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Argumentation Using the Indigenous Language as a Strategy to Reduce Misconceptions: Addition and Subtraction of Directed Numbers Classroom

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ABSTRACT

This article explores argumentation using indigenous language as a strategy to reduce misconceptions in addition and subtraction of directed numbers. Within a social constructivism theory, the study was a quasi-experimental design. The two groups, the experimental group (n=39) and control group (n=39), wrote a pre-test and post-test. The pre-test was analysed to find the persistent errors that the students made and were interviewed to find their misconceptions. The finding of the study has revealed that the students have the misconception of an overgeneralization, misconception of direct translation and commutative misconception. During the intervention, both groups were familiarised with scientific argumentation, the control group argues in English and the experimental groups were introduced to argumentation in their native language (Sesotho). After using the statistical package for social science (SPSS) the experimental group's performance on the post-test was significantly better than that of the control group. The number of misconceptions for the experimental group was reduced. Lastly, the study's finding has shown that the arguments were longer, clear, and more meaningful in their indigenous language. The students' performance was even positively influenced by indigenous language argumentation. It is, therefore, recommended that the students' homegrown language be used as an alternative language of instruction.

INTRODUCTION

An argumentation is a discourse comprising a claim, data, warrant and backing (Doğan & Sir, 2022). Argumentation exposes one to different ideas and improves learning amongst the students (Gross *et al.*, 2008). Argumentation is a learner-centered strategy (Qhobela & Moru, 2011). Ojose (2015) posits that learners would always experience misconceptions due to the nature of mathematics. Fumador and Agyei (2018) assert that misconceptions are unavoidable; therefore, further research is needed on misconceptions and strategies to minimise them. Misconceptions can be minimised through strategies including argumentation using indigenous languages. Makara and Tau (2019) postulate that directed numbers, as a part of mathematics, is defined as the positive (numbers to the right of zero), and negative numbers (numbers to the left of zero). According to Makara and Tau (2019) and Makonye and Fakude (2016), directed numbers are useful for temperatures less than zero, and owing in the bank is designated by the negative. The directed numbers lay foundation for most of the topics in mathematics, for example, algebraic expression, sequences, vectors, matrices, transformation and equations, to mention but a few.

Mathematics is acquired through language-based activities, which involves listening, reading and discussions (Essien, 2018). The students who learn in another language are challenged by concepts than those who are instructed in their native language. According to Msimanga and Lelliott (2014), learning in a second language impose dual risk to the students who are learning the second language, which they are not even good at and using it to acquire the academic content. A number of studies were conducted on the importance of the use of native language in content delivery and acquisition (Essien, 2018; Msimanga & Lelliott, 2014; Taylor & Coetzee, 2013). In several other African countries, such as Eswatine, English is considered as a language of instruction. In Lesotho, there are two official languages: Sesotho (the language of people in Lesotho) and English, which is the only mode of instruction used in classrooms across the country in secondary schools.

Several studies (Faize *et al.*, 2018; Gross *et al.*, 2008; Indrawatingsih *et al.*, 2020; Qhobela, 2012), have emphasised on the importance of argumentation in a classroom. As Faize *et al.* (2018) note, argumentation develops critical thinking, enquiry promotion, conceptual understanding and performance improvement. In the context of Lesotho, there two studies about argumentation, Qhobela and Moru (2011) and Qhobela (2012). Qhobela (2012) has studied the challenges of argumentation as a strategy to improve talk in a Physics classroom. Qhobela and Moru (2011) wanted to establish learning physics using argumentation as a feasible strategy. Other studies were contacted in the directed number focusing on misconceptions, errors and their causes in the directed numbers (for example, Khalid & Embong, 2020; Kshetree *et al.*, 2021; Makonye & Fakude, 2016; Ojose, 2015; Sadler, 2012). The current study differ with all those in that, I have combined the indigenous language, argumentation and misconceptions, which lead to persistent errors in an attempt to increase the

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literature on argumentation using indigenous language as a strategy to reduce misconceptions in addition and subtraction of the directed numbers from the context of Lesotho. As highlighted above, researchers have shown the importance of argumentation in learning and it is a strategy of introducing learners centered approach (Qhobela and Moru, 2011). What stands out to be the theme of this paper is practicing argumentation using the Sesotho language to reduce misconceptions.

Statement of the problem

Mathematics is spiral in nature (Ministry of Education and Training [MOET], 2009), and the directed numbers lay a foundation for most topics in mathematics. As a result, there is a need for it to be understood by the students, and it is essential to be delivered successfully to the students. The directed numbers are a basis for success in algebra (Khalid & Embong, 2020). The earlier researchers, such as Gross *et al.* (2008), have underscored the significance of argumentation. Essien (2018) has established the importance of native language in learning. However, in Lesotho, the notion of the directed numbers, important as it is, is taught in English, the second language. This study was, therefore, motivated by the fact that the existing literature on reducing misconceptions, argumentation using indigenous language showed very little evidence of pursuance of the phenomenon in the context of Lesotho. The following research questions inform the study:

What persistent errors do grade 8 students make, and the misconception they have in addition and subtraction of the directed numbers?

Can argumentation using the indigenous language in class help in reducing the misconceptions that the students have?

What are the challenges of argumentation in Sesotho language?

The findings of this study would, consequently, assist the teachers to design their instruction to help minimise the students' misconceptions.

LITERATURE REVIEW

The literature was reviewed on persistent errors and misconceptions in directed numbers from both empirical and theoretical perspectives. This was followed by the advantage and disadvantages of argumentation and indigenous language used in learning and teaching of mathematics.

Persistent errors and misconceptions in addition and subtraction of directed numbers

Misconceptions are unavoidable stages in the learning process (Moru & Mathunya, 2022). The result that the misconception leads to persistent errors has been shared by the several studies, for example, Iddrisu *et al.* (2017) and Moru and Mathunya (2022). In the study conducted by Aydin-Guc and Aygun (2021) and Kim *et al.* (2016), it was reported that the students made a reversal error where they map the order of words from the question. These results resemble those of Iddrisu *et al.* (2017) where the participants did not mind the subtrahend and the minuend in the question. In this case, the student has the misconception of direct translation (Kim *et al.*, 2016; Mathunya, 2022). The misconception of direct translation is where the students match the order of words that appear in the question (Kim *et al.*, 2016). In the study of Makonye and Fakude (2016), the students carried out the operations in the reverse order by matching the terms in the given words order. Based on the feedback from the learners' task and the interview of Makonye and Fakude (2016), where the students were asked to subtract -12 from -10, the minuend is -10 and subtrahend is -12. However, the students took minuend as -12 and subtrahend as -10 and gave their answer as -2. The students did not consider the minuend and subtrahend in the question, and this overlaps with the finding of the studies by Kim *et al.* (2016) and Rababaha *et al.* (2020).

Misconceptions originate from inappropriate generalisation of previously learnt content (Aydin-Guc & Aygun, 2021; Im & Jitendra, 2020). This is a misconception of overgeneralisation. In dealing with integers, the students make an error called sign error. In the study by Khalid and Embong (2020), the students were given -6-(-2); in this study the students gave their answer as 4. Makonye and Fakude (2016) reported that the students were asked to solve -7-(+3), and the students gave their answer as 4. In both studies, the students ignored the negative sign involved. Misconceptions are the underlying wrong beliefs and principles in one's mind that causes errors (Makonye, 2016). Olivier (1989) opines that misconception of interference is a situation where the previously learnt content interferes with the new knowledge. Rule mixes error, which is a case where the students mix the rules learnt. For example, in the study of Khalid and Embong (2020), the students were given -2-6 and their answer was 8 because negative and negative make positive. Multiplication of integer's knowledge interferes with the addition of integer knowledge.

Advantage and disadvantages of argumentation and indigenous language used in learning and teaching of mathematics

Conner *et al.* (2014), Faize, (2015), Foutz (2018) and Qhobela (2012), supported by Indrawatingsih *et al.* (2020), who confirm the importance of argumentation and emphasised that effective argumentation skills are vital for conceptual understanding and good communication. Conner *et al.* (2014) argue that argumentation assist the students to reflect on their learning. Conner *et al.* (2014) and Foutz (2018) posit that argumentation is a technique for mathematics instruction that assist the students to overcome misconception and other challenges such as self- doubt. Mueller and Yankelewitz (2014) noted that argument clear up the misunderstanding. Classroom mathematics argumentation leads to increase in conceptual understanding and better achievements (Faize, 2015; Faize *et al.*, 2018; Kosko *et al.*, 2014;). Doğan and Sır (2022) argue that argumentation improves mathematics

strategies.

Three components of an argument are the claim, data to support the claim, and lastly, warrant connecting the data to claim (Toulmin, 2003). However, the teacher may have problems teaching the students argumentation. Taylor and Coetzee (2013) state the importance of the use of native language as opposed to English language. Essien's (2018) research in three different African countries, where the focus was on the role of the language in the teaching and learning of early grade mathematics, the study found out that the indigenous languages used in class are facing the challenge that are not fully developed into academic languages. Qhobela and Moru (2011) found that practicing argumentation using a second language as a challenge and turn to use their native language as opposed to the medium of instruction.

The theoretical frame work

This study is underpinned by the Vygotsky (1968) Social Constructivism Theory. Constructivism can be summed up as the students actively constructing knowledge rather than passively receiving it from the environment. It also shows that social interactions are important for knowledge construction. Smith *et al.* (1993) contend that the students' mathematical misconceptions are directly connected to constructivism. This includes a schema as an intellectual tool for knowledge stages and retrieval, along the twin process of accommodation and assimilation. The new knowledge contradicts the prior knowledge leading to error and misconceptions. When the schema is not properly reshaped and reorganised, misconceptions result (Zhiqing, 2015). In light of the above, the study used social constructivism as the students engaged into argumentations with each other to construct knowledge. Argumentation involves social process where the students works in groups and engaged in mathematical discourse; in which they support their position and weaken the opponent.

METHODOLOGY

The study was a quasi-experimental research design with pre-test and post-test for both control and experimental groups. The pre-test seeks to find the error that the students display and the misconceptions that they have. The experimental group was subjected to argumentation in Sesotho while control group argued in English. The two classes of 39 students of 13-17 age range each made up the study population. The experimental group had 29 girls and 10 boys while the control group had 31 girls and 8 boys. A toss of a coin did the naming of the group as experimental or control. The researcher taught both groups. The study was conducted in one high school in a semi-urban area of Lesotho. This school is located 10 kilometers from Teyateyaneng town, and it is found in Leribe district. It is mixed gender school with classes from Grade 8 to Grade 11. It admits the students from the entire Kolonyama community. It was selected purposively and conveniently because it is closer to the researcher, that is, it is accessible, imposing to financial constraints and time wasted.

Stages of data collection

The data were collected in three stages from the learner pre- and post-test with 20 open ended questions, interview and observation. The first stage was solving the directed numbers problems to identify the persistent errors and the interviews to spot the misconceptions that the students have. As underscored earlier, a persisted error is a result of misconceptions. The students from both the groups were given the same test to write on the directed numbers. The questions of the tests were designed by the researcher from various mathematics textbooks and were aligned with the Grade 8 curriculum, and they were designed in alignment with the literature review. This helped note the persistent errors the learners made in evaluating the directed numbers. The interviews were conducted with ten (10) students from both the groups to trace their thinking pattern to find the misconceptions they have.

In the second stage, the students from both the groups were then introduced to the formal argumentation for 6 months. They were taught how to make a mathematical claim and evidently support it. They were also familiarised to discuss a mathematics phenomenon argumentatively. The control groups were asked to argue in English on the task looking at their answers. The experimental group students were asked to form arguments in Sesotho. Both groups are given ten (10) activities from the mathematics curriculum over 6 months from January 2022 to June 2022 to practice before working on the post-test. The students were in groups of 5 for both control and experimental group. The argumentation were video recorded, depending on the persistent error that the students had; they were 160 episode of the argumentations recorded. The videos were observed and transcribed.

On the contrary, in the stage 3, the students from both groups were then given a pre-test to write, which was organised as the pre-test. The post-test was written by the students after argumentation in languages. The scripts from both groups were then analysed to note the persistent errors that were made. This helped to comprehend whether the argumentation in the indigenous language helped reduce the misconceptions.

Reliability and validity of data collected

The author constructed the test items and validated by mathematics educators from others schools; one of them is a marker for Lesotho General Certificate of Secondary Examinations (LGCSE) final examination. The tests items were closely aligned with the research questions. The expert validated the tests in relation to the content, construction and language used. The comments from those expect were discussed and implemented to give the tests the new structures. The interviews were audio recorded and the argumentation episodes were video recorded for accuracy when analysing the data. The

video-recording increase the accuracy when transcribing the arguments of the episodes. Translating from Sesotho to English was done by the expert from the National University of Lesotho.

Analytical framework

Coral and Bokelmann (2017) perceive that analytical framework is difficult to define; however, it is a model that guides and facilitates sense making and understandings. It further assists to organise a research by linking the theoretical question to the empirical analysis, which represents the flow of knowledge in various contexts and conditions. According to Essien (2017), an analytical framework is developed from the theoretical framework. It should also have clear descriptors or indicators that will help in answering the research questions. This framework also provides an explanation within the scope of the theoretical field on how to get to the categories and sub-categories of the analysis and their contribution to the thrust of the study in answering the research questions (Essien, 2017). Where the intention was to identify the persistent errors (an error done by the students in two or more questions) and the misconceptions that the students have, thematic analysis was used for both the pre-test and the interview. Alhojailan (2012) defines thematic analysis as a process of locating the thinking pattern of the interviewees, and the pattern of action showed. The researcher analysed the students' tests noting the error pattern and conduct, as well as the interview to find the misconceptions that they have.

An argument is made up of the claim, supporting explanation for the answers (warrant) and a further explanation (backing) to verify why the warrant is valid, hence the claim. The second research question, the SPSS was used to find the statistical analysis, for example, mean, standard deviation and the t-test for both groups. They were done to find the statistical significance between for the pre-test and post-test averages.

RESULTS

As highlighted earlier, the results of the pre-test were analysed to identify the persistent errors that the students have while the interview was conducted to find the misconceptions that the students have. The intervention part followed where the students made arguments in English and Sesotho. The post-test was used to find the effect of the languages on the students' misconceptions

Stage 1: Persistent errors from the pre-test and the misconceptions from the interview analysis

This section presents the persistent errors and the misconceptions that the students have from the interview. Note that the word "researcher" is abbreviated with the letter, "R", for the interview, S40 means the students number forty, and Q3 is question 3. The analysis of the students' scripts from both groups displayed five common persistent errors. Those errors include sign error, where the students know the expectations of the question but do not consider the negative signs involved. Below is an extract from the interview with S35, who is from the experimental group on Q2 (a).

R- Can you explain how you obtained 16 as an answer to -9+7?

S35- I took 9 and added 7. That is 9+7=16 and I put negative in front of 16.

The interview shows that when preceding a number, the negative sign is ignored. The students focused on the sign in between the two terms. The misconception that the learners have is the misconception of overgeneralisation over the addition operation. The finding that the student ignores the negative sign involved overlaps with that of Khalid and Embong (2020).

Table 1: Sign error and the frequent students' responses

Questions	**3 (a)** **-9+7**	**(d)** **-7+(-4)**	**(e)** **-6-(-10)**	**(f)** **-8-(+3)**	**(h)** **-3-(-2)**
Answer(s)	-16	-3	-16	-11	-5
Experimental	(19) 48.7%	(19) 48.7%	(16) 41.0%	(18) 46.2%	(16) 41.0%
Control	(20) 51.3%	(21) 53.8%	(17) 43.6%	(15) 38.5%	(17) 43.6%

Reversal error is where the students match the order of words as they appear from the question. S23 made the reversal error on all questions shown on table 2. Below is an extract from the interview with S23 who is from the experimental group on Q3 (a).

S23 The question writes, "subtract 2 from 5", and I said 2-5= -3 because it said subtract, so we use minus sign.

According to the constructivist theory, such errors occur because the learners fail to comprehend the question's requirements (Abdullah *et al.*, 2015). This is caused by a

Table 2: The frequent students' responses showing Reversal error

Questions	**3 (a)** **subtract 2 from 5**	**(d)** **subtract-2 from 8**	**(c)** **subtract -5 from -2**
Answer(s)	-3	-10	-3
Experimental	(27) 74.4%	(31) 79.5%	(31) 79.5%
Control	(30) 76.9%	(30) 76.9%	(29)74.4%

misconception of direct translation. This misconception concurs with the finding by Kim *et al.* (2016).

Method error is the error unique to this study resulting from incomplete procedure in a method. This method works for addition and subtraction of the directed numbers, but the learners could not complete it. S80 (who is a member of control group), made this error persistently on all the questions shown on table 3. Below is what transpired in the interview with S80 about Q2 (b).

R - Are you saying that + -= - hence 8-10, if so can you tell me how you got 2 as an answer?

S80- I looked at 10 and subtracted 8, that is, 10-8=2; that is how I got 2.

R- Why have you interchanged 8 and 10 to have 10-8 instead of 8-10?

S80-The method, Sir that we used in class allows us to do that, and the answer will still be the same with those who used number line or other methods. Again, sir, 2+3=5=3+2=5.

According to the constructivists, the learners had an incomplete appropriate schema. The interview shows that the learners knew how to add the directed numbers but could not complete the method used by assigning the answer the sign of a bigger number. The commutative misconception causes it; this misconception has emerged as a result of this study. This misconception is as a result of the interference of the two schemas: the directed number, addition and the commutative property from the last line where the student made an example of a correct commutative property of addition.

Table 3: Method error the frequent students' response

Questions	**3 (a)** **-9+7**	**(d)** **-7+(-4)**	**(f)** **-8-(+3)**	**(h)** **-3-(-2)**
Answer(s)	2	3	5	1
Experimental	(19) 48.7%	(26) 66.7%	(15) 38.5%	(24) 61.5%
Control	(20) 51.3%	(25) 64.1%	(16) 41.0%	(22) 56.4%

Stage 2: Argumentations in Sesotho (experimental group) and in English (control group)

The following are the episodes of the argumentation that took place in the groups of students. Note that whenever words are in brackets (), it shows a direct translation from Sesotho, the bolded words in brackets were English words used during the Sesotho argument, three dots = … denote inaudibility of the video and S72 denotes students number 72.

Episode 1

The following argumentation took place amongst the members of the experimental group on the sign error (persistent error) caused by the misconception of overgeneralisation.

Item: work out the following -8-(+3)

S74 (-8-(+3)=-5. I combined the signs ± =-, and this will give -8-3, which gives -5; therefore, my answer is -5).

S52 (I disagree with you. -8-(+3)=-11. After combining the signs, the question looks like -8-3. We stared first by adding 8 and 3 to get 11 and put a negative sign in front of 11. We can also use a number line to get the same answer).

S74 and S52 started their arguments with the claims that -8-(+3)=-5 and-11. S74 supported the wrong claim by warrant and backing. However, he made a wrong conclusion. S52 maintained the claim by workings, providing enough backing by the use of the number line to get to the correct answer. This episode shows that S52 was fluent in his home language.

Episode 2

The following argumentation took place amongst 8 members of the control group.

Item: work out the following -8-(+3)

S10 My answer is -11. I said -8-3=-11

S24 My answer is -5.

S18 I agree with -11 and I used a number line.

There is a claim and no evidence that supports the claim from the above argumentation. The students just mentioned their answers to -8-(+3). It was, consequently, observed on the video recorded that the students made the correction of the related questions after realising that the answer is-11 without accounting for their answers.

Episode 3

The following is the argumentation of the students from the experimental group on reversal error (persistent error) caused by the misconception of direct translation.

Item: subtract 2 from 5

S66 (My answer is -3. I said 2-5=-3. With the use of number line you can still get -3 as an answer).

S75 (Did you understand the question? Which is the subtrahend in the question? Can you make yourself clear? The question said subtract 2 from 5 not subtract 5 from 2. I think you did not read the question for understanding. My answer is 3; I said 5-2=3).

S67 (I think I understand and agree with S75, the subtrahend is 2 and minuend is 7. I made a mistake as S66).

From episode 3, the students had the claims, which were supported. S75 started by opposing the opponent and make a claim, which was warranted. The above argument shows clearly that the entire members understood the question expectation. That means engaging in this argument lead to conceptual understanding as S67 admitted. The finding that argumentation improves conceptual understanding match those of Qhobela (2012).

Episode 4

This argument is from the control group on reveal error (persistent error) caused by the misconception of direct translation.

Item: work out the following "subtract 2 from 5"

S04 My answer is - 3 because I said 2-5=-3.

S29 My answer is 3. I said 5-2. We subtract 2 not 5.

From episode 4 each learner made a claim and supported it, but the backup reason was not supported. The students showed how they evaluated their answers. As observed in the video, the students were not socially flexible to explain their answer.

Episode 5

The following is the argumentation of the students from the experimental group on method error (persistent error) caused by the commutative misconception.

Item: work out -9+7

S48 (Let us talk about the question: -9+7, which is the correct answer? I can see two possible answers, that is, -2 and -16. what is your take on it? My answer is -16. I said 9+7=16 and placed negative in front of 16, which is my answer).

S56 (I agree with -2. I took the bigger number and subtracted a smaller number, and the answer that I got took the sign of a bigger number. See, 9 is bigger than 7, which means that we are going to say, 9 subtract 7, which is 2 and you put negative in front of 2. We can also use a number line method to see that a negative in front of 9 should be taken as part of 9, showing where it should be on the number line and compare the answers).

S48 (I think that I get your point. I did not consider the negative involved thanks).

Episode 5 shows that S48 presents a claim, which is a wrong claim. There was a warrant to support this claim, and a concluded 16 as an answer. S56 proposed a correct claim, which contradicted S48. S56 provided a correct warrant and the data to draw a conclusion that is sound. S56 also backed up the argument with the use of the number line. The argumentations above show that the students can freely express themselves when they use their native language (Sesotho) and a sound argument can be made. According to the constructivist, the students engaged their prior knowledge in their discussion (Olivier, 1989).

Episode 6

Argumentation from the control group on the method error (persistent error) caused by the commutative misconception.

Item: work out -9+7

S19 Answer is -16. I took -9+7=-16

S10 I disagree with you. My answer is -2 . I took 9 and subtracted 7 to get 2. I took the sign of a bigger number.

From episode 6, the students make some claims and said their workings without explaining their answer, for example, S19. On the contrary, S10 made a short explanation of how the answer is arrived at. After the explanation given by S10 in the argument, S19 was still uncertain with the explanation as observed in the video.

In general, the argumentations show that the students can freely express themselves when they use their native language (Sesotho). The language is wordy in Sesotho while in English, some did not even construct full sentences; this finding concurs with that of Qhobela (2012). Argumentation in Sesotho was clear on how the conclusion was arrived at while in English, it sounds just like discussions where a good idea is supported without both warrant and data supporting the claim. The finding that the students code-switch between the two languages matches that of Essien (2018). This was seen where the students lack enough Sesotho-Mathematics vocabulary.

Stage 3: Comparison of the students' performance after the two languages

According to LGCSE standard, pre-test, only 1(2.56%) out of 39 students, passed from the control group and 3(7.69%) out of 39 students passed from the experimental groups. The marks of all the students in the experimental group students increase after the indigenous language argumentation. About 7 students from the control groups' marks did not improve after auguring in English. There was a general improvement of the students' marks in the experimental group, meaning that the numbers of misconception were reduced. The experimental group had a mean score of 25.79 and control group's mean score was 23.59 in the pre-test with a p-value of 0.521 which is grater that 0.05, this shows that the two means were the same statistically with 95% level of confidence. After augmentation in Sesotho and English, the mean score for the experimental group was 55.64 and 34.87 for the control group. The p-value is less than 0.05; therefore, the two means are different statistically with 95% confidence level. This means there is a statistical significance rise in experimental students' scores in the post-test as oppose to control group.

Table 4: It shows the paired statistical analysis of the students' performance for pre-test and post-test for both groups

Tests	Groups	Mean%	Standard deviation	Mode	Range	t-value	p-value
Pre-test	Control	24.62	14.07	30	(50)50-0	-0.648	0.521
	Experimental	26.79	15.15	30	(60)60-0		
Post-test	Control	34.87	14.89	30	(55)60-5	-5.514	0.000
	Experimental	55.64	12.99	40	(55)85-30		

DISCUSSION

The indication that the students have the misconception is when they make the persistent error on the given task. The study shows that the students made the following persistent errors: sign error and reversal error, which overlap with those reported in the literature. In addition, there surfaced the method error, which is unique to the study, hence the study's contribution to the literature. In the case of the sign error, the students could not comprehend the binary nature of the negative sign. According to the results of the study, the grade 8 students have the misconception of overgeneralisation and the misconception of the direct translation with overlaps with those reported in the literature. The lesson learnt from this study is that, the teacher should ensure that the methods that they give to learners do not lead to more misconception in mathematics. It is evident in this study that argumentation using Sesotho language is meaningful and lengthy while in English, the short sentences are made and conclusions are arrived at from unclear argument. The study also found that argumentation using indigenous language brings about good performance as the number of misconception deceases. This means that the score of the post-test of the experimental group and the control group were 53.13 and 34.13, respectively. That insinuates a means deference of 19.0 points for the post-test between the two groups.

In addition to the study of Qhobela (2012), who showed that argumentation is crucial in classroom, this study has found that argumentation using native language is more important. It can be concluded that argumentation using the indigenous language assists the students to recall their prior knowledge as the students were able to refer mostly to what they learned before. Argumentation using Sesotho improves the students' investigation skills as the students collect information to convince their opponent and build their argument. Argumentation using the indigenous language is challenged because the Sesotho language has not been developed into the language of instruction. This complements the findings of other studies, such as Essien's (2018). Some of the words were difficult to translate them into Sesotho because of lack of Sesotho-mathematics vocabulary. The students from the control group had a problem with the mathematics command, such as, "subtract from". Those who used their language (tlosa ho), mastered all the questions with that phase because they were in their language.

CONCLUSION

The students made persistent error and have misconception when solving the directed numbers. The theory of social constructivism and the literature assisted the researcher in naming the emerging error and the misconception. The study has shown that the students' indigenous language argumentation appear to be useful and lead to meaningful arguments and conceptual understanding as their performance improved, which is the study's contribution to the literature. However, there are challenges associated with the use of indigenous language in argumentation to reduce misconceptions. Those include deficiency of Sesotho-mathematics vocabulary. It is, therefore, recommended that Sesotho should be developed into a language of instruction.

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