# Teachers' use of language in teaching mathematics in Basic Schools in Cape Coast, Ghana

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In this paper, I present the initial analysis of data collected on how teachers in two basic schools in Cape Coast use language in teaching mathematics to classes four and six pupils and why they use language the way they do. I present an overview of initial findings from classroom observations, semi formal interviews and stimulated recall interviews with three teachers. The data revealed that English is the preferred choice of language for classroom interaction despite pupils' limited proficiency in the language. This was largely due to teachers' perception that English was the language of mathematics and schooling in general.

**Keywords:** Language/medium of instruction, mathematical language, classroom interaction and discourse

## Introduction

According to Kaphesi (2001, 1), "teaching and learning mathematics is like teaching and learning a language in another language". This assertion lends support to the notion that mathematics is a language (Lee 2006, Gutierrez 2002). Obviously, if one is fluent in a language and is being taught another language, it stands to reason that the language that is already known will be used as a resource to teach the new language. But what happens if the learner is unfamiliar to the language being used to teach the new language; in this case – mathematics? Ghana's language in education policy presents such a situation. The policy stipulates that teachers should use the local language and English where possible to teach all subjects including mathematics for the first three years of formal education with a complete switch to English as medium of instruction from the fourth year. Most pupils in Ghana, especially in the rural areas, rarely encounter English outside the school compound. Though pupils' mother tongue may not be the language of the communities in which they dwell, they mostly will have conversational fluency (Cummins 2000) in the language of the community. Should teachers follow the stipulations of the policy, then they will not draw on the known language (pupils' primary language) especially in upper basic (classes four upwards) to teach this new language (mathematics) but rather use an unfamiliar language (English) to teach this new language (mathematics). Thus, the teaching and learning of mathematics in English rather than the learners' primary language or a language that the learner is familiar with becomes a very complex thing, which drawing from Kaphesi, could be likened to the teaching and learning of a language in another language with a different language. This complex situation is the focus of the study – to explore how teachers negotiated their way through this complexity and the reasons for the choices they made.

Mathematical language consists of particular ways of using language to express mathematical ideas (Lee 2006, Pimm 1987). Other writers like Halliday and Martin (1993) and Setati (2003) refer to it as the mathematics register, to reflect its dependence on natural language to express mathematical ideas.

## Research context and participants

Two basic schools in Cape Coast, one public and one private were selected for the research. It was anticipated that English would be exclusively used as medium of instruction in the private school whereas the local language would be mostly used in the public school (Ampiah, Davis, & Mankoe Undated).

In Ghana's education system, basic school comprises the first nine years of formal education; six years of primary education and three years of junior high school education. The basic school level was selected for this study because that is where the foundation is built and I envisaged that the language issue would be more visible there. Classes four and six were selected because they were transition points; class four being the point where the switch to English medium education was to take place and class six the transition from primary level to junior high school level.

Mathematics teachers of classes four and six in these schools were the main participants for this study since the teacher is considered as a mediator and a facilitator of pupils' construction of knowledge (Khisty 1993). These classes were observed for teachers' use of language. Though utterances of pupils in these classes were also recorded, they were viewed in relation to teacher elicitations.

## Methods of data collection and analysis

Data for this study was collected through classroom observation using video and audio recordings. Field notes were also taken. The videos were also used as stimulants to conduct stimulated recall interviews with the teachers to ascertain the reasons behind their actions in the lessons observed. These teachers were also interviewed on various aspects of language use in the teaching of mathematics.

As already stated, this report is on the initial analysis of the data. Thus, it reports only on my initial immersion into and familiarization of the data. Therefore this stage took a grounded approach to data analysis - iteratively watching videos, listening to audio records, transcribing, reading and thinking.

## Results and discussion

### *Use of language*

English was mostly used in all the classes observed in both schools. In the private school, English was exclusively used in the classroom by both the teacher and the pupils. According to the teacher, this was because it was school policy that English alone should be spoken within the school premises. The use of the local language by pupils was a punishable offence. The following extract shows how the teacher and other pupils reacted to a pupil who spoke Fante in Class.

> Teacher: Who is speaking Fante? (I think the teacher heard someone speak Fante in the background)
>
> Pupils: Ansah (Pupils make some sounds in the background to indicate that Ansah was in trouble)

Here, the teacher was copying from the textbook onto the board. Other pupils in the class were talking until suddenly one of them spoke Fante prompting the immediate reaction in the form of the question "who is speaking Fante?" from the teacher. Some of the pupils who heard Ansah speak Fante called out his name. The teacher's response was a stern look at Ansah who buried his head in his palms. Asked

why he reacted that way, the teacher indicated that apart from the school's policy, if he "did not check that kind of behaviour, they will always speak Fante in class". This response indicates that the teacher's reaction was to the language use rather than the content of what Ansah said. This further indicates that the teacher was more interested in pupils speaking English than mathematics. Teachers' emphasis on English rather than mathematics was not limited to the private school; in the public school teachers did not discourage pupils' use of Fante in class but they were very particular about pupils learning English.

In the public school, the class six teacher also used English only in class. The pupils were however heard speaking Fante in the classroom without being reprimanded. Discussions with the teacher revealed that he was not fluent in Fante, and his decision to use English only partly due to his weakness in Fante and partly his desire to get the pupils to learn English. He indicated that the pupils had to be competent in English in order to pass the Basic Education Certificate Examination, the national examination used to select pupils to the senior high school. Thus the language of examination was a factor for this teacher's choice of language for teaching mathematics.

It was only the class four teacher who was observed to use both English and Fante in her teaching. She also favoured the use of English in teaching. She indicated that she had to use English in teaching, but that the pupils were 'dull' and did not understand the English, so she used Fante to help them follow the lesson.

This same teacher indicated at a point that English is the language of mathematics, but that she used Fante only to explain things to the pupils. She suggested that the pupils would not pass if they were not taught in English.

This indicates that this teacher, like many other Ghanaians, equates pupils' ability in English to academic brilliance. Describing pupils as 'dull' simply because they do not understand English which is not even their second language and which they rarely encounter outside school is to me very harsh.

Moreover, this teacher, like her colleagues in this study sees English as the language of mathematics. This perception surely has effects on their use of language in teaching mathematics. Thus this teacher will only resort to the local language after pupils are unable to answer her questions correctly. She would then use Fante to lead pupils to the expected answer, after which she will re-state it in English. Note that the use of italics in transcripts indicate a translation from Fante to English. For example,

> Teacher: … What about between, between six and nine? Between six and nine. Between six and nine, Steven….
>
> Steven: Three
>
> Teacher: Between! Between! I said from between what and what?
>
> Pupils: Six and nine
>
> Teacher: Between six and nine, Tetteh
>
> Tetteh: Madam two
>
> Pupils: Madam!
>
> Teacher: *Come and show us where you started from. So if you add eleven to one, what do you get?*
>
> Tetteh: Twelve
>
> Teacher: *So why did you say two?* So between six and then nine, we have those who had seven and then eight. Eleven people had seven, one person had eight. Let's move on.

In this excerpt, after two pupils had given wrong answers, the teacher uses Fante to lead one of them to the expected answer after which instead of consolidating pupils' understanding in Fante, she switches to English. Thus it appears that the teacher's emphasis was more on the use of English and appeared to be teaching it too.

The policy did not seem to have a lot of influence on the public school teachers' use of language for classroom interaction. As discussed above, teachers' choice of language for classroom interaction seemed to be largely influenced by their perception of English as the language of schooling, the language of examinations, and the language of curriculum materials. Through out all the lessons observed, where textbooks were available, teachers were seen referring to the government approved textbooks. These are all written in English.

Moreover, teachers' own competence in the local language influenced their choice of language for classroom interaction. The private school teacher and the class six public school teacher were both non-natives of Cape Coast. They both indicated that though their own competence was not a major factor, it played a role. The public school class six teacher was especially handicapped in the use of Fante and indicated that the pupils sometimes laughed at his Fante.

### *Teaching strategies*

All the mathematics lessons observed were in the form of teacher led exposition, followed by independent practice questions by pupils and a whole class discussion of the pupils' practice questions after which teachers gave class exercises or take home practice exercises. Thus the teachers did most of the talking in class. However, the private school teacher indicated that he sometimes uses group work but it was time consuming. Thus time could be another factor for teachers' actions.

There were lots of repetitions by all the teachers observed. The teachers indicated that they repeated things so that as one of them put it, "it will stick with the pupils". This could also be a strategy to give the pupils time to think about questions before answering. Especially in class four of the public school, the teacher kept repeating and isolating key components of questions that she asked before eventually calling to pupils to respond. The following extract is an example of such repetitions.

> Teacher: What about those who had six to ten? How many people had six to ten? Six to ten? Six to ten?
>
> Pupils: Madam
>
> Teacher: Eric, *from* six *to* ten, *how many people had that? From* six *to* ten, *how many people had that?* Let's see the numbers between six and ten. From six to ten, what are the numbers there? (Fante translations in italics)

Here the teacher kept mentioning from six to ten. Even after pupils called to her for attention, she switched to the local language and kept emphasizing the six to ten. This could be intended to 'hammer in' the question to the pupil. The teacher had mentioned six to ten three times before calling Eric to respond but interestingly switched codes and kept repeating the question. It appears that the teacher wanted the pupil to get the question very well and also think about it before attempting a response. Interestingly again, though she switched codes, the number names were mentioned in English. In fact the number names were never mentioned in Fante throughout the observation period though the vocabulary existed and was common.

Most of the teacher questions did not require real responses (Messenger 1991) which required thought. Teacher questions or elicitations required repetitions or routine agreement or disagreement with some statement made. These responses were

usually in unison. This could be a strategy to get more pupils to participate in classroom discourse. In the few cases where pupils were asked to explain their answers, teachers did not give enough time for pupils to articulate their thoughts before calling other pupils or intervening with their own reasoning. The following extract exemplifies the nature of teacher elicitations.

> Teacher: He says the four; he did not get four so he will not stand up. Allow him. He didn't get four so he will not stand up. Four or less. It starts from where?
>
> Pupils: Four (Teacher points to four on the board)
>
> Teacher: It starts from where? Four, (teacher points to the numbers as pupils call them out)
>
> Pupils: Three, two, one
>
> Teacher: And then zero, so if you say four or less, four or less, that means from four to zero. This one (Teacher points to the numbers) is less than, excuse me. Four, this one, this one is also less than four. One is also less than four, and zero is less than four. Is that okay?
>
> Pupils: Yes madam
>
> Teacher: So when you are asked, you had exam or you write exam and your teacher says those who had four downwards or four or less stand up, all those who had four, three, two, one and zero must stand up. Is that okay?
>
> Pupils: Yes madam
>
> Teacher: Is that okay?
>
> Pupils: Yes Madam
>
> Teacher: Let's go back to the table. Now, the question is how many people got four or less? You see four or less, all these people must stand up. Those who got four, three, two, one or zero must stand up. So Tetteh, from the table, how many people got four or less?
>
> Tetteh: Four
>
> Teacher: Four, go and count and let me see. Go! Go and count and let me see, you started counting from where? We are using the table, those who had four or less, bring your mind here. All hands down. Now this is our table, these, (teacher points to the board) these are the marks that the people had or got, these marks are what the people got and how many people got these marks here are what we have down here, Is that okay?

In the extract above, one of the pupils had indicated that he would not stand up while he should have said he would stand up. The teacher goes on and repeats the reason the pupil gave for saying that he will not stand up. She then points to the board, on four and asks 'four or less, it starts from where'? This obviously does not require thought to answer since the visual clue was given by the teacher pointing to the four. All the pupils had to do was to mention the number that the teacher pointed to. She confirms the pupils' responses and continues pointing to the other numbers less that four (three, two, one) as pupils recite these numbers. The teacher continues to offer an explanation to the pupils after which she asks if it is okay for which pupils respond in the affirmative.

Teachers were also observed to use analogies and gestures to support their utterances. One teacher, in explaining the concept of between, used pupils sitting in the spaces between other pupils as an analogy. Again, another teacher in explaining the word 'reciprocate' sketched two 'stickmen' on the board; one head up and the other upside down to illustrate. This may only have helped pupils to use the idea to write the multiplicative inverse of rational numbers expressed in the form a/b; where a

and b are integers and b ≠ 0 and use them in solving questions on division of fractions. None of the pupils that the teacher called to the board was able to answer that question correctly leading to this episode:

> Teacher: Fine, look at this, when we have this, that means when we are dealing with fractions, any number that stands on its own, we believe, you are not yet at that stage, that there is one under it or it's being divided by one because one will go to itself one, one will still go to eight, eight times so it's still eight. Have you seen that?
>
> Pupils:Yes sir

Thus though the teacher had good intentions in using that particular analogy, it rather got the pupils confused.

## Conclusions

This seemed to be the only way the teachers knew how to teach mathematics. They indicated that that was how they were taught and that was how they have been teaching all along. Pupils' participation in classroom discourse could be affected by the extensive use of English in the classroom by teachers since it has the potential of prohibiting some non-fluent pupils to speak in class. Teachers ensured that more pupils participated in classroom discourse by encouraging chorusing through the nature of their elicitations. I recommend that teachers are engaged in the debate on using local languages as a teaching resource in multilingual settings and also encouraged to vary their teaching methods to include strategies that will get pupils to express their thoughts.

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