Collaborative Approach for Continuous In-Service Teacher Professional Development

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Abstract: In the present indian context of implementing seminal documents like NCF2005 and RTE 2009 towards student centered teaching there is urgent need to address teacher professional development to prepare teachers to realize the vision in the documents. In this paper experience of using collaborative approach to teacher professional development with a government school teacher has been shared and its purported role in supporting teachers change in practices has been discussed. The arguments for adapting collaborative approach is supported by evidence of teacher's questioning of her beliefs related to mathematics, its teaching, learning as well as students in the discussions done with the researcher.

Introduction

Teacher education in India is essentially disconnected with the stark realities that teachers face daily in their classroom. It has been recognized in various documents that preparatory teacher education is too theoretical and fraught with "ritualisation" of practices like preparing lesson plans, teaching aids, organizing morning assembly without much critical reflection on the part of student teachers (NCFTE 2009). In service programmes on the other hand are not designed based on the needs of the teachers as they are designed mostly by faculties who have neither taught in any school nor are aware of the realities of the teachers (Dewan 2009). From my own experience as a teacher in a government school for six and half year, I have a few observations to share. In service teachers don't get encouragement to pursue professional development from their administration as it will lead to scarcity of staff in an already understaffed school. Since promotion is based on seniority rules rather than the participation in professional development programs it does not hold much value for most of the teachers. Most teachers seek professional development "attendance" at the time when prerequisite number of professional development attendance is required to get promotion or seniority pay scale. Such attitudes of teachers says a lot about the quality and kind of programs offered to teachers as they are considered as mere formality to be completed by them.

 In present scenario there is a grim need to train teachers across the nation in order to implement the two seminal documents NCF 2005 and RTE 2009.These two documents portray a vision of the kind of environment that should be there for *all* students to learn in schools but fail to address the question of preparing teachers to adequately enable such an environment in school (Batra 2005).

Both the documents pose an immense challenge to teachers and the way that is adopted by authorities to implement them (NCF, RTE) is through issuing circulars in form of diktats. Teachers are expected to comply and conform where as meaningful discussion based on reading is hardly done with teachers. For instance in one government school system teachers and principals were expected to pass tests based on NCF2005. Teachers view these documents as prescriptive texts and thus fail to engage deeply with issues raised in the document. In such an professional environment teachers adapt coping strategies like incorporating appropriate terminologies in the discourse like "teacher as facilitator", "Activity based learning" without deeply engaging with its meaning and purpose in education. Such phenomena of adapting terminologies along with superficial changes in response to governmental interventions have been reported earlier in the context of DPEP by Sarangapani (2003).

Rationale for collaborative approach for Teacher professional development

The above scenario indicate that serious consideration need to be done to evaluate the "top down/ filtration" approach adopted in the Indian education system to "train teachers" . There is need to empower teachers to look critically at their practice and the beliefs held by them in context of teaching, learning as well as what counts as knowledge. The critical reflection by teachers is only possible in situations where teachers think for themselves and articulate their views in a non threatening environment, where enough support is available to them initiate changes in their practices as well as guidance to develop student centered practices. Collaborative professional development environment offer opportunities for teachers to do such critical reflection by considering them an important decision maker for developing student understanding. The aim of any collaboration is working towards a common goal with shared responsibility and when the common goal is developing students' understanding it provides teachers with the "litmus test" against which they should be making their choice of teaching strategies. It is ironical that teachers choice of strategies is otherwise governed not by students understanding but by "pressure of completion of syllabus" and the kinds of questions that will be coming in the test. Studies have found that teachers attribute low performance of students with students "lack of ability" rather than as a result of teaching strategies adopted by them(Philipp 2007). In order to overcome this blindness teachers need to see how students understanding are developing as a result of their teaching by reflecting on the responses of students and looking for possible sources which led to that response. Collegial discussions with other teachers can help teachers ascertain sources for students

understanding like e.g. daily life situations, textbooks, activities in which students engage in as well as the teaching. However very few space is available for teachers in their own schools to discuss their teaching in non threatening environments and thus collaborative environment is a promising alternative. In my discussions with teachers I found that teaching done in class is hardly discussed out of the class by teachers. Even subject committee meetings are used to arrive at consensus for covering portions of syllabus and test construction rather than for discussing alternative strategies for teaching in student centered manner.

In this paper I am going to share the experiences of working with a government school teacher Swati (Pseudonym) teaching mathematics to middle grades by establishing teacher-researcher collaboration both outside and within the class. The nature of the collaboration established with the teacher will be elaborated. The nature of change in practices of a teacher will be described while discussing the role of collaboration in supporting the change in practices.

The study

The findings being reported here are part of a larger study from 2009-2011 on collaborating with teachers to develop classroom practices aimed at teaching mathematics for understanding. The study had different components: professional development workshops, collaborative follow-up of classroom teaching by the first author (referred to henceforth as "researcher") and planning and designing instruction for specific topics. Participants in the study were mathematics teachers teaching primary and middle grades in a nation-wide Government school system and were nominated by their principals to participate in the study. Of the 12 teachers who participated in the first workshop, 8 teachers were local, i.e., from the same city. Four local teachers were identified for participating in the collaborative phase. All the eight local teachers participated in a six-month long instruction design project focusing on specific topics in their curriculum.

Data about teachers' beliefs and practices was collected through written questionnaires, detailed individual interviews during the professional development workshop, and written logs of classroom observation and notes of discussion during the collaborative phase. All the sessions of the first workshop were video recorded. All the interviews, and most of the classroom lessons and discussions were audio-recorded. The individual interviews were fully transcribed. In this paper, I describe the change in practices accompanied with questioning of beliefs held by one of the teachers, Swati (pseudonym), through an interpretative analysis of her questionnaire responses, the interview transcripts and notes of classroom observation and discussion held with the teacher.

Additionally, the audio-records of classroom teaching and discussion with the teacher, were reviewed, and segments were transcribed to examine instances of tension in beliefs.

The initial workshop for all the participating teachers was held in May-June 2009. The researcher visited Swati's classroom during three time periods: Aug-Sep 2009 July 2010 and Nov 2010. A total of 50 lessons of 35 minutes each were observed (19, 16 and 15 respectively in each period). In these lessons, Swati taught a variety of topics: divisibility tests, algebra, integers, and elementary geometry to 6th graders, lines, angles, triangle and its properties to 7th graders and quadrilaterals and practical geometry to 8th graders. Apart from the extended interview during the first workshop, the researcher had continuous brief interactions with Swati throughout the period of collaboration, including about six occasions where she had extended discussions about her views and aspects of her teaching.

The nature of collaboration

The collaboration established between researcher and teacher for the purpose of improving students understanding of mathematics by changing the pattern of classroom interactions and development of culture in classroom which facilitates students participation in discussion about important mathematical concepts. This included adoption of teaching strategies like accepting multiple ways of solving by allowing students to explore, asking "why" questions to provoke students to think deeply about the mathematics procedures and why they work, connecting mathematics in classrooms with students daily life to name a few. Modeling of such strategies was included in the initial workshop where an important component was series of demo lesson involving students being taught, while the teacher sat at the back of classroom and observed the lesson. After the demo class the discussion was held with the teachers in order to elicit beliefs and share the thinking behind the decisions taken during teaching and the kind of preparation and planning that is involved while teaching in student centered manner.

The researcher collaborated with the teacher to achieve the goal of improving students' understanding by analysing and reflecting on the events in the classroom together with the teacher. The researcher interacted regularly with the teacher during the period of observation in school, both prior to and after the lesson in order to help plan the lessons. The researcher also provided resources in form of research findings, worksheets of students work form previous trials, logs of teaching and manipulative used in previous trials as well as sharing researchers' own experience of teaching in those trials. The researcher even helped in preparing worksheets, designing manipulative and

assessment for the class. The discussion with the teacher outside the class helped teacher to reflect on what transpired in the classroom as the researcher shared observations of classroom interactions and student interviews as well as share her own analysis of it.

Thayer-Bacon and Pack-Brown (2000) define collaboration as

> *The intellectual and emotional interaction that takes place between diverse people who are in changing relation with each other are able to mutually communicate through an accurate and shared verbal and non verbal language;therefore, they are potentially able to influence each other.*

In other words collaboration can also be defined as working together, building together,learning together, changing together and improving together. It was with this understanding of collaboration that researcher worked with the teachers. Although power dynamics was evident initially in teacher researcher interaction as the teachers were assigned to the professional development project by the school administration, teachers realized the intentions of the researcher is to work towards student understanding and helping teachers achieve it in their classroom. Researcher knew that teacher is viewing the relationship as collaboration when the teacher collaborator introduced the researcher to other colleagues by telling them that researcher is going to help her and her students in learning mathematics. Another teacher told her colleague that researcher is not doing "classroom observation" (which has got negative connotations with teachers because of association of inspection with the word observation) instead she is "studying her classroom". Also teachers freely gave their opinions about the suggestions given by the researcher and made all the decisions for teaching herself (though they may be influenced by discussion they had with the researcher). Researcher also reiterated to teachers that they are the expert of their class since they know their students better than her.

As indicated above the driving point of collaboration was the 'discussion' that the researcher had with the teacher both in school as well as during the one day workshop when the teachers came over to the institute and interacted with mathematics education group at HBCSE. Another area where collaboration was manifested was within the class. There were occasions when teachers asked researcher's opinion about how to move forward in a lesson when they were trying new approaches and got stuck. At other instances the researcher intervened the flow of teaching when she felt that mathematics behind a student response needs to be highlighted to the whole class (which the teacher was not aware of) or to ask a conceptual question at a point where there was need to assess students developing understanding of the concept and at times to suggest alternative approach for a concept when students were having difficulty understanding. These interventions made by the

researcher in the class also brought into focus important issues about students understanding during the discussion done outside the class. This also helped to elicit teachers basis for decision making in class, beliefs held by teachers about mathematics, its teaching,learning and about students as well as provided teachers with alternative viewpoints for teaching and evidence and data of students understanding as a result of researcher's intervention. Here it is important to note that it was a learning experience for the researcher also in terms of developing understanding about students thinking in various mathematical concepts and what works to develop students thinking.

Swati's Initial belief and practices for teaching mathematics

Swati is a middle school teacher who had a Master's degree in Mathematics and a professional qualification of Bachelor of Education. She is 42 years old, and has a total teaching experience of 17 years out of which in the first ten years she taught science and mathematics at the primary level (grades 1 through 5) and in the remaining 7 years she taught mathematics from grade 6 through 10. In her interview she said that as a student she has had a positive experience of learning mathematics in a class setting where competition was emphasized. She was motivated by the teacher remarking that she was "first in class" in mathematics and that her work was "excellent".

In the initial interview, held during the first professional development workshop in May-June 2009, Swati's statements indicated that there exists tension among some of her beliefs. Some of this may be due to the interaction and discussion during the workshop sessions, where there was often explicit focus on what it means to teach mathematics for understanding. Tensions pertinent to classroom teaching included seeing mathematics as more than calculation and teaching focus on concepts while at other times during the interview she talked about "writing all the steps" as an indication of "reasoning it out" along with focus on getting the answer right for questions which usually come in test. While she admitted teaching shortcuts for enhancing speed she realised that "one cant learn maths by knowing shortcuts". While she claimed that she allow students to interact by calling them to blackboard to show solutions and "allow them to give answer whether right or wrong" her teaching indicated predominance of responses from "bright students" who didnt let other students give time to even think. For learning mathematics her view was that it needs lot of practice as much as "50 problems at one go" although at the end of workshop she changed her response to disagree from agree for the statement that "*When students make errors, the best remedy is to make them repeatedly practice these types of problems*" .

From the observation of the initial lessons, the impression formed by the researcher was that Swati

had a traditional approach to teaching, including a focus on remembering rules for solving problems, presenting complete solutions to problems followed by students solving similar problems, emphasis on lots of practice aimed at aiding memorisation. The students had to be coaxed to come to the blackboard and even when they did the teacher asked students to solve by looking at the earlier solution done by her on the blackboard. In discussion with the researcher she admitted that her class is not that interactive but felt helpless in curbing immediate answers by the "bright students".

Changes in teachers practice during the course of collaboration and significant events

In the course of the collaboration, elements of this teaching approach appeared to undergo a change and Swati appeared to become more responsive to students' understanding. For example, she asked more 'why' questions, did not end the discussion after getting a correct answer from one student, probed for students' thinking behind incorrect answers, made connections between mathematical ideas and real world experience, leading to increased participation of the students in classroom discussion. At times, Swati also referred explicitly to some of the changes in the discussion with the researcher.

During the collaborative phase, as the teacher and researcher discussed students' responses and the kind of understanding of mathematics that students are developing after a lesson, there were occasions when Swati questioned certain beliefs that she or her colleagues had expressed.

One instance was when she had done an activity of equating area of two squares on the sides of the right triable eqaul to the area of square on the hypotenuse. Later in the discussion she criticised students for doing the activity mechanically and interpreting Pythagoras theorem as a rule.

Swati: They are more interested in procedure part like that girl, pythagoras property likh diya (wrote down). Ek method seekh liya (She learnt a method): if hypotenuse is not known what is given you subtract, bus (that's all). She said as a rule we can remember like that.

Recognising the students focus on procedure and its futility in developing understanding of the theorem made her realise the value of reasoning in mathematics. She felt that reasoning should be focused in teaching of mathematics and speculated about the conditions which can foster reasoning in students.

Swati: But humko itni aadat nahi hai activities ka. At least primary mai they are used to taking activites. I dont know if it happens. Agar woh really lete hai toh agar hum 6th me lete hai toh bacche comfortable hoge. Toh agar flow me ayega toh 'reasoning' will come. It will take time. (We are not used to taking activities. At least primary teachers are used to taking activities, if it really happens. If they really take and then if we take in grade 6 then students will be comfortable. So if it is done in continuation reasoning will come. It will take time.)

In another instance, Swati questioned beliefs that teachers (including perhaps herself) hold about students. This was in July 2010 when the researcher and Swati jointly constructed a test after looking at several textbooks by selecting open ended questions that really tested the "concept" for quadrilaterals. When the students performed poorly she reflected that it was because students "know how to solve" the textbook questions (the focus of her teaching) but may not understand the concept. During a meeting with other teachers she shared this incident and said

Swati: Students whom we call bright are not really bright because its just that they have already done the chapter and thus know the answers but if we twist the question they are not able to answer. They don't know the basics but they will solve it."

This is important because earlier in her teaching these "bright" (term used by her) students gave almost all the answers to the textbook questions asked by her and as a result other students did not have sufficient time or opportunity to think and understand. Her teaching almost exclusively concentrated on solving exercises in the textbook. Her lessons would typically begin by her asking the students what they have been doing and students responding by quoting the exercise and question number. Some students used to study the chapter in advance which resulted in an identifiable pattern of interactions in class where these "bright" students dominated while giving responses. Thus focus on solving textbook questions was inhibiting Swati in really engaging with student understanding. Her remarks quoted above and the implied questioning of her beliefs may have made her open to using real life contexts and questions beyond the textbook while focus on students' understanding.

Later in the collaboration Swati gave a presentation to a group of teachers in the workshop as resource person and talked about her experince in the project .

What I observed when I was teaching subtraction of integers in the class. Some children had already done , they knew with the answer but when I asked them

to explain they were not able to explain. So taking such an activity in class made them also think , when I asked the reasoning. They told that "Mam we dont know the reasoning but we know this is the answer". They directly learn the rules. Learning rules is easier and for these bright children they are able to learn the rules very fast. They also...What is the disadvantage they dont want to know the reason because they are small children. Baccho ko answer jaldi ane chahiye who ek craze hota hai Aur fatafat answer jaldi lane ke liye they learn the rules(Children like getting answer quickly and that is why they learn the rules). But how to get it the reasoning they dont do. That is the advantage of having something different in the class which is not there   in the textbook.

In the above excerpt one can see the reflective stance of the teacher and her concern for developing reasoning in students. The practice accompanied by this concern is doing activities which are different from the textbook and thus moving away from the textbook and becoming an empowered teacher to play an active role in decision making for developing student understanding. Earlier her decision making was mostly governed by the textbook and tests. Here Swati is talking about an activity that she did in class which was developed as result of one day workshops in institute and planning of lessons done by teacher while making decisions for the sequence in which concepts related to integers have to be taught.

Discussion

The experience of teacher and researcher considered in this paper can be considered for discussing ways in which collaboration played a role in supporting the change in teachers belief and practice with respect to mteaching mathematics as a set of rules to memorized and moving towards reasoning as an essential part of mathematical thinking. The affordances provided by the collaboration included sharing of alternative viewpoints about mathematics, its teaching,learning students as well as alternative data to consider for making future decisions for teaching , made available due to researcher interventions in the class. The discussion with researcher involved articulation and justification for the teaching decisions which could have made teacher think about the routines that had become automatic for her over the years. Also the negotiations with the researcher about students understanding by using data in form of students responses and written work in a class provided teacher time and space to think about what happened in class and why , which otherwise teachers are not able to do. This also brought into focus students thinking about

mathematics for the teacher which earlier did not play a major role in teaching decisions. The joint construction of test provided the teacher with data in form of students responses which challenged her belief of doing textbook questions and getting correct answers of them is sufficient for understanding mathematics. The participation of the researcher in teaching and taking joint responsibility for students learning, provided the teacher with the safe environment to voice her thinking about various issues and reflecting on it. Thus the collaboration provided opportunities for teachers to become aware of their own beliefs when they have to take positions, draw inferences, give clarifications and provide elaboration and explanation of their viewpoints.

Although the paper presents effectiveness of collaboration for changing practice of one teacher, still there are lessons to be drawn about the implications for general teacher professional development. The imposed nature of teacher training done in Indian education system makes the teacher feel alienated and demotivated to implement suggested changes in classroom as adequate support in terms of meeting *teachers' needs* are not there. The identification of teachers' needs has to be done in the context of challenges posed for implementation of student centered teaching. Some of the needs identified in the study are design of activities to promote students thinking and reasoning and developing teachers understanding of use of the activity itself, improving content knowledge of teachers in order to identify and work with the mathematics implicit in students' responses, development of community of teachers where experiences in the class can become subject of reflection for all teachers in non threatening environment through collaboration, availability of research publications in relevant areas to teachers in accessible form and its discussion in community in presence of people knowledgeable about the research paradigm and lastly establishing connections and collaborations of schools with centers of education research so as to facilitate the solutions of problems faced by teachers in the classroom.

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