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An Exploratory Study of Mathematics Teaching and Learning in Ghana: Hearing Students’ Voices

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Abstract

The purpose of this exploratory study was to explore the views of junior high school students (12-14 years) on the nature of their mathematics lessons and some of the challenges they face when learning mathematics. The study involved 21 students from 3 junior high schools in the Cape Coast Metropolis of Ghana. The data collection instrument was a semi-structured questionnaire, which was administered to the 21 students. The data from the questionnaire was arranged serially and coded, after which it was fed into the computer and analysed using the Statistical Package for Social Sciences (SPSS).

The study revealed that most of the students who took part in the study experience mathematics in the traditional way, where they have to sit back and listen to their teacher with little or no active participation in the teaching and learning process. In addition to this, the study revealed that students encounter many challenges learning mathematics both at school and at home, and these challenges were threefold: student, school and home related challenges. Though the respondents indicated that there are some personal and home-related challenges which impact on their learning and understanding of mathematics, there are also common challenges that related to classroom factors. The results from the study suggest that there is the need for further research in the area to understand the holistic views of students on the teaching and learning of mathematics, in our quest for improving the teaching and learning of the subject.

Introduction

Mathematics holds a key position in the curriculum and in virtually all countries it is a core component of the curriculum. It is seen as a pivotal subject, both in its own right and also because of its important connections in diverse fields such as the natural sciences, engineering, medicine, and the social sciences (Keith, 2000). However, despite the significant importance of mathematics in all aspects of life, it is generally believed that among all school subjects, mathematics is the most difficult and most feared among most students (Eshun, 2004).

In view of this, improving mathematics teaching and learning has been an issue of considerable concern in almost every part of the world for some time. In improving the teaching and learning of mathematics, education systems in most countries have undergone a series of restructuring, leading to the introduction of new educational reforms and their accompanied changes in classroom practices (Nabie, 2001). With the introduction of these educational reforms, changes to the curriculum in school were necessary. Ways of improving mathematics teaching and learning have been an important focus in
mathematics education research for some time now (Potari & Georgiadon-Kabouridis, 2009). Different teaching methods have been used in mathematics classrooms. However, the search for a universally accepted approach for teaching mathematics continues to be an issue that perplexes both teachers and educational authorities (Boaler, 2002).

Two major teaching practices are distinguishable in the literature of mathematics teaching and learning and the pedagogy of mathematics lessons in schools: the traditional and reform-oriented approach to the teaching and learning of mathematics. Boaler (2002) described a traditional method of teaching as the lecture method, during which students sit quietly and are presented with new mathematical concepts and skills. Then they work through short and closed problems. In a traditional mathematics classroom, the teacher introduces students to the different procedures in a clear and structured way and the students have to listen and copy notes as the teacher takes them through a series of procedures and steps in solving a problem (Boaler, 2002). In most cases, students in the traditional classroom have to master the steps and procedures presented by the teacher, to be able to apply them in solving subsequent questions (Boaler, 2009).

Zohar and Schwartz (2005) described the reform-oriented approach as method that promotes the development of students’ higher-order thinking. Thus, the reform-oriented approach is a learner-centred approach to teaching in which the student plays an active role in the teaching and learning process. One of the main tenets of this approach is cooperative learning, where students work in groups to develop their own understanding (Boaler, 2009). Though there is no single best method for teaching every topic in mathematics, the traditional method leads to passive learning among students and does not encourage students in solving problems using a variety of methods (Nabie, 2001; Boaler, 2002). According to Boaler (2009), students’ active participation in the teaching-learning process promotes their own understanding of a particular concept, and increases their level of confidence.

For example, Ma (1996), in examining mathematics teaching and learning in Chinese high school students, found that students do not live in isolation from their immediate environment, which includes friends and classmates. Learning in groups promotes better understanding among students and increases the confidence level of individual students, especially lower achievers in mathematics. However, despite the importance of group learning, most teachers find it difficult to implement. Research by Ottervange (2007) reported that most classrooms in Sub-Saharan Africa are characterised by students playing passive roles in the teaching-learning process, with students listening and copying notes while the teacher does all the talking.

Alexander (2006) has argued that the single most important factor that influences students' learning and understanding is the kind of classroom practices that the students are introduced to. However, student-related factors such as attitude and self confidence also impact on students’ understanding and achievement (Singh, et al., 2002). For example, Lampert (1990), in examining fifth-grade mathematics teaching in a public school, established that many students appear to hold a lot of naive and incorrect beliefs about mathematics and sometimes see the subject as appropriate for a particular group of students but not for them. Similarly, Singh, et al. (2002), in their research on ‘mathematics and science achievement’, also identified similar findings. In examining the effects of school-related constructs – motivation, attitude, and academic engagement – on eighth-grade students’ achievement in mathematics and science, Singh, et al. (2002, p.324)
suggested that ‘attitudinal and affective variables such as self-concepts, confidence in learning mathematics, interests and motivation have emerged as salient predictors of achievement in mathematics’ and also crucial in improving the teaching and learning.

In the changing context of mathematics teaching and learning, improving teaching practices has come under intense scrutiny in Ghana. In response to this, researchers, educators and others have advanced educational arguments supporting the need to help students to acquire mathematical skills, insight, attitude and values, which are the main objectives of the junior high school mathematics curriculum (MoESS, 2007). Different researchers have researched the problem from different perspectives, with some focusing on the classroom, while others focus on issues like teacher development, provision of teaching and learning resources and increase in funding.

For example, research by Mereku (2003), Frempong and Ayia (2007) and Anku (2008) have examined ways of improving the teaching and learning of mathematics from the classroom perspective, with emphasis on improved teaching methods and resources. Mereku (2003) and Anku (2008), similar to Boaler (2002, 2009) and Ma (1996), have also argued for a teaching method that promotes students’ active participation in the teaching-learning process, as stipulated in the national curriculum. In addition to this, Ampiah, et al. (1996) have also examined teachers’ and students’ attitudes towards mathematics, as well as the issue of teacher development and training. Similar to Singh, et al. (2000), they also argued that students’ attitudes play a crucial role in their learning of mathematics in school.

However, according to Stigler and Hiebert (1999), the present trends in mathematics teaching and learning show that the problem is a complex issue not easily addressed by educational reforms, increases in spending, teacher development, and searching for the ‘best’ teaching method. One area which has been neglected or has not received much attention in Ghana’s quest for improving the teaching and learning of mathematics is the voice of students. Therefore, the purpose of this exploratory study was to examine students’ views about the nature of their mathematics lessons. In addition to this, the study also sought to examine some of the challenges that they face when learning mathematics. The study was designed to answer the following research questions:

1. What are students’ perceptions of the nature of their mathematics lessons?
2. a) What challenges do students face when learning mathematics?
   b) What are students’ views on how to minimise these challenges?

**Research Design**

The research design was exploratory – a pilot study for my ongoing doctoral research. This exploratory research was conducted in the Cape Coast Metropolis of the Central region of Ghana. A total of 21 students from 3 junior high schools were selected for the study with the help of mathematics educators in these schools. The sampling procedure was in two phases. Firstly, three mathematics teachers who were willing to participate in the research were identified and selected. These teachers were my former students at the university, who are now teaching at junior high school level. I discussed the purpose of the research with the teachers and they voluntarily agreed to allow their students to be used for the research. In the second phase, seven students were selected randomly from each of the three classes with the help of the class teachers. The teachers had agreed for their classes to be used, and the consent of students was also sought. In addition to this, the students were made aware that their participation was voluntary and they were free to withdraw at any time.
The data collection focused on students’ views about their experience of mathematics lessons, the challenges that they face when learning mathematics and how they think these challenges could be minimised. The instrument used to collect data was a semi-structured questionnaire. The questionnaire was in two parts: The first part had 10 closed-ended questions used for eliciting demographic information and students’ perceptions of the nature of mathematics lessons. The second part had three open-ended questions for eliciting information about the challenges that students face when learning mathematics, and how they think these challenges can be minimised. The data analysis procedure was both quantitative and qualitative. All the questionnaires were coded and entered into the computer and SPSS software was used to analyse the data. The closed questions were analysed quantitatively, while the open-ended questions were analysed qualitatively to identify common themes and categories.

Research Findings
The mean age of the respondents was 13.86 years, with 12 years the youngest and 17 years as oldest. In answering the first research question, all the responses from the 21 students, on the nature of their classroom lessons, were tabulated and presented in a bar graph below.

![Graph showing the nature of mathematics lessons](image)

**Figure 1: Nature of Mathematics Lessons**

The analysis of the results from the questions eliciting information about the nature of mathematics lessons disclosed that most students who took part in the study experience mathematics in the traditional way. For example, from Figure 1, it is clear that most often students do not ask questions in class and almost all the talking is done by the teacher, while the student listens and copy notes. Figure 1 shows that 20 (95.2%) of the respondents normally sit down and listen to their teacher, thereby playing a passive role in the teaching and learning process. Also, 10 (47.6%) of the respondents indicated that they normally do not ask questions during lessons, thus, learning mathematics without talking (Boaler, 2009). In addition to this, though there was some amount of group work among students at some times, the responses show that most often students learn individually by following teachers’ instructions and using their teacher’s methods and procedure to solve questions.
In addition to this, the analysis of the responses revealed that there were a number of challenges that students encounter when learning mathematics. These were categorised into three different themes: student, school-related factors, and home-related factors. Some of the student-related factors which arose from the analysis were: having the perception that the subject is difficult, not having interest in the subject, and an inability to practise mathematical problems at school and at home. The main home-related factor which came up in the data was students’ inability to get someone to help them with their homework. However, of all the three factors the classroom-related factors happen to be the most common among the responses from the respondents. Some of the major issues which came up were: students find mathematics difficult because the teacher does not explain well, thus they find it difficult to learn the formulae, as well as students’ inability to ask questions when they do not understand because they are normally not encouraged to ask questions in class.

In addition to this, when students were asked how they think these challenges could be minimised, some students indicated that they have to practise and also their teacher should organise extra classes for them. Other students were asking for group work because they think when they learn in groups they understand well, as compared to when they sit down listening and copying notes. This confirms Ma’s (1996) assertion that group learning promotes active participation, as well as deeper understanding of the concept presented. In addition to this, some of the students also indicated that they need to be taught different methods of solving a particular problem, as well as being given the chance to ask questions in class.

Discussion
The purpose of this study was to examine the views of junior high school students about the nature of their mathematics lessons and some of the challenges they face when learning mathematics. The responses from 21 students were examined, considering the 2 domains of teaching: traditional and reform-oriented methods. This research is significant in view of the unprecedented calls for new ways of mathematics teaching and learning, which promote students’ active participation in the teaching and learning process (Boaler, 2002, 2009).

The participants in the study emphasised that they experience mathematics in the traditional way. This theme was endorsed by more than 95% of the participants, who indicated that they normally sit down and listen to their teacher, which was consistent with Ottervange’s (2007) report on classrooms in Sub-Saharan African countries. In addition to this, an examination of the participants’ views also revealed that they go through a number of challenges when learning mathematics. This study revealed that students face a number of challenges when learning mathematics. These are similar to those reported by Alexander (2006), such as classroom-based teaching and learning practices, which play a vital role in supporting student understanding of mathematical topics or concepts learnt.

Conclusion
This exploratory study indicates that, despite the fact that the traditional teaching method has lost favour in most educational systems, students still experience this teaching method in their mathematics lessons. The reform-oriented approach to the teaching of mathematics has not been realised in these classrooms. It can be concluded that despite the numerous interventions by government and educational authorities to move the teaching and learning
of the subject from a teacher-centred approach to a student-centred approach, as documented in the national curriculum, the traditional approach still plays a major role in some classrooms.

Although generalising the findings from this study to the larger population of all junior high schools was not one of the aims of this study, the findings can form the basis for further research. For example, the findings from this study provide some useful information which can be used as the basis for further research to ascertain the reasons behind teachers’ inability to implement the reform-oriented approach in their respective classrooms, as documented in the national curriculum. In addition to this, the findings from the study also provide some vital information which needs to be examined by policy makers, especially the Teacher Education Division (TED), when planning the teacher education curriculum.

Notes
Ernest Ampadu is a PhD student in the Faculty of Education, Anglia Ruskin University.

References


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