

Tensions between Theory and Practice: Challenges and Issues in Teacher Transition in Classroom

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A change in perspectives

For the last ten years there has been an emphasis on educational reform that aims to achieve a conceptual shift in the practice of teachers from traditional to innovative methods in Pakistan. This new practice views a teacher as a facilitator, where facilitation is seen in terms of supporting and developing students' thinking capabilities, i.e., to promote teaching, that is in accordance with the child's psychological and social perspectives of learning (adopted from Earnest, 1990; Cobb *et al* , 1991; Jaworski, 1994). The teacher educators believe that characteristics for teaching should be in accordance to a child's psychological and social perspectives of learning in the classroom. Therefore, a teacher in mathematics classroom is expected to set tasks for the students and analyse outcomes of the tasks in order to understand how students construct meanings, listen to the other students, understand their level of thinking, and help them to achieve a common agreement of a concept. For example, Cobb et al (1991) describe the teacher's role as follows:

.. facilitator and stimulator of students' learning; posing interesting questions and situations for investigation, challenging them to think and explore knowledge (p.5).

A teacher facilitation in a mathematics classroom, where both teachers and learners consult and respect each other's experiences and knowledge as well as question them, enhance meaningful learning as Povey and Burton (1999) suggest:

As such, meaning is understood as negotiated. External sources are consulted and respected, but they are also evaluated critically by the knowledge makers, those making meaning of mathematics in the classroom, with whom *author/ity* rests. Such a way of knowing opens up the possibility of understanding knowledge as constructed and meaning as contingent and contextual, and personal in the sense that it reflects the positionings of the knower. The teacher and the learner meet as epistemological equals (p.234).

With this shift, the notion of teacher learning has also been reconceptualised. Teachers are being viewed as reflective practitioners -reflective thinking develops a relational understanding of practice, which results in a construction of new knowledge and improvement (Schon; 1983; Kemmis, 1986).

A number of educational reformers have suggested that that reflection on experiences and justification of self-actions enable teachers to analyze limitations of old practice, understand new practices in the reality, and their own contribution to achieve improvement, thus teachers are expected to take responsibility for their continuous professional development. Teachers' participation in communication and problem solving is central to achieving shared understanding. When teachers engage in dialogue they connect their new knowledge, resulting from considering other's perspectives, with their previous knowledge; these two ideas are then put together and a shared understanding is gained (Rogoff, 1990; 2001). Such participation also support risk taking and struggle entailed in transforming practice (Fullan,

1999). This perspective of teacher learning is parallel to the perspective of students' learning in a mathematics classroom as discussed above. Thus, theoretical assumptions of a teacher new role make a lot of sense, as they discuss how this results in teacher learning and consequent improvement in student learning outcomes.

However, a number of research have indicated that although the teacher education programmes offered to teachers provide valuable opportunities for teachers to learn and think in new ways (Putnam & Borko, 1999). Teachers' engagement and experiences in the teacher educational programmes generally lead to a change in their teaching perspectives on what mathematics teaching could or should be and what could be the limitations of the traditional mode of teaching for students' learning (Mohammad, 2005). The teachers start to believe that traditional teaching practice tend to promote rote-memorization in which learning is built up into a habit of repetition, reducing children's cognitive and intelligent thinking. Thoughtfully combining teacher education programme –and real field based experiences can be difficult to accomplish in classrooms. Even when change is desirable and teachers have the motivation to improve their practices; the teachers in most cases can not successfully implement child-cantered learning in their classrooms which in turn, has implications for children learning outcomes. The growing concern in teacher education is despite various innovation in teacher education, the classroom practices, have received limited or no impact (reference). If the teachers' learning has no impact on student learning, what benefit can there be of new theoretical perspectives? It has been suggested to teacher educators and researcher to studying the impact of the initiatives at the classroom level to accomplish reform. For example, Stevens (2004) suggests

We need to continue to move education on the path to a more evidence based discipline, with an emphasis on building and using a knowledge base to move the field forward.... we need to focus on research questions that have relevance and importance in the lives of learners (p. 395)

This paper discusses the complex issues of mathematics teachers' transition from traditional teaching to new practice within the conceptual and contextual constraints; it has also raised some concerns and questions related to its impact on students' learning outcomes. It is expected that this discussion will stimulate teacher educators in Pakistan and at large to reflect on their own ways of working with teachers, and to challenge the assumptions that inform and shape their theoretical perspectives and practices. The discussion will examine the practical reality of a school context and its relations to theoretical perspective of change.

Context of Findings

The university, where I work as a teacher educator, has been involved in improving the quality of education for the last decade, where teacher education has been conceptualized on the basis of the theoretical perspective discussed above. The university offers a variety of in-service programmes for educational improvement to teachers in order to bring reform at classroom level. The participants of these various programmes are with the university for a specific duration (depending on the nature of the programme). These programmes are field based in which the participants get opportunity to work in the practicality of their classroom in order to learn integration of theory and practice. After the completion of the university-based programme, they go back to their schools on the assumption that they would be engaged in the 'change-process' in their respective contexts.

The data (anecdotes/examples) that are used in this paper for discussion comes from my doctoral work and later research work with the mathematics teachers who participated in mathematics teacher education programmes at the university. The new aim of their teaching was to increase students' participation in their own learning and develop students' conceptual understanding of mathematics (adapted from their learning at the university). The nature of my research was reflective and participatory. These were basically designed to follow up some of the teachers after the programme or during the programme (while they worked in their classrooms) to support and examine teacher implementation of new ways of teaching resulting from their learning in the teacher education programmes at the university. As a teacher educator/researcher my work with the teachers was based on principles of collaborative partnership (as discussed in Wagner, 1997, Fullan, 2000); I facilitated the teachers in planning, teaching and reflecting on these teaching experiences in order to improve their teaching as well as tried to make sense of teachers' implementation process in the practical reality of classrooms. The data includes audio-recorded conversations in pre- and post- observation meetings; field notes during the teachers' participation in teaching or in their learning with the teacher educator, the teachers' written comments (when provided), and my own reflective journal entries as a teacher educator/researcher.

Inside the Classrooms

This section discusses some examples for the analysis of impact that both conceptual and contextual problems have in inhibiting teachers' disposition towards capacities for development. These examples were highlighted from the teachers' participation with the teacher educator and within their schools' culture in which they were challenged, supported and committed to teaching for achievement of their new aims. The teachers' capacity to learn was increased during the period of collaborative work; however, they need support in dealing with the issues for further enhancement. However, analysis of my experience of working very closely with the teachers, identify the issues that were common to the all mathematics teachers' new practices and its implications for students' mathematical learning. The teachers were able to plan interesting activities, invite students' answers, organise group work etc., but they were unable to relate such activities to create conceptual understanding/ meaningful learning. They had difficulties in engaging students in any problem solving method to generate their own ideas. They dominated the discussion, limited the students' participation and thus appeared to be routinized in their actual classroom practice. I share below some examples from my observations in order to discuss the issues related to teachers' implementation of new ideas.

Example 1 – (How did you find the number?)

This example is taken from a teacher – Sahib's lesson on equations. He aimed to increase students' participation through allowing them to express their responses, and therefore, he planned the lesson by using some of the examples learned at the programme. The students were from Class 7 (age group 12). He began the lesson by asking the question, '*Somebody has thought of a number, multiplied it by three, subtracted one and got five. Tell me the number he has thought of*'. The teacher also wrote on the board, $x \cdot 3 - 1 = 5$. He allowed students to think and discuss in group and then invited them to share their answers. One student's response was, 'Two', and others confirmed that, too. The teacher probed further, '*How did you find out?*' and invited one of them to the board to write his method. The student wrote on the board, $2 \cdot 3 = 6 - 1 = 5$ [the student multiplied 2 by 3 first, getting 6, and then subtracted 1 to get 5]. The way it appears in writing is mathematically wrong (since $2 \cdot 3$ is not equal to $6-1$); however, the student seemed clear in thinking while writing. The teacher asked again, '*How did you get 2?*' That student was silent. The teacher then asked

other students to explain in words what their friend wrote on the board. However, he got the similar answer that *product of 2 and 3 was six and five was one less of six*. The teacher kept probing ‘how did you get it’. However, there were no responses when the teacher probed further about their reasons of getting the 2. Lastly, the teacher then told the student. ‘*First, you added one to five and you got six on the other side. Then you divided six by three to get two*’.

Example 2- (Can you say, $1/3$ and $1/3 = 2/6$?)

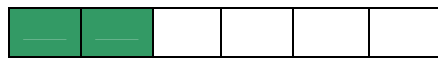
Neelofar taught fractions in Class 6 (age group 11); her aim was to promote discussion-based teaching in relation to improve students’ learning outcomes. One of the problems she gave for discussion was, ‘*divide two chocolates among three people*’. She then invited the groups to present their respective solutions to the class. The one group responded ‘*each one would get $2/6$* ’. The teacher asked for the reasons and the students made following justifications through drawing on the board or poster presentation:

The students respond was, $1/3$ and $1/3$ is $2/6$, and they showed this with the help following figure,



The teacher asked, ‘*can you say, $1/3 + 1/3 = 2/6$?*’

The response (another group): *Yes, $1/3$ and $1/3$ is $2/6$, and they justified the answer with the figure below:*



The teacher encouraged students to think about their answers but for the students their response was correct.

The teacher said, ‘*Twice of $1/3$ is always $2/3$* ’, and she wrote, $1/3 + 1/3 = 2/3$. Then she said, ‘*Denominators are not added in addition of fractions*’.

Example 3 (Why $\frac{xy}{x} = x^{1-1}y = y$?)

One other teacher wanted to teach algebra through pattern seeking, so the students could know rational behind algebraic method of division. He began the lesson by testing the students’ knowledge of basic algebra; for example, definitions of *variable*, *constant* etc and then he drew the following table and explained the rule of ‘powers of two’.

2^4	$2 \times 2 \times 2 \times 2$	16
2^3	$2 \times 2 \times 2$	8
2^2	2×2	4
2^1	2×1	2
2^0		1
2^{-1}		$\frac{1}{2}$
2^{-2}		$\frac{1}{4}$

After that explanation, the teacher wrote the question $\frac{xy}{x}$. He solved the question in this way: $x^{1-1}y = y$. However, he did not provide any linkages between his explanation of the rule

involving powers of two and his solution to the question. Then he gave another question and invited the students to solve this on the blackboard. The whole class sat listening to the teacher; none of them raised their hands. The teacher encouraged them to solve the problem using his pattern/method but the whole class was silent. The teacher himself solved that question and asked the students to copy from the board.

Analysis of Teaching and Learning

In the *first example*, the student's justification was correct but the teacher explained the student's symbolic representation in a very different way to that used by the student. I observed that working on the blackboard, the student multiplied 2 by 3 first, getting 6, and then subtracted 1 to get 5. The student had his own way of thinking but the teacher ignored the student's way of thinking and did not confirm the student's method. The teacher did not seem to notice that students had developed different interpretations of what the teacher had been asking or presenting in the class. Nor did he clarify what was inappropriate in their explanations and why. Although, he appeared to be pushing the students to speak by using encouraging comments - struggling to reduce the students' threat of providing wrong answers, his interpretation affected the student's level of confidence, because after that example none of the students offered their thinking process, either verbally or in writing. For example, Sahib then gave another equation, $x * 4 - 3 = 5$, and asked for the answer. One of the students said it was 2, but none of them then expressed a method to get the answer (symbolically on the board, or verbally). The teacher seemed to impose his own traditional method while explicitly he asked the students to explore their own ways of solving equations.

During our discussion, I asked the teacher regarding his different way of expressing what the student had written. The teacher reasoned that he wanted to teach a 'proper' method. He also talked about the students' poor background of mathematics as a barrier in increasing their participation. In the teacher's opinion, it was very time-consuming to involve students and expect them to explain their thinking. He said that if he had taught the same lesson traditionally, he would have finished the entire exercise in the textbook.

Example 2 uncovered the teacher's difficulties both in addressing students' thinking processes and in helping students get the right answers through their own mathematical reasoning. The students could not maintain consistency in their decision of 'whole'; firstly they had divided each cake (taking each one as a whole) into 3 equal parts, and secondly, they combined two cakes (considering them a whole) and divided the whole into three parts. However, the teacher did not seem with what seemed like errors and confusion in the students' understanding/thinking, and what were the reasons for making the mistakes. She ignored the students' answers and imposed her own conclusion from the textbook knowledge. Thus, children were left alone with their confusions and were without any clear justification for the correctness or incorrectness of their answers. In the post-observation discussion, the teacher said, *the students' responses did not meet hers* (the teacher's expected answer), however, the reasons she gave were the students' difficulties in addition of fractions.

The *third example* suggests that the teacher's intention seemed to be helped the students to generalise the rule of exponents from that example of 'powers of two', and to apply the rule in the presented task. However, he did not provide adequate explanations to support the students' ability to understand such questions. The students did not develop an understanding of the reasoning behind the rule which the teacher applied in solving the question, as it was evident from the students' passive behaviour when the teacher invited them to solve the following question.

Thus, in all cases the teachers' stated focus was to increase the students' participation in their learning but their practice did not provide evidence of their attempting to view students' solutions from the students' perspectives, examine the students' mathematical assumptions and build on further or enable them to rationalise mathematical rule or methods.

Teachers' Constraints

It is evident that the teachers aimed to encourage students' participation in their learning; therefore, they adapted relevant strategies accordingly. However, it was difficult for teachers to promote participation or helped students to develop mathematical understanding. My analysis is that shift in the teachers' goals following their learning at the university demanded that they use their intellectual capabilities in planning, teaching and evaluating their lessons, contrary to routine practice. The teachers made efforts to involve students through inviting responses, i.e. their views regarding solution of the given problem; but it was difficult for them to accept any answer, which was different from the textbook explanation. The teachers could not think beyond the textbook explanations with which they were familiar. Secondly, the teachers seemed to face difficulty in building on the students' responses in order to add to their mathematical understanding. They taught the lessons in discrete bits without establishing explicit connections between students' ideas and the text book's method, or incorporating students' responses and between the different activities they had planned. Although, the teachers' intention (of increasing students' participation and developing mathematical thinking) was mentioned as an objective in their oral planning, in their practice, they did not move very much away from the traditional interaction. There were various constraints that inhibited teachers' further growth, which are as follows:

1. Knowledge of Mathematics
2. Prior identity
3. Working Condition

Teachers' Knowledge of Mathematics

The teachers' knowledge was based on the textbook procedures for which they did not have conceptual understanding. Therefore, the teachers were unable to analyse students' thinking and assumptions underlying their answers and to build further on these responses for developing relational understanding. It was difficult for them to integrate children's informal learning experiences into the formal mathematical assumptions in order to promote students' concept building and establish appropriate link between the mathematical activities and textbook knowledge. Thus, they were unable to review, clarify and rationalize the mathematical assumptions behind the textbook exercises; unable to extend students' ideas, help them to formalise intuitive understanding and challenge their incorrect notions in promoting shared standard meaning of mathematics in relation to the textbook procedures. In example 1, the teacher was unable to connect the students' response with mathematical assumptions in the textbook's procedures. Example 2 identifies the teacher difficulty in analysing the mathematical assumptions behind students' answers and to use these answers to develop understanding of 'fractions'. Example 3 uncovers the teacher's difficulty in understanding the reasoning of the rule from the activity he planned, and therefore he taught the lesson into different pieces. It is evident from my wider set of examples that while teaching with reasoning the teachers imposed their own idiosyncratic way of thinking –drive from the textbook explanation- and could not make any logical or mathematical sense of the topic. The mathematical knowledge communicated to the students was meaningless in many

cases; there was no logical reasoning given for explaining - it was more or less a kind of technique/ trick to reach answers.

It seems that although the teachers had modified their beliefs and aims of teaching through their participation in the teacher education programme, their inadequate content knowledge obstructed achievement of their aims identified for the lessons and sustained their authority in the classroom in a manner similar to traditional teaching methods but in contrast to what they wanted to achieve.

A gap exists between the mathematics the teachers had studied and what they expected of students' learning with reasoning. Due to the gap the teachers seem to be unable to conceptualise their new teaching in the real classroom conditions in the context of their improvement in practice. How can teachers teach differently, if they have only memorized rules themselves? If the teachers' own experience of doing mathematics means following the teachers' rules, how can they provide the experience of mathematics with reasoning without their knowing the reasoning themselves?

The issue of how teachers can develop new roles with their inadequate mathematical background need to be addressed. I judge that the limitations of mathematics can be a big threat for the teachers' confidence and desire for developing teaching. In the context of a Pakistani school, mistakes are not accepted due to an expectation that focuses on the product and 'the what' instead of the process and 'the why'. For example, in one case when a parent asked for clarification of the teacher's explanation (that was different from the textbook's explanation), the teacher was threatened. The teacher reverted to the textbook and blamed the student's carelessness in listening to the teacher, because she wanted to avoid further complications and misjudgments. The teacher did not want to be dishonest but an issue was her job evaluation and her position at the school. The teacher's behaviour reflects the context of Pakistani schools, where mistakes are not expected and accepted, particularly from professionals and elders. My own background experience of living and teaching in Pakistan confirms that it is a matter of shame and threat to admit a lack in knowledge; it is highly embedded in the cultural norms. If teachers make efforts to improve their teaching, they run a risk that their efficiency will be negatively viewed because it exposes their lack of knowledge and this will be seen as having a negative effect on students' learning outcomes.

Prior Identity

The new aim in their teaching was to enable the students to be independent through allowing them to solve problems in their own ways, rationalise the methods and increasing participation. However, the teachers appeared to be highly routine-bound. They sustained their authority through imposing their knowledge irrespective of the students' perspectives and independent thinking, therefore, they could not move from very traditional interaction. Sahib invited students, while teaching equations to the board and offered encouraging comments for their verbal and written explanations. The student had offered correct answers. Sahib did not confirm the student's explanation but probed further without showing any approval or appreciation of the stated answer. The teacher's behaviour in terms of dealing with the students' answers did not encourage them to offer more explanations; rather it caused silence, and then the teacher himself offered the information given in the textbook. Similarly, students' subsequent silence was observed in Nilofar's class; they accepted the teacher's statement without any further argument.

It was also difficult for the teachers to reduce their own domination of the lessons, to stop telling the students what to do or to provide the students with the space and facilitation to organize their thinking. For example, in one class the teacher had assigned a problem solving task to the students to be discussed in groups. However, it was difficult for the students to understand what to discuss and one student raised a concern about her being unable to do the task, '*Miss this is all confusing; I do not understand anything*'(student). But the teacher did not provide appropriate facilitation required at that point to promote discussion. Rather, she sustained her traditional role of dominance by telling the student, '*I will tell you but first you try. OK, discuss in your group first*' (teacher). The teacher did not allow the students to step back from dependent modes of behaviour.

In fact, all the teachers interrupted and directed the students' thinking through their continuous comments and questions and imposition. Although making sense of the students' responses and actually dealing with them was difficult for the teachers, meanings of student responses in the classroom were not central to the teachers' practice. This situation encouraged the teachers to sustain their prior identity wherein they gave preference to their own knowledge and imposed their own decisions.

The teachers' analyses of a lesson focused mainly on what the student said, what the teacher wanted and what the wider social problems were in relation to the achievements or failures of their new aims of teaching. They appeared unable to critique their own mathematics and mathematics teaching.

The teachers were not in a habit of looking explicitly at their practice and maintaining an open vision of their teaching to continue their professional development. They looked and thought from an external perspective rather than rationalizing and judging self-practices. They mainly blamed students when they could not achieve participation and their expected outcomes.

This problem is embedded in the transfer of top-down dependency or authority from one level to another, for example, government to school, school to teacher and teacher to learner. Power, or dependency on the powerful, shown from one level to another, or from one relationship to another, can be observed in the Pakistani culture and contributes to an unspoken ban on thinking about practice. For example, a particular group of leaders determine the curriculum and impose it on a school. The school asks the teachers to follow the curriculum and produce results. The teacher then continues the practice in the class by transmitting the knowledge only according to the book. Authority lines are maintained and limitations are unchallenged. Therefore, it is likely to be hard for the teachers to see the dominating and the dominated behaviour in the classroom along their intention of encouraging students' participation. This pattern sustains a cultural norm of 'underestimating students' strength' because placing blame on elders is not acceptable in parts of Pakistani society where it is assumed that children have low potential for thinking, and wisdom occurs through age and experience.

My analysis is that the teachers were not only dependent, controlled or habituated in the traditional sense but also they were unaware of the complexity of inhibited practice in relation to their new aims as well as unable to cope with the challenges while bound by their own resistance to change.

The teachers' constraints indicate the teacher education programme might not have taken sufficient account of the teachers' real life in the school context while providing them with a framework of innovative teaching. For example, at the mathematics education programme there had been discussion about a teacher's response to students' right or wrong answers to a question. The discussion had addressed the issue of closure in dealing with a wrong answer and considered approaches that would encourage students' further thinking rather than cut it off. However, the teachers had interpreted this to mean that teacher should not indicate that a student is wrong. And therefore, they ignored the students' answers which were wrong to them. It seemed the teachers had put on a layer of 'new practice' on their traditional practice in response to what they learned at the university without viewing integration between them. This prohibited them from acknowledging their inner resistance. This conflict resulted in a tension of using new approach in the absence of its essence -extending a gap between theory and practice instead of improvement. Can the teachers disassociate their long-term identity of many years from their own self-development? Does teacher education mean replacement of the prior identity by the new role; if so, are the teachers ready for this revolution? If not, how can the teachers alone provoke change?

Working Conditions

The teachers faced difficulties in order to achieve their new aims of teaching in the time available to them in school, and within the time allocated for a lesson. The teachers' new practice demanded quality time to comprehend and rationalize new aims and new practices; however, that time was out of the teachers' reach. The time these teachers contributed to the collaborative work with the teacher educator was crucial for them. That was their non-teaching time at school in which they had to fulfil the routine requirements of correction of students' work and dealing with other issues. They had replaced this routine work with discussion in relation to achieving new aims of teaching; however, the cost of such replacement was their own time at home. Despite all this devotion, the time was still not sufficient for the teachers to satisfy the expectations of their new role. They would devote time (after the school) and spend own resources in planning lessons. For example, Sahib planned a lesson on geometry theorem, he spent his not-teaching time in thinking about new methods to teach the topic but the provision of time for planning was not sufficient, therefore, he completed his planning at home; *'Last evening I spent my time in buying the material and drawing triangles. I bought paper sheets and a geometry box to prepare these worksheets. It is not easy to plan a lesson in the way I learned'*. Moreover, in many cases when the teachers allowed their students to discuss or present their own ideas it was difficult for the teachers to complete the planned lesson. In their opinion, it was very time consuming to involve students in the activity. This resulted in additional pressure on the teacher to continue the lesson on the following day and also had implications for the syllabus completion. For example, Sahib was unable to finish the textbook exercise in the time, when he encourage students' participation in the lesson on 'Equations'; he said, *..if I give them thinking time I would not be able to concentrate on written work. Tomorrow I have to continue this exercise, I cannot move to another before this.* .

The teachers were also under pressure of their annual appraisals which requires completion of the textbook in time and increase in examination result. These limitations affected the teachers' practice and confidence in tackling with their new aims of teaching. For example, in one case the majority of the students in the teacher's class failed in the half-yearly examination. The teacher wanted to work on the students' former weaknesses in order to improve their foundations, and for that purpose he went to the head teacher to seek permission regarding reducing the syllabus topics. The headmaster asked him to ignore the

students' needs and to complete the remaining part of the textbook/syllabus as a requirement for the final examination. A top-down form of decisions, inspections and increasing workload diminishes the teachers' confidence of improvement and minimizes possibilities of learning.

My analysis is that the teachers wanted to adapt their practice according to new aims of teaching (adopted from their participation in the teacher education programmes) but they preferred routine teaching when they were required to manage their practice in the school's situation. The teaching according to the schools' expectations was considered a safe, manageable and reward option for the teachers, because it protected their time, stress, position and promotion in the school, although it did not enhance their understanding of their professional development or contribute to students' understanding of concepts. They were aware of limitations of their knowledge but they did not know how to cope with them. The teachers want to be more secure, confident and progressive in their behaviour, despite the limitations of the school.

We need an environment to 'push' [drive] us. You are here and the work has started again, but what will happen if you leave. . I agree with you that an individual can play a role in changing the world but that is not easy. We need favorable conditions. At the school nothing is certain. This is the same school, without electricity and facilities but the important thing is that you are here with your own willingness and sincerity. If I asked my colleague to do so the same thing, he would have changed the topic [issues related to teaching and learning] within two minutes.

The teachers also discussed the tensions and frustrations resulting from their low financial and social status in society. Their financial stress required the teachers to do more jobs besides teaching. These teachers asked questions about betterment of their financial status, workload and family responsibilities. Can teachers achieve any improvement, if the culture works against the teachers' improvement? How can we, as teacher educators, liberate teachers from the imposed constraints of schools in their contemplation of change?

Transition or Transmission – Questions and Implications

I judged that teachers' setting-up an image of learner-centred teaching with their conceptual and contextual constraints push teachers' practice at school in the opposite direction to the theory presented at the university. Teachers cannot move forward with conceptual constraints. There is a possibility that the teachers would either revert back to their former practices or they would continue new practices with the same gaps (as identified above). In either case, there are serious implications for children's learning - leaving students alone with their confusions, ignoring their responses after inviting them for their opinion, offering meaningless explanations and developing misconceptions – what would be the impact, if it all? This raises significant questions for us as mathematics teacher educators – If a teacher can neither understand students' responses nor build on them, what is the purpose in encouraging their responses, and, what is the motivation for students to supply their own answers? Although encouraging students to participate actively (contrary to a traditional mode of teaching) teachers effectively opened up a possibility of learning with understanding, they did not show approval, appreciation or rejection of the students' different answers during the lessons, and for the students, lack of approval or appreciation might have implied rejection. What are the implications of this behaviour for students' development? In addition, their inadequate knowledge did not enable students to learn mathematics as the teachers

intended to. What are they learning in mathematics classrooms, if at all? How can we prevent students to develop misconceptions?

Teachers' new expectations and attempts at achieving a child-centred learning within limitations of understanding mathematics and new practice may cause intellectual, emotional and affective hindrance of the students' growth. The entire notion of teacher education has been reconceptualized for provision of a teaching environment where children have freedom of thinking, arguing and explaining their assumptions to develop logic and meaning of mathematics; however, it is children themselves are being affected– what is the cost of teachers' continuing with their gaps for the children's holistic development.

The teacher educators need to have a great sensitivity to, and understanding of, the consequences of the teachers' limited knowledge on students' learning as well as implementing the learning from a teacher education course to a classroom.

They need to find ways of enabling teachers to conceptualise mathematics and their work with pupils in the classroom, i.e., how to get right answers with an incorporation of students' mathematical reasoning and teachers' own standards.

- Teacher educators need to relate the content knowledge the teachers have to teach to their students together with appropriate methods.
- Teacher educators need to address the problem of the length of teaching time required for a lesson and length of non-teaching time at the school as well as how to adjust new teaching in the available time in relation to introducing innovative ideas from the university.
- Teacher educators need to discuss ways to establish a learning environment in the school where teachers focus on students' learning and understanding together with fulfilling textbook requirements with limited resources and within the school expectations.

If teachers' needs are ignored in teacher education programmes the tensions between theory and practice will continue. Within their constraints the teachers cannot sustain their growth, and the result would be similar to that of seeds growing on stony ground expecting green plants!

References

- Borko, H., & Putnam, R. T. (1999). Expanding a teacher's knowledge base: A cognitive psychological perspective on professional development. In T. R. Guskey & M. Huberman (Eds.), *Professional development in education: New paradigms and Practices*. (35-66). New York: Teachers College Press.
- Carr, W. & Kemmis, S. (1986). *Becoming Critical: Education: Knowledge and Action Research*, London: The Falmer Press.
- Cobb, P., Wood, T. & Yackel, E. (1991). A Constructive Approach to Second Grade Mathematics'. In Von Glasersfeld, E. (Ed) *Radical Constructivism in Mathematics Education*, Dordrecht: Kluwer AC
- Ernest, P. (1991). *The Philosophy of Mathematics Education*. London: The Falmer Press.
- Freire, P. (1971). *Pedagogy of the Oppressed*. New York: Seaview.
- Fullan, M. (1999). *Change Forces: The Sequel*. London: The Falmer Press
- Jaworski, B. (1994). *Investigating Mathematics Teaching: A Constructive Enquiry*. London: The Falmer Press
- Ma, L. (1999). *Knowing and Teaching Elementary Mathematics*. London: Lawrence Erlbaum Associates.

- Mohammad, F. R. (2002). From theory to Practice: An Understanding of the Implementation of IN-service Mathematics Teachers' Learning from University in to the Classroom in Pakistan. Unpublished PhD Dissertation. UK, Oxford: University of Oxford.
- Mohammad, F. R. (2005). Problems of teachers' re-entry in schools after in-service education. In I. Farah and B. Jaworski (Eds), *Partnerships in educational development Karachi*. Pakistan, Oxford University Press. (In press)
- Povey, H. and Burton, L. (1999). Learners as Authors in the Mathematics Classroom. In Burton, L. (ED) *Learning Mathematics: From Hierarchies to Network*. London: Falmer Press.
- Rogoff, B. (1990). *Apprenticeship in Thinking: Cognitive Development in Social Context*. Oxford: Oxford University Press.
- Rogoff, B. (2001). *Learning together: Children and adults in a school community*. Oxford, UK: Oxford University Press.
- Schon, D. (1983) *The Reflective Practitioner*. New York: Basic Book
- Skemp, R.P (1976). Relational Understanding and Instrumental Understanding. *Mathematics Teaching*, 77.
- Stevens, J.B. (2004). Why do educational innovations come and go? What do we know? What can we do?. *Teaching and Teacher Education*, 20 (389-396)
- Wagner, J. (1997). The Unavoidable Intervention of Educational Research: A Framework for Reconsidering Researcher-Practitioner Cooperation. *Educational Researcher*, 26(7), 13-22.