

A cautionary note – is research still caught up in an implementer approach to the teacher?

Jeppe Skott

Växjö University, Sweden & the University of Aarhus, Denmark

Abstract: In this paper I outline two historically important approaches to research on and with mathematics teachers. One is to adopt a fairly individualistic perspective and consider the teacher an implementer of reform initiatives developed elsewhere. This is based on an assumption of a *linear movement* from ends to means to outcomes. The other approach is to view classrooms more socially and theorise the role of the teacher for the practices that emerge. This approach conceives of the relationship between theory and practice as a *theoretical loop* of developing theoretical constructs from practice and expecting them subsequently to inform practice more generally. Historically there has been a significant move from the former to the latter of these approaches. However, care should be taken not to insert expectations of implementation into the more social perspective.

The late 1970s marked a shift of focus in mathematics education research and development. As Bauersfeld (1979) noted in a UNESCO/ICMI-publication, the field was until then primarily interested in investigations of either the mathematical contents per se or in clinical studies of student achievement. These studies dealt with the matter meant or the matter learnt. What had been missing, Bauersfeld claimed, was a concern for what he saw as the link between the two, the matter taught. In Bauersfeld's own terminology,

both research and development had focussed on only one of two main determinants of the learning process: the pupil or the curriculum. They did not consider the influence of the teacher nor of the general context of instruction. (Ibid., p. 200.)

There seem to be at least two intentions behind Bauersfeld's paper. On the one hand it reflects a theoretical interest in understanding the role of teachers in mathematics classrooms; on the other it is also and possibly primarily concerned with a developmental aspect: how may changes in student learning be supported by improved teaching methods?

Since Bauersfeld wrote his piece, teachers and teaching have become pivotal concerns of mathematics education research. Often based on small-scale, qualitative and sometimes collaborative studies of the interactions in one or a few classrooms the field has contributed with novel understandings of for instance

- the role of classroom communication for student learning;
- the character of mathematical knowledge for teaching;
- the roles of teachers' beliefs for the classroom practices; and
- the social and socio-mathematical norms that may develop.

In all of this, the two intentions discernable in Bauersfeld's paper still orient the field, although with differing mutual emphases between them in the different subfields. On the one hand, research on mathematics teachers and teacher education aims to develop new theoretical understandings of how the learning opportunities that unfold in mathematics classrooms relate to teaching. On the other it is highly committed to improving teaching so as to further develop the opportunities for the students' mathematical learning.

The two intentions of theorising practice and contributing to its further development are considered highly compatible. This part of mathematics education research, then, considers itself in line with Schoenfeld's general characterisation the field (Schoenfeld, 2002). Referring to Stokes

(1997), Schoenfeld claims that it is an example of use-inspired basic research, i.e. of research that coordinates a commitment to contribute to a field of practice with an ambition to develop fundamental understandings of the field under investigation.

In spite of the apparent compatibility between these intentions, I shall point to a certain tension between them. My main argument is that although they are both laudable aims, the expectation that new theoretical understandings may easily be transformed into improved teaching practices and student learning may be overly optimistic. Indeed this expectation appears – somewhat ironically – to be based on an assumption that dominated mathematics education research a couple of decades ago and that the qualitative studies of classroom interaction set out to do away with. This is the assumption that teachers are primarily to function as implementers of educational reform.

Problems of implementation and of ‘implementation’

There have been two major responses on the part of the research community to the research shift towards the teachers in the late 1970s. One of them concerns teachers as the missing link between curricular intentions and student learning, i.e. as implementers of educational reform. The other investigates the role of teachers from a more social perspective and views teachers as participants in emerging practices. I shall discuss the two of them in turn, drawing on ICMI-studies when doing so.

Teachers as implementers

In 1986 ICMI published the second volume in the ICMI study series: *School Mathematics in the 1990s* (ICMI, 1986). As the other ICMI-studies, it sums up the views of a substantial part of the research community, this time on the relationship between visions for school mathematics and how they may be realised. The aim of the book is summarised as follows:

This ICMI Study is intended to help those who wish to form a vision of what school mathematics might be in the 1990s and who want to work towards the fulfilment of specific goals. In doing this it draws on the experience of the past thirty years which have taught us that what is desirable might not be attainable; and that goals must be set which acknowledge the existence of constraints. (Ibid., the text on the back of the book).

In line with this, a main concern in the study is the problems of implementation of curricular reform, i.e. on the problematic relationship between visions for the school subject and the limitations on their realisation. The book presents a set of themes that may be considered when forming a vision for school mathematics. These include mathematics in a technological society, mathematics and general educational goals, and the aims and contents of school mathematics. In relation to each theme one or more key problems are outlined, and a number of alternative ways of addressing the problems are listed. Finally a set of possible consequences of each alternative are described. To some extent, then, the group behind the study avoids prioritising their own suggestions for reform. Instead they discuss possibilities and potentials.

The section on *Classrooms and teachers in the 1990s* begins with the regret that the bulk of mathematics classrooms are dominated by “a stereotyped form of teaching which relies heavily on the textbook and the traditional teaching pattern of exposition-examples-exercise” (ibid., p. 75). The teacher struggles hard under different types of pressure, and due consideration should be given to the circumstances under which teachers work (p. 80). Also, some of the suggestions for revised curricula and new forms of evaluation may increase the pressure on teachers. Finally, it is acknowledged that teachers’ conceptions and solutions to the problems of mathematics teaching and learning may be useful. The study, then, to a large extent avoid condemning the ways in which teachers handle their obligations.

In spite of this, the study seems based on a technical rationality that sees teachers as the key obstacle to educational reform. There is little doubt that teachers are considered the most significant

”constraint” for the realisation of a new vision for school mathematics (cf. the quotation). This is evident from the concluding chapter on *The processes of change*. The last section of the chapter is one of the few in which the authors do not formulate different solutions to the problems raised and outline some consequences of each. Instead they acknowledge the key role of the teacher for the realisation of educational reform, and raise one question related to that role:

the vast majority of teachers of the 1990s are already in post and have firm ideas about their role in the school and clear expectations regarding both the curriculum and their students. Significant changes in school mathematics will only be achieved if there are marked changes in the perceptions and attitudes of these teachers and if they are assisted to develop necessary new skills.

How can one attempt to change attitudes, values, skills, teaching styles, etc. and develop confidence in the use of new methods and technology? (Ibid., p. 94)

Teachers, then, are primarily seen as implementers of reform initiatives developed elsewhere. This is highly compatible with traditional development-implementation approaches to educational reform. It focuses on teachers as the missing link between the matter meant and the matter learnt. As a consequence it also focuses on teachers as the main ‘problem of implementation’.

Teachers as participants in emerging practices

The other major response on the part of the research community to the challenge understanding the matter taught (cf. Bauersfeld, 1979) adopted a different perspective on classrooms and teachers: rather than implementers of curricular initiatives, teachers are seen as participants in the practices that emerge in the classroom. Bauersfeld himself is a dominant advocate of this approach.

Ten years after he wrote the paper quoted previously, Bauersfeld looks back on his own work from the 1970s onwards. At this point he claims that his interest in the role of the teacher and the general context of learning has generally been replaced by one in teacher-student relationships and the social interaction in the classroom. Elaborating on this last approach he says:

[...] we learned about the relative symmetry of classroom actions: Both teacher and students contribute to the classroom processes. It is a jointly emerging ‘reality’ rather than a systematic proceeding produced or caused by independent subjects’ actions [...] Teacher and students jointly create the reality of the classroom. (Bauersfeld, 1988, p. 29-30)

Bauersfeld’s point, then, is that in order to understand classroom interaction one has to perceive it as such. In other terms, one has to focus not on the alternating actions of teachers and students as cause and effect respectively, but on the evolving patterns and the “intersubjective constitution for norms for action” (ibid., p. 32). This is a perspective that views interactions as both influenced by and continually (re-)generating local contexts. This perspective does not see teachers as the main problem of implementation; rather it questions the very notion of implementation and implies a shift from problems of implementation to problems of ‘implementation’.

Bauersfeld’s remarks in the late 1980s are – as are the ones from 1979 – indicative of broader developments in mathematics education research. Inspired by Blumer (1969) and symbolic interactionism, they may be considered both a signal of and a contributing factor to what Lerman (2000) much later calls *the social turn* in the field. This is defined as “the emergence into the mathematics education research community of theories that see meaning, thinking, and reasoning as products of social activity” (p. 23). Lerman links the turn primarily to influences from Soviet psychology and social practice theory, most notably Vygotsky and Lave and Wenger, respectively.

Lerman does not include symbolic interactionism as a theoretical source of inspiration of the social turn. Nonetheless, the increasing number of references to symbolic interactionism from the late 1980s onwards does indicate an increasing interest in looking beyond the individual in efforts to account for the character of mathematics teaching and learning in the classroom. This is so

although the emphasis in symbolic interactionism is on the locally social rather than on the broader cultural aspects that dominate other parts of the social turn.

The understanding of the teacher as a (potential) implementer of reform implies that she is expected to carry curricular intentions into the classroom and ensure that they are realised. Although the intentions are developed outside the classroom, what happens within it is considered the teacher's responsibility. From this point of view it is indeed the teacher's practice. This perspective is challenged by an appreciation of the significance the social aspects of teaching-learning processes. As Cooney (2001) points out in another ICMI-study, the teacher operates in a social and political arena with its own defining characteristics. This implies that "reform in the teaching of mathematics is not just a function of the individual teacher; rather it is a combination of circumstances in which that teaching occurs" (ibid., s. 455). In other terms, it is not "the teacher's practice".

From linear relationships between theory and practice to theoretical loops

The two approaches to research on teachers and teacher education outlined above have different implications as far as the understanding of the relationship between theory and practice is concerned. The shift towards the locally social, then, also marks a shift in the balance between theory and practice in mathematics education.

The implementer-approach to research on teachers asked how one may bridge the gap between the matter meant and the matter learnt. It is based on the expectation that there should and could be an immediate connection between the aims and goals of education and student learning. The focus on teachers, then, was to supplement the a priori analyses of mathematical contents and the clinical interviews with students that used to dominate the field. The intention was to ensure a linear movement from ends to means to outcomes in mathematics education.

This is in contrast to the approach developed as part of the move towards understanding the locally social. From this perspective research on mathematics teachers becomes a theoretically informed process of theorising the teacher's role in mathematics classrooms, i.e. one of developing constructs that contribute with novel ways of understanding issues emerging from the interactions of the classroom in question. This, however, does not mean that there is no longer a commitment to contribute to practice. On the contrary, new theoretical constructs gain at least part of their legitimacy from their ability to guide instruction, i.e. to feed back and shape the practices of mathematics classrooms (Cobb, 1995). Rather than a linear relationship this process may be described as theoretical loop from practice to theory to practice (Skott, 2005).

Concluding remarks

Most research on and with mathematics teachers has by now done away with the implementer approach. Teachers are generally considered autonomous professionals within the context in which they work. However, just as with studies in the teacher-as-implementer approach, there are frequent regrets that research on teachers does not have the expected impact on the practices on mathematics teaching and learning. This is so for instance in the field of beliefs (e.g. McLeod & McLeod, 2002), but appears to be the case also in other fields.

Because theoretical constructs are now more closely linked to classroom processes, there seems to be some surprise as to why they do not easily inform classroom processes in general. The problems that are addressed now emerge from classroom practices; but why, then, do their 'solutions' in the form of theoretical constructs and relationships not readily inform general approaches to teaching?

From the perspective of the majority of teachers, however, these constructs are not necessarily relevant to the way in which they conceive of their local contexts. From such a perspective, the

movement in the latter half of the theoretical loop, from theories back into practice, may be as problematic as the linear relationship between ends, means and outcomes in the traditional teacher-as-implementer approach. We should, then, not expect such a movement to run smoothly. Doing so would be to disregard the role of the local social context, i.e. it would be tantamount to disregarding the very concept of context that we wanted to include when viewing classrooms as “a combination of circumstances in which that teaching occurs” (cf. Cooney, 2001).

The point I have tried to make is not that research on and with teachers should not primarily be small-scale studies taking local contexts seriously; neither is it that we should do away with the commitment to practice. In fact I consider both essential. The point is that we should reconsider the ease with which we expect the results of small-scale studies to transform teaching-learning practices in ordinary classrooms. We should take it seriously that contexts matter, not only as starting points for research, but also when we consider the potential impact of research results.

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