



Code-Switching: A Means to Alleviate Mathematics Instruction to Learners with Limited English Proficiency

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Abstract. The Philippines is an archipelago that has been colonized by a number of countries over the years. One of the consequences of colonization is that the Philippine language has been influenced; it is evident in both formal and informal conversation of Filipinos. Even today, their impacts are still visible and have a massive effect, as seen in the Philippine educational system. Since language is such an important factor in the teaching-learning process, especially in multilingual classrooms with students from varied linguistic and socio-cultural backgrounds, code-switching has become a common practice. This paper aims to investigate the pedagogical impact of code-switching in teaching Mathematics. An experimental research method was used, which involved a questionnaire, interviews, assessment tools, and observation. Results showed that students who utilize their primary language along with English while learning perform better than individuals who do not.

Keywords: English Proficiency · Mathematics · Code-switching · Taglish

1 Introduction

Code-switching is a change by a speaker of a language or language assortment to another. It can happen in many situations, for example, when a speaker poses their inquiry in one language while the other individual answers in another or assortment thereof. In the educational context, code-switching is defined as the act of exchanging between a first language and an optional language. It is perceived as the quickest, least demanding, and the best method for saying something.

Over the previous years, numerous researchers looked into code-switching. An investigation uncovers that code-switching is successful in showing an unknown dialect. Like in other subjects, code-switching is utilized in the discussion of Mathematics, in which the more significant part of the learners is honestly confronting a few troubles in word-problem issues. Code-switching was noted as a vital instructive asset and intended to encourage the numerical comprehension of the students [1]. There are likewise a few investigations that analyzed the viability of code-switching in this area.

An analytical study explored the functions of code-switching in multilingual public elementary schools in Ile-Ife, Nigeria [2]. It decided the impacts of the dialects utilized

on educating and learning arithmetic with the end goal of exhibiting code-switching as a suitable mechanism of guidance to encourage the advancement of proficiency in children. The outcome demonstrates that code-switching is a way to understand a concept better through the use of language. The investigation reasoned that the utilization of code-switching in a multilingual Mathematics classroom does not bring about inadequacy in learning; however, a useful strategy in classroom interaction and an efficient way of transferring knowledge to students.

Another is the comparative investigation of two educators with respondents of 32 third-year secondary school students. It showed that their impression of code-switching during classroom instruction is an asset in making information more intelligible to the learners than when just English is utilized [3].

The differentiating perceptions of how code-switching can contribute to the learning of Mathematics have caused the researchers to evaluate the effectiveness of code-switching in teaching Math in a Filipino classroom.

1.1 Theoretical Framework

This research adopted the work of Cummins as a theoretical framework to supply the study about code-switching in the learning of word problems in Mathematics. The research perceives language as a method for imparting ideas and abilities. The way where students acquire information is through correspondence with others because of the utilization of language. Students in Math classes speak with one another and the instructor through casual also, formal language (Mathematics language). During the interaction, students utilize many words that mean numerous things in ordinary circumstances and mathematics settings.

Cummins' theory emphasized that the primary language will help the securing of ideas communicated in a subsequent language. Thus, it was used to assist the study in finding out the effects of code-switching in the learning of mathematical word problems in mathematics classrooms.

2 Related Studies and Literature Palette

The English language is chief in its significance concerning education not merely because this is a universal language but because this is utilized in practically all types of instruction and national and global assessments [4]. Learning to speak and write in English in this age of globalization and industrialization is necessary to compete in this knowledge and skills-competitive world. Thus, English has been a mandatory medium of instruction in various subjects. It was believed that the use of the language on a regular basis would help students acquire the necessary proficiency and fluency. There are numerous components that impact spoken English, for example, attitude, inspiration, classroom exercises, classroom conditions, and learning assets. English learning merits quite a bit of the teacher's consideration since language learning can realize character changes in students; in this manner, the above variables should be placed into thought [5].

English language proficiency is directly related to the academic performance of students in science and technical education. Therefore, it is very important to emphasize

language proficiency to those students who are admitted to those courses. This is supported by the study which states that the higher the student's English proficiency level, the higher the level of academic achievement [6].

English has become a part of the Philippine education curriculum; however, the proficiency of Filipinos in English seems to be slowly deteriorating. Technical subjects such as Science and Mathematics are instructed through the use of the English language. Despite this, teachers often need/opt to switch from English to Filipino to make the students understand the concepts of the lesson. The switching from L2 to L1 is called code-switching.

Code-switching, as from the term itself "code" means language, and "switching" is changing from one thing to another, which in general, is moving from one language to another in a conversation. It has been stated that it is a process of communication where the speaker alternates between two languages in one sentence or conversation without changing the content of the discussion [7]. It commonly happens in bilingual countries where people can use more than one language to communicate.

Code-switching often occurs in speaking than in writing [8]. The utilization of code-switching in the classroom by the learners and teachers during discussion shows that it is either utilized deliberately and unconsciously by them. Code-switching is an unpredictable procedure, and teachers' performance will influence the students either unequivocally or certainly [9]. Moreover, utilizing code-switching in a language classroom will be considered a helpful methodology for classroom interaction and communication, that is if its point is to make significant and to move information to students in a productive manner [10]. When code-switching is used, pupils become more willing to try because they feel less pressure to speak English fluently and exactly. [11]. Also, students themselves can predict which teachers' classroom practices bring about the ideal result if the teacher code-switch. Accordingly, it permits more space for the students to control and be dependable on their own learning [12]. Speakers often use code-switching for pragmatic reasons [13]. It found out that there is a need to apply the code-switching technique for there are students who cannot competitively speak in classroom discussions because they are hesitant about speaking the English language [14]. Furthermore, teachers could make the students understand concepts better through learning by doing and serving as facilitators rather than translators [15]. In lieu of this, it is regarded that educators and students have a comparative inspirational disposition to teachers' code-switching during instruction [16].

In the Philippines, Mathematics has been regarded as a difficult subject for most students. Aside from the governing aspects of the course, its technical language has been a hindrance in understanding its concept. Students supported the use of code-switching because they became more immersed in the lesson, and it has created a positive learning climate in the classroom [17]. However, the fact that lack of proficiency in English was the primary reason that evoked students to depend on exchanging and blending codes [18].

Indeed, proficiency in the English language is essential for academic success because assessments written in the English language can be confusing for students with low levels of English proficiency [19]. Relatively, English language competency is directly proportional to cognitive skills, which are rudiments in understanding Mathematics [20].

Students also regard the English language as essential to their education but, they still prefer code-switching to further understand concepts and maintain their attention [21]. Teachers frequently change their code to decipher or expand the significant message on the way toward clarifying new jargon, syntax focuses, or on the other hand, guidelines as opposed to proceeding in the foreign language [22]. Teachers can also utilize code-switching for interpretation, explanation, appreciation check, technique, and bearings giving and learning procedure to connect the class' level of language capability [23]. Code-switching helps the triumphant arrangement of the significance of confused writings coded in English and makes input understood to the students; produces a low-uneasiness classroom that is positive for learning; and, keeps the students focused in a class where exercises are profoundly specialized in nature [24].

The mere thought of the subject of Mathematics causes students to have anxiety; students' achievement in the subject varies according to their anxieties [25]. Therefore, a positive learning climate should be manifested in the classroom to enable learners to perform at their best. Code-switching is utilized in Mathematics to bridge the gap between mathematical registers to informal terminology that students are accustomed to [1]. This also makes them more comfortable in dealing with the subject. This research study aims to determine the effect of code-switching in teaching mathematics to learners with low English proficiency.

3 Methods and Procedures

This study utilizes an experimental research design to explore the effectiveness of using code-switching in teaching Mathematics to students concerning their English Proficiency. The research design was selected to gather the data depending on the needs and purpose of the information. Since this study is descriptive, it is reasonable to interpret the collected data from the verbal interpretation prepared for every category.

The researcher administered an English proficiency exam on 85 grade 8 students to identify students with limited English proficiency. From these participants, the researcher determined 27 students with low English proficiency. The respondents were grouped into two. Both groups were taught the same lesson by the same teacher using a different medium of instruction in two separate sessions. In the first session, Group A was instructed without the use of code-switching, while Group B was taught with the aid of code-switching. Test results for the two sessions and the English Proficiency Test will be tallied and statistically treated.

Moreover, a set of questionnaires was utilized to determine students' perception of code-switching in classroom discussions.

The researcher used a descriptive method to know if there is a significant difference between test scores of the students who were instructed with code-switching and those who were solely instructed with English.

Also, the data from the adapted questionnaire [21] were broken down and deciphered through the weighted mean.

Table 1. Grade 8 Students' Level of English Proficiency

LEVEL	NUMBER OF STUDENTS
A1 – Beginner	8
A2 – Elementary	19
B1 – Lower Intermediate	18
B2 – Upper Intermediate	23
C1 – Advanced	11
C2 – Proficient	6

4 Results and Discussion

The students answered a 50-minute English Proficiency Test through an online standardized English Test, which is the EF Set. The EF SET English Certificate Plus is rated on a size of 0 to 100. It has a differentiated score credited for reading and listening as well as an overall rating. EFSET English Certificate Plus scores are mapped to the 6-level CEFR groups from A1 to C2.

Table 1 shows that the English Proficiency of the Grade 8 students is varied with regard to the 6 clusters. Eight (8) students are in the Beginner Level; this means that they understand familiar everyday words, carefully articulated, slow speech with a long pause, concise, simple texts, familiar names, and concepts. Nineteen (19) students are in the Elementary Level, which means that they understand very basic personal, family, and job-related language, enough to meet their needs with slow, clear speech and short, simple texts on the familiar matter. Eighteen (18) students are in the Intermediate Level; this means that they understand the main points of clear, standard input on common issues regularly encountered in work, school, & leisure. Twenty-three (23) students fall under Upper Intermediate Level; thus, they understand the main ideas of complex text or speech on both concrete and abstract topics, including technical discussions in their field of specialization. Eleven (11) students belonged to Advanced Level, and it shows that they understand a wide range of demanding, longer texts, and recognizes implicit or nuanced meanings. Six (6) students also showed excellent English proficiency as they fall under the Proficient Level, which means that they understand with ease linguistically complex text and any spoken language, including live broadcasts delivered at native speed.

The identified 27 students with low English Proficiency (Beginner and Elementary) were divided into two groups; 14 students went to Class A while 13 students went to Class B. Each class had the same lessons (Fundamental Counting Principle and Probability of Simple Events) which were taught for two weeks. The teacher made use solely of the English language in Class A while he utilized English and Filipino in Class B (Table 2).

Based on the test scores, results show that the math scores of students with the use of code-switching are higher than that of the students without the aid of code-switching. Furthermore, since the students that were taught using code-switching have

Table 2. Mathematics Scores of Students

STUDENT	CLASS A (without Code- Switching)	PERCENTAGE	CLASS B (with Code- Switching)	PERCENTAGE
1	5	25%	9	45%
2	6	30%	8	40%
3	7	35%	8	40%
4	4	20%	11	55%
5	7	35%	10	50%
6	4	20%	10	50%
7	5	25%	8	40%
8	6	30%	7	35%
9	5	25%	4	20%
10	6	30%	6	30%
11	4	20%	7	35%
12	3	15%	11	55%
13	4	20%	7	35%
14	5	25%		
AVERAGE	5.07	25%	8.15	40.7%

an achievement rate of 40.7% in their mathematics assessment while students without the use of code-switching have only accumulated 25% achievement rate, this means that code-switching is more effective than teaching only with the use of one language which is English. The results support the study of Rambely et al. which states that the ability to comprehend the numerical language should be learned in the local language and the native language is additionally a forerunner in learning mathematics using a second language.

The respondents also answered a survey to determine their perception and attitudes towards code-switching. The results have unveiled and supported Abad’s claim that code-switching is a convenient speech mode for the ease and naturalness in expression it provides the speakers.

Table 3 reveals that students strongly agree with all the attitude indicators. It could be derived from the responses of the students that they practice code-switching during the informal discussions, as they think of it as an ordinary event inside the setting of language use in regular day-to-day existence. It could be deduced from the students’ responses that they regard code-switching as useful to them as it could assist them with understanding concepts better.

It could be gleaned from the table that teachers likewise perceive the significance of bilingual instruction and bilingualism, particularly code-switching, to enable the students to comprehend the lessons better and to let them communicate better during classes.

This is upheld by the discoveries of Abad that code-switching helps students in understanding troublesome ideas [3]. Furthermore, in light of the fact that code-switching

Table 3. Students' Attitudes towards Code Switching

Attitudes towards Code-Switching	Weighted Mean	Descriptive Interpretation
1. I converse with my friends using Filipino and English during our casual conversation.	3.48	Strongly Agree
2. In my Mathematics subject, I speak my own dialect and switch to English from time to time.	3.63	Strongly Agree
3. As a routine, I mix English and my vernacular language in my Mathematics subject because my teacher allows me.	3.37	Strongly Agree
4. During classroom discussion, mixing vernacular language and English language is a good practice among students.	3.33	Strongly Agree
5. Mixing Filipino and English can be a means of expressing oneself easier and more accurate.	3.63	Strongly Agree
6. Using both Filipino and English during class discussion makes the learning of Math lessons easier and faster.	3.55	Strongly Agree
7. During group activities, I use the combination of my dialect and English because my teacher allows it.	3.33	Strongly Agree
8. Combining my dialect and English language is just natural because it is a linguistic trend being practiced by everyone.	3.41	Strongly Agree
9. In using technological gadgets in the school, I prefer using English and Filipino.	3.48	Strongly Agree
AVERAGE	3.42	Strongly Agree

is an agreeable mode, it facilitates the trouble of certain students in fathoming lessons led in either straight English or straight Filipino. It is likewise discovered that when the educators permit students to code-switch, the class gets loose and is urged to partake in conversations since sentence structure concerns are negligible effectively.

5 Summary, Conclusions and Recommendations

This paper investigated the effects of code-switching in teaching mathematics to Grade 8 students with low English Proficiency. It additionally discovered the students' perspectives on code-switching and their level of English Proficiency. The following findings were drawn:

1. Out of the 85 Grade 8 Students, 27 have low English Proficiency (Beginner and Elementary Level).
2. The average English Proficiency Level of the students lies in the Intermediate Level.
3. The students taught with the use of Code-switching performed better than those who were instructed solely with the English Language in Mathematics.
4. The students have a positive attitude towards the use of code-switching in their Mathematics classes.

This study supports the theory that students who utilize their primary language using English while learning perform better than individuals who do not. The research has demonstrated that code-switching in the classroom is essential and inevitable. It is not just some portion of communicative resources of a bilingual repertoire but an additional functioning part in the learning process.

In light of the findings in this study, the following are recommended:

1. Educators ought to think about the utilization of code-switching as a method for helping students comprehend Mathematics lessons better.
2. The students should continue to code-switch as the need emerges for them to unre-servedly communicate their thoughts and for them to participate effectively during class discussions.

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