

Mother Tongue-Based Bilingual Education and Concept Formation in Children in Bafut Sub-Division

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ABSTRACT

This study aimed at investigating mother tongue-based bilingual education and concept formation of children in Bafut in the North West Region of Cameroon. A quasi-experimental design was adopted whereby 20 male and female children were purposefully selected for the study. An adapted version of the Mayer and Mayer (1975) picture description task, a language comprehension test, as well as a sociolinguistic Questionnaire were used to measure the language proficiency of participants. Both the bilingual and monolingual samples were administered the symbol substitution task, the Dimension Change Card Sort (DCCS), Test of Linear measurement and object classification task to measure their concept formation abilities. Data were analyzed using a pre-designed EpiData Version 3.1, SPSS version 21.0, Mann-Whitney U test and Spearman's Rho correlation test. Results indicate that there was no bilingual advantage in the various tasks. The main explanation for no bilingual advantage lies in the fact that a predominantly subtractive bilingual sample was used. Recommendations were made to stakeholders, as well as suggestions for further research and conclusion.

KEYWORDS: *Mother tongue, Bilingual education, subtractive bilingualism, concept formation*

INTRODUCTION

Research has widely hypothesized that bilingualism affects some core cognitive functioning of children like metalinguistic awareness (Ben-Zeev, 1977), selective attention (Bialystok, 2000), and concept formation (Liedtke & Nelson, 1968). Concepts according to Carey (2000) are like mental representations that, in their simplest form, can be expressed by a single word, such as plant or animal, alive or dead, chair or table, pear or banana. Concepts may also represent a set of ideas that can be described by a few words. Carey goes further to say that through the use of language, individual concepts can be connected to build more complex representational structures, like for example, "fishes swim" or "dogs bark". At other times two concepts can be combined to form a third representational structure. An example of this can be "density" which is the "matter" per "volume", that is, a concept that stands in itself but is a product of two other concepts. Carey (2000) claims that new concepts can be created that can stand by themselves, and more complex concepts can describe a whole idea, like for example "the big bang model of the universe." In other words, within a particular representational structure, concepts help us make deductions and explain even more complex ideas. Carey concludes that concepts can act like building blocks of more complex or even abstract representations.

As far as Keil (1992), Lamberts & Shanks (1997), Margolis & Laurence (1999) and Murphy (2002) are concerned, concepts are among the basic building blocks of human cognition, knowledge, and learning. Concepts help us organize or have a map of the world in what Piaget (1929) describes as schematic organization which occurs through the processes of assimilation and accommodation. These authors maintain that coping with the world requires that we operate with increasingly complex theoretical concepts.

The theoretical underpinnings of this study was informed by Piaget's (1929) Theory of Cognitive Development with focus

being on object classification. Piaget holds the view that our conceptual representation of the world, our experiences and knowledge are stored in the form of schemas (schema is the structure of knowledge). In line with Piaget (1929) on how we represent experiences in our mental or conceptual structure of knowledge, Helm & Novak (1983); Novak (1987); Smith, DiSessa & Rochelle (1994) claim that children come to school with already formed ideas on many topics, including how they view and interpret the world around them. They go further to say that children have their own individual present knowledge, beliefs and ways of thinking. Drawing from Piaget and other proponents who claim that children's past experiences play a role in learning, Pinker (2003) holds the view that children do not enter the classroom a "blank slate".

Balaban & Waxman (1997), Welder & Graham (2001) and Xu (2002, 2005) have all looked at the impact of language on concept formation very early in development. These authors posit that when language effects are found later in development, it may be the case that children have learned certain correlations between aspects of language and aspects of cognition without language being a causal factor in conceptual development.

In a study on conceptual development in children, Ben-Zeev (1977) tested children on Piagetian classification and reclassification tests. Although the results were mostly only marginally statistically significant, the trends were in favour of bilinguals. Bilinguals tended to give more classifications, were less inconsistent across the tests and gave more attention to detail. Using six tests of linear measurement from Piaget (1929), Liedtke & Nelson (1968), on their part found that bilinguals were ahead on concept formation. They were more advanced on the concept of conservation (for example, of the length of plasticine when changed from a ball to a "worm") and on the concept of measurement.

Statement of the Problem

In our society, it is quite glaring that the language in which children are enculturated and socialized at home is not often the language they encounter in school. Cameroon is a country with about 248 national languages (Breton and Fohitung, 1991). One might look at this rich linguistic background as diversity in every aspect of culture. Unfortunately, such diversity is not reflected in the school system. By the time children begin school, the mother tongue in which they have been socialized from birth fast becomes a minority language, and they have to undertake learning in a second language. Thus, as children go to school, they are more and more alienated from their linguistic roots. In terms of language, learning in our schools is disconnected from everyday life. If language is indeed a tool for cultural transmission, then a great deal of learning takes place through the mother tongue.

Research has proven that a solid foundation in one's primary language is a sine qua non in learning a second language (Vygotsky, 1987). The Cameroon school system, however, has not provided the necessary foundation for children to be properly grounded in their mother tongue for a smooth transition into English Language education. This means that most of our children end up not effectively mastering the two languages (mother tongue and English), which invariably affects learning in the classroom. As a result, their conceptual development is not provided the necessary stimulating environment to thrive. Children find it easier to learn new concepts and information based on what is already familiar to them, working from simple to more complex knowledge. This lack of, or delay in conceptual development leaves a gap in terms of developing children's reading ability, understanding the rules of grammar, and learning as a whole.

Aim of the Study

This study aimed at investigating whether mother tongue-based bilingual education will influence concept formation in children

Research Question

Can mother tongue-based bilingual education influence concept formation in children?

Hypothesis

Ho: Mother tongue-based bilingual education will not influence concept formation in children

Ha: Mother tongue-based bilingual education will influence concept formation in children

Research Method

This study adopted a quasi-experimental design wherein 10 Bafut and English speaking subtractive bilingual samples were compared against 10 monolingual control group of exclusively English speaking children. In this regard, one might consider bilingualism as an environmental treatment to be compared with the alternative treatment of monolingualism. The type of quasi experimental design used was the non-equivalent control group post-test only design.

A sample of 20 pupils from primary 3 to 6 aged 7 to 8 years were purposively selected. Purposive sampling enabled the researcher to make sure those in the experimental group were bilingual (able to speak English and Bafut) while those in the control group were fluent only in English language.

The researcher controlled for age, class, gender and socioeconomic background. The researcher made sure that he got the informed consent of the participants, their teachers, parents and school authorities, so that the participants were all aware of what the experiment was about.

A 20 item 5 point Likert scale sociolinguistic questionnaire was designed for the participants, alongside a Picture-based Oral Proficiency task adapted from Mayer and Mayer (1975) and an oral comprehension tests (20 semi structured items) were administered to test the children's proficiency in English and Bafut. To measure children's conceptual development the symbol substitution task (analysis and control) (adapted from Ricciardelli (1992) and Cromdal (1999)), Dimensional Change Card Sort (DCCS) (adapted from Bialystok (1999); Bialystok & Martin (2004)), object classification task (Cummins, 1978) and Linear Measurement Task (Piaget, 1929; Liedtke & Nelson, 1968) were employed.

Validity in the language test items was ensured by making sure that language experts in the faculty and in the schools where the study was conducted went through the items to ensure that the wordings, as well as the test items matched the level of the participants. Moreover, cross linguistic translation from English to Bafut was facilitated by the Bafut language teachers in the schools where the research was carried out. As for the tasks to test concept formation the tasks used were standardized and their validity have been proven by previous research.

Procedure

Having screened the participants for language proficiency, those who scored above average in each of the three tests of proficiency in both Bafut and English were placed under the Bilingual (experimental) group while those who scored above average in English and below average in Bafut were placed under the monolingual (control) group (English only). Thereafter, all the 20 participants were administered tasks to measure their concept formation. The first of these tasks was the DCCS whereby Children were asked to follow a simple rule to sort a set of cards and then reverse that rule to sort the same cards in a different way. Frye, Zelazo, & Palfai (1995) and Bialystok (1999) have used this task in their study. In this task, children were shown two large card boards, one was carved in the shape of a square, and the other was round. One of the cardboards had a pink color and the other was yellow. The children were then given a set of cards containing instances of shape-color combinations that reversed the pairings, in this case, yellow squares and the pink circles. Children were first told to sort by one dimension, for example, color, and place all the yellow squares in the compartment indicated by the yellow circle and all the pink circles in the compartment indicated by the pink square. When they had completed that phase, the post switch phase required them to re-sort the same cards by the opposite dimension, shape. In this case, the yellow squares must be placed in the compartment indicated by the pink square and the pink circles must be placed in the compartment indicated by the yellow circle. Response time and errors were computed for both the pre-switch and post-switch phases of the task to get participants' scores.

The next task was the symbol substitution task whereby children were required to substitute given words for target

words in sentences, despite the fact that the results violated semantic and syntactic rules. For example, the children were told that the way we say 'she' is to say 'fish'. So how do we say 'she' likes swimming? Hence this task placed higher demands on children's ability to control linguistic processing. Going beyond control to analysis of linguistic processing, children were then required to correct the resulting grammatical error. Thus greater demands were placed on the analysis of language. For instance, children were told to substitute the word 'she' with 'they' in 'she is laughing'. Then they were asked to do the necessary changes to make the sentence sound right. That is, the children were told to change 'is' to 'are' so that the sentence could be read as 'They are laughing'. There were 8 items in this test. Time use and errors were computed to get participants' scores.

The object classification task was based on Piagetian (1952) classification task. In this task, children were asked to group objects into particular categories based on color, shape and function. For this task 12 flowers (purple, yellow, blue purple, red), 6 bowls (lemon green, blue, Red), 8 pens (2 white, 2 red, 2 blue, two black), and 6 assorted items (1 white (bic), 1 red (comb), 1 blue (charger), 2 lemon green ball and a toy fruit) were used. Response time and errors were computed to get participants' scores.

The test of Linear Measurement was also based on Piagetian (1952) conservation test. For this task, two rulers of equal length were used. For the pre-switched phase, children were required to indicate which ruler was longer when the rulers were placed equally on the same position. During the post-switch phase, one ruler was slightly moved forward and children were asked to say which one was longer. Response time and errors were computed to get participants' scores.

Data Analysis

A pre-designed EpiData Version 3.1 database which has in-built consistency and validation checks was used to enter the data. Further consistency, data range and validation checks were also performed in SPSS version 21.0 (IBM Inc., 2012) to identify invalid codes and data were analyzed using this very software. A Mann-Whitney U test was used to compare two independent groups for significant difference, for instance monolingual and bilingual, male and female. To compare more than three groups, for instance monolingual, early bilingual, unbalanced bilingual and subtractive bilingual, Kruskal Wallis test was used. Inter-item correlation was performed using the non-parametric Spearman's Rho correlation test. Frequency and proportions were used to describe individual categorical indicators and to compare categories for equality of proportions using the Chi-Square test. All statistics were discussed at the 0.05 significant level ($\alpha=0.05$).

Sample description

Gender

Having identified gender as an intervening or control variable, both genders were equally represented, 50% (10) male and 50% (10) females.

Age

Age was considered a variable which, if not controlled could influence the result of the study. Hence, the gap in participants' ages was not big. Participants were about the same ages, ranging from 7 to 8 years. This is the age group that represents late bilingualism.

Class

Given that this study deals with cognitive abilities, it was necessary to look at class as a potential variable which, if not properly controlled could influence results. Their classes ranged from class 3 to 6.

Parents' Occupation

Parents' occupation was equally identified as one of the extraneous variables, which, if not controlled could influence the result of the study. 40% of the participants had parents with unskilled occupation while 60% had parents with semi/unskilled occupation.

Parents' Level of Education

Parents' level of education was identified as one of those background variables which, if not controlled could influence the result of the present study. 50% of participants' parents had attended secondary school, 40% had attended high school and 10% had attended university. Therefore, all the parents of the participants had minimum education at least at the secondary level.

Results

Table 1: Comparing language tasks' scores, task time and errors for Bafut

| | | Bilinguals | Monolinguals |
|-------|--------|------------|--------------|
| Time | N | 10 | 10 |
| | Mean | 133.70 | 145.60 |
| | Median | 132.50 | 144.00 |
| Error | N | 10 | 10 |
| | Mean | 1.10 | 12.70 |
| | Median | .50 | 12.50 |

Comparing Bafut language tasks time scores, bilinguals recorded a mean time of 133.70 as against 145.60 for monolinguals. This time difference was significant ($P<0.05$). As for errors, the bilingual sample recorded fewer errors (1.10) relative to the monolingual sample who recorded 12.70.

Table 2: Comparing language tasks' scores, task time and errors for English language across cohorts

| | | Bilinguals | Monolinguals |
|-------|--------|------------|--------------|
| Time | N | 10 | 10 |
| | Mean | 129.80 | 146.10 |
| | Median | 133.50 | 145.50 |
| Error | N | 10 | 10 |
| | Mean | .30 | .10 |
| | Median | .00 | .00 |

As for tasks time scores for English language, bilinguals had used less time (129.80) compared to monolinguals (146.10) in completing the task. This time difference was significant ($P<0.05$). As for errors, the trend was different with bilinguals recording slightly more errors (.30) than monolinguals (.10).

Table 3 Comparing Concept Formation Ability Between Subtractive Bilingual and Monolingual Children

| Tasks | | Subtractive bilingual (N=10) | Comparable monolingual (N=10) | Mann-Whitney U |
|---|-----------|------------------------------|-------------------------------|-----------------------------------|
| Classification task time (second) | Mean± SEM | 60.60±4.44 | 55.00±3.31 | U=33.000 P=0.196 |
| | Median | 59.50 | 57.50 | |
| | SD | 14.05 | 10.48 | |
| | Range | 45-95 | 35-65 | |
| Classification task error | Mean± SEM | 1.00±0.00 | 0.50±0.17 | U=25.000 P=0.012 |
| | Median | 1.00 | 0.50 | |
| | SD | 0.00 | 0.53 | |
| | Range | 1-1 | 0-1 | |
| Dimension change card sorting task time (second) | Mean± SEM | 39.30±3.35 | 37.20±3.98 | U=16.000 P=0.010 |
| | Median | 35.50 | 34.00 | |
| | SD | 10.59 | 12.58 | |
| | Range | 24-56 | 22-62 | |
| Dimension change card sorting task error | Mean± SEM | 0.50±0.27 | 0.20±0.13 | U=43.000 P=0.485 |
| | Median | 0.00 | 0.00 | |
| | SD | 0.85 | 0.42 | |
| | Range | 0-2 | 0-1 | |
| Symbol substitution task time (second) | Mean± SEM | 45.50±2.32 | 44.70±1.54 | U=46.500 P=0.790 |
| | Median | 44.50 | 45.00 | |
| | SD | 7.35 | 4.88 | |
| | Range | 35-55 | 37-52 | |
| Symbol substitution task error | Mean± SEM | 0.90±0.38 | 1.00±0.36 | U=48.000 P=0.872 |
| | Median | 1.00 | .50 | |
| | SD | 1.20 | 1.15 | |
| | Range | 0-4 | 0-3 | |
| Linear measurement test rope (progression score) | Mean± SEM | 1.00±0.00 | 1.00±0.00 | U=50.000 P=0.000 |
| | Median | 1.00 | 1.00 | |
| | SD | 0.00 | 0.00 | |
| | Range | 1-1 | 1-1 | |
| Linear measurement test ruler (progression score) | Mean± SEM | 1.00±0.00 | .90±0.10 | U=45.000 P=0.317 |
| | Median | 1.00 | 1.00 | |
| | SD | 0.00 | 0.32 | |
| | Range | 1-1 | 0-1 | |
| Total time for concept formation | Mean± SEM | 146.40 | 137.90 | U=18.500 P=0.017 |
| | Median | 147.00 | 142.00 | |
| | SD | 20.452 | 21.179 | |
| | Range | 105-180 | 100-163 | |
| Total error for concept formation | Mean± SEM | 3.40±0.45 | 2.60±0.52 | U=33.000 P=0.190 |
| | Median | 3.00 | 2.50 | |
| | SD | 1.43 | 1.65 | |
| | Range | 2-6 | 0-5 | |

Looking at the task individually on table 32, subtractive bilinguals used more time (60.60) for the classification task compared to the monolingual sample who recorded a mean time of 55.00. As for errors, subtractive bilinguals had a mean error of 1.00 as against 0.50 for the monolingual sample. As for the DCCS task, the trend was similar with subtractive bilinguals scoring a mean error of 0.50 as against 0.20 for the monolingual sample. In terms of time for this task, subtractive bilinguals used slightly more time (39.30) relative to monolinguals who recorded a time value of 37.20. For the symbol substitution task, both groups recorded similar error scores with subtractive bilinguals scoring 0.90 as against 1.00 for the comparable monolingual sample. As for time for this task, subtractive bilingual sample, once more, used more time (45.50) in completing the task relative to their monolingual counterpart who used a mean time of 44.70 although this difference was not significant.

Finally, as concerns the Linear measurement task the mean error was similar for both groups with subtractive bilinguals

recording a mean of 1.00 as against .90 for the monolingual sample. In terms of the average performance for all four tasks, subtractive bilinguals had slightly more errors (3.40) than the comparable monolingual sample (2.60). As for time for concept formation, subtractive bilinguals had higher value of 146.4 as compared to 137.9 for monolinguals indicating a significant difference ($P < 0.05$). On the basis of this, the null hypothesis was accepted and the alternative hypothesis rejected. Therefore, subtractive mother tongue-based bilingualism will not improve concept formation in children.

Discussion

The result of this study which portrays no bilingual advantage as far as concept formation is concerned is in synergy with Bialystok and Shapero (2005) who found that bilinguals did not differ from monolinguals in the duck-rabbit. Kohnert et al. (1998) on their part found that bilinguals scored below the norms on the Boston Naming test. The present result is also consistent with Prior &

MacWhinney (2010) who found no evidence for the bilingual advantage in mixing costs (difference in performance between single-task blocks and non-switch trials in mixed-task blocks). It is also in line with Lanco-Worrall (1972) who in a study to find out whether bilingual children are aware that words are arbitrary by calling for explanations of names found no differences between the bilingual and the monolingual group.

These results would show evidence for the monitoring processes underlying categorization, but no differences in performance between monolinguals and bilinguals. It is worthy to note that most of the tasks used to measure concept formation (for example, object classification), did not require any switching. Due to the fact that switching was not required, it was very possible that monolinguals would be able to perform at the same level as bilinguals. Typically, the bilingual advantage is shown when the tasks are more cognitively taxing (that is, switching mental sets). Note should be taken that Switch trials require more mental resources to correctly categorize the stimulus, which takes more time, and this is reflected in the reaction time trends.

Notwithstanding the above studies supporting a bilingual disadvantage or no advantage for bilinguals, it is evident that this indeed was an interesting finding as the null hypothesis was accepted, hence, rejecting the alternate hypothesis. One might wonder why but there is enough literature to substantiate this position. The contextual realities of this study whereby a weaker version (subtractive bilingual) of bilingualism was sampled offer another plausible explanation. To begin, it is important to note that most of the earlier studies that found a bilingual advantage focused more on the balanced and more efficient bilinguals and did not focus on subtractive bilingualism or less efficient bilinguals which is what this hypothesis investigated. Subtractive bilingualism, it must be reminded is the opposite of additive bilingualism. In subtractive bilingualism, one of the languages, as well as the culture that comes with it is gradually being deemphasized in the daily life of the bilingual child. This is a less efficient group relative to their additive bilingual counterparts.

The results of the present study were contrary to Ben-Zeev (1977) and Liedtke & Nelson (1968). Ben-Zeev (1977) tested children on Piagetian classification and reclassification tests. Although the results were mostly only marginally statistically significant, the trends were in favour of bilinguals. Bilinguals tended to give more classifications, were less inconsistent across the tests and gave more attention to detail. Using six tests of linear measurement from Piaget (1952), Liedtke & Nelson (1968) found that bilinguals were ahead on concept formation. They were more advanced on the concept of conservation (for example, of the length of plasticine when changed from a ball to a "worm") and on the concept of measurement. The authors explained their findings through the possible different social interaction and social environment of bilinguals, rather than through the ability to analyze language which in turn accelerates concept formation. The bilinguals may have two cultural worlds and additional experiences due to operating in two languages. For Liedtke and Nelson (1968), it is the additive social and cultural experience that benefits concept formation.

The explanation provided by Liedtke and Nelson (1968), thus provides an aha moment in terms of understanding why the results of the present study are not in favour of the bilingual children. Liedtke and Nelson (1968), posit that it is the additive social and cultural experience that benefits concept formation. Particular attention must be paid to the word additive which is the direct opposite of subtractive. The findings of these authors are explained within the context of additive bilingualism whereby the cultural and social experience is enriching and both languages are equally emphasized in the life of a bilingual child. Unfortunately, the present study did not study additive bilingual children but rather looked at subtractive bilingual children whose social and cultural experience with one of their languages is gradually being eroded if not deemphasized.

It should be noted that the sample of the present study learnt the mother tongue (Bafut) up to class four and at the beginning of class five; they were no longer taught Bafut but more of English language. Thus, the Bafut language is gradually being deemphasized in favour of English (subtractive). Such a group, compared to their additive counterparts cannot be efficient enough and equally in both languages. Additive bilingual children are more efficient than the subtractive bilingual children in terms of their bilingual competence. This now gives us the latitude to delve more into the nature of additive and subtractive bilingualism and make proposals for the type of bilingualism (additive) that promotes social, cultural and linguistic enrichment rather than one (subtractive) that reduces, and takes away opportunities for social, cultural and linguistic enrichment of children.

Limitations

One major limitation of the present study is that the tasks are not generalizable to everyday life. Bilinguals are not switching between languages for every word they utter. A code-switch does happen from time to time, but for the most part, bilinguals only switch languages when they are switching contexts or situations. There are always exceptions, but bilinguals generally do not rapidly switch languages in the same way that they switched between instructions in the task.

Recommendations

Firstly, Bilingual dictionaries in mother tongue and English should be developed for at least three major local languages in each region of Cameroon at all levels and Africanize words if necessary as English does. Secondly, the curriculum should be organized around events and tasks which students work on together and which require the use of language. This will provide students with more opportunities to express themselves within a bilingual context, hence enhancing their bilingual abilities. Thirdly, resources such as dictionaries, encyclopedias, books, schedules in both mother tongue and English necessary to accomplish tasks should be made available to all students. This will facilitate their knowledge of languages. Fourthly, Government and policy makers should go beyond looking at bilingualism as a panacea to nation building and invest more energy, resources and man power into tapping more into the cognitive benefits that bilingual education has in store.

Conclusion and Suggestions for Further Research

The results of this study point to the fact that within a subtractive bilingual context, there will be no bilingual

advantage over monolinguals when it comes to concept formation. The use of a predominantly subtractive bilingual sample for this study eliminated a bilingual advantage and this has been substantiated by the fact that with this version of bilinguals, part of their culture is gradually being eroded as they are being introduced into a more dominant and prestigious language. The result thus makes the case for a more balanced, if not additive bilingualism to be encouraged in our society. Future research should focus on longitudinal studies that look at how monolingual and bilingual children develop both linguistically and cognitively over an extended period of time. Future studies should also clarify the effect of proficiency compared to exposure in regards to bilingual advantage, and how the similarity or difference between a bilingual's languages modulates cognitive processing.

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