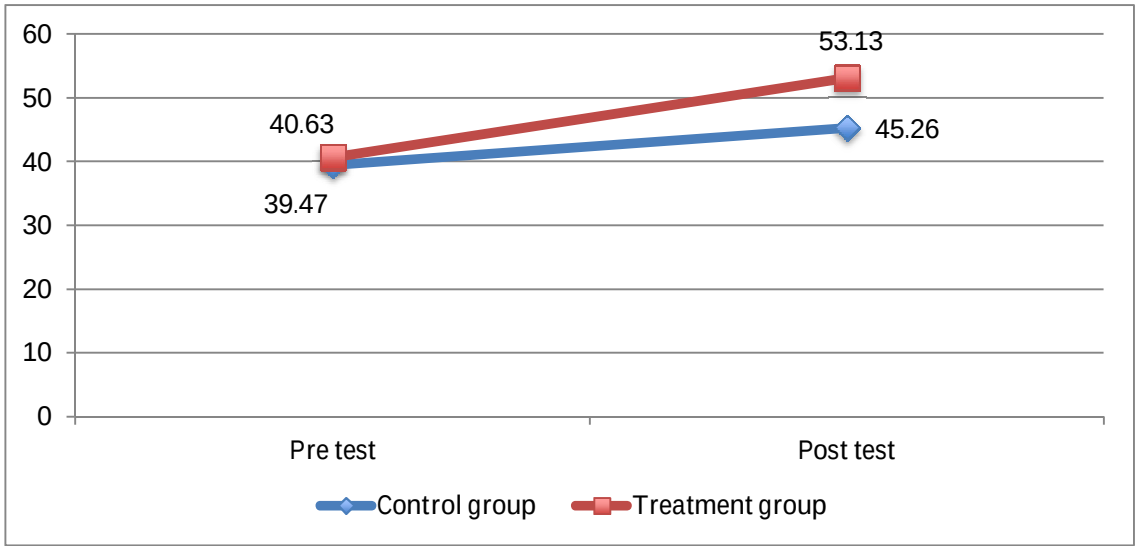

Figure 1 *Mean analysis for control and treatment group*

In a qualitative study by Noren (2008), the incorporation of mother tongue was found to provide an easier access and information gain in fundamental knowledge in mathematics. In addition, Noren also found difficulties faced by pupils from Swedish minority groups due to communication barrier in achieving cognitive creativity to solve mathematics problems The findings were also consistent with a quantitative study by Israel and Thomas (2013), who conducted a quasi-experimental study in Nigeria about mother tongue-based instruction, which demonstrated higher positive changes in groups that use mother tongue in their classroom.

Conclusion

The study was set out to explore the effect of mother tongue-based bilingual education practice for minority ethnics in Kapit, Sarawak in teaching Mathematic, as compared to the standard method of using Bahasa Malaysia. Although Bahasa Malaysia is the National Language that is prevalent throughout Malaysia, many minorities living several kilometers inland of rural Sarawak have minimum exposure to the language on every day basis. For children in schools, especially those in primary schools, the use of an unfamiliar language as the instructional medium in school can be uncomfortable and could affect their understanding of mathematical concepts and thus could lead to less participation in the classroom.

However, the question of appropriate role of language continued to linger among many nations with sizable ethnic minorities in determining whether to maintain their national language as the sole instructional medium in school. As remarked by Cummins (2001) mother tongue bilingualism not only impacted the understanding of concepts, it also encourages pupils to create a relationship between the concept and the majority language. As the pupils continue to gain deeper understanding of mathematical concept in their language of comfort, they are exposed to the majority language indirectly that subsequently promotes fluency for the majority language.

While every ethnic is trying to preserve the traditions and culture, educators have to think of a way to assimilate learning process with the local culture for effective learning. As highlighted by Stigler and Hiebert (1999), teaching can be cultural to present the knowledge in a digestible form for a particular culture. For decades, Iban people try to preserve their language by continuing the practice among their children. Respecting that effort, it is possible for educators to employ incorporating mother tongue into the classroom instruction which would also strengthen the pupils' practice of communication.

The researcher believed that incorporating mother tongue in mathematics classroom benefits pupils in term of knowledge acquisition. Learning of mathematics requires several conceptual understandings and certain degree of imagination that need to see the flow of mathematical notions. Aided by representations and diagrams that could strengthen pupils' interest in learning mathematics, the influence of language too holds certain keys to encourage their participation and digestion of knowledge.

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