

ENGAGING PRIMARY SCHOOL CHILDREN IN MATHEMATICAL DISCOURSE: AN EXPERIENCE OF A PAKISTANI CLASSROOM

Shahid Hussain Mughal

Associate Professor, Department of Education,
Sukkur Institute of Business Administration (IBA), University, Sukkur, Sindh,
PAKISTAN.

smughal38@yahoo.com

ABSTRACT

Mathematics occupies an important position in primary school subjects in Pakistan. The National Education Policies of Pakistan has emphasized the significance of Mathematics not as a subject but also as an important domain of knowledge for further research. Teaching of Mathematics, in the context of Pakistan, is suffering due to many factors. Among these factors, the prominent ones are teachers' inability to satisfy learners' mathematical needs, inappropriate assessment techniques and unimpressive teachers' professional development courses and ineffective teaching strategies. The purpose of this paper is to report experiences of mathematics classroom as a result of engaging children in mathematical discourse and to share challenges teachers face while pursuing mathematical discourse in the classroom. Qualitative approach was used for data collection. Within this paradigm, action research was employed. The findings of the study indicated that mathematical discourse can be used as a powerful teaching approach. Through discourse teachers not only enhance students' participation level in the classroom but also use it a vehicle to improve students' subject matter knowledge and critical thinking skills. However, teachers' poor content knowledge and lack of seriousness and motivation are the big hurdles in promoting mathematical discourse among children. This study has recommended some policy suggestions for improving the teaching of mathematics at elementary level.

Keywords: Mathematics, Elementary level, Discourse

INTRODUCTION

There is general perception among students that Mathematics is a difficult subject. Students consider Mathematics as a boring and life disconnected subject. All these perceptions lead towards fear and anxiety of Mathematics among children. As a result, students' performance in Mathematics have not reached at desirable level. There are many reasons that adversely affect students' poor performance in school Mathematics. Student poor performance in Mathematics is widely discussed in variety of circles of the society because Mathematical understanding, mathematical proficiency and good mathematics score is a key for success in variety of careers not in Pakistan but anywhere in the world. Without effective knowledge and understanding of Mathematics no one can imagine to get admission in universities. All foreign scholarships give high weightage and priority to Mathematics score. Society especially parents held high expectations from schools regarding their children's performance in Mathematics. It has been observed that generally students who graduate from high schools

demonstrate poor understanding of mathematics content, low level of motivation and interest. Beside this students mathematical confidence, language and communication skills remain very poor. Mathematics in schools is taught as a subject having pack of rules and formulae. Mathematics is not taught as a fun or as a subject that build communication skills. Strong Mathematical communication skills help to interpret data effectively and to take data based decisions. The question arises ‘Why students’ Mathematical communication skills appear to be poor in Pakistani government schools?’

There are many reasons of this:

- i. Teachers in Pakistani government schools mostly depend on chalk and talk method while teaching mathematical concepts to children.
- ii. Teachers were themselves taught by their teachers in the same way. Teachers only use prescribed test book for teaching Maths. The examples in textbook do not help teachers to initiate discussion on mathematical topics.
- iii. Students seldom ask questions in mathematics classroom because of their low communication skills, this ultimately results in their low confidence and morale.
- iv. The Mathematical assessment is designed in such a way that it promotes role learning of maths formulae. There is very little space for teachers to engage students in mathematical talk or discourse.

No doubt mathematical talk or discourse not only raise students’ confidence but also help them to relate Mathematics with daily life. Research findings show that mathematical talk or discourse has great impact on student learning. Edwards & Mercer, advocate that “Talk is both ‘a medium for teaching and learning’ and ‘one of the materials from which a child constructs meaning’ (1987, p. 20, Cited in Debra Myhill, 2006). Sfard (2000) and Dorfler (2000) describe mathematics as a subject that includes different kinds of conversations and this conversation is culturally- oriented. They further argue that realities of the world are discourse- oriented. The discourse has myriad interpretations such as observing, doing, speaking and writing some mathematical phenomenon. The NCTM (2000) clearly argues that discourse and communication are the integral parts of ideal mathematical teaching and learning.

Teachers can foster students’ intellectual development by using discourse as a medium of instruction in mathematics classroom. This is very useful in constructing new knowledge and developing students’ conceptual understanding. When students interact with each other through talk, it enrich their experiences and as a result it contributes towards their mathematical proficiency and know-how (Driver, Asoko, Leach, Mortimer & Scott, 1994, Cited in Smith, 2013).

Literature supports that Mathematical discourse can be used as a teaching strategy in the classroom. This strategy has great benefits not for teachers but also for students. Crowin (1995) explains that “Mathematics discourse can serve many purposes. They include forming ideas, internalizing ideas, thinking aloud and assessing learning” (p.3). Mathematics discourse helps students to raise their confidence, social skills, morale and self-esteem. According to Mercer (1995) “the talk of classroom from the perspective of teacher and pupils understating a joint construction of knowledge” (p.34).

While attending Master of Education course at Aga Khan University-Institute for Educational Development, I realized the importance of mathematical discourse. While teaching mathematics to primary school children, I found that students’ communication skills were

very week. They felt shy to speak in class. Whenever I ask questions on any content areas they keep silent and hardly speak out. This made me perplexed and the situation led me to design my teaching that contain activities that provide opportunities for discussion in the classroom. Another reason to choose this topic for further investigation was that in my teaching I never used discourse in Mathematics Classroom. This was a great opportunity for me to further my understanding about a new teaching method.

RESEARCH QUESTIONS

The following research questions guided the inquiry:

1. What experiences emerge for researcher during promoting discourse about basic Mathematics concepts in a lower secondary classroom?
2. What challenges teachers face while pursuing mathematical discourse in the classroom?

METHODOLOGY

The study was qualitative in nature. Within qualitative method, action research was used a strategy for data collection. Action research is an approach that help practitioners to solve immediate problems. It is an effective strategy to improve not only one's teaching skills but also to facilitate students in leaning. In this action research, I used three steps, Pre-Intervention (Planning and designing my lesson plan and activities), Intervention (teaching and facilitating students in eliciting their views, encouraging mathematical talks) and Post Intervention (Reflection on my teaching and post conference with my peer friend). An action research was conducted at a prestigious private school in Karachi. In this project, I with my peer friend taught two Mathematics lessons in school. The lesson plan contained activities that promote discussion about Mathematics concepts in the classroom. The purpose was to introduce a culture of sharing ideas in a traditional classroom. For data collection reflective diaries was maintained. The researcher continuously wrote his notes in the diary and reflected on the classroom episodes. My peer friend looked at my lesson plans. His observation and feedback helped me a lot in making my lesson interesting for children.

Permission was sought from school management and parents for using cassette recorder to record voices in the classroom. Data were transcribed and meanings were inferred from it.

Reflection, Analyses and Interpretation

It was a sunny morning when we reached a private school of Karachi to teach students. After attending the assembly, we were supposed to teach Mathematics lessons to class four. When we reached class, students smiling faces welcomed us. After greetings, and sharing our purpose, I started teaching. My planning include setting targets of my lesson, activities based on the philosophy of Mathematics discourse. In this lesson, I was teaching them properties of two dimensional geometrical figures. I have used S1, S2, S3, S4, and S5--- for students and T for teacher as acronym in the following discussions which took place in the classroom.

While teaching area of 'Rectangle', I draw different shapes of two dimensional shapes on white board. The talk started as:

T: Can you name the shapes which are drawn on the white board?

S1: It is triangle.

S2: It is rectangle

S3: It is parallelogram

T: How do you say it is rectangle? (Pointing towards rectangle)

S2: It has four sides

S6: It has four angles.

S4: It has opposite sides equal. It has length and width.

T: Can you draw rectangle? [Students draw rectangles of differences sizes and present in the classroom]

T: Teacher helped students to deduce the formula to find out area of rectangle. Students were asked find out the area of rectangle?

(Excerpt Taken from Classroom Discourse)

Students calculated the area of rectangle and shared in the classroom. After students' presentations, the researcher was very excited that everybody was eager to share his/her point of view. Students told that they have never been exposed to such kind of opportunities. They further told that only selected students have opportunities to talk in the classroom. They further clarified that in Mathematics classroom, teachers usually ask them to memorize the formula. When I reflected on my teaching at school, I realized that in past I have not managed such kind of conversations and activities. I realized 'how such kind of Mathematical talks create thrill among children?' The NCTM (2000) advocates that when students give their remarks on mathematical ideas, their understanding become lasting and permanent.

The first day teaching helped me to set some rules for mathematical conversations. Students were instructed not to poke their nose during the conversation. Everybody was asked to seek permission from teacher before they talk. My second teaching sessions was designed on the topic of 'Multiples.' The discourse took place in the following way:

T: Teacher writes numbers on the white board. 1, 2,3,4,5,6,7,8,9,10,11,12,13,14 and ask about types of numbers.

S1: These are whole numbers

T: How do you say?

S2: These are natural numbers.

T: Can anybody tell me multiples of 2?

S3: they are 2,4,6,8,10,12,14

T: Why 2 is multiple of 8?

S4: Because 2 divides 8 by 4 times and there is no remainders left.

T: Write multiples of 4 and 5 upto 200.

Students engaged in to find out the multiples in groups and present their work in the classroom. Students first of all, wrote numbers from 1 to 200 and then developed a number grid. In number grid they asked from each other about natural numbers, odd, even, composite and prime numbers. Students were themselves asking from each other. I was observing them and facilitating them. The first day experience taught me that teacher should give maximum time to students for sharing their ideas. This has been endorse by Ball (1993). He explains that when students lead their mathematical discussions, it helps them to make meaning of mathematics. When students infer meaning from mathematics they try to probe in deeper about mathematics.

CHALLENGES

Arranging Mathematical discourses in primary classroom require proper planning. Teachers and head teachers demonstrate high patience and temperament. Teachers face challenges in the management of overcrowded classroom. In order to minimize disciplinary problems teachers have to set ethical rules. This will encourage teachers to ensure equal participation of students, which is the real purpose of Mathematical discussions. The role of teacher should be a facilitator and guide. Students themselves lead the discussions.

SUGGESTIONS

Pakistan Mathematics curriculum may propose mathematics communication or discourse as a separate standard for secondary and upper secondary classes. Teachers training for serving teachers may embed discourse in mathematical concepts. Teachers guide in Mathematics should contain fair amount of activities that facilitate teachers to initiate discussions on Mathematics concepts. Cramming on mathematics topics should be discouraged and conceptual understating may be increased through Maths discourse. Teachers may use this strategy to improve students' mathematical language.

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