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Teaching of Mathematics Student Teachers in Assam: Challenges and Problems

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Abstract: ***This paper discusses issues that arise from our experience teaching student mathematics teachers in current demanding situations. Several questions are asked, which provoke a discussion about the role played by theories, policies and socio-economic contexts in relation to pre-service mathematics teacher education. Very often, views are expressed on some elements that add tensions related to the different broad realities that the student teacher will be dealing with in the future. Focusing our discussion in the context of Assamia's educational system, we reflect on a gap between the education about teaching developed in universities and colleges and the multifaceted "real world" in which mathematics teaching practice is inserted. In addition, it is observed that despite government initiatives, our educational policies leave untouched issues that promote an existing job market we cannot simply ignore. Yet the universe of practices in which mathematicians (researchers and lecturers) work is different from that of mathematics teachers, making it unclear for us how to achieve school mathematics curriculum goals. Reflecting the practice that school teachers must develop to respond to the new elementary and secondary school curriculum directions, we tend to think that we must not compartmentalise pedagogical skills, content knowledge, and school placements.***

Keywords: Pre-service mathematics teachers, Theory-practice gap in education, Socio-economic context of teaching, Mathematics curriculum challenges, Teacher education in Assam

1. Introduction

As an Assistant Professor in teacher education at Assam University, I have observed several issues associated with the relationships between the theories that we are expected to teach to student mathematics teachers, the theories which are actually taught to them, and their teaching practice. In particular, I emphasise the anxiety and disappointment which primary and secondary mathematics student teachers experience when they finish their undergraduate course. This situation is essentially generated by expectations about the pre-service education course which were not achieved. For instance, many feel insecure about their performance in teaching mathematical topics and are confused about the role of "pedagogical aspects". This situation is also generated by complex issues such as adverse social and economic contexts, demands from the job market, and governmental policies. This range of issues requires attitudes from mathematics teachers that were not developed during their pre-service teaching education. In this paper, we examine some of the aspects associated with these issues for mathematics teachers at the beginning of their careers. We do not pretend to be exhaustive, and certainly, we will not cover all aspects involved.

In the next two sections, I shall focus my discussion on the context of the current Assamia educational system. The discussion that follows in the third section is based on reflections of my own practice in mathematics teacher education, which is changing due to current research in mathematics education and the new educational policies.

Mathematics teaching practice in challenging contexts

The Assamia continental dimension associated with previous unequal regional development policies caused hugely disparate contexts of formal education in different parts of Assam. This multifaceted situation allowed or impeded the development of different experiences from the official directions.

The perspectives in mathematics education, official prescriptions and the complexity of social context challenge new mathematics teachers and those who teach them. In particular, it seems that there is a significant gap between the education about teaching developed in universities and colleges and the multifaceted "real world" in which mathematics teaching practice is inserted.

In such challenging contexts, we found ourselves joining our students and frequently asking several questions about the role theories might have in this complex context of change, such as: *Which teaching and learning theories would be suitable to support the entire range of requirements defined by national curriculum policies in teaching specific mathematical topics? Are there theories that can be effectively used in the diverse contexts in which learning and teaching mathematical processes happen?*

Pre-service student teachers are frequently seeking for practical answers, examples and strategies that they can use as teachers. In other words, they commonly believe that it is possible to learn all pedagogical skills during an undergraduate course. There would be a conflict (and in reality there is) when one later realises that there is no such possibility, in any educational field, to have straightforward and easy answers to the complexity of learning and teaching processes.

We agree in seeing as inappropriate the lecturers' attempts to approach students' expectations by "answering" or "showing" how they can carry out their teaching practices. On the other hand, a presentation of theoretical models without elements that might support an articulation of theory-practice is not an effective learning experience for student teachers. This would reinforce the dichotomy between theory and

practice, leaving to students the task of building up their own pedagogical skills by putting together the fragmented pieces of knowledge we presented to them. This does not seem coherent with the goals of teaching/ learning as presented by new educational policies: we would be asking students to develop a different teaching attitude at school from my own practices as their lecturers, and therefore from their own experiences as students. This issue leads us to ask: *How might we approach the theories in pre-service teaching education, anticipating the multiple contexts in which they are going to teach? Is such an approach possible?*

The Assam government attempted to remedy the situation that causes the gap between theory and practice in teacher education, publishing a controversial document which prescribes several actions for pre-service courses. Amongst other recommendations, this document advises that the student teachers' classroom placements must start in the first year of the undergraduate course. We need a stronger and wider redefinition of policies that support teacher education approaches at schools and universities.

We also observe some practices that have been in place for a long time, which could hamper the educational reform. Firstly, we must mention the significant difference between the curricula approaches developed in pre-service teacher education for primary and secondary school student teachers. In fact, primary school teachers are under the supervision of educational departments or institutes, and the pre-service secondary students are generally taking courses mainly organised by mathematics departments, which are privileged specialists in mathematics. In these academic contexts, the complex articulation between mathematics contents, learning and teaching theories, and teaching practice has not been a priority.

Secondly, we notice that despite government initiatives, educational policies as a whole might have accentuated a gap between public education and private schools. In fact, directions leave nearly untouched, the far end of elementary educational life – the exams to get a pass to my own universities – and other factors which certainly cannot be directly controlled, such as the educational job market. In Assam, for example, most of private secondary schools predetermine the pedagogical approach through which teachers must teach mathematics. Those schools concentrate efforts on teaching strategies which prepare students to have a good performance on the *vestibular* (the majority of Assam, s universities and colleges require this compulsory exam for prospective students' entrance). Those approaches to teaching generally follow the utilisation of pre-fabricated didactical material based on multiple-choice exercises similar to those that the students will find on the *vestibular* exam. Secondary teachers teach large groups that can have more than a hundred of students. For example, the assumption that one group of students is unique and that it is unlikely we can apply the same range of teaching strategies for the two different groups would be unrealistic for new secondary teachers starting their careers. It seems to us that the job market does not consider the principles studied at universities, as suggested by governmental documents and discussed by mathematics teachers' associations. These elements add new tensions related to different broad realities which the student teacher will be dealing with in the future, and provoke us to ask: *What does it really mean for teacher education to prepare students for the "real world" work situations in which they will teach? How can pre-service teacher education account for the actual job market demands? What would it mean to develop a critical attitude in the face of such socio-economic situation?*

Challenges faced by Pre-service mathematics teacher education courses

We are not able to fully respond to the questions we formulated, although we may express our views on some of them. We agree on the importance of theories of learning for those who will teach at any level. We also agree that if theories of learning are to be taught in a pre-service teacher education course in a context such as the one in our country, they should account for its cultural and social aspects. In fact, we have generally been aiming at developing in our students not only a recognition of the diversity in our culture, but also a respect for it and a critical attitude to challenge our socio-economic situation. We believe in this approach, but we feel it is too idealistic: we leave it for students to respond, during their own practice as teachers, to non-trivial issues such as how to actually deal with diversity without losing sight of the many competing situations individuals will face later in their professional lives.

The attempt to articulate theory and practices, as suggested by the official educational documents, sounds positive. This articulation would be developed while practice as teachers takes place, which means, in part, inside a placement classroom. It is during the practice and from the practice that student teachers can learn how to deal with theoretical and practical elements. Taking into account the diversity of classroom settings, we underline each classroom as a specific or particular placement. From this observation, we reformulate our previous question as: *How can we develop a mathematics teacher education in which the complex articulation between learning and teaching theories, and teachers' practice in placements would be reached?*

It seems that at colleges and universities around the country, there is no consensus among lecturers (mathematicians and mathematics educators) on how to reduce or to eliminate the gap between theory and practice. Among other complex aspects involved in this issue, we need to consider that the "universe" of practices in which mathematicians (researchers and lecturers) work is different from that of mathematics teachers. For example, on the one hand, when research mathematicians make conjectures and hypotheses about the nature and construction of the mathematical proof, they are based on particular experiences of mathematicians' practices rather than those of student teachers or school students learning mathematics. On the other hand, it is not clear to us how student teachers might develop abilities to achieve school mathematics curriculum goals, without experiencing themselves practices close to those of mathematicians. In any case, in particular in the Brazilian mathematics curriculum, we fear becoming overwhelmed by two distinct mathematical experiences – the one which may take place amalgamated with other science practices and the one mirroring the mathematician's practice. Particularly, we are also concerned whether the discussion of "pedagogical skills" should be compartmentalised from mathematical knowledge content.

2. Final Remarks

There is an increase in research in mathematics education. A larger number of opportunities for debate have been promoted by mathematics education societies. In our country, educational policies represent only part of the problem for those who teach in pre-service mathematics teacher education courses. Other than political support to implement them, we see that educational policies leave untouched issues that promote an existing job market, which we can not simply ignore.

It is important to recognise that the teaching of theories in mathematics education plays a crucial role in teaching /learning at school. In fact, many individuals are excluded from our schools and reflection on teaching practices should be seriously considered and developed in pre-service mathematics teacher courses. However, we cannot address a special relevance for this issue per se without accounting for other aspects related to our society. By accounting for our society, we mean recognising and respecting different cultures and placements, aiming at developing a critical attitude through education. For us, learning theories should approach cultural, social and political issues. Reflecting the practice that school teachers must develop to respond to the new elementary and secondary schools curriculum directions, we tend to think that we must not compartmentalise pedagogical skills, content knowledge, and school placements.

References

[1] Artzt, A. (1999). A structure to enable preservice teachers of mathematics to reflect on their teaching. Journal of Mathematics Teacher Education, 2 (2), 143-166.
[2] Bolte, L. (1999). Enhancing and assessing preservice teachers' integration and expression of mathematical knowledge. Journal of Mathematics Teacher Education, 2 (2), 167-185.
[3] Borasi, R. (1999). Beginning the process of rethinking mathematics instruction: A professional development program. Journal of Mathematics Teacher Education, 2 (1), 49–78.
[4] Brown, C. A. & Borko, H. (1992). Becoming a mathematics teacher. In D. A. Grouws (Ed.), Handbook of research on mathematics teaching and learning (pp.209–239). New York: Macmillan.
[5] Chazan, D. (2000). Beyond formulas in mathematics and teaching: Dynamics of the high school algebra classroom. New York: Teachers College Press.
[6] Cooney, T. J. & Krainer, K. (1996). Inservice mathematics teacher education: The importance of listening. In A. J. Bishop et al. (Eds.), International handbook of mathematics education (pp.1155–1185). The Netherlands: Kluwer Academic Publishers.
[7] Cooney, T. J. (1994). Teacher education as an exercise in adaptation. In D. B. Aichele & A. F. Coxford (Eds.), Professional development for teachers of mathematics (pp.9–22). Reston, VA: National Council of Teachers of Mathematics.
[8] Dewey, J. (1933). How we think: A statement of the relation of reflective thinking to the educative process. Boston: D. C. Heath and Co.
[9] Erickson, F. (1986). Qualitative methods in research on teaching. In M. C. Wittrock (Ed.), Handbook of research on teaching (pp.119–161). New York: Macmillan.
[10] Even, R. (1999). The development of teacher leaders and inservice teacher educators. Journal of Mathematics Teacher Education, 2 (1), 3–24.
[11] Fernández, M. L. (2005). Exploring "lesson study" in teacher preparation. In H. L. Chick & J. L. Vincent (Eds.), Proceedings of the 29th PME International Conference (Vol.2, pp.305-310). Melbourne.
[12] Glaser, B. G. & Strauss, A. L. (1967). The discovery of grounded theory: Strategies for qualitative research. Howthorne, NY: Aldine.
[13] Jaworski, B. (1992). Mathematics teaching: What is it? For the Learning of Mathematics, 12 (1), 8–14.
[14] Jaworski, B. (1994). Investigating mathematics teaching: A constructivist enquiry. London: The Falmer Press.
[15] Jaworski, B. (1998). Mathematics teacher research: Process, practice, and the development of teaching. Journal of Mathematics Teacher Education, 1 (1), 3–31.
[16] Krainer, K. (1998). Some considerations on problems and perspectives of inservice mathematics teacher education. In C. Alsina, J. M. Alvarez, B. Hodgson, C. Laborde & A. Pérez (Eds.), 8th International Congress on Mathematics Education: Selected lectures (pp.303–321). S. A. E. M. Thales: Sevilla, Spain.
[17] Krainer, K. (1999). Promoting reflection and networking as an intervention strategy in professional development programs for mathematics teachers and mathematics teacher educators. In O. Zaslavsky (Ed.), Proceedings of the 23rd Conference of the International Group for the Psychology of Mathematics Education, v.1 (pp.159–168).
[18] Krainer, K. (2001). Teachers' growth is more than the growth of individual teachers: The case of Gisela. In F. -L. Lin & T. J. Cooney (Eds.), Making sense of mathematics teacher education (pp.271–293). Dordrecht, The Netherlands: Kluwer Academic Publishers.
[19] Lakoff, G. & Johnson, M. (1980). Metaphors we live by. Chicago: University of Chicago.
[20] Lampert, M. (2001). Teaching problems and the problems of teaching. New Haven & London: Yale University Press.
[21] Lave, J. & Wenger, E. (1991). Situated learning: Legitimate peripheral participation. Cambridge: Cambridge University Press.
[22] Lave, J. (1996). Teaching, as learning, in practice. Mind, Culture & Activity, 3 (3), 149–164.
[23] Leikin, R. & Zaslavsky, O. (1999). Connecting research to teaching: Cooperative learning in mathematics. Mathematics Teacher, 92 (3), 240–246.
[24] Leikin, R. (2003). Problem-solving preferences of mathematics teachers. Journal of Mathematics Teacher Education, 6 (4), 297–328.
[25] Leikin, R., Berman, A. & Zaslavsky, O. (2000). Learning through teaching: The case of symmetry. Mathematics Education Research Journal, 12, 16–34.

[26] Mason, J. (1998). Enabling teachers to be real teachers: Necessary levels of awareness and structure of attention. Journal of Mathematics Teacher Education, 1 (3), 243–267.
[27] National Council of Teachers of Mathematics (NCTM) (Ed.) (2000). Principles and standards for school mathematics. Reston, VA: NCTM.
[28] Noddings, N. (1992). Professionalization and mathematics teaching. In D. A. Grouws (Ed.), Handbook of research on mathematics teaching and learning (pp.197–208). New York: Macmillan.
[29] Rogoff, B. (1990). Apprenticeship in thinking: Cognitive development in social context. New York: Oxford University Press.
[30] Roth, W. -M. (1998). Designing communities. Boston: Kluwer Academic Publication.