(RESEARCH ARTICLE)

Check for updates

Bilingual instruction practices and students' performance in teaching-learning mathematics: A case study (June 2023)

John Emil Velayo Brosas, Kayla Palic De Leon *, Jaynalene Garcia Panaglima, Ma. Cristina De Mesa Perez, Rose Nannette Joven San Juan and Jhon Jhon Pamilacan Zotomayor

College of Education, Laguna University, Santa Cruz, Laguna, Philippines.

Abstract

This study delves into bilingual instruction practices and their impact on students' participation patterns within a classroom environment. The research aims to understand how students engage during classes where bilingual instruction practices are employed.

Qualitative research methods were used for the purpose of data collection and analysis in this study. The selection of participants was carried out through purposive sampling, focusing on the forty-six (46) students from Grade 11 Agarao at Laguna Senior High School at Sta. Cruz, Laguna. To gather the data, a video recording and observation of a one-hour class discussion were conducted. The findings were analyzed through the application of thematic analysis.

The results reveal that code switching, encompassing extra-sentential, intra-sentential, and inter-sentential types, is a prevalent bilingual instruction practice used by teachers. Notably, intra-sentential code-switching was the most frequently utilized by the teacher. Additionally, the study identifies four distinct participation patterns: total integration, conditional participation, marginal interaction, and silent observation. The study found that a significant portion of Grade 11 Agarao students exhibited conditional participation and marginal interaction tendencies out of the total cohort of forty-six (46) students. Understanding these dynamics provides insights into how bilingual instruction influences students' involvement and contributions within the classroom.

Base on the following findings, it is recommended for schools to include bilingual instruction in their school improvement plan and school development program. It is also recommended to add another research instrument, such as an audio recorder, to easily transcribe the data and yield better results.

Keywords: Bilingual instruction practices; Code-switching; Participation patterns**;** Case study

1. Introduction

Language is fundamental in comprehending mathematical concepts. Language and mathematics are intertwined and complement each other in the learning process. Mathematical concepts can be difficult to understand without the right vocabulary and syntax to describe them. In addition, language is also essential for problem-solving in mathematics. The ability to read and understand word problems, translate them into mathematical equations, and communicate solutions effectively requires strong linguistic skills. Moreover, the medium of instruction is critical in teaching and learning mathematics. In the Philippines, English prevails as the predominant medium of instruction. Technical subjects such as science and math are taught through the use of the English language.

---

* Corresponding author: De Leon Kayla P

However, in the study conducted by Canilao (2018), the majority of the participating students expressed their preference for languages other than English as the medium of instruction and assessment in teaching and learning mathematics. They reported difficulties in understanding the concepts when taught in English. As a result, teachers frequently employ code-switching between English and Filipino to ensure that students grasp the lesson effectively.

Bilingual instruction practices are important in teaching and learning mathematics, benefiting both students and teachers. However, the significance of these practices is sometimes overlooked due to their widespread use. The researchers conducted this study to gain a deeper understanding of the bilingual instruction practices employed by teachers during classroom discussions and to identify any patterns in students' performance. The aim of the study was to explore the use of bilingual instruction practices at Laguna Senior High School.

Objectives of the study

This study aims to;

- Identify the bilingual instruction practices among the grade 11 teachers and to know how the students performed during mathematics discussions, and
- Determine the types of participation that can be derived by the students' performance in learning mathematics.

2. Materials and methods

2.1. Design

The researchers used qualitative research to explore the bilingual instruction practices among grade 11 teachers and their impact on students' performance. According to Bhandari (2022), qualitative research involves gathering and analyzing non-numerical data to understand ideas, perspectives, or experiences.

They employed a case study research design, which involves observing subjects or cases in their natural setting with minimal interference from the researcher (Nair, 2021). This research design is appropriate for the study as it allows the researchers to gain in-depth knowledge about the performance of students when learning mathematics.

2.2. Participants

In this study, the focus will be on one section, specifically Grade 11-Agarao, Accountancy, Business, and Management students at Laguna Senior High School. The researcher employed purposive sampling to select members of the population for observation. The population consists of forty-six (46) students and one (1) teacher who will be observed to determine the teacher's bilingual instruction practices, as well as the students' participation and performance in learning mathematics.

2.3. Data Collection and Analysis

To collect data, a video recorder was set up to capture the entire class discussion. Additionally, the researchers actively participated in the class discussion and utilized overt observation as the data collection method, wherein the students were aware of being observed. Observation is a method of data gathering that involves observing behavior, events, or physical characteristics in their natural setting (Centers for Disease Control and Prevention, 2018). The recorded video was transcribed verbatim and subjected to thematic analysis, enabling the researchers to analyze and understand the students' performance in the presence of bilingual instruction practices during the discussion.

3. Results and discussion

Thematic analysis summaries typically include the problem statement, themes, and sub-themes. The problem statement describes the specific issue that the research project aims to address. In this study, the researchers investigated the bilingual instruction practices used by the teacher and how students performed during mathematics discussions. Themes are patterns that emerge from the data. Through the observation and transcription of the video recordings, the researchers identified a recurring topic or concept, which was code-switching and types of class participation. Sub-themes are specific elements that align with the central organizing concept of the theme. During the data analysis, the researchers discovered that teachers employed different types of code-switching in teaching mathematics, and they also observed a pattern in student participation.

Table 1 Summary of Thematic Analysis

Statement of the Problem	Theme/s	Sub-theme/s
Bilingual Instruction Practices	Code-switching	Inter-sentential codeswitching happens either at the beginning or end of a sentence. Intra-sentential codeswitching happens in the middle of a sentence. Extra-sentential or Tag code-switching happens when a word or tag phrase is inserted from one language into another.
Students' Performance	Total Integration	Students actively participate
	Conditional Participation	Students participates infrequently, they participate when they feel confident
	Marginal Interaction	Students are inactive and speak occasionally
	Silent Observation	Students avoid participation

Table 2 Summary of Types of Code-Switching

Types of Code-Switching	Number of Times it is Repeated by the Teacher
Intra-sentential code-switching	28
Extra-sentential code-switching	27
Inter-sentential code-switching	18
Total	73

3.1. Bilingual Instruction Practices

The observation revealed that code switching was used by the teacher as a bilingual instruction practice in teaching mathematics. Based on the analysis made, it is clearly shown that there are types of code-switching, and they code switched for several purposes.

3.1.1. Content Acquisition

Data analysis revealed that teachers' reasons for code switching acts on class observations was the attainment of the content.

- Excerpt 1

Teacher: *"Okay, very good. Aside from that, how do we differentiate null and alternative hypotheses?"*

Student 3: *"Uhm, null hypothesis is an initial claim which the researchers try to modify or reject."*

Teacher: *"Very good."*

Student 3: *"While alternative hypothesis, which, uhm, where the research tries to prove."*

Teacher: *"Tries to prove. Very good. According to Oliveros, when we say null hypothesis is the initial claim of the researcher. Right? While the alternative hypothesis that is the contrary of the null hypothesis. The alternative hypothesis contradicts the statement of the null hypothesis."*

The first excerpt presented above clearly shows a code-switching act was committed by the mathematics teacher while teaching the students. In this case, the teacher used the intra-sentential code-switching type when he repeated and

translated his explanation by saying, *"The alternative hypothesis contradicts the statement of the null hypothesis."* In this example, he is switching between two languages in one sentence.

This finding is supported by Yadav (2023), who stated that intra-sentential code-switching occurs within the sentence or clause. A part of the sentence is in one language or language variety and is then followed by one from another language or language variety.

Moreover, the given excerpt reveals that the code-switching acts performed by the teacher during the instruction serve the function of instructional content acquisition. When the teacher asked for another answer regarding the alternative and null hypothesis, Student 3 provided a correct response. The instructor then repeated the student's answer and initially explained it in English. Subsequently, he repeated and translated certain Tagalog phrases by stating, *" The alternative hypothesis contradicts the statement of the null hypothesis."* to emphasize the point. The use of two languages (English and Filipino) interchangeably to clarify the information highlights the main reasons why teachers engage in code-switching.

This claim is supported by the study conducted by Mangila (2018), wherein a detailed analysis of the class observation transcription revealed that the teacher employed simultaneous use of two languages, English and Bisaya, to provide a thorough explanation of the poem's general implications and to present practical and familiar situations to the students. The primary objective of the teacher in using code-switching during the instruction was to facilitate the students' easier acquisition of the lesson content.

As observed, the teacher predominantly used pure English when providing mathematical explanations or defining mathematical terms, which is in line with the findings of Bravo-Sotelo (2020). Code-switching to Tagalog or Tagalog-English was employed by the teacher specifically when elaborating on a particular question or concept.

Effective acquisition of knowledge enhances students' confidence. When students feel knowledgeable and competent in a subject, they are more likely to actively participate in class discussions, answer questions, and share their opinions.

- Excerpt 2

Teacher: *"To sum up again, you can express your answer in Tagalog. Let's Tagalog. What is the difference between type 2 wrong or error or type 1 wrong or error?"*

Teacher: *"What is the type 1 error?"*

Student 33: *"You deny what is right!"*

Teacher: *"You deny what is right. Very good, great!"*

Student 33: *"Then in type 2 error you accept what is wrong!"*

Teacher: *"You are accepting the wrong! Give him ten claps!"*

Just like the first excerpt presented, this second excerpt clearly demonstrates that the teacher also made an intra-sentential code switch by asking the question, *"What is the difference between type 2 errors and type 1 errors?"*

In this excerpt, the teacher provided an opportunity for students to participate in the class discussion. By asking a question about the difference between type 1 errors and type 2 errors, the teacher stimulates students' recall of what they have learned. This finding aligns with one of the findings reported by Cohen, Manion, Morrison, and Wyse (2010), as cited by Wirza and Sholihah (2019), which suggests that recalling students' memories can trigger their participation and is useful for testing learning and focusing attention.

3.1.2. Facilitate Learning

The observation revealed that code switching was used by the teacher as a bilingual instruction practice in teaching mathematics. Based on the analysis made, it is clearly shown that there are types of code-switching, and they code switched for several purposes.

- Excerpt 3

Teacher: *"Okay let us proceed to our application, this time we will have the group activity. 1 2 3 4, you are juries again, group 1, group 2, group 3, group 4."*

- Excerpt 4

Teacher: *"That's three, why is your manila paper so small? The assign situation in group 1 is three situations. Where is no. 1? Oh no. 1 pastes it, write group."*

- Excerpt 5

Teacher: *"Group 2, may I see, group 3 where's group 3 solar panel, group 4 is all about drainage, okay group 2 this is your irrigation. To avoid writing, you just paste it."*

The excerpts presented above also show several instances of code-switching performed by the teacher while giving instructions to the class. The teacher utilized three types of code-switching: extra-sentential, intra-sentential, and inter-sentential code-switching when explaining the group activity to the students. In excerpt 3, an example of extra-sentential code-switching is observed when the teacher uses the word "kayo." He inserts a tag phrase from one language into a sentence in the other language. In excerpt 4, the math teacher employs intra-sentential code-switching by saying *"manila paper"*. He switches from Tagalog to English in the middle of a sentence. Lastly, in excerpt 5, inter-sentential code-switching is evident. The teacher begins giving instructions in English and then switches into Tagalog. Here, a complete sentence or clause in one language is followed by one in another language.

This finding is supported by Esen (2022), who states that in inter-sentential code-switching, the language switch occurs at sentence boundaries, specifically at the beginning or end of a sentence. In intra-sentential code-switching, the shift happens in the middle of a sentence without any interruptions, hesitations, or pauses to indicate the switch. The speaker is usually unaware of the shift. Extra-sentential or tag switching involves the switching of a single word or a tag phrase (or both) from one language to another. It entails the insertion of a tag from one language into an utterance in another language.

In the extracts provided, the teacher effectively utilized both languages to convey instructions smoothly to the students. She employed commonly heard instructions in English and switched to Tagalog to provide clarity and emphasize her instructions. The excerpts demonstrate that facilitation is one of the purposes behind the teacher's code-switching practices. This assertion is supported by Mangila (2018), who defines facilitation as the underlying reason for the teacher's code-switching behavior. The teacher's role shifts from being a content or language instructor to that of a facilitator in the classroom. In this case, the teacher deliberately employed code-switching during classroom discussions as part of the classroom routines and management. By delivering instructions or directives in a more familiar language like Tagalog instead of English, the teacher aimed to facilitate the students' active participation in the class. Effective facilitating learning assure participation in the classroom by providing specific instructions on how students can participate.

- Excerpt 6

Teacher: *"Other hand. The same hand holding the finger. None? Try to answer."*

- Excerpt 7

Teacher: *"Okay very good group 3, the first honor is group 3, group 3 kindly post you work on the board. Everybody please chooses representative to explain your work."*

The presented excerpts demonstrate various instances of code-switching employed by the teacher during the class. Excerpt 6 exemplifies an inter-sentential code switch, where the teacher transitions from English to Tagalog to give instructions for students to raise their hands. In excerpt 7, the teacher utilizes extra-sentential code-switching to direct students to post their work on the board and explain their answers.

Furthermore, the provided excerpts highlight that facilitation is another purpose served by the teacher's code-switching practices during instruction. By instructing students to raise their hands and select a representative to explain their answers, the teacher fosters opportunities for active student participation, thereby facilitating their engagement in the learning process.

The foregoing finding also strongly supports another major finding of Martin (2014) as cited by Factor (2022) that Filipino teachers often used code switching to ensure students' active participation not only during the class discussions but also in accomplishing certain activities in the classroom.

3.1.3. Students' Performance

Table 3 Summary of Students' Performance

Types of Participation	Frequency (f)	Percentage (%)
Total Integration	2	4.35%
Conditional Participation	18	39.13%
Marginal Interaction	18	39.13%
Silent Observation	8	17.39%
Total	46	100%

An in-depth observation was conducted, revealing that the respondents were categorized into four types of participation patterns: total integration, conditional participation, marginal integration, and silent observation. Additionally, a summary table of the students' performance was presented.

3.1.4. Total Integration

In categorizing the students into the four types of participation, the researchers observed that some students were the most active. Sayadi (2007), as cited by Warsame (2018), explains that total integration involves students who interact with both their peers and professors. These students actively participate in class discussions, asking questions and making remarks to the instructor and other students.

- Excerpt 8

Student 3: *"Uhm, null hypothesis is an initial claim that the researcher tries to modify or reject. While alternative hypothesis, which, uhm, is where the research tries to prove."*

- Excerpt 9

Student 3: *"Alyanna insists that she is 30 years old, when in fact she is 32 years old. What error is Alyanna committing? So, we found out that type I error is Alyanna committed. Why? Because, she is 30 years old and when in fact she is 32 years old. So, she is rejecting the fact."*

- Excerpt 10

Student 5: *"Mr. Ramboo Tan made a correct decision because at the moment his salary is not that high. There are more priorities where he can allocate his expenses."*

- Excerpt 11

Student 5: *"We can state the null hypothesis for his test as: H is can be quantified as the demand is high enough. So here is Bryan, looking very stylish. So, what would be the consequence of a type I error in this setting. So, what we choose is that he doesn't choose a city where demand is actually high enough. Because we want to choose a city where there is high demand, but he didn't choose a city where there is high demand, so he is rejecting the demand. So, for type II error we choose a city where demand isn't actually high enough, because in the other statement, that would be the demand is not high enough then he is choosing a city but the demand is not actually high so he is accepting the false."*

The eighth, ninth, tenth, and eleventh excerpts highlight the active participation of students 3 and 5 in the class discussion. Excerpts nine and eleven demonstrate their engagement when the teacher asks questions or seeks their opinions, while excerpts ten and twelve showcase their involvement as representatives of their respective groups, reporting their answers. Throughout the entire class discussion, the researchers noted that students 3 and 5 were more proactive in responding, answering, and raising their hands compared to other students. Consequently, student 3, who participated twelve (12) times, and student 5, who participated thirteen (13) times, were identified as the most active participants in the class discussion and can be classified as total integration types. This finding is supported by the study

of Yusof and Han (2019), where they stated that full integration refers to students who are able to actively engage in classroom discussions and are aware not only of the ideas, they want to express but also of the boundaries of what they are allowed to say. These students typically participate in class spontaneously and naturally.

They believe that through their participation, they can gain a better understanding of the topic, achieve higher grades or academic success, and enhance their overall performance in class. Having such students in the classroom makes the discussions livelier and encourages other students to participate. Active participation can lead to excellent interactions between the teacher, students, and their peers.

According to Bekkering (2021), active class participation improves subjective and objective student performance. Students perceive that they do better in class, and objective criteria like Grade Point Average and scores on final exams confirm this. Moreover, Zinjay (2022) mentioned that the students who actively participate in the class are able to learn better than those who do not. It clearly supports that classroom participation helps to achieve better academic performance.

3.1.5. Conditional Participation

In categorizing students into the four types of participation, the researchers observed that participation levels can be influenced by various factors. According to Sayadi (2007), as cited by Warsame (2018), conditional participation occurs when a student's engagement is influenced by external elements such as social-cultural norms, self-efficacy, and the classroom environment. Students in this category carefully consider their involvement in class, determining when and what to contribute, and may have limited interaction with others.

- Excerpt 12

Student 23: *"The owner closes the pool when it does not need to be closed, even if the quality of the water is good the owner still chooses to close the resort, they rejected the truth, that's why it is a type I error."*

Student 30: *"So, the consequence is the owner doesn't close the pool when it needs to be closed, because a type II error means that you are accepting the false."*

- Excerpt 13

Student 31: *"Our answer is they do not conclude that the solar panel is effective when it is actually effected, effective. So, the type I error is like they didn't include what they didn't choose or they included the one that is not working, so it means that they are rejecting the true."*

- Excerpt 14

Teacher: *"Anybody, can you differentiate type 1 and type 2 error without looking at the monitor? Can you differentiate type 1 and type 2 error without looking at the monitor? Anybody, nobody? Anyone? No one? Other hand. Both hands including fingers. None? Try to answer. Are you raising your hand? Yes, Student 4, do not look at the monitor please."*

Student 4: *"Null hypothesis is all about-"*

Teacher: *"Null hypothesis? Again? or type I error?"*

Student 4: "*Ah type I error is all about rejecting what is true."*

Teacher: *"How about type II error?"*

Student 4: "*While type II error is not rejecting what is false."*

Excerpts twelve, thirteen, and fourteen highlight the participation of students who engage in classroom interactions but at a minimal level. Excerpts thirteen and fourteen feature the responses of students 23, 30, and 31 when they were asked to report their group's answers during a group activity. The difference among the three students is that students 23 and 30, who are in the same group, presented their answers with a script, leading to minimal errors. On the other hand, student 31 expressed her answers without notes, resulting in some stuttering, as seen in excerpt 14. The researchers also observed that students 23 and 31 were chosen by their group because they had already interacted with the teacher, albeit minimally. Furthermore, excerpt 15 showcases a conversation between the teacher and student 4.

The teacher poses a question and, in the absence of a response, encourages the students to answer. This can be observed in excerpt 15 when the teacher says*, "Can you differentiate type 1 and type 2 error without looking at the monitor? Anybody, nobody? Anyone? No one? Other hand. Both hands including fingers. None? Try to answer."* As a result, student 4 felt motivated to answer, leading to their active participation in the class discussion.

In contrast to students in total or full integration who contribute naturally, these students are only seen contributing when they are certain of their answers, feel confident in class discussions, are encouraged by the teacher, or believe it is the appropriate time to participate. For instance, student 30, who used a script to convey their group's answers, only participated twice throughout the entire class discussion. The script played a significant role in her ability to deliver in front of the class. Students 23, 31, 30, and 32 are not the only students of this type; there were others as well. Specifically, student 4 participated five (5) times, while student 6, student 12, student 22, student 33, and student 44 participated three (3) times. Student 23 participated seven (7) times, while student 24, student 31, and student 35 participated four (4) times. Student 32 participated six (6) times, and student 7, student 13, student 14, student 16, student 18, student 19, and student 30 participated two (2) times. These students had limited interaction with the teacher and other learners but made efforts to be active and engage in the class discussion. In this case, they can be categorized as conditional participation types.

Since these types of students are mostly influenced by internal and external factors, their self-esteem, the teacher's behavior, peers, seating arrangements, encouragement, and praise become crucial elements for their participation. These students also serve as role models that can encourage other students to answer and join in the class discourse. Many of these students are influenced by their seatmates, who motivate them to participate. Furthermore, their active participation inspires the teacher to call on students who rarely engage in the discussion.

This finding is supported by the study of Rohi and Muslim (2023), where they found that the level of participation was higher in classes characterized by respect, small class sizes, student support, constructive feedback, and theory relevant to real-life situations. They also identified five major factors that can contribute to students' lack of verbal participation: lack of self-efficacy, teachers' personalities, lack of self-confidence, lack of preparation, and fear of making mistakes and being ridiculed by others. Additionally, according to Abdullah et al. (2012), as cited by Warsame (2018), the lecturer's role plays a significant factor in a student's engagement in class discussions. The lecturer's effective traits and teaching style are also key factors. When students perceive that their contributions will benefit the class and that their mistakes will not be criticized, they are more willing to participate actively throughout the entire class.

3.1.6. Marginal Interaction

In categorizing the students into the four types of participation, the researchers observed that there are students who exhibit limited participation in class activities. According to Sayadi (2007), as cited by Warsame (2018), marginal interaction refers to students who rarely contribute to class discussions. Instead, they prefer to listen, take notes from the lecturers, and ask questions of the students.

During the class discussion, some students show a lack of initiative in answering, responding, or raising their hands when the teacher asks questions. However, they are willing to participate in group activities. As the teacher divides the class into five groups, only four groups are assigned to perform these activities. The researchers consider this form of class participation, even though these students do not interact with the teacher directly after the group activity and prefer to listen or take notes. Small group activities involve collaboration among participants, which is then reported in a plenary discussion (Aziz, F. et al., 2018). Based on the researchers' observations, students 1, 2, 8, 9, 10, 11, 15, 17, 20, 21, 25, 26, 27, 28, 29, 36, 42, and 44 participated only once, demonstrating attentive listening but limited engagement in the class discussion. These students can be categorized as exhibiting marginal interaction types.

These types of students are typically active listeners in the classroom. They are attentive when their teachers or classmates speak and make an effort to learn from them. They pay close attention to the speaker, aiming to absorb as much information as possible. They find it beneficial to take note of key terms and concepts to aid in their recall of the information later on. While they may not actively participate in oral classroom discussions, they do engage in group activities. They willingly share their knowledge with other group members to collaborate and accomplish tasks together.

This finding is supported by Waterford org (2020), which states that strong listeners not only have better retention of information but also experience reduced classroom anxiety and frustration. Developing listening abilities can enhance a student's self-efficacy, which refers to their belief in their ability to succeed in school. Improved listening skills contribute to learners feeling more secure, comfortable, and prepared to excel academically.

3.2. Silent Observation

In categorizing the students into the four types of participation, the researchers observed that there are students who prefer to observe or listen rather than participate in classroom discussions. According to Sayadi (2007), as cited by Warsame (2018), silent observation occurs when students choose to listen to class discussions and take notes when necessary. If they encounter any difficulties, they consult their close friends or conduct searches on the internet or other sources. These students remain silent and refrain from participating through oral communication in class.

Based on the researcher's observation, students 37, 38, 39, 40, 41, 43, 45, and 46 show no or zero (0) participation at all. These students prefer to observe or listen rather than take part in classroom discussions. They remain silent and choose to absorb information and observe their surroundings instead of actively participating in the conversation.

In this study, one factor that explains why these students have no participation is their exclusion from any group activities. Despite occasional encouragement from the teacher to raise their hands and participate, these students choose not to engage. They differ from students with marginal interaction who absorb information without participating in oral discussions or group activities.

These students find satisfaction in acquiring knowledge from their teachers. They believe that listening to their teachers is the most effective way to learn, and they see no need to exert energy in contributing to class discussions. As a result of their limited participation, these students are likely to receive lower grades compared to their more active peers who meet the grading criteria.

According to ZOE Talent Solution (2023), a review of evidence on the efficacy of problem-based learning suggests that students who receive traditional instruction, characterized as passive learning, tend to perform significantly worse on exams and have lower grade point averages compared to those who engage in problem-based learning. The study indicates that interactive forms of instruction are more effective in enhancing student performance and knowledge retention than passive methods.

These types of students do not prefer to contribute to oral discourse. Several affective factors contribute to their passiveness, including a lack of confidence, fear of speaking, and lack of motivation. They are often afraid of failure and tend to overthink the potential consequences of their actions. Fear, worry, the environment, and mindset are the root causes of this kind of student behavior.

According to Grade Power Learning (2018), students struggle with participation for various reasons. One reason is the fear of providing incorrect answers, as they worry about being judged or embarrassed. They may also believe that they have nothing valuable to contribute to the discussion. In addition, being unprepared or lacking knowledge on the topic can hinder their willingness to participate. Lastly, the fear of public speaking, including speaking in front of their peers, further deters them from engaging in class discussions

4. Conclusion and recommendation

The study has concluded the following based on the aforementioned findings:

- The bilingual instruction practice used is code-switching. Intra-sentential, inter-sentential, and extra-sentential (tag) are types of code-switching. Furthermore, the teacher uses code-switching in the class discussion for content acquisition and to facilitate learning, and
- Total integration, conditional participation, marginal interaction, and silent observation are the participation patterns.

In light of the above findings and conclusion, the following recommendations are respectfully endorsed: (1) A study about bilingual instruction practices can be an eye-opener as to how code-switching in classrooms can help students learn and encourage them to participate. Therefore, it is recommended for schools to include bilingual instruction in their school improvement plan and school development program. This enables the use of this useful strategy for better comprehension and education for both students and teachers, (2) This study utilized video recording and observation to gather data. Upon reviewing the recorded video, it was revealed that some of the responses and answers of the students were too hard to understand. Hence, it is recommended to add another research instrument, such as an audio recorder, to easily transcribe the data and yield better results, (3) The researchers also recommend that teachers participate in a seminar or workshop to enhance their knowledge, abilities, and expertise in teaching students who are learning in a bilingual environment. They suggest that the use of code-switching as a bilingual instruction practice is a

legitimate and potent resource for learning and teaching mathematics. It can indeed be a pedagogic tool that teachers can use to make content comprehensible, and (4) This study focused on observing only one teacher to examine their bilingual instruction practices in the classroom. The researchers recommend that future researchers observe at least three teachers' bilingual instruction practices in order to gain a thorough understanding of them. It is also recommended that the topic of the discussion be Geometry and Statistics, as there are many terms, words, and explanations needed to fully understand the subject.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] Ambarini, R. (2017, November 30). ERIC - EJ1169995 - Teaching Mathematics Bilingually for Kindergarten Students with Teaching Aids Based on Local Wisdom, English Language Teaching, 2018. https://eric.ed.gov/?id=EJ1169995

[2] Anglia, N. (2022, April 2). The benefits of bilingual education. BVIS HCMC. https://www.nordangliaeducation.com/bvis-hcmc/news/2022/04/02/the-benefits-of-bilingual-education

[3] Aziz, F., Quraishi, U., Kazi, A. (2018). Factors behind Classroom Participation of Secondary School Students (A Gender Based Analysis). Universal Journal of Educational Research 6(2): 211-217, 2018. DOI: 10.13189/ujer.2018.060201.

[4] Bekkering E. (2021). Class Participation and Student Performance: A Follow-up Study. Information Systems Education Journal (ISEDJ), 19, (4), ISSN: 1545-679X

[5] Bhatti, A., Shamsudin, S., Binti Mat Said, S., (2018). Code-Switching: A Useful Foreign Language Teaching Tool in EFL Classrooms. https://eric.ed.gov/?id=EJ1179229

[6] Bilingual Education in the Philippines: Research Paper (2020). Havard University. https://www.coursehero.com/file/91351695/bilingual-education-in-the-philippines-research-paper-converteddocx/

[7] Bravo-Sotelo (2020). Exploring the Tagalog-English Code-Switching Types Used for Mathematics Classroom Instruction. https://files.eric.ed.gov/fulltext/EJ1245827.pdf

[8] Canilao, M. (2018, March). English in the Teaching of Mathematics: Policies, Realities, and Opportunities. ResearchGate. https://wwwresearchgate.net/publication/323499905_English_in_the_Teaching_of_Mathematics_Policies_Realities_and Opportunities

[9] Caulfield, J. (2022). How to Do Thematic Analysis | Step-by-Step Guide & Examples. Scribbr. https://www.scribbr.com/methodology/thematicanalysis/

[10] Centers for Disease Control and Prevention (2018). Data Collection Methods for Program Evaluation: Observation. https://www.cdc.gov/healthyyouth/evaluation/pdf/brief16.pdf

[11] Crosley and Rautenbach, (2021). What (Exactly) Is Thematic Analysis? https://gradcoach.com/what-is-thematic-analysis/

[12] Delve (2020). How To Do Open, Axial and Selective Coding in Grounded Theory.https://delvetool.com/blog/openaxialselective#:~:text=With%20open%20coding%2C%20you%20break,engage%20with%20your%20qualitative%20data.

[13] ElJishi, Z., Taylor, T., Shehata H., (2022). A Case Study on the Effectiveness Instructors Compared with Monolingual Instructors at a Private University in Saudi Arabia. http://journals.aiac.org.au/iphp/IJELS/article/view/7074/4842.

[14] Esen, S. (2022). Code Switching: Definition, Types, and Examples. https://owlcation.com/humanities/Code-Switching-Definition-Types-and-Examples-of-Code-Switching

[15] Essien, A. (2018, April). The role of language in the teaching and learning of early grade mathematics: an 11-year account of research in Kenya, Malawi and South Africa. Sabinet African Journals. https://journals.co.za/doi/abs/10.1080/18117295.2018.1434453

[16] Factor, R. S. (2022). Code Switching of Filipino Elementary Teachers in Online Platforms. https://www.google.com/url?client=internal-elementcse&cx=partner-pub5857703812409507:6651582534&q=https://ijrp.org/filePermission/fileDownlaod/4/d5e2fd507bfd f4f6b9740717de61a8eb/2&sa=U&ved=2ahUKEwiEg_zD4rv_AhUjxjgGHRcIBtwQFnoECAEQAQ& usg=AOvVaw3D8M4ZQIFbbC9yPE5RuCT-

[17] Flores, C., Garcia, C., Marcelino, E. (2019). Bilingualism in the Development of Communication Skills and Academic Learning of Students in Wenceslao Trinidad Memorial National High School. https://ojs.aare searchindex.com/index.php/AAJMRA/article/view/5688#:~:text=INTRODUCTION,be%20strictly%20practice d%20in%20teaching.

[18] Gong, M. and Kim Y. (2019). The study of bilingual learning of mathematics at International High School in South Korea. KoreaScience. https://koreascience.kr/article/JAKO201924752115680.page

[19] Grade Power Learning (2018). Why Students Don't Participate in Class. https://gradepowerlearning.com/why-students-dont-participate-in-class

[20] Hartson, R., and Pyla, P. (2012). Video Recording. Science Direct. https://www.sciencedirect.com/topics/computer-science/video-recording

[21] He, V. (2018). What is a bilingual education? https://www.nordangliaeducation.com/news/2018/09/19/what-is-a-bilingual-education.

[22] Jiang, S., Ma, L., Chen, B. (2022). Dynamic Engagement of Cognitive Control in Intra-Sentential Code-Switching During Comprehension. https://www.cambridge.org/core/journals/bilingualism-languageandcognition/article/abs/dynamic-engagement-of-cognitive-control-intrasentential-code-switching-during-comprehension/2BC7A21C3568A6DD19ED51345E88E2A5

[23] Kashi, H. (2018). Effect of Inter-sentential vs Intra-sentential Code-Switching: With a Focus on Past Tense. https://journals.aiac.org.au/index.php/IJALEL/article/view/4166

[24] Maluleke, M. (2019). Using code-switching as an empowerment strategy in teaching mathematics to learners with limited proficiency in English in South African schools. AJOL. https://www.ajol.info/index.php/saje/article/view/189823

[25] Mangila, B. B. (2018). Pedagogic Code-Switching: A Case Study of the Language Practices of Filipino Teachers in English Language Classrooms. https://files.eric.ed.gov/fulltext/EJ1288199.pdf

[26] Mohamad Khalil, S. and Shahril Firdaus, M. S. Z. (2018). Inter-Sentential and Intra-Sentential Code Switching in Parliamentary Debate. https://ir.uitm.edu.my/42812/1/42812.pdf

[27] Momoh (2022). Population Definition in Statistics and How to Measure It. Investopedia. https://www.investopedia.com/terms/p/population.asp

[28] Morrison, C. D. (2024, March 15). Code-switching | Linguistic benefits & challenges. Encyclopedia Britannica. https://www.britannica.com/topic/code-switching

[29] Nair, K. (2021, December 2). Case Study Research: Methods and Designs. Harappa. https://harappa.education/harappa-diaries/case-study-method/

[30] Nordquist, R. (2019, July 25). Learn the function of code switching as a linguistic term. ThoughtCo. https://www.thoughtco.com/code-switching-language-1689858

[31] Online Learning College (2022). Observations. https://online-learning-college.com/knowledge-hub/gcses/gcse-psychology-help/observations/?fbclid=IwAR05aqfcAOb_l0us9O4Da8HeYBFHx1hqDzhLVopUhw7Ut0GMjJO8rwKNbk

[32] Panhwar, F. and Buriro, G. A. (2020). An Overview of Theories and Approaches To Code Switching. https://www.proquest.com/openview/1d25cd2d1e371c7f07dc6f712643e41b/1?pq-origsite=gscholar&cbl=1726349

[33] Perez, A., Ericson A., (2018). Change of "Tongue" from English to a Local Language: A Correlation of Mother Tongue Proficiency and Mathematics Achievement. Eric. https://eric.ed.gov/?id=ED597105

[34] Renanda, E., Amin, M., and Zamzam, A. (2021). Language Choice in Teaching Content Subjects at English Department FKIP University of Mataram. https://jeef.unram.ac.id/index.php/jeef/article/view/9

[35] Renaissance (n.d.). Bilingual Education. https://www.renaissance.com/edword/bilingual-education/

[36] Rohi, S., & Muslim, S. (2023). Factors Influencing Classroom Participation: A Case Study of Undergraduate Students at Education Faculty, Paktia University. Journal for Research in Applied Sciences and Biotechnology, 2(1), 99–104. https://doi.org/10.55544/jrasb.2.1.13

[37] Salekhova, L. and Tuktamishov, N. (2020). Abstract thinking and bilingualism: Impact on learning mathematics. https://hal.archives-ouvertes.fr/hal-02435382/

[38] Sobrepeña, M. (2020). Teacher attitudes towards the principle of bilingual education: an application of exploratory analysis. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&as_ylo=2018&q=bilingual+instruction+in+the+Philippines+&btnG=#d=gs_qabs&t=1663506984658&u=%23p%3DHP99jXeS-cYJ

[39] Tawantawan, J. C. and Aman, J. P. (2018, April 21). Bilingual medium of Intruction: Effects on Students Conceptual Understanding, Problem Solving Performance and Interest in Mathematics | Tawantawan | International Journal of Humanities and Social Sciences. https://ijhss.net/index.php/ijhss/article/view/447

[40] Teng, L., and Yuanyue, H. (2022). Does Bilingual Instruction Impact Students' Academic Performance in Content-Based Learning? Evidence from Business School Students Attending Bilingual and L1Courses. https://www.mdpi.com/2071-1050/11/1/263/htm

[41] Upor, R. and Mihayo, M. (2021). Dual Language Instruction: Teaching Civics in Public Primary Schools in Tanzania. BRILL. https://brill.com/view/journals/utaf/16/2/article-p163_1.xml

[42] Utami, N. M. V., Hakim, D., & Adiputra, I. N. P. (2019). Code switching analysis in the notes made by the sales assisstants in ripcurl. Lingual: Journal of Language and Culture, 6(2), 20.

[43] Villanueva, L. and Gamiao, B. (2022). Effects of Code Switching Among Villanueva, L. and Gamiao, B. College Instructors and Students in a Philippine Classroom Setting. https://journals.e-palli.com/home/index.php/ajmri/article/view/292

[44] Warsame, A. A. (2018). Determinants of Class Participation Case Study. https://sorer.somaliren.org.so/record/129/files/DETERMINANTSOFCLASSPARTICIPATION.pdf?download=1

[45] Waterford Org. (2020). The Value of Listening in the Classroom: How to Teach Your Students Active Listening. https://www.waterford.org/education/active-listening-in-the-classroom/

[46] Wirza, Y., & Sholihah, U. I. A. (2020, March). Teacher Talk in Encouraging Students' Participation in the EFL Classroom. In 3rd International Conference on Language, Literature, Culture, and Education (ICOLLITE 2019) (pp. 287-293). Atlantis Press.

[47] Yadav, S. (2023). Code Switching: Definition, Types and Examples. https://helpfulprofessor.com/code-switching/

[48] Yi, H. J. (2022, September 14). Potential Benefits from Bilingual Education - cuemedia. cue media. https://onstarplus.com/archives/4120

[49] Yusof, M. and Han, L. (2019). Students' Self-reflections of Own Participation in English Language Oral Class. https://www.researchgate.net/publication/337839040_Students'_Selfreflections_of_Own_Participation_in_English_Language_Oral_Class

[50] Zinjay, S., Wangmo, P., Pelden, S., Rai, S., and Thinley, K. (2022). Action Research entitled: Improving Classroom Participation to Enhance Academic Performance. 30. https://www.researchgate.net/publication/365890393_Action_Research_entitled_Improving_Classroom_Participation_to_Enhance_Academic_Performance

[51] Zoe Talent Solution (2023). Passive Learning Vs. Active Learning. https://zoetalentsolutions.com/passive-learning-vs-active-learning/