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Does Peer Influence Affect Students Participation in Mathematics?

Ernest AMPADU[1]

Abstract

This study explores students' views regarding how peer influence impacts on their learning of mathematics. Twenty students from four Junior High Schools (12-14years) in Ghana formed the sample for this study. The instruments used for collecting the data were observation and interview. The findings revealed that all the participants have the enthusiasm and willingness to answer questions in class. However, it was interesting to note that all the participants reported that given a wrong answer is something they all try to avoid as their colleagues will mock at them. Students' participation is to a large extent influenced by the kind of feedback they get from their colleagues when they answer a question, as all the participants indicated that they prefer to remain silent than to give a wrong answer. The result challenges teachers' to be proactive in promoting a classroom environment which is free from intimidation and fear of participation. The results also call on teachers and students to see mistakes as part of the learning process and correcting such misconceptions among students lead to the creation of new knowledge.

Key Words: Participation, Peer Influence, Teaching and Learning

Introduction

Many studies have been conducted concerning mathematics teaching and learning and there has been a considerable interest in ways of improving the teaching and learning of mathematics in schools. Recent assessments and studies have shown that students are faced with numerous challenges as they learn different mathematical concepts and skills they are presented with. Three factors are distinguishable in the literature: student related, classroom related and school related factors. Student related factors include: student's ability, motivation, effort, attitude and self confidence. Classroom related factors include: instructional practices, assessment procedures as well as teachers' actions and inactions. School related factors also include teaching learning materials, staff and other resources that needed in promoting effective teaching and learning.

[1] Anglia Ruskin University, UK, ernest.ampadu@anglia.ac.uk

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These different but interrelated factors come together to make or mar the effectiveness of the teaching and learning of mathematics in schools. In exploring the possible means of improving the teaching and learning of mathematics, both policy documents and empirical evidence have shown that the core of the interplay between the leaner and what is learnt is accredited to the teacher and for that mater what happens in the classroom is influenced by the teacher's actions and inactions (Hanna and Nyhof-Young 1995). For example, according to Turnuklu and Yesildere (2007) the way a teacher communicates or presents his/her ideas go a long way to determine how students' conceptualise these ideas to create new knowledge. Apart from the classroom related factors, Mji and Makgato (2006) also argued that lack of learning materials and qualified staff are other major factors associated with poor performance among students. They added that, the provision of adequate teaching and learning materials does not only help teachers in having the resources needed to enhance their teaching, it also promotes critical thinking among students as they have different materials and the chance to explore the problem from different perspectives.

Recently, Vincent and Stacey (2008) also added that the provision of adequate teaching and learning materials has become an important factor in promoting effective teaching and learning of the subject as the learning of mathematical concepts and skills cannot be learnt in isolation with these materials that students will need to comprehend and make meaning to what they have been taught. However, despite the importance of the classroom and school related factors, the way the individual student learns and develop knowledge is largely affected by his or her personal characteristics such as attitude and motivation. Investigating into how these students' related factors affects students' achievement and learning experiences is well documented in the literature (eg. Lampert 1990, Schoenfeld 1992).

For example, Lampert (1990) argued that the kind of beliefs that a student holds about mathematics affects the way he or she learns it. Brown and Borko (1992) also argued that, the kind of attitude and conception that the individual student has towards mathematics influences his/her learning practices. Other research indicates that personal characteristics

such as motivation promote effective learning among students. For example, Ryan and Deci (2000) also found out that, intrinsic motivation promotes high-quality learning and creativity among students which helps students to take responsibility of their own learning. Myers (2009) also established that when students intrinsically motivated, they have the chance in relating the concepts and skills they have learnt to their personal lives and experiences which help them to develop conceptual understanding of the mathematical concepts they have learnt and apply them in real life situations.

One can say that individuals and for that matter students' vary considerably in how they construct new knowledge and have different academic learning strengths and weaknesses (Felder 1993). The social setting that students find themselves in, in their respective classrooms does not promote learning in isolation. Students interacts with one another in developing and creation of new knowledge and the importance of such interactions in promoting effective teaching and learning had been highlighted by Boaler (2009). In addition to this, Turner and Patrick (2004:1760) also added that active participation in learning is a valuable work habit for several reasons as it provides students with opportunities to learn and practice new knowledge and strategies as well as recognizing the need to revise thinking.

Willis (2010) also established that, the best way that students learn mathematics is through physical, emotional and psychological involvement in the teaching learning process. She further added that through such involvements, students explore, discover and create new knowledge where they learn from their mistakes and misconceptions to develop new knowledge. She however added that in most cases students' misconceptions and mistakes are normally ignored in most mathematics lessons despite the vital role such misconceptions and mistakes play in the creation of new knowledge. The benefits that students achieve in active participation in the teaching-learning process are well documented in the literature. For example, Betts and Zau (2004), Vigdor and Nechyba (2004) have explored into the impact of peer influence on students academic achievement and established that peers affect students' academic achievement.

In addition to this, research by Burke and Sass (2008) also established that positive and highly significant peer effects exits within every level of schooling and for both reading and mathematics. They added that as much as individual characteristics impacts on students' achievements, they however added that, peer influence also plays a vital role in students' achievements and participation. For example, Sullivan et al (2006) also found that students' positive and negative response and attitude toward school mathematics and engagement are to a large extent influenced by peer influence. They added that the classroom culture and for that matter peer influence is a strong determinant individual student participation and engagement than the curriculum and other related factors.

There have nonetheless been relatively few studies that have explored into weather or not peer influence affects students' participation in the teaching and learning of mathematics especially within the Ghanaian context. In addition to this, no study has specifically answered the research questions posed in this present study. Hence this research comes as an attempt to examine students' views regarding the impact of peer influence on their learning experiences. The purpose of this study is therefore to examine the impact of peer influence on students' participation in mathematics classrooms and it is guided by the following research questions:

a) How are the different levels of students' participation in mathematics lessons?
b) What are mathematics students' views regarding their enthusiasm in participating in the teaching-learning process?
c) Do students' actions and inactions influence their participation?

Methodology

Methods

Based on the objectives of the study two main instruments were employed in data collection process: observation and interview. The purpose of the classroom observation was to examine students' participation in the teaching-learning process and how the actions and inactions impact of students' impact on their learning experiences.

The researcher observed ten lessons in the four schools and each lesson lasting 35minutes and the individual interviews lasted for an average of 15minutes. For the purpose of consistency, classroom observation and interview protocols were used during the data collection process. All the lessons observed and the interviews were recorded using a voice recorder with the participants consent and all the participants were assured of confidentiality of their responses. Based on the purpose of the study, and the research questions, the present study employed a mixed method approach in collecting and analysing the study data. The use of this approach gave the researcher the opportunity to examine students' learning experiences within the classroom as well as their views about their learning to provide a holistic view of the phenomenon under consideration (Creswell 2003).

Participants

Two different group of people participated in this study: Firstly, all the students' and their respective mathematics teachers in the five schools where the researcher did the classroom observation formed the first group of participants. This group was considered as partial participants of the study as they only took part in the first phase of the study. The second group which forms the actual participants of the study included twenty students who were randomly selected from the ten classrooms where the researcher had the observation.

Data Analysis Procedures

The data analysis started at the same time the data were collected and in all classrooms, although the researcher had the chance of recording all the lessons observed and the interview conversations with the participants, he took notes during the observation and interview and the filed notes provided a summary of the two data sets. The objectivity of the notes taken during the observation and interview was tested by listening to the recordings and checking the consistencies with the two sources of data. The data was then transcribed after which the researcher read transcript through to illuminate similar and divergent views.

The data was analysed under pre-determined themes which were established in the classroom observation and interview protocols. However, the researcher did not only concentrate on these predetermined themes as room was created for other emerging themes. For example, the predetermine themes in the classroom observation protocol were: teaching methods, students' participation, students' engagement and assessment. The emerging themes which came up when analysing the classroom observation were students' skill acquirement. The predetermined themes used in the interviewed protocol were: enthusiasm, participation and peers feedback. The emerging themes which were developed from the interview results were: confidence, beliefs. The summary of the individual interview transcripts were then condensed in finding answers to the research questions posed in this study.

Findings

The findings are divided into two sections; the first section presents a summary of the classroom observation data which was used in eliciting information regarding students' participation in mathematics lessons. The second part presents the description and analysis of the individual interviews from the twenty students.

Classroom Observation

Table 1: Summary of the General Characteristics of Mathematics Teaching

Feature	Characteristics
Introduction	-Revised students related knowledge through questioning
Presentation	Lesson were presented in varied ways - structured and procedural approach with few examples - open ended approach giving students the chance to participate through the use of different methods and examples
Skill Acquirement	- through procedural application of the teacher's method - presentation and discussion of work in front of the class - comparing of answers
Student Engagement	- answering of questions - presentation of work in front of the class
Assessment	- questioning and class exercises

In finding answers to the first research question, the classroom observation data was analysed under the categories mentioned and the summary of the results is presented in table 1.

The results established that, students' participation was at two levels. At the first level, students participated in the teaching learning process when they were called by the teacher to answer a question and the questions they answered varied from factual to probing questions. However, in most cases the questions were factual questions and most of the time use in testing students' ability to memorise the skills and concepts they have been introduced to. At the second level, students participated in the teaching-learning process by presenting their work in front of their colleagues and this level of participation was very minimal in all the lessons. In general it can be argued that students' participation in these classrooms was dominated by answering of factual questions and accepting the teacher's approach without questioning. The result therefore echoes Felder (1993) assertion that individual students learn differently and the results from this study also concur to this as students participation in the lesson varied from one lesson to the other.

Students' Interviews

Table 2: Students' Interview Responses

Interview Question	Categories of descriptions
If you know the answer to a question will you volunteer to answer it?	Yes – but when they confident the answer is correct Yes – but when they called by the teacher Sometimes – when they want to test their understanding No- Because they are not good in mathematics and think their answers may wrong. No- Because their colleagues will laugh at them
What happens if you give a wrong answer?	Correction – the teacher will correct them Mocked at- their colleagues will laugh at them Rethink- will think about the question and correct themselves Silent – they will prefer to be silent
How do you feel when you give a wrong answer?	Shy – as their colleagues may mock at her Unhappy- it brings their confidence level down ashamed- will look like they have not been paying attention in class Indifferent – does not affect them in any way
How often will you answer question in class after given a wrong answer?	Never- they will never talk for the rest of the period When called- When they are called by the teacher

Evident from table 2, almost all the participants indicated their enthusiasm and willingness to volunteer to answer a question in class if they know the answer to the question. However, despite their willingness to answer questions it was interesting to note that their willingness were influenced by their confidence levels and their ability to provide correct answers as only correct answers are acknowledged in class. In addition to this, two of the respondents indicated that they prefer to remain silent in class even when they know the answer to a question because they are not good in mathematics and think they will be laughed at when they give a wrong answer. This was evident during the observation as in almost all the lessons observed a number of students never raised up their hands when a question was asked and also incorrect answers were not acknowledged in most cases.

As highlighted above, in most of the lessons observed, only correct answers were acknowledged and students' misconceptions were ignored in most cases. Evident from table 3, the respondents indicated that, their teacher will normally correct them when they give a wrong answer; it was interesting to note that, all the participants reported that their colleagues will mock at them when they give wrong answers. It was also evident from the classroom observation that, only the few students who were confident were prepared to answer a question when the teacher asked a question as the others listen and copy notes.

Individual student's participation in the teaching-learning process is influenced by a number of factors both internal and external factors. However, the kind of feedback that students get from their colleagues has a greater influence on their participation in class. For example, although almost all the participants expressed their willingness and enthusiasm to volunteer to answer a question in class when they know the answer, but when asked if they will volunteer to answer a question after given a wrong answer, they all responded no and the obvious reason was that their colleagues will mock at them. That is to say the actions and inactions of peers in class influence individual student's participation in class.

Discussion

The main purpose of this study was to explore students' views regarding their participation in the mathematics lessons and how peer influence impacts on students' participation in the teaching and learning of mathematics. This research is significant in view of the unprecedented calls for new ways of mathematics teaching and learning which promotes students active participation in the teaching and learning process (Boaler 2009; Willis 2010). The results established that almost all the participants had the enthusiasm and willingness to participate in the teaching-learning process by volunteering to answer a question if they know the answer. As highlighted by Willis (2010) this could be considered as a thing in the right direction as students active participation is what is needed for promoting conceptual understanding of mathematical concepts.

Similar to the findings of Felder (1993) the results from the study established that students learn differently and participated at different levels during lessons. However, majority of the respondents mostly participate at a lower level which promotes procedural understanding of the mathematical concepts with little or no independent learning. The findings also echoes Willis (2010) assertion that in most cases students mistakes and misconceptions are ignored despite the important role that mistakes and misconceptions play in developing new knowledge. The findings also established that, the kind of feedback that students get from their colleagues influence their level of participation and willingness to answer questions in class.

The findings therefore provide some useful information for mathematics teachers' in promoting a classroom environment free from intimidation and fear of participating in the teaching-learning process. This calls on teachers and students to understand and see mistakes as part of the learning process and correcting such misconceptions leads to the creation of new knowledge.

References

Boaler J. (2009). *The Elephant in the Classroom: Helping Children Learn and Love Maths*, Souvenir Press Ltd. London.

Brown, C.A. and Borko, H. (1992). Becoming a mathematics teacher, in *grouws, d. a. (Editor) Handbook of Research on Mathematics Teaching and Learning*, Oxford: Macmillan Publishing Company.

Burke M. A. and Sass T. A., (2008). *Classroom peer effects and student achievement national centre for analysis of longitudinal data in educational research, working paper 8*, University of Texas, USA.

Betts, J. R. and Zau, A., (2004). *Peer groups and academic achievement: panel evidence from administrative data*, Unpublished Manuscript.

Creswell J. W (2003). *Research design: qualitative, quantitative and mixed methods approaches*, Sage Publications: California.

Felder, R.M (1993). Reaching the second tier - learning and teaching styles in college science education, *Journal of College Science Teaching* 23(5) 286-290.

Hanna, G. & Nyhof-Young, J. (1995). An ICMI study on gender and mathematics education: Key issues and questions. In B. Grevholm and G. Hanna (Eds) Gender and mathematics education, An ICMI study in Stiftsgarden, Akersberg, Hoor, Sweden, 1993 (pp. 7-14). Lund: Lund University Press.

Lampert, M. (1990). When the Problem is not the question and the solution is not the answer: Mathematical knowing and teaching, *American Educational Research Journal* 27 (1), 29-64.

Mji, A., & Makgato, M. (2006). Factors associated with high school learners' poor Performance: A spotlight on mathematics and physical science. *South African Journal of Education,* 26(2), 253–266.

Myers, D. G. (2009). *Exploring Social Psychology* (5th Ed.) New York: McGraw-Hill.

Ryan, R. M., and Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic Definitions and new directions, *Contemporary Educational Psychology*, 25(1), 54-67.

Sullivan, P., Tobias, S., and McDonough, A. (2006). Perhaps the decision of some students not to engage in learning mathematics in school is deliberate. *Educational Studies in Mathematics*, 62(1), 81-99.

Turnuklu, E., Yesildere, S. (2007). "The pedagogical content knowledge in mathematics: preservice primary mathematics teachers' perspectives in Turkey", *Issues in the Undergraduate Mathematics Preparation of School Teachers: The Journal*, Vol.1, 1-13.

Turner J. C. and Patrick H. (2004). Motivational influences on student participation in classroom learning activities, *Teachers College Record*, 106(9), 1759-1785.

Vigdor, J. and Nechyba, T., (2004). Peer effects in elementary school: Learning from apparent random assignment, Unpublished manuscript.

Willis J. (2010). *Learning to Love Math: Teaching Strategies that Change Student Attitudes and get Results*, ASCD, USA.