

A Look into the Discursive Practice of Multilingual Learners in Mathematics: Translanguaging Discourses

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ABSTRACT

The identities of individual languages in structural and/or socio-political terms become relevant most often than not in a teaching-learning environment. In multilingual setting such as that of Philippines, where learners come from diverse cultural and linguistic backgrounds, teachers need to synchronize their pedagogies to multilingual principles and translanguaging to ease the transfer of knowledge and to establish their linguistic repertoire. Studies have pointed to the unfamiliarity of language used in the classroom as one of the reasons for the underachievement of students in Mathematics. Hence, this qualitative method was conducted to identify the discursive practice on translanguaging on multilingual learners in Mathematics. Using the phenomenological design, the study utilized transcripts from the triangulation of classroom observations and video and audio recordings as research corpora. In total, eight observations were conducted. Purposive sampling technique was employed to identify the participants with consideration of the inclusion and exclusion criteria. Findings revealed that learners' discourse used during translanguaging in

mathematics class includes exposition and argumentation. It is concluded that multilingual learners employ varied discourses during translanguaging. The findings of the study could have a significant benefit in the study of discursive practices on translanguaging in different areas like English or Science.

KEYWORDS

Applied Linguistics, Education, Translanguaging, Mathematics, Modes of Discourses, Phenomenological design, Philippines

INTRODUCTION

The identities of individual languages in structural and/or socio-political terms become relevant most often than not in a teaching-learning environment. In an environment of Mathematics learning, there has been an identified gap in achievement among monolingual and multilingual learners, as evidenced by researches in some countries dating more than 30 years ago. For other countries, this gap has been acknowledged more recently and traced back to limited language proficiency in the official language of instruction (Haag, et al., 2013).

In simpler terms, the underachievement of students in Mathematics has been purported to the unfamiliarity with the language used in the classroom (Nath & Vineesha, 2009; Ongstad, 2006). The low understanding level accompanied by discouraging achievements of the students in Mathematics has become a cause of great concern in our country and has bothered the educationists badly (Patena & Dinglasan, 2013). Scholars concerned with academic underachievement among bilingual students began to address important questions about the language these students bring to school and how language may relate to the understanding of school failure (MacSwan, 2017).

Nevertheless, a study revealed that the use of the Filipino language as a medium in teaching Mathematics has significantly improved students' performance. Further, the study investigated the benefits of introducing such intervention to students from a broader perspective. Thus, the adoption of multilingual instruction in Mathematics is then believed to be essential in alleviating students' performance.

In a multilingual setting such as that of Philippines, where learners come from diverse cultural and linguistic backgrounds, teachers need to synchronize their pedagogies to multilingual principles and translanguaging to ease the transfer of knowledge and to establish their linguistic repertoire (Canagarajah, 2013; García & Leiva, 2014). Moreover, higher education is increasingly characterized by the global movement of people and ideas. For this reason, it is a particularly ripe context for translanguaging.

Nonetheless, even with the groundbreaking researches described above, much remains in question about translanguaging. Almost no literature exists on translanguaging in higher education, since most (though not all) of the existing literature explores translanguaging in primary and occasionally secondary classrooms. Furthermore, studies of spontaneous translanguaging have mainly focused on cases of bilingual speakers who speak an additional language in English-speaking countries (Martin-Beltrán, 2014; Martinez-Roldán, 2015; Gort and Sembiente, 2015) and not on the regional and local minority languages with minority status in the country. Thus, there is also a lack of research on translanguaging in global bi- and multilingual contexts. The purpose of this study is to determine discourses used during the translanguaging of multilingual learners in Mathematics.

METHODOLOGY

This study employed a phenomenological qualitative research design. Qualitative data through classroom observation, audio and video recording, and transcription were collected and analyzed. Recording devices were positioned at the back of the classroom, facing the writing board, in the middle of the classroom, and on the teacher's table at the front of the classroom.

Upon approval of the study, the participants and individuals were oriented about the conduct of the study, its significance, its purpose, and objectives. The participants were asked to sign an Informed Consent Form specifying their voluntary participation in the study. Next, as the researcher, it was important to inform the participants about the protection of their confidentiality. Hence, the data gathered were used only for the study. A schedule was set for the conduct of classroom observation.

The classroom observations were recorded with permission from the concerned Mathematics instructor/s. Eight observations were conducted during the course of the study. The transcribed recorded utterances served

as the study's research corpora. Through discourse analysis, the detailed transcripts were explored as to modes of discourse employed by the participants during the classroom interaction.

Non-probability sampling, specifically purposive sampling techniques, was employed. In this study, the participants were tertiary multilingual learners officially enrolled in Mathematics in the Modern World subject at University A in the first and second semesters of the academic year 2018-2019. Furthermore, the participant's ages ranged from 18-30. These participants speak languages other than English and Tagalog. Moreover, to protect the identity of the participants, coding was used. The study did not cover multilingual learners not enrolled in Mathematics in the Modern World subject at University A.

The study was conducted at University A at Lianga, Surigao del Sur. The University Campus is one of the satellite Campuses of the SDSSU System. As State Universities and Colleges (SUCs) offer tuition-free higher education, University A has attracted linguistically diverse students from all over the CARAGA region, which made the locale a prospect for multilingual translanguaging in higher education. The university is situated in the only Kamayo-speaking community in District 1 of Surigao del Sur. However, despite being situated in a Kamayo community, Bisaya is one of the languages in the multilingual speaker's repertoire and most commonly used by students next to Tagalog, increasingly English, and sometimes other languages.

RESULTS

Shown in Table 1 is the profile of the participants who were the data source for this study. Codes are used in the presentation of the participants to keep the confidentiality of the study. CO is the code used for classroom observation. In the classroom observation, there was a minimum of 20 students and a maximum of 50 students in each class. For every participation taken by the students, codes are assigned to them. SX-f is assigned to an unknown student identified only as female, while SX-m is for an unknown student identified only as male. S is for a known student, and Ss is for students or group of students. There were a total of eight classroom observations conducted. The number next to CO in the reference identifies the sequence of the classroom observation. Lastly, the classes observed from CO₁ to CO₈ are multilingual as they either use or understand English, Tagalog, Bisaya, and Kinamayu languages in their Math class.

Table 1. Profile of the Participants

Code	Reference	Languages	Study Group
Ss1-Ss17	CO 1	English, Tagalog, Bisaya, Kinamayu	Classroom Observation
S1-S22	CO 1	English, Tagalog, Bisaya, Kinamayu	Classroom Observation
SX-m1-SX-m11	CO 1	English, Tagalog, Bisaya, Kinamayu	Classroom Observation
SX-f1-17	CO 1	English, Tagalog, Bisaya, Kinamayu	Classroom Observation
Ss1-Ss17	CO 2	English, Tagalog, Bisaya, Kinamayu	Classroom Observation
S1-S17	CO 2	English, Tagalog, Bisaya, Kinamayu	Classroom Observation
SX-m1-SX-m38	CO 2	English, Tagalog, Bisaya, Kinamayu	Classroom Observation
SX-f1-14	CO 2	English, Tagalog, Bisaya, Kinamayu	Classroom Observation
Ss1-Ss12	CO 3	English, Tagalog, Bisaya, Kinamayu	Classroom Observation
S1-S18	CO 3	English, Tagalog, Bisaya, Kinamayu	Classroom Observation
SX-m1-SX-m29	CO 3	English, Tagalog, Bisaya, Kinamayu	Classroom Observation
SX-f1-12	CO 3	English, Tagalog, Bisaya, Kinamayu	Classroom Observation
Ss1-Ss19	CO 4	English, Tagalog, Bisaya, Kinamayu	Classroom Observation

Shown in Table 2 are the modes of discourses used during translanguaging. In this study, it was found that exposition and argumentation were the modes of discourses used during translanguaging in Mathematics class. The table also includes sample utterances per discourse used by the students from the eight classroom observations conducted by the researcher.

The result confirms two modes of discourses of the multilingual learners used during translanguaging namely, exposition and argumentation. Moreover, other data consist interconnection of exposition, argumentation, description and narration discourse within an utterance. This happens whenever the observed multilingual students use one discourse as a method to build up another discourse. Although such cases are noted in the study,

the exposition and argumentation discourses are the only main discourses constantly employed from classroom observation one to classroom observation eight.

Moreover, the students translanguage in four languages: English, Filipino, Bisaya and Kinamayo by mixing, shifting, translation. In some cases, one language is used for input, while another language is employed for input.

Table 2. Discourses Used During Translanguaging

Mode of Discourse	Utterances
Exposition – definition	T: infinite set. oh what is infinite set?
	SX-f4: walang katapusan.
	SX-f5: cannot be measured.
	T: cannot be measured?
	SX-f6: cannot be listed.
	(CO 1)
	T: oh what is Cartesian product. {calls random students} walay na re-search sa definition?
	...
	SX-m6: X and Y ra.
	T: X and Y. yes mister [S4/last].
	S4: uhm from the word itself Cartesian product is Cartesian plane you see the X and Y where is the X, is the positive and negative, aw <mumbles>.
	yeah a b basta there are four. {students laugh}. yeah basta X and Y considered da Cartesian plane.
	(CO 4)
	T: ... naa pay last? yes we have the? <7>power set.</7> oh what is power?
	huh? yes miss,
	Ss16: <7>power set.</7>
	...
	SX-f11: kuan ma'am raise the possible subset ma'am. then aruy kanaan sign iyang P then e.
	T: ye:s.
	(CO 4)

Mode of Discourse	Utterances
Exposition – classification	T: what is natural number? starts with 0? Ss2: sa 1 ma'am. T: yes. starts with 1. so kung ... mag-start ta sa 1, natural number between 1 and 2, SX-m2: dili na s'ya natural ma'am. ... T: 1.1, 1.2 to 1.9 is not a natural number. SX-m4: dili na natural kay naa na nay point. (CO 1) T: how about 0? how about 0? 0 is not included since 0 is not? a positive? integer. how about 15? SX-f16: dili <16>na s'ya ma'am kay less than 15 man.<16/> SX-f17: <16>dili na ma'am kay less than man.<16/> T: ye:s 15 is not included kay diba based on the given, Ss11: less than 15. T: less than 15. SX-m24: <17>14 ra taman.<17/> (CO 2)
Exposition – comparison and contrast	T: ... okay let us proceed to the next one which is the, fourth type of set. what is the next type? {students talk in chorus} yes we have the? finite set. oh what is finite set? SX-m7: opposite of infinite. T: yes the opposite of infinite (CO 1) T: ... how will you differentiate the two groups? S1: ang sa (.) sulod ma'am gamay ray makita nato but in the outside ham-ok hamok ang makita nato. <3>based on my experience.<3/> (CO 3) T: and then? what's the difference lagi between sa CxD and Dx C? ingon ka parehas ra. S5: bali ra sila ma'am. SX-m7: reverse. SX-m8: swapping. <laughs> (CO 4)
Exposition – process analysis	T: okay who will explain? miss, [S22/last] explain. kay kaw man nag-answer. S20: so, B intersection C. so ang intersection sa B ug C is, 4, 8, 9. then, difference kung A, is union to C is 0, 1, 3, 4, 5, 6, 7, 8, 9. then, ato i-cancel out ang common elements para makuha nato ang, difference. so, ang common elements is, aw are, 4, 8 and 9. so, diba galaong si ma'am na haw difference is, mas i-priority ang pinaka-una. so, mawara da ini. so ang bilin, null set. (CO 1)

Mode of Discourse	Utterances
Exposition – process analysis	T: okay you explain. ... S11: ang result gani kay ... prime man siya diba? ... so kani ug kani atong basehan ug ang (.) result ani. so diba intersection? ... intersection. diba ang intersection is ang common sa ilaha? so ... unsa man ang common ani niya ug kani? SX-f11: kanang 1 2 3 4 5. S11: ... kuan ra 1 2 3 5 ra. ... wala man tay 4 diria. 1 2 3 5 is the final result. 2 3 5 is the final result. (CO 5) T: unsay pattern? unsay nakita na pattern ani? based sa example? dili. ni ingon na ko ganina nga 16. correct tong kang mister [S nga 16. ang ako pangutana unsa diay pattern? nganong 16 man? yes miss [S9]]? ... SX-m24: <13>ma'am i-add baya. i-add.<13/> T: i-add ang? SX-m24: 1+1, 2. 2+2, 4. 4+4, 8. 8+8, 16. (CO 8)
Argumentation	Teacher: so as business people in the near future, ... why is it important to study or to have a problem solving skill? S3: for me ma'am, it is very important especially in business because (2.o) like ah (.) accounting, part g'yud na sa magkuan because accounting is art of recording, specifying, summarizing, interpreting the business transaction in terms of <un> xxxxx. </un> (CO 6) T: huh? way pangutana? okay my question is, what is the best method? is it inductive reasoning or deductive reasoning?... oh nakadungog ko diri'g inductive. ngano inductive man? SX-f33: deductive for me because when, when you analyze the situation, uhm you can (.) prove that your answer is correct because through your solution. (CO 7) SX-f9: si Rihanna sab ma'am kay di sab yaan matawag na Treasurer kay older pa sa kaha ang Treasurer ma'am tapos si Rihanna ug ang Secretary youngest sa kaha sila ma'am. ... T: okay X. so therefore? Ss16: yaan ang Vice President. <cheer> (CO 6)

Exposition Definition. Learners are using exposition definition as a discursive practice in the Math class. This discourse is evident when

multilingual students are asked to explain the term “infinite set.” By defining, students’ translanguage by translating or mixing languages in an utterance. The excerpts below are the direct utterances of the students, which prove that this discourse is employed in the class.

T: infinite set. oh what is infinite set?

SX-f4: *walang katapusan*.

SX-f5: cannot be measured.

T: cannot be measured?

SX-f6: cannot be listed.

(CO 1)

T: infinite set. oh what is infinite set?

SX-f4: unending.

SX-f5: cannot be measured.

T: cannot be measured?

SX-f6: cannot be listed.

As shown in the excerpt above, the teacher uses the English language to ask the class to define an “infinite set.” SX-f4 responds in Filipino by translating the main term “infinite set” to “*walang katapusan*.” In like manner, after hearing the translated term in Filipino, SX-f5 and SX-f6 are more apt to respond in English defining “infinite set” as “cannot be measured” and “cannot be listed.” This is still a manner of translanguaging where the students hear the translation in Filipino and speak the definition in English. By translanguaging, SX-f5 and SX-f6 are able to verify and give the definition of “infinite set” by associating it with the Filipino phrase “*walang katapusan*.” Similarly, mixing of languages is also employed when giving definitions. This is also shown in the excerpts below.

T: oh what is Cartesian product. {calls random students} *walay na research sa definition?* ...

SX-m6: X and Y *ra*.

T: X and Y. yes mister [S4/last].

S4: uhm from the word itself Cartesian product is Cartesian plane you see the X and Y where is the X, is the positive and negative, ... yeah a b *basta* there are four. {students laugh}. yeah *basta* X and Y considered *da* Cartesian plane.

(CO 4)

T: oh what is Cartesian product. {calls random students} You haven't research any definition? ...

SX-m6: X and Y only.

T: X and Y. yes mister [S4/last].

S4: uhm from the word itself Cartesian product is Cartesian plane you see the X and Y where is the X, is the positive and negative, aw <mumbles>. yeah a b as long as there are four. {students laugh}. yeah as long as X and Y considered already (as) Cartesian plane.

S4 mixed the languages by shifting from one language to another in the utterance. The teacher uses English to ask for the definition of "Cartesian product". Later, she as well mixed Bisaya and English to question if her students did not find a definition for the term. SX-m6 responds in mixed languages with Math variable "X and Y" in English and "ra," used as an adverb, in Bisaya. Using English, the teacher recognizes that the short translanguaging utterance contains the main idea of Cartesian product and thus, asks the SX-m6 to expound on this. What follows is SX-m6 expounding the definition by mixing English with Kinamayo adverbs "basta" and "da" or as long as and already at the middle of the sentence. The use of Kinamayo in this translanguaging utterance shows SX-m6 defining Cartesian product in a gist. He uses Kinamayo to outline that as long the set contains coordinates X and Y, it already defines Cartesian product.

It can be seen from the excerpts that the student defines Math concepts "infinite set" and "Cartesian product" by either translating into Bisaya or mixing the utterance in English with Kinamayo, as shown above.

Exposition Classification. Another type of exposition used as a discourse in the class is classification. This discourse is utilized when multilingual students are to identify which items qualify the categories "natural numbers between 1 and 2" and "positive integers less than 15" being presented. The excerpt below is an example of such discourse.

T: what is natural number? starts with o?

Ss2: sa 1 ma'am.

T: yes. starts with 1. so kung... mag-start ta sa 1, natural number between 1 and 2,

SX-m2: dili na s'ya natural ma'am.

...

T: 1.1, 1.2 to 1.9 is not a natural number.

SX-m4: *dili na natural kay naa na nay point.*
(CO 1)

T: what is natural number? starts with o?

Ss2: with 1 ma'am.

T: yes. starts with 1. so if we will start on 1, natural number between 1 and 2,

SX-m2: it's no longer natural ma'am.

...

T: 1.1, 1.2 to 1.9 is not a natural number.

SX-m4: it's no longer natural because it has a point.

As shown in the excerpt above, the teacher is using English to ask the students about “natural numbers” and to identify what numbers belong to this category. She initiates the categorization by proposing “o” as the starting number of the natural numbers. Ss2 is quick to respond, mixing the vernacular “sa” or with the English “1”. This denotes that although translanguaging, Ss2 can classify 0 as not a natural number and 1 as the starting point instead. As shown in the following line, the teacher, in mixed languages, verifies Ss2's answer as correct and uses this to continue the categorization. The teacher asks the students to identify what natural numbers are found between 1 and 2. SX-m2 then identifies that the numbers between 1 and 2 are not natural numbers by mixing the Bisaya “*dili na s'ya*” which means it is no longer with English “natural.” Further at the last line, SX-m4 gives the reason why 1.2 to 1.9 do not qualify the category of a natural number by mixing the Bisaya “*dili na*” or no longer with the English “natural” then shifts to Bisaya again with “*kay naa na nay*” which means because it has then ended with English “point.” As indicated in the excerpt, even if Ss2, SX-m2 and SX-m4 mix languages, they not only can classify what belongs or what does not belong to natural numbers between 1 and 2 but also give a reason for the non-classification of other numbers because the use of vernacular facilitated their understanding and reasoning of natural numbers. The use of vernacular activates their understanding of what natural number is and makes them reason why other number, like 1.1 to 1.9, are not so.

In addition, students also translanguange when putting boundaries on items of a “positive integer less than 15”. This is shown in the excerpt below.

T: how about o? how about o? o is not included since o is not? a positive? integer. how about 15?

SX-f16: *dili* <16>*na s'ya ma'am kay* less than 15 *man*.<16/>

SX-f17: <16>*dili na ma'am kay* less than *man*.<16/>

T: ye:s 15 is not included *kay diba* based on the given,

Ss11: less than 15.

T: less than 15.

SX-m24: <17>14 *ra taman*.<17/>

(CO 2)

T: how about 0? how about 0? 0 is not included since 0 is not? a positive? integer. how about 15?

SX-f16: no <16>longer because it's less than 15.<16/>

SX-f17: <16>no longer because it's less than 15.<16/>

T: ye:s 15 is not included because based on the given,

Ss11: less than 15.

T: less than 15.

SX-m24: <17>only up to 14.<17/>

As shown in the excerpt, students are asked to name the positive integers less than 15. In English, the teacher asked the students if “15” belongs to the category named above. SX-f16 and SX-f17 respond in mixed languages that “15” does not belong to the category by mixing Bisiya “*dili na s'ya kay*” which means no longer because with English “less than 15” and shifts back to Bisaya “*man*” to emphasize that the category asked is less than 15. The teacher affirms this and leads the analysis. The following lines show both the teacher and Ss11 repeating in English the condition of the category “less than 15”. In the last line, SX-m24 classifies 14 as the last number to be included in the category “positive integers less than 15” by mixing the English number “14” with Bisaya “*ra taman*” which means only up to. As shown in the scenario, SX-f6, SX-17, Ss11 and SX-m24 are able to classify information because both teacher-student and student-student interactions smoothly adapted the use of English and Bisaya.

Exposition Comparison and Contrast. Aside from the two aforementioned types of exposition, comparison and contrast is another type of exposition discourse employed in the Math class. This type is usually used by multilingual students when looking at similarities and differences of set concept in Math. The excerpts below illustrate this discourse.

T: ... how will you differentiate the two groups? ...

S1: *ang sa (.) sulod ma'am gamay ray makita nato* but in the outside
hamok hamok ang makita nato. <3>based on my experience.<3/>
 (CO 3)

T: ... how will you differentiate the two groups? ...

S1: in the (.) inside ma'am we can only see few but in the outside we can
 see a lot more. <3>based on my experience.<3/>

Using English, the teacher asks the class to differentiate two groups, the inside group being the things found inside the classroom, and the outside group, the things found outside the classroom. S1 translanguages from Bisaya to English and then to Kinamayo to point out the differences between the two groups being scrutinized. S1 responds by describing the inside group in Bisaya saying, “*ang sa sulod... gamay ray makita nato*” while shifts to using English to describe the outside group saying, “but in the outside” then shifts again to Kinamayo to continue saying, “*hamok hamok ang makita nato.*” Despite the inability to consistently use English in the utterance, it indicates that this multilingual student proficiently uses English, Bisaya, and Kinamayo languages to scrutinize the inside and outside groups because of a source, his own personal experience.

On the other hand, a different case of comparison and contrast is presented in the next excerpt.

T: and then? what's the difference *lagi* between *sa CxD* and *DxC*? *ingon ka parehas ra.*

S5: *bali ra sila* ma'am.

SX-m7: reverse.

SX-m8: swapping. <laughs>

(CO 4)

T: and then? what's really the difference between in *CxD* and *DxC*? You said they are similar.

S5: they are only inverse ma'am.

SX-m7: reverse.

SX-m8: swapping. <laughs>

Here, we see that although comparison and contrast discourse is still used, translanguaging is employed to help S5 use an appropriate term to correspond to an answer. The teacher, in mixed languages, is trying

to exhaust the student's explanation on the difference between "CxD and DxC." S5 responds in Bisaya saying, "bali ra sila." Again, this is still translanguaging as the question is received in English, and S5 responds in Bisaya. After hearing such, SX-m7 and SX-m8 then answered translating the Bisaya "bali" or inverse to "reverse" and "swapping," which they believe would be more appropriate to explain the difference between the two sets mentioned above. As shown above, S5, SX-m7 and SX-m8 are able to differentiate flexibly sets CxD and DxC by connecting not only the languages spoken but also the languages and the symbols presented. This shows that the students use not only translanguaging but also trans-semiotizing strategy to learn the concept. Moreover, the cooperative construction of the answer displayed by S5, SX-m7 and SX-m8 indicates that English is used with Bisaya to deliberate appropriate wording.

Exposition Process Analysis. The last type of exposition discourse used is process analysis. This discourse is noted when multilingual students explain the pattern of a deductive reasoning activity performed in class. On some level, process analysis has something in common with narrative. The excerpts below affirm this finding.

T: *unsay pattern? unsay nakita na pattern ani? based sa example? ... ang ako pangutana unsa diay pattern? nganong 16 man? yes miss [S9]:*

...

SX-m24: <13>ma'am i-add baya. i-add.<13/>

T: i-add ang?

SX-m24: 1+1, 2. 2+2, 4. 4+4, 8. 8+8, 16.

(CO 8)

T: what is the pattern? what pattern can you see in this? based on the example? ... my question is, what is the pattern? why is it 16? yes miss [S9]:

...

SX-m24: <13>ma'am add. add.<13/>

T: add what?

SX-m24: 1+1, 2. 2+2, 4. 4+4, 8. 8+8, 16.

In this excerpt, the teacher uses mixed language to ask the students to justify 16 as the answer to the current problem by looking for a pattern found in the answers (1, 2, 4, 8) from the previous problems. SX-m24 answers in mixed languages, particularly prefixing the English word "add" with Kinamayo "i-." Prefix "i-" is identified in this utterance as Kinamayo because

of the use of the Kinamayo interjection “baya” or oh. Remarkably, the use of Kinamayo injection “baya” indicates that SX-m24 finally understands the pattern. Also, his manner of repeating the English Kinamayo-prefixed “i-add” shows that he is convinced of the pattern that he finds out. The teacher then questions in mixed languages about what are added. This time in the last line, SX-m24 responds in English explaining how the variable “1” added to itself to come up with the sum “2.” This sum becomes another variable added to itself which results to the sum “4.” This process is repeated until he arrives to “16,” the answer which requires justification. In this discourse, SX-m24 used mixed languages to present how procedures, “1+1, 2. 2+2, 4. 4+4, 8. 8+8, 16” condition one another to determine the product “16.” Meaning, by mixing English with Bisaya, he was able to describe a particular theory in terms of how the content “16” evolved. The method of showing the steps of action is likewise seen in the next excerpts.

T: okay who will explain?... miss, [S22/last] explain. *kay kaw man nag-answer.*

S20: so, B intersection C. so *ang* intersection *sa* B *ug* C is, 4, 8, 9. then, difference *kung* A, is union to C is 0, 1, 3, 4, 5, 6, 7, 8, 9. then, *ato* i-cancel out *ang* common elements *para makuha nato ang*, difference. so, *ang* common elements is, *aw* are, 4, 8 and 9. so, *diba galaong si ma'am na haw* difference is, *mas* i-priority *ang pinaka-una*. so, *mawara da ini*. so *ang bilin*, null set.

(CO 1)

T: okay who will explain?... miss, [S22/last] explain. because you answered it.

S20: so, B intersection C. so the intersection of B and C is, 4, 8, 9. then, difference if A, is union to C is 0, 1, 3, 4, 5, 6, 7, 8, 9. then, we will cancel out the common elements to get the, difference. so, the common elements is, oh are, 4, 8 and 9. so, didn't ma'am say that if (it is) difference, prioritize more the first (set). so, this will be gone. so what's left, null set.

As shown in the excerpt above, S20 explains the chronological step of arriving to the correct answer on the difference between B intersection C and A union C. In the initial part of the utterance, S20 constantly shifts from English to Bisaya. This is evident when S20 says in English “so, B intersection C. so” and continues with the Bisaya determiner “ang” or the then shifts backs to English “B” which is cut short by the Bisaya “ug” or and goes back

to use English with “C is, 4, 8, 9.” This is the same manner of shifting that S20 uses on the next sentence. Although there are words which can be understood in both Bisaya and Filipino, like “kung” or if and “ang” or the, the mixing of languages for the first two sentences is considered between English and Bisaya only. This is analyzed as such because there is no use of inherently Filipino word present to associate “kung” and “ang” as Filipino terms. Whereas at the later part of the utterance, S20 shifts from English to Kinamayo as evident in the utterances “galaong” which means said, “haw” and “mawara da ini” to continue explaining the process. Shifting from English-Bisaya to English-Kinamayo indicate S20’s way of enhancing the opportunity of making sense of the new information. The same is true with the next excerpt.

T: okay you explain.

...

S11: *ang result gani kay ... prime man siya diba? ... so kani ug kani atong basehan ug ang (.) result ani. so diba intersection? ... intersection. diba ang intersection is ang common sa ilaha? so ... unsa man ang common ani niya ug kani?*

SX-f11: *kanang 1 2 3 4 5.*

S11: *... 1 2 3 5 ra. ... wala man tay 4 diria. 1 2 3 5 is the final result.*

(CO 5)

T: okay you explain.

...

S11: the result anyway is ... this is prime right? ... so we will base on this one and this one and the (.) result of this. so intersection right? ... intersection. isn’t the intersection the common between them? so ... what is common between this and this?

SX-f: that 1 2 3 4 5.

S11: ... only 1 2 3 5 only. We don’t don’t have 4 here. 1 2 3 5 is the final result.

The teacher uses English to instruct student S11 to explain the answer on an intersection set problem. In S11’s utterance, it can be noted that she also constantly shifts from Bisaya to English all throughout the explaining the process. For example in the last sentence, S11’s utterance starts with English “so” then Bisaya “ang” or the, followed by English “common” then

shifts back to Bisaya “ani niya ug kani” or between this and this?. Another thing that can be noted in this excerpt is that S11 tries to engage the class into the analysis by asking them. The following line shows SX-f11 giving “1 2 3 4 5” as the answer. At this time, S11 responds in mixed languages saying in English “1 2 3 5” then Bisaya “ra” which means only. Note that S11 uses “ra” to indicate a recast and correction previous answer which contains “4”. Then continues to explain in Bisaya “wala man tay” which means we don’t have, followed by English “4” and shifts back to Bisaya saying “diria” or here. By using the Bisaya “diria”, S11 can be noted to going back to the process of deriving to the answer. The last sentence is in English saying “1 2 3 5 is the final result”. Even if S11 can’t speak the English language fluently, this utterance indicates that S11 is still able to follow and present the process correctly by using Bisaya as scaffold to determine the procedural knowledge and even correct erroneous information. In addition to this, the mixing of languages as shown in the last line, shows that S11 extends the process to include why “1 2 3 5” happen and why it was important to follow the steps in accomplishing the task.

The findings denote exposition as a discourse used in the classroom. Through this discursive practice, it enables students to flexibly use their vernacular languages simultaneously with the target language in presenting and understanding mathematic concepts. This includes giving definition of a mathematic term, gathering ideas into categories, understanding concepts in relation to another, and describing how something works.

Argumentation. The second mode of discourse used by students during translanguaging is argumentation. This discourse is often used when multilingual students articulate opinion or reason on the importance of having problem solving skills and on which method between inductive and deductive reasoning is best. The direct utterances between teacher and students are presented below.

T: huh? *way pangutana?* okay my question is, what is the best method? is it inductive reasoning or deductive reasoning?... *oh nakadungog ko diri’g* inductive. *ngano* inductive man?

SX-f33: deductive for me because when, when you analyze the situation, uhm you can (.) prove that your answer is correct because through your solution.

(CO 7)

T: huh? no question? okay my question is, what is the best method? is it inductive reasoning or deductive reasoning?... oh I heard someone saying inductive here. why is it inductive?

SX-f33: deductive for me because when, when you analyze the situation, uhm you can (.) prove that your answer is correct because through your solution.

The teacher uses English to ask for the student's opinion on the best method. Upon hearing a random answer from the class, she uses Bisaya to recognize it and to ask for justification. SX-f33 responds in English presenting her claim, reason and evidence for articulating deductive reasoning as the best method. This scenario is still considered translanguaging in a sense that Bisaya "ngano inductive man?" which means why is it inductive is used to ask SX-f33 and English is used by SX-f33 to answer. The scenario indicates that translanguaging afforded an important support for SX-f33 to draw out a claim "deductive for me", a reason "because when, when you analyze the situation, you can prove that your answer is correct" and an evidence "because through your solution".

Teacher: so as business people in the near future, ... why is it important to study or to have a problem solving skill?...

S3: for me ma'am, it is very important especially in business because (2.0) like ah (.) accounting, part *g'yud na sa magkuan* because accounting is art of recording, specifying, summarizing, interpreting the business transaction in terms of <un> xxxxx. </un>

(CO 6)

Teacher: so as business people in the near future, ... why is it important to study or to have a problem solving skill? ...

S3: for me ma'am, it is very important especially in business because (2.0) like ah (.) accounting, it's really a part of (filler) because accounting is art of recording, specifying, summarizing, interpreting the business transaction in terms of <un> xxxxx. </un>

As indicated in the excerpt above, S3 translanguages to present her opinion on the importance of having problem solving skills. English "for me ma'am, it is very important especially in business because like accounting, part" is used to start the sentence, then it is mixed with Bisaya "*g'yud na sa*

magkuan” which means it’s really a part of in the middle and is ended with English “it’s really a part of (filler) because accounting is art of recording, specifying, summarizing, interpreting the business transaction in terms of <un>xxxxx. </un>”. It is worth noticing here that S3 employs translanguaging not only to present an argument, but markedly uses Bisaya “g’yud na sa...” as an emphasis to her claim “it is very important especially in business because” and reason “because accounting is art of recording, specifying, summarizing, interpreting the business transaction” which are in English. It indicates that shifting from English to Bisaya afforded S3 to demonstrate accentuated appraisal on having problem solving skills. A different way of presenting an argument is indicated in next excerpt.

SX-f9: *si Rihanna sab ma’am kay di sab yaan matawag na Treasurer kay older pa sa kaha ang Treasurer ma’am tapos si Rihanna ug ang Secretary youngest sa kaha sila ma’am.*

...

T: okay X. so therefore?

Ss16: *yaan ang Vice President.* <cheer>

(CO 6)

SX-f9: Rihanna as well ma’am cannot be labelled as Treasurer because on this account, the Treasurer is older (than the Secretary) and on another account, Rihanna and the Secretary are the youngest ma’am.

...

T: okay X. so therefore?

Ss16: *she is the Vice President.* <cheer>

The activity requires the students to identify the killer of crime with clues provided which include the Vice President being the killer. SX-f9 holds a claim on the argument and present her reason in a problem-solving activity. She shifts back and forth English and Kinamayo while using comparison and contrast method to establish her judgment. This method is evident in the mixed Kinamayo-English utterances “...kay older pa sa kaha...” and “...tapos si Rihanna ug ang Secretary youngest sa kaha...”. Strikingly, the utterance of SX-f9 implies she may sometimes use other discourse as method to employ and build on other discourses. Added to this, the use of Kinamayo “kaha” which means on this account is used to construct critical opinions and connections from two clues available, Treasurer is older than

the Secretary and Rihanna and the Secretary are the youngest. As shown in the next line, the teacher responds in English to verify Sx-f9's answer and lead the analysis. The last line shows Ss16 shift from Kinamayo "yaan ang" or she is the and English "Vice President" as they arrive to the evidence that Rihanna is the Vice President, thus the killer. The scenario shows SX-f9 and Ss16 controlling their own learning which resulted to the student-directed teacher-student interaction. It further suggests that drawing from their English and Kinamayo languages enable Sx-f9 and Ss16 to demonstrate what they know, and what they can do with language

The excerpts from the classroom observation are proof that exposition and argumentation are used by the students as discourses during translanguaging. When looking at exposition, it was possible to see the types of exposition that the learners used during translanguaging. The learners would translanguague when they define, classify, compare and contrast, and do process analysis. Despite students not being fluent speakers of the English language, they are still able to appropriately use exposition and argumentation in Math class through connection and association of the English to Tagalog, Bisaya and Kinamayo languages. Notably, the participants' discourses during translanguaging included code switching, mixing and translation, prefixing, and trans-semiotizing or the mixture of one with the other. Lastly, English language is not the dominant language used in the classroom. This implies that the translanguaging practices manifest influence in the classroom's use of language.

DISCUSSION

The triangulated data from classroom observation and recordings confirms two modes of discourses used during translanguaging namely, exposition and argumentation. The study also revealed that multilingual learners shift and mix English, Filipino, Bisaya and Kinamayu languages. In some of the discourse, it was revealed that during translanguaging, language input is done in a different language while language output is done in another language. This finding confirms what Garcia, Skutnabb-Kangas, & Torres-Guzmán (2006) suggests that translanguaging could probably be used in a such a way that the language inputs (reading and listening) will be done in one language and the language outputs (writing and speaking) may be done in another language. She believes that it is one way in which

bilingual learners get engaged in the classroom.

Exposition. This study supports the findings that exposition discourse is used during translanguaging (He, Lai, & Lin, 2016; Creese and Blackledge, 2010; Duarte, 2016). The results backs up the study of He, Lai, & Lin (2016) which employed oral presentation strategies such as classification, exemplification, and contrast facilitate understanding of the complex mathematic discourse. This study noted a student translanguaging between English and Bisaya and trans-semiotizing the Bisaya explanation “bali” with the Mathematics symbol “CXD and DXC”. This further supports the claim of He, Lai, & Lin on focusing on the translanguaging (between Chinese and English) and trans-semiotizing (between verbal explanations and visual displays, Mathematics symbols, images, and graphic organizers, etc.) strategies might have been carried on mathematical meaning-making more smoothly.

Using expository discourse is also evident in the study of Creese and Blackledge (2010). The current study strengthens the findings that teachers and students in community schools flexibly adapted English and Gujarati resources to convey information, provide clarification, and determine procedural knowledge. This study also shows teacher and students flexibly using English, Filipino, Bisaya and Kinamayu to define, classify, process analysis and compare and contrast.

Moreover, it authenticates what Wells, as stated in Tyler (2016), asserted that spoken discourse is an opportunity for learners to ‘talk their way in’ to ways of making sense of new information. As evident in this study, it verifies that when jointly constructing answers, translanguaging is used to set forward a particular formulation in terms of content, hypothesize, recast and correct previous information, negotiate meaning, quote from sources and worksheets, and discuss appropriate wording (Duarte, 2016).

Argumentation. this study also proves that argumentation is another discourse used during translanguaging (Kelly & Green 2018; Brodie 2010; Stavrou 2015; Mgijima & Makalela 2016). Kelly and Green (2018) reported that translanguaging provided a very important scaffold for the emergent bilinguals using argumentation discourse. This study bears out the examples of this scaffolding to include, but is not limited to translanguaging to elicit a claim, evidence, or reasoning from students. Moreover, the current study supports the research on Mathematics teaching of Brodie (2010) which shows the possibility of teachers working with learners’ mathematical reasoning as it becomes available through talk.

Also, this study endorses Stavrou (2015) who found out translanguaging provides constructive and critical opinions in the discussions in the classroom and thus enable the students to control their own learning which became learner-directed. Bilingual students may not be able to show that they can do the things, for example, support an argument, if only allowed to use the language legitimized in school. This study also attests that only by drawing from the student's entire language repertoire will they be able to demonstrate what they know, and especially what they can do with language Gracia (2009).

Lastly, the study also confirms Mgijima & Makalela (2016) result that translanguaging techniques indicate improved performance in terms of learners' use of background knowledge when drawing inferences, instead of heavily relying on the reading text. Notably, the participants' discourses during translanguaging included code switching, mixing and translation, prefixing, and trans-semiotizing or the mixture of one with the other. According to McSwan (2017), some have used a variety of terms within the same publication to capture nuanced differences or used different terms in different publications depending on their research purpose. While these terminological contrasts reflect subtle differences, they also share many common attributes.

The result also supports Tse (1996) findings that translanguaging practices include code-switching, translating, and language brokering. Similar findings of Blackledge & Creese (2009) state that multilingual's translanguaging does not only include code switching, mixing and translation. Translanguaging of the participants did extend beyond to access multiple semiotic repertoires for the purpose of meaning-making and revealed the practice of trans-semiotizing.

Rumsey & Langrall (2016) identified general instructional strategies to effectively promote students' use of argumentation within the context of exploring the arithmetic properties. They found that students needed language support in developing the discourse of mathematical argumentation. It can be implied that this language support can be maximized by accessing the language repertoire of the multilingual students of Mathematics in the Modern World since Mathematics discourse is multimodal in nature, and mathematical meaning is realized through the co-deployment of multiple semiotic systems (Moschkovich, 2007; Schleppegrell, 2007).

Lastly, English language is not the dominant language used in the classroom. This implies that the translanguaging practice manifests influence in the classroom's use of language. This result supports Bezzina (2016) who found that through basic statistics that the target language is often far from being the dominant language in the FFL classroom

CONCLUSIONS

From the results and analysis, the researcher may conclude that the multilingual learners employ varied discourses during translanguaging in Mathematics like exposition and argumentation. This could be due to the nature of Mathematics teaching and learning which require comprehensive explanation and systematic reasoning than using descriptive examples to convey an image and telling a story. This means that although these learners can translanguange in narration and description discourse, they use exposition and argumentation since they are the most valuable discourses in Mathematics.

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Gunning Fog Index: 11.68
Flesch Reading Ease: 49.77
Grammar Checking: 92/100
Plagiarism: 1%