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Full Length Research Paper

Discourse practices produced in preparing mathematics teacher educators for a multilingual classroom: a critical discourse perspective

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In this study, we investigated how mathematics teacher educators in initial teacher training colleges prepare the student teachers to teach mathematics in multilingual classrooms in Malawi. In comparison with other studies, most research places more emphasis on school mathematics teaching and learning, the challenges being faced by the mathematics teachers. To further knowledge in the area of multilingualism in mathematics education, this research article examines how mathematics teacher educators train their student teachers in a college mathematics classroom. In particular, it examines the discourse practices that mathematics teacher educators produce as they train student teachers who are going to teach mathematics in multilingual classroom. The study subjects were 4 mathematics teacher educators from two different initial teacher training colleges in Malawi. The research instruments included classroom observations, pre-observation and reflective interviews and focus group discussions. Data were collected during their residential sessions in January and February 2007. Using three levels of critical discourse analysis, the research findings indicate that there were three common discourse practices that were displayed which are IRE, traditional lecturing and group discussions. It is also found that the IRE and traditional lecturing discourse practices went together with directive discourses for procedural control. The study recommends that change needs to be done in preparation of student teachers who are going to teach mathematics in multilingual classrooms. In-service workshops for mathematics teacher educators could be adopted mainly to sensitize them how student teachers can be prepared to teach mathematics in multilingual classrooms.

Key words: Mathematics teacher educators, initial teacher training colleges, student teachers, college mathematics classroom, multilingual classrooms, IRE, traditional lecturing, group discussions, directive discourse.

INTRODUCTION

The common discussion practice in multilingual classrooms is the use of the IRE (Pimm, 1987). Pimm (1987) explains that in a mathematics classroom, the oral communication tends to be strictly controlled and one of the difficulties with the teaching and learning of mathematics is the emphasis on a quiet, controlled, individual atmosphere as being appropriate. He further argues that the most familiar situation in a mathematics classroom is that of a teacher initiated question and the response is then evaluated. In this type of communication a teacher retains control of the conversation. Colleman (1996) reports that in the classroom in Brunei where he conducted his study, it was observed that the class was the orchestration of choral responses (p. 17). Colleman referred to this as the “completion chorus phenomenon”. Prophet and Rowell (1993), in their study, also reported that this phenomenon was common in a junior secondary school in Botswana. They referred to this strategy as ‘the most commonly used question and answer technique.

Investigating secondary school mathematics teaching strategies in Lesotho, Polaki (1996) reports how the teachers' strong desire to attain high pass rates in the public examinations led teachers to adopt the largely teacher-centered strategies such as teach, give an example and then learners do the exercise, question-and-answer, and exposition, consolidation and practice. Primary school teachers in Lesotho were also reported to have a preference for 'teach-example-exercise' as it was believed to be very effective in preparing learners for the examination (Polaki, 1996). In such situations, mathematics teaching and learning are viewed as processes involving nothing more than the attainment of correct answers by using correct procedures. Writing about mathematics elementary classrooms in which the LoLT was the mother tongue, Burton (1992) echoes the same observation. She further observes that lessons are more often characterized by teachers' presentations and independent silent work than by group discussion. Krashen (1982) and Long, (1983) report that, even though classroom discussions were being observed in their study, the effectiveness of those classroom discussions was doubtful because it was the teacher who initiates what is to be discussed, decides who must provide a response, which the teacher either commends or condemns, and decides when to put an end to the discussion. According to Sinclair and Coulthard (1975), such classroom talk is characterized by a predictable sequence, which they call the initiate-response-feedback (IRF) sequence. As Le Roux, (1996) noted, the IRF framework, which is very common in many less affluent African classrooms, places the learner in a responding role. The learners' opportunities for participating productively in the classroom in a multilingual classroom are very limited and constrained.

Apart from the IRE pattern in multilingual classrooms, it is also observed that, this IRE goes together with the procedural discourse. Procedural discourse is where the emphasis in teaching mathematics is aimed at establishing the steps that should be taken to solve a problem with little or no development of concepts. Khisty (1993) observed a pattern of discourse in a bilingual classroom, which she characterized as being procedural. This discourse introduces a learner to traditionally accepted procedures. Even though doing mathematics requires some knowledge of algorithms, it also requires a good deal of conceptual understanding in order to know why and how the steps should be undertaken. When the emphasis is on following procedures, much of what the teachers say is in the form of directions that learners have to memorize. Setati (1998a) argues that switching between the learner's home language and English enhanced the quality of mathematical interactions in the classroom. She demonstrates that conceptual discourse (where the emphasis is on knowing why and how the steps should be undertaken) dominated in classrooms where the home language was being used. Thus the home language of the learners is being used to clarify the concepts and so enhance the conceptual understanding of the mathematics. Similarly, in Brunei, use of Malay allowed a greater freedom of expression and provided more meaningful opportunities for real communication which enhanced the conceptual understanding. This reflects that, when teachers in a mathematics classroom do not resort to the use of home languages, in most cases, their lessons are characterized by the IRE pattern of interaction accompanied by a procedural discourse. At this point, one wonders where these patterns of interactions come from. Can there be a link between what the teachers do in a mathematics classroom and what mathematics teacher educators do in a college mathematics classroom?

More relevant to this paper is that this literature makes explicit claims as to what is considered as the most common teacher-pupil talk in a multilingual mathematics classroom. It shows the heavy reliance upon the IRE pattern of interaction. Classrooms need to be places where teachers assist learners to perform/act in many different ways using tools of different kinds, but particularly discourse. The traditional, easily recognized classroom discussion of the IRE variety tells a story in which children are constrained socially, cognitively and linguistically.

Research questions

With the literature sketched above, we formulate the following questions to be addressed in this article:

- What are the discursion practices that mathematics teacher educators display in a college mathematics classroom?

The study

The sample in this study included two teacher training colleges in Malawi, one from the central region and the other from the southern region, both of which are multilingual colleges. Four mathematics teacher educators, two from each college, were selected purposefully (Patton, 1990) based on the following criteria: each mathematics teacher educator had to have a tertiary mathematics qualification to ensure that they had at least a high level qualification. Each teacher had to have at least three years of teaching experience at college level and therefore was well experienced, which ruled out the possibility that their language practices might be due to lack of teaching experience. They were also selected on the basis of their willingness to participate in the study.

The four mathematics teacher educators to be presented here came from different regions and have different home languages. Mrs. Joshua (All the names of the participants and the colleges used in this article are

pseudonyms) and Mr. Lukhere came from the northern region of Malawi and Chitumbuka is their home language. Apart from Chitumbuka, these teacher educators can speak Chichewa (since it is a national language) and English as the official language. Both of them were teaching at Kachere TTC in the southern region of Malawi. In their classes there were four major languages, Sena, Lomwe, Chichewa and Yao. These classes had very few students who could speak the teacher educators' home language, Chitumbuka.

The other two teacher educators, Mr. Otani and Mr. Chipasula came from the central region and they both speak Chichewa as their home languages. The other language that they can speak is English as the official language. These two were teaching at Chayamba TTC located in the central region of Malawi. In their classes, there were two major languages, Chichewa and Chitumbuka. However, both of these mathematics teacher educators neither understand nor speak Chitumbuka.

RESEARCH METHODS

Qualitative methods were used to uncover the ways in which mathematics teacher educators in teacher training colleges constructed a multilingual classroom. The research methods employed in this study included pre-observation interviews with each mathematics teacher educator separately, up to five hours of mathematics lesson observation of up to five consecutive lessons in one of each mathematics educator's classes, reflective interview with each mathematics teacher educator on the classes observed. These interviews depended on the lessons observed and were facilitated by showing the mathematics teacher educators selected video recordings of their lessons. Mathematics teacher educators focus on group discourse that was conducted two weeks after the lesson observations with all the teachers involved per college. All the interviews were tape recorded and the classroom observations were video recorded.

Findings: The instructional practices

What kinds of instructional practices are used in a college mathematics classroom?

In order to address this research question, it was analyzed the videotaped lessons and list observations under headings typifying facets of college classroom mathematics teaching.

The IRE discourse practice

Using CDA, the data analyzed in this study indicate that the IRE form of discursion practice is mostly used by the mathematics teacher educators in a college mathematics classroom. For example, in Mr Otani's class, most interactions were initiated by him either through questions or instructions. This form of interaction is reflected in extract 1 below. In this extract, Mr Otani announced that they are going to use the place value chart to teach addition of fractions. He wrote an example on the chalk board and wanted to use this example to demonstrate to the student teachers how to teach additions of fractions using the place value chart. He told the student teachers that, first step, they needed to draw the place value chart and then indicate the place values on that chart.

Extract 1

Mr Otani: *All right, let us use this place value chart to teach addition of fractions. Let us say we have this one, ah one point zero seven plus zero point six two. We want to use place value chart. How can we use place value chart? First you should write the place value that is on top, okay!*
Ss: *yes*
Mr Otani: *then tens, then hundreds, then from one going this side!*
Ss: *tenth*
Mr Otani: *tenth, aha!*
Ss: *hundredth*
Mr Otani: *hundredth aha!*
Ss: *thousandth*
Mr Otani: *thousandth, now after having, after writing the heading what you should do is to model those numbers; can use counters, using really objects tikugwirizana [do we agree]!*
Ss: *yes*
Mr Otani: *aha, so let us model one point zero seven, here under the ones you put how many counters!*
Ss: *one*
Mr Otani: *you put a single counter, one then under the tenth!*
Ss: *zero*
Mr Otani: *aah, you put zero!*
Ss: *counters*
Mr Otani: *[laughing], okay just leave it as it is; under the hundredth!*
Ss: *seven*
Mr Otani: *seven counters, one, two, three, four, five, six, seven! So that is one point zero seven; so here you indicate that this one is zero point what!*
Mr Otani *& Ss:* *seven*
Mr Otani: *after that, write your plus sign, then you model now zero point six two; how many counters under ones!*
Ss: *nothing*
Mr Otani: *okay, what about tenths!*
Ss: *six*

In this extract, there are a number of interactive structures that show the domination of the mathematics teacher educator in the turn-takings. Firstly, the interaction is organized according to the mathematics

teacher educator's initiated moves followed by student teachers' chorused responses and mathematics teacher educator's acceptance. Student teachers were allowed to give brief answers as a class, of which Mr Otani would repeat, giving the student teachers a confirmation that their answer is correct.

Secondly, the mathematics teacher educator controls the moves/step selection in discussion. This takes place when the next step is proposed as a result of the mathematics teacher educator accepting the student teachers' response. Thirdly there is a prominent use of closed questions indicated with a high pitch such as "*it is what!*", or "*how many here!*" which do not require responses that provide opinions or the type of answers that require thinking. As a result, student teachers are not given an opportunity to speak more or express their opinions because the response to be given is limited. Thus, the mathematics teacher educator controls the discursions.

In extract 1, this type of discourse practice is seen to go with a range of directives. Firstly, he uses the teacher-inclusive imperatives such as "… *let us use…." "…let us say…" "…let us model…" "…let us add…"* and *"let us count."* He is also seen to use direct imperatives for procedural control. For example "…*first you should write…", "…you put a single counter…", "…now convert…." "…then write nine…" "….write your plus sign…""…you indicate…" and "… you model now…*" All this reveals the mathematics teacher educator's expectation of absolute observance of his instructions from the student teachers. Thus, the extract reveals the directive discourse that ensures control over the student teachers' participation.

A similar pattern was repeated in other exchanges in different classrooms as well. For example, Mrs Joshua expressed similar teacher-inclusive imperatives in an IRE discourse practice even though she tried to be democratic in her use of directives with the student teachers. In a way, Mrs Joshua indirectly is in control of the class and controls the discursion as well. For example see extract 2 below. In this lesson, Mrs Joshua was trying to teach the student teachers how to teach the naming and writing of fractions.

Extract 2

Mrs Joshua: *okay, so let's move on to naming and writing fractions [distributing pieces of paper to the groups]. Ok can we cut our piece of paper into two equal parts, two equal parts? [Students cutting in their groups]. Can one member from the group pick one piece of ah paper, one piece of paper. Ok so you have [writes], one, one piece of paper out of how many!*
Ss: *two*
Mrs Joshua: *out of two, eti [not so!]!*
Ss: *yes*
Mrs Joshua: *you have had two pieces, so you have picked!*
Ss: *one*
Mrs Joshua: *so you have [writing], one piece of paper out of! Two pieces, okay, and that piece of paper because, previously had one complete thing and now have part of it, that means that one piece which you have picked is!*
Mrs Joshua & Ss: *a fraction*
Mrs Joshua: *okay, now how do you write that, that one piece of paper you …. It is one out of how many which you have! [writing one over two]*
Ss: *two*
Mrs Joshua: *okay, that's one piece; one part which you have, which you have is one out of! Two pieces of paper which you have, okay!*
Ss: *yes*
Mrs Joshua: *and its written as one bar down there two, okay so this is giving us ah [writing] number, in this case we have number of pieces of paper, number of pieces of paper picked [referring to one on top of two] over what!*
S13: *total number*
Mrs Joshua: *total number of pieces [writes referring to two down], are*
we together?
Ss: *yes*

Extract 2 illustrates the IRE interaction in Mrs Joshua's class, where the mathematics teacher educator asks a question, student teachers respond in a chorus form and then she evaluates. She is seen to use closed questions marked with the use of high pitch that does not require student teachers to provide opinions or the type of answers that require thinking. Student teachers were allowed to give brief answers as a class. There is also prominent mathematics teacher educator talk. She talks much more than the student teachers and so she controls the discussion.

In this extract, Mrs Joshua also uses teacher-inclusive imperatives at the beginning when she was trying to explain what they are going to do in their class. For example, she uses words such as "*let's move on", "can we cut our piece of paper into two equal parts",* and *"can one member from the group pick one piece of ah paper."* This reveals that Mrs Joshua's expectation for observance of her instructions and control over the procedure.

Another interesting feature in this extract is where Mrs Joshua herself answered the questions that she asked. For example she said, "*so you have [writing], one piece of paper out of! Two pieces,"* in her first turn *"okay, now how do you write that, that one piece of paper you …. It is one out of how many which you have",* in her ninth turn and "*okay, that's one piece; one part which you have which you have is one out of! Two pieces of paper which you have"* in her 11th turn. Mrs Joshua did not provide

time for the student teachers to offer their own answers. In other words, the mathematics teacher educator denied the opportunity for the student teachers to be active and participate in the discussion.

In general, in all these examples, moves were initiated by the mathematics teacher educators followed by the student teachers' responses and then acknowledgement by the mathematics teacher educators, confirming the findings of other researchers that the IRE discourse practice that goes together with the directive discourse is also common in a college mathematics classroom. In the analysis of classroom discussion, studies reveal that this specific discourse practice is normally found in institutions that involve the "professional" and the "public" or "teacher" and the "student" (Fairclough, 1992, p. 153). In this case the mathematics teacher educator dominates the turn-taking.

This IRE discourse practice excludes a number of other possibilities, including student teachers practicing the discourse that can be developed and encouraged for mathematics teaching. So, for example, in these extracts no sentence was produced by the student teachers, no chance was given to them to explain how they would teach this type of example. Even though phrases such as "… *let us use…*", "… *we have this one…*" and "… *we want this…*" were used, in the process it was actually the mathematics teacher educators who were doing most of the things.

A traditional lecture discourse practice

Among the four mathematics teacher educators involved in this study, Mr Lukhere seems to be the only one who has been observed to employ this type of discourse practice in his lessons. The data analyzed reveal that Mr Lukhere presented the material as student teachers listen, watch and take notes. This structure is seen in extract 8.11 below, where Mr Lukhere and his student teachers were discussing how to model the addition of fractions whose denominators are the same. Mr Lukhere uses charts to enable him to explain the process of modeling and at the same time enabling the student teachers to see clearly how to add the fractions that have the same denominators. Mr Lukhere read aloud the steps involved from the chart and expanded more where he deemed necessary to do so. In extract 3, it is illustrated the discourse that Mr Lukhere commonly employed in his mathematics classroom and how he displayed it to the student teachers.

Extract 3

Mr Lukhere's presentation

Mr Lukhere: *[Hanging a chart on top of the chalkboard], okay, addition of proper fractions whose denominators are the same, addition of proper fractions whose denominators are the same, [reading from the char]). Consider the following addition problem that is, one plus, one over five plus three over five [reading from the chart]. Model the addition process as follows, that is to say when we are trying to teach addition of fractions, we normally start with simpler things which pupils can appreciate, that is, they can easily see. That is why there is need for us to model the addition of these fractions, and to do that we are going to use a rectangle with eh some subdivisions, and for this sum of one over five plus three over five. First of all there is need for us to model the addition process as follows: draw a rectangle as I have done this one [pointing to the rectangle]. It has to be a rectangle or a circle, divide that rectangle into ah five equal parts as shown below. By dividing this rectangle into five equal parts, because of the denominator, that we are using in this addition then model the fractions one fifth and three fifth. How have we modeled the fractions in this case? I have modeled one fifth by shading this different from ah three fifth which is these three parts and then out of the five parts, one part has been modeled as one fifth, which is this one. Three parts have been modeled which represent that fraction [pointing to three fifth] and then when we add the total number of parts which have been shaded. We end up with one, two, three, four out of how many parts?*

Ss: *five*

Mr Lukhere: *five, so that's the way we can model the addition of fractions whose denominators are the same.*

During this part of the lesson, the hanging of the chart demonstrates a number of points about presenting and displaying the discourse for mathematics teaching. To begin with, it is clear that the chart will play a central position in the demonstration. Secondly, the mathematics teacher educator's choice of the major steps to be included on the chart provides a statement about the necessary steps to be used in modeling the addition of fractions with the same denominators. The hanging of the chart is also significant as it provides a visual part of the demonstration to the student teachers about the resources and procedure that will be used in this part of the lesson. Thus the chart was used as a way of transmitting the discourse to the student teachers in this lesson.

In extract 3, Mr Lukhere demonstrated and explained, using an example how to model the addition of fractions that have the same denominator. It is seen from this extract that there were no interruptions as the mathematics teacher educator was demonstrating. The student teachers were seen to listen, watch and take notes quietly. Thus, Mr Lukhere reflected a traditional lecture discourse practice in his classroom. Later, as will be seen in this section, after his demonstrations, student teachers were given an exercise on the chalk board to be solved individually.

Mr Lukhere also through his language indicates that there is a traditional type of discourse for school mathematics teaching. Mr Lukhere notes, for example,

that as mathematics teachers "… *when we are trying to teach addition of fractions, we normally start with simpler things which pupils can appreciate, that is, they can easily see. That is why there is need for us to model the addition of these fractions*". There is a sense in which these words reflect a traditional type of discourse to mathematics teaching practice – namely a discourse which is established and inflexible as a way of teaching mathematics in that one usage of "*we normally start with*".

In this discourse practice, Mr Lukhere uses direct imperatives such as "*model the addition process as follows...*"; "*draw a rectangle as I have done this one...*" ; *"it has to be a rectangle or a circle"; "divide into five equal parts as shown below"* and *"that's the way we can model."* These are phrases which assume unquestioning student teacher compliance with the steps of how to teach mathematics. His use of "we" indicates the voice of authority. Also throughout the extract, there were no questions posed to the student teachers, only statements indicating his authority. The student teachers at this time needed to be listening and watching what the mathematics teacher educator was doing. Furthermore, throughout this extract, Mr Lukhere used statements rather than questions, implying that what he was saying is rather a command than a suggestion. This is further confirmed when he concluded his presentation with another statement that says "*that's the way we can* ..." The extract, therefore, reflects the professional as expert perspective embedded (Fairclough, 1995 p.15) in the discursive practices of the mathematics teaching. It also reflects the unquestioned student teachers compliance.

In compliance with the lecture discourse practice, at the end of his demonstration in his class, Mr Lukhere required the student teachers to do the exercise on the chalkboard individually and they were supposed to reproduce what they had been taught. For example, Mr Lukhere said that:

Extract 4

Mr Lukhere: *using the same procedure for modeling addition of fractions, may I have one volunteer to model the addition of four seventh plus two seventh [writing on the board, model using the number line the following 4 over seven plus two over seven] for those two fractions. Ladies, I can't see you. Are you here? Ahh may I have one volunteer?*

In another class he said:

Extract 5

Mr Lukhere: *using the same example, may I have a volunteer, once again to demonstrate to us how to add [writing one third plus one quarter] the two numbers using lowest common multiple of the two denominators of the fractions, yes,*

Mr Lukhere emphasized here and directed the student teachers that they should "*use the same procedure*" that he demonstrated when he was teaching them how to teach addition of fractions followed by a polite imperative "*may I have one volunteer*". This was used as a way of evaluating if the student teachers had understood the mathematics teacher educator's presentation.

To illustrate further that what was more important was the reproduction of what has been taught, below is an example of the comments made by the mathematics teacher educator where he indicated that what has been followed in the presentation is not what he wanted.

Extract 6

Mr Lukhere: *anyway, he is correct but he has gone too far; that is not the one I was looking for; the issue here is the denominators are the same eh!*

In extract 6, Mr Lukhere indicated that what the student teacher did was correct, but that is not what he was looking for. In other words, the student teacher did not do what Mr Lukhere demonstrated in his lecture. The expectation, of Mr Lukhere, was that student teachers should be able to reproduce what their educators have done in the classroom.

An important point to mention here is that Mr Lukhere was re-creating the practices that a "society" has recognized as legitimate and so helps to create a major reference point for what is a "good" practice for mathematics teaching. In this case, the practices participate in ideological regulation. Thus the ideology that stands behind this section is a commitment to the traditional teaching of school mathematics and clear mathematics teachers' roles and values in a mathematics classroom. It appears that maintenance of ideology of culture of expertise, preservation of the high status of the mathematics teachers' identity features highly. Thus, Mr Lukhere's practices are part of a system of enforcing the expertise of the teacher.

A group discussion(s) discourse practice

Mr Chipasula is one of the mathematics teacher educators who used group discussions in his classroom. His student teachers were divided into small groups of six each and student teachers in each group worked together. The main feature in group discussions is where learners talk about mathematics in such a way that they reveal their understanding of concepts. Learners also learn to engage in mathematical reasoning and debate. In this case, the discourse involves asking strategic questions that elicit from learners both how a problem was solved and why a particular method was chosen. Learners learn to criticize their own and others' ideas and seek out efficient mathematical solutions. Paul Cobb (2006) states that there are two parts to a mathematical explanation: the calculation explanation which involves

explaining how an answer or result was arrived at – that is the process that was used; and a conceptual explanation which involves explaining why that process was selected – that is what the reasons for choosing a particular way are. In this way learners have to be able not only to perform a mathematical procedure but justify why they have used that particular procedure for a given problem.

In the data analyzed, the group discussions focused on the calculation explanation where student teachers were involved in discussing the procedure only. For example, extract 7 shows Mr Chipasula telling his student teachers to discuss how to multiply two decimal numbers in their groups and then come up with a general procedure for multiplying decimals. Immediately, student teachers began formulating the procedures in their groups.

Extract 7

Mr Chipasula: *so since we are talking of decimals and place value of decimal numbers, necessary now with this knowledge, how can we teach multiplication for the first time? So in your discussions please include rules which we follow when multiplying decimal numbers. Use the following example [writing the example on the board, 6.9 × 0.005], six point nine times zero point zero, zero five, discuss steps of procedure to be followed to come up with a correct answer. So those procedure will give you some general rules. Let's have five minutes*
Ss: *[students discussing in their groups]*

In this extract, Mr Chipasula gave the student teachers an opportunity for group discussions in the class. It is also observed that Mr Chipasula explained to the student teachers what they were expected to discuss in their groups, that is, to come up with a procedure for multiplying decimal numbers. Thus, the group discussions here focused on developing the procedure.

Mr Chipasula, also, when giving instructions to the student teachers for the group discussions, used both direct and polite imperatives such as *"please include rules which we follow"*, "*use the following example*" and "*discuss steps of procedure to be followed*." By the use of these directives, focus and direction are prescribed by the mathematics teacher educator as on a single perspective. It has clear content boundary, that is, calculation discussions. Even though the student teachers were allowed to discuss in their groups, it is noted that the discussions were about finding the rules or procedure that can be used for teaching multiplication of decimal numbers in schools. The mathematics teacher educator positioned himself as a facilitator and the student teachers were restricted in terms of the focus of their discussions.

This observation echoes what Krashen (1982) and Long (1983) found in their studies in schools. Krashen (1982) and Long (1983) observed that even though classroom discussions were used in their study, the effectiveness of those classroom discussions was doubtful because it was the teacher who initiated what to be discussed, decided who provides a response, which the teacher either commended or condemned. Furthermore, the teacher decides when to put an end to the discussion. Therefore, the student teachers' participation in the college mathematics classroom is limited and controlled even though it is group discussion.

Sometimes in Mrs Joshua's class there were discussions on how the student teachers had done the problem and the chance was also given for the student teachers to report what they had discussed to the whole class. As it will be seen in the following extract, although the chance was given for debate, suddenly the opportunity was taken away from the student teachers ending up with the mathematics teacher educator demonstrating the steps. This is seen in the following extract.

Extract 11

Mrs Joshua: *[moving around checking the group that is through], okay, can we have the group at the corner there, to show us the number line, how you have come up with a number line; two ah, two four over five, yes, this group, group one*
SG1: *one*
Mrs Joshua: *yes, come and show us how you have come up with two, four over five [moving the chart on the board]*
SG1: *[draws a line, demarcating into parts] from zero to three [i.e. five parts] between zero and one, one and two, two and three and indicated two four over five as fourteen over five*
Mrs Joshua: *okay, yes any group with a different number line*
SG2: *[draws a line, label from zero to two, after two demarcated to five parts to three, then indicated one over five, two over five, three over five, four over five]*
Mrs Joshua: *okay, another group with a different number line or are the same [talking to another group] okay*
SG3: *[draws their line]*
S5: *[students laughing]*
Mrs Joshua: *okay, time is not on our side. From these number lines the demarcations from zero to three are the same. Although they didn't use a ruler but you were supposed to use a ruler and even the distances should be the same and, when you are saying over five, that means you have five demarcations from zero to one whether ah from zero to one, you have five! Segments, okay, five segments. So that means, you should have, from here to here, these ones should be five, so as they are here, they are five. And if they are five from zero to one, that means, one part is, one segment is one over! Five of! One, okay. So here to here is four over five. okay, now up to here [that is one], this is five over!*

Ss: *five*
Mrs Joshua: *then as you proceed here and then ten over [at two]*
Ss: *five*
Mrs Joshua: *up to whatever, but as I have already said our interest is on the number line,*

In this part of the lesson, Mrs Joshua asked the student teacher representatives of each group to show on the chalk board how they had allocated the number four over five on the number line. The main feature in this extract is that the student teachers from each group were seen drawing the number lines on the chalk board and indicating the point without explaining how and why they did that. Later on, it is seen that it was actually the mathematics teacher educator who summarized how to indicate four over five on the number line. Even though the opportunity was given for class discussion and debate for the student teachers to publicize/report their findings that chance was taken away from them. This reflects how the mathematics teacher educator controlled the discourse in her class and student teachers were denied the opportunity to discuss the discourse. Thus the teaching of mathematics in this classroom can be characterized as being procedural with little or no development of concepts. Student teachers were not given an opportunity to explain how they came up with the number on the number line. Instead the mathematics teacher educator ended up explaining to the student teachers how to come up with the solution.

With all this control, the mathematics teacher educator continued to use teacher inclusive imperatives. Although she positions herself as a facilitator, indirectly she controls the discourse and focus on the procedure.

SUMMARY AND CONCLUSION

In this article, we have identified three main different discourse practices that dominated the mathematics teacher educators' classrooms and that go hand in hand with the directive discourse and procedural discourse are identified: directive discourse in an IRE discourse practice and in a traditional lecturing discourse practice; and procedural discourse in group discussions.

Comparing the findings in this article against the existing literature as discussed above and the practices of various discursive events that take place in multilingual school mathematics classroom, the results suggest that discourse practices produced in a college mathematics classroom are similar (but not all) to the discourse practices that are produced in a school mathematics classroom. These discourses focus on conventional practices, meaning that the act of production has centered on the mathematics teacher educators being professionals and experts. For example, this practice happens when the mathematics teacher educators prefer to offer directives, give explanations and prescriptions to the student teachers rather than allowing the student teachers to discuss, analyze or summarize in order to seek their own answers. In these cases the mathematics teacher educators speak more than the student teachers. Therefore, one can argue that the discourse practices center on the mathematics teacher educators.

Earlier on in this paper, we pointed out from the literature some of the strategies that mathematics teachers employ in multilingual mathematics classrooms. One of the strategies that teachers in most multilingual mathematics classrooms, where the LoLT is different from the home languages of the learners produce is mostly the IRE pattern of discourse that goes together with the procedural discourse. We gave examples of studies conducted by Krashen (1982), Le Roux (1996) and Long (1983), indicating that the IRE pattern of discourse is a common phenomenon in multilingual mathematics classrooms.

The discourse practices that have emerged as the mathematics teacher educators prepare the student teachers are embedded in conventional practices of multilingual classrooms – the act of production that centers on the mathematics teacher educators as being professional and experts. Also considering the discourses being displayed in a college mathematics classroom, the way in which mathematics is taught reflects the traditional focus on acquisition of facts, mastery of procedures and technical skills. These practices limit the student teachers' involvement in learning how to teach mathematics and uphold the prominent teacher role. The question that arises here is whether the discourse practices reflected in the multilingual school mathematics classroom is the reproduction of what the teachers are exposed to in teacher education programmes. Although this might be difficult to answer now, the findings here show a match in these discourse practices and so it might be possible to argue that partly, the discourse practices displayed in multilingual classrooms might come from the college mathematics classroom.

Emphasis on the procedural way of teaching mathematics in a college mathematics classroom highlights the fact that student teachers are not exposed to other discourse practices in teaching mathematics. Dufficy (2001) argues that different discourse practices encourage learners to construct joint understandings of the world. Similarly, research on effective instruction for learners whose main language is not the LoLT emphasizes the importance of using a variety of methods (*discourses*) tailored to learners' needs (August and Pease-Alvarez, 1996). August and Pease-Alvarez continue to explain that instructional methods (*discourses*) selected depend on the level(s) of English Language proficiency and available resources among other factors. Using multiple approaches (*discourses*), Reyhner and Davison (1993) and August and Pease-Alvarez (1996) argue that teachers can meet the needs

of a wider variety of learners. This is indeed a challenge for mathematics teacher educators.

CONCLUSION

In the discussion of the mathematics teacher educators' lessons, we have identified and then tried to explain the commonly used discourses for mathematics teaching. We have illuminated what the mathematics teacher educators' discourses are, in particular areas that they want to promote and preserve. There are ranges of discourses such as multilingualism that remain untouched by these mathematics teacher educators. In all these lie significant challenges for the mathematics teacher educators which clearly need to be revisited and include opportunities for the student teachers to engage explicitly with the challenges that exist in multilingual mathematics classrooms.

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