

Mathematics Educators: Identity, Beliefs, Roles and Ethical Dilemmas

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For some time now the beliefs, attitudes and emotions of preservice primary teachers towards mathematics have been seen as problematic in their development as teachers of mathematics. In response, mathematics educators have changed their preservice courses to attend to these affective qualities. These changes have required mathematics educators to undertake different roles. The focus upon affective reform has given rise to a number of moral and ethical issues, and in this paper these concerns are discussed. The discussion concludes with a call for mathematics educators to give more overt attention to the ethical dilemmas that are inherent in mathematics education courses that have an affective dimension.

Introduction

In recent times there has been increased interest in the role preservice teachers affective views play in their development as teachers (Fang, 1996). In the field of mathematics education this has become more of a focus in recent years and it has been widely documented that preservice teachers' beliefs and attitudes can profoundly influence their learning in their initial teacher education (ITE) program and their subsequent teaching (Richardson, 1996). This being said, what has received less attention in this research and theorising is a discussion on the ethical dilemmas that emerge teacher educators focus more explicitly on affective qualities in their courses and programs, and questions about mathematics educators' concomitant change of identity.

This discussion paper reflects on some of these issues and explores the subsequent implications for mathematics educators. To support this discussion, I will draw upon my experiences over the last eight years when I have investigated the affective dimension of learning in teaching mathematics and my work as a mathematics educator in a range of preservice teacher education programs. A frame of reference for this discussion will be provided through a brief review of literature relating to the influence of the affective domain in learning to teach. From this foundation, I will then explore the role or identity of mathematics educators and the moral and ethical dilemmas that are inherent in initial teacher education (ITE) programs which explicitly focus on affective qualities as part of their courses and programs.

The Influence of Beliefs and Affective Factors in Learning to Teach Mathematics

There has been a growing interest in the affective dimension of education which has resulted in a burgeoning amount of literature on the role of aspects such as beliefs, attitudes and emotions in teaching and learning. This has led to teacher educators changing their view of how they work with preservice teachers. At the same time constructivist theories of learning have been influential meaning that traditional views of teacher education have become problematic (Boote, 2003).

While the nature of beliefs, attitudes and emotions has been discussed at length in the literature (see for example Pajares, 1992 or Leder, Pehkonen & Törner, 2002) it has been

commonly noted that these dimensions are notoriously difficult to clearly define and conceptualise due to their overlapping and interchangeable nature. This being said, generally, beliefs are seen as having both an affective and a cognitive dimension. They are subjective, personal assumptions of truth which can strongly influence a person's behaviour or action (Rokeach, 1968), in addition, they tend to be relatively stable. On the other hand, emotions are viewed as more affective and less cognitive, arising as an affective response to a particular situation. In turn, emotions are often temporal and unstable in nature. Bridging these two dimensions, attitudes are developed when the same feelings or emotions are experienced in response to a series of repeated events (McLeod, 1992).

Many writers have acknowledged the significant impact of the affective domain in preservice teachers' ITE. For example, Fang (1996) outlines:

Educators are now beginning to realise that teachers (preservice, beginning or experienced) do hold implicit theories about students, the subjects they teach and their teaching responsibilities, and that these implicit theories influence teachers' reactions to teacher education and to their teaching practice. (p. 51)

In addition it has been documented that preservice teachers will begin their ITE with well-established beliefs about teaching and learning, that are grounded in their experiences as a school student (Lortie, 1975; Raths, 2001). These beliefs have been found to be firm, tenacious and notoriously resistant to change (Stuart & Thurlow, 2000). Preservice teachers' beliefs about mathematics are no different; moreover, it has been found that these beliefs are often described in absolutist and instrumental terms. These resilient beliefs are often accompanied by a poor attitude to the subject and debilitating feelings of disenfranchisement, fear, anxiety and pessimism (Ambrose, 2004; Szydlik, Szydlik & Benson, 2003). In short, the literature presents a rather pessimistic picture of the beliefs and attitudes that preservice teachers hold towards mathematics.

Given that these views and responses are seen as significantly impacting the teaching and the learning to teach of these preservice teachers, a number of researchers have explored avenues for facilitating affective reform in their ITE course and programs (Ambrose, 2004; Grootenboer, 2003b, Smith, 2002). Of course, as mentioned previously, these beliefs and attitudes seem to be stubborn and resilient to change, and so it is no small challenge to bring about such change. Indeed, the mixed and guarded reports of success in the literature indicate that in many respects there is still a great deal of research and thinking to be done on this issue. While most of the literature focuses on this issue in relation to student-teachers, it is clear that it also has implications for mathematics educators — for their role and practices in their courses and programs with preservice teachers, and indeed their identities as mathematics educators.

Implications for Mathematics Educators

In this section a discussion will begin that focuses on the role and identity of the mathematics educator. In many respects this is a new discussion because it centres on the mathematics educator, not on the student-teacher or the mathematics education course, and this appears to be a dialogue that is overdue.

As indicated previously, the burgeoning amount of literature that is developing around the beliefs and attitudes of preservice teachers to mathematics strongly suggests that a change from traditional approaches to teacher education is required. Changes in programs and courses are part of that reform and a number of these have been reported and discussed

in the literature (Ambrose, 2004). However, this change also demands something different from mathematics educators. In teacher education courses the mathematics educator is the one who personifies and models the pedagogical and mathematical ideas being presented and as such they mediate between the student-teachers and the concepts being taught (Palmer, 1998). Indeed, it has been suggested that the teacher (in this case the mathematics educator) is perhaps the most critical factor in developing affective responses to mathematics (Grootenboer, 2003a). However, these new roles may be ones for which the mathematics educator is not prepared. Moreover, their identity as a mathematics educator may be challenged as they work more consciously at an affective level alongside their traditional lecturing in knowledge and skill development. While these requirements may be widespread and multifaceted, in the ensuing discussion I will focus on one aspect, namely the role of ‘therapist’. The term therapist is used to highlight the responsibility mathematics educators may have assumed to heal and restore the mathematical hurts that many preservice teachers seem to bring to their ITE courses. I will begin this discussion by briefly summarising my own experience.

From Mathematics Teacher to Mathematics Educator

When I first began working with preservice primary teachers in their ITE programs in mathematics education I was somewhat surprised at the apparent negative attitudes that many of the student-teachers displayed towards mathematics. Having been a mathematics teacher for a number of years and enjoying teaching mathematics, I was probably rather naïve in not appreciating that everyone may not feel the same way about mathematics education as I did. In short, this led into my doctoral studies that explored the affective responses of preservice primary teachers to mathematics. One finding that was personally striking through this study was the critical role the mathematics teacher had played in the participants’ perceptions, beliefs and feelings about mathematics. As a mathematics teacher I had never seen myself as one who critically shaped students’ affective responses to mathematics — I just taught them the skills and knowledge. My identity as a mathematics teacher centred on being able to clearly explain concepts and procedures so students could learn them and apply them in appropriate contexts. It was confronting to realise that as a school mathematics teacher I had probably inadvertently caused some students to develop beliefs and attitudes about the subject that were not positive or enabling. This disconcerting personal revelation pierced at the heart of what I perceived my role to be and certainly as I was moving into the role of mathematics educator I experienced feelings of uncertainty and dissonance. In short, it seemed that I was not just a teacher of skills and knowledge, but I also had a significant role in facilitating reflective consideration of beliefs, values, attitudes and feelings — a sort of counsellor or therapist.

Mathematics Educators as Therapists

It seems to be fairly well established that many preservice primary teachers are anxious about mathematics and have beliefs about the subject that are not necessarily ‘mathematical’ or conducive to good mathematics learning and teaching. The primacy of this problem requires a review of the mathematics education curricula in ITE programs, but it also requires a different sort of mathematics educator from the traditional role as it has been understood and articulated previously (Richardson, 1996), as is illustrated in my own experience above. I have termed this position as one of a ‘therapist’. I am not suggested

that mathematics educators are therapists in the professional use of the term, but rather there seems to be a counsellor or therapist-type role inherent in the broad conception of mathematics educators that is emerging in the literature.

Mathematics educators are adopting a therapist role as they try and provide a more holistic, humanistic approach that encompasses the affective domain alongside the traditional knowledge and skill development aspects. While this can deal with a range of diverse affective issues, it seems to focus on two key functions:

- changing preservice primary teachers beliefs about mathematics; and
- building positive attitudes and feelings towards mathematics.

Tillema (2000) stressed that these sorts of affective views were developed through significant experiences and stored in episodic memory largely impervious to logical and cognitive review. Therefore, in order to facilitate affective change the preservice teacher will need to revisit past experiences that most likely have been difficult and emotional (Grootenboer, 2003b). However, facilitating this sort of change and even healing requires certain qualities, skills and abilities — those of a therapist or counsellor. This is problematic as few mathematics educators are trained therapists or counsellors. This is but one of the ethical and moral dilemmas that are inherent in this new role.

Ethical and Moral Dilemmas for Mathematics Educators

The real concern over the beliefs and attitudes of preservice primary teachers to mathematics has rightly been raised as an issue that requires action, but associated with any such change are ethical issues that may not be resolved, but that do require discussion and research. In this final section I will raise some of these moral dilemmas and begin to discuss them. It is not envisaged that the short discussion here will be in any way comprehensive, but rather it is hoped that it will prompt thought and further discussion. Also, there are many ethical topics that warrant attention, but here I will address only three:

- the role of the mathematics educator;
- ‘correct’ mathematical beliefs; and
- the success of affective reform agendas.

The Role of the Mathematics Educator

As highlighted previously, mathematics educators now need to take on a role that is akin to counselling as they work with preservice primary teachers in their development as teachers of mathematics. This can require them to venture into volatile territory — a journey that demands particular training; training that mathematics educators generally do not have (Boote, 2003). Certainly I can recall several instances in mathematics education classes over the last few years where this has been the case and it seemed to me that there was the potential for harm and damage as I did what I thought was best in a relatively uncomfortable and unfamiliar situation. I think this aspect of practice has been underestimated and if mathematics educators are to continue to facilitate and even require affective change than perhaps some professional development and training is needed.

If indeed mathematics educators began to think about developing a counselling or therapist dimension to their professional identity, then another dilemma emerges. While this role seems necessary for effective mathematics teacher education, it does seem to conflict with another role of teacher educators, namely that of evaluator and gatekeeper. In reviewing a large body of literature on teacher education, Richardson (1996) suggested that

effective teacher education programs be based on collaborative constructivist principles that are largely non-judgemental. Educators have for many years dealt with the tension between their dual roles of teacher and evaluator, but the current move in mathematics teacher education towards a greater focus on affective aspects demands a more personal and intimate level of sharing that makes this more problematic. Teacher educators cannot avoid their responsibility as gate-keepers to the profession and yet at the same time, at least in mathematics education, there is an equally compelling need for a more personal curriculum.

The dilemma of this double-bind can also place student-teachers in an unenviable position. Surely it is not lost on them that the same people who are acting as therapists for their mathematical beliefs and attitudes are also the ones who will mark their assignments and evaluate their suitability to enter the profession. For some student teachers the dilemma then will be whether to engage honestly and deeply with the belief and attitude reform being facilitated by their lecturer-cum-counsellor, or to perform what appears to be required and ‘jump through the required hoops’. In working in ITE mathematics courses I have had noted that some preservice teachers manage this dilemma by performing differently in different contexts (Grootenboer, under review). For example, some student-teachers produced essays espousing positive beliefs and attitudes towards mathematics and mathematics education, and yet when I observed them teaching children they employed a more traditional, formal pedagogy with textbooks and worksheets. It appeared as if they had enacted the ‘required beliefs’ in the different contexts. In this case it would seem that the mathematics education course has been to some extent unethical in that it requires some students to make a moral choice about how they meet these somewhat contradictory demands. Of course this case is rather polarised and preservice teachers will negotiate a path through these competing agendas, but certainly the situation demands careful consideration, and perhaps more overt discussion amongst mathematics educators.

‘Correct Mathematical Beliefs’

Allied to the preceding discussion and inherent in the calls for belief change amongst preservice teachers is the underlying assumption that their initial beliefs are wrong and they need fixing. Of course, this raises the question about what are the correct beliefs required to teach mathematics well? It is clear that mathematics educators will have some fairly firm beliefs, values, opinions and attitudes about mathematics and mathematics teaching and learning. These affective views will underpin their work with preservice primary teachers and will be at least tacitly, presented to the student-teachers. Given the many calls for belief reform with preservice primary teachers, it is also likely that mathematics educators will be actively and overtly promoting the views that they consider ‘correct’ and appropriate. I am not suggesting that it is necessarily wrong for mathematics educators to do this, but it is an ethical issue when someone is trying to change the beliefs of another, particularly when the educator also has a powerful gate-keeping role. I think it also behoves mathematics educators to carefully consider the beliefs they are promoting and to thoroughly research and analyse the benefits of these views for effective mathematics education.

To exacerbate this position, it is important to note that in many respects it appears as if it is the mathematics education community that stands apart from many others in regards to their views about what constitutes good mathematics education. Preservice teachers arrive at their ITE program with fairly firm views about mathematics and mathematics

teaching and learning, and these beliefs are generally reinforced through their practicum experiences and their professional contexts once they begin their inservice teaching career (Gustafson & Rowell, 1995). Some have suggested that because the preservice teachers existing beliefs — based on years of observation in classrooms as a student, coalesce so closely with the views and practices they experience in school classrooms, the tertiary course experience can be seen as an anomaly and in time, dismissed (Zeichner & Tabachnick, 1981). This being the case, mathematics educators need to be cognisant that they may well be promoting mathematical beliefs that will require the preservice teacher to ‘swim against the tide’ in their practicum experiences and their teaching career. In this sense, it could be seen that mathematics educators are asking preservice primary teachers to pay a price for the promotion of their agenda, albeit with the best of intentions.

Student teachers have a fairly firm general goal of completing their degree and securing a teaching position (Wideen, Mayer-Smith & Moon, 1998). While some preservice teachers may be looking to be agents of school reform, the majority will identify with the dominant school culture and be tacitly and consciously seeking to reproduce the prevailing norms and practices (Boote, 2002). The perceived risk of doing otherwise is the fear of not graduating and not meeting external standards of quality for being registered and getting a job. However, mathematics educators have an agenda that focuses on developing teachers through their ITE program that will challenge and change the prevailing traditional beliefs and practices of mathematics teaching and learning. Thus, it is possible that the importance of a change agenda in mathematics education is frequently not shared by preservice teachers. Again, I am not suggesting that these agendas always exist in a polarised form or indeed, that the agendas need to be mutually exclusive, but it is the ethical responsibility of mathematics educators as the ones in the position of power, to be conscious and thoughtful of this situation. In short, mathematics educators cannot surreptitiously use their preservice teachers to further their reform agenda in mathematics education, acting as missionaries converting their neophyte teachers to their truths, beliefs and values.

If mathematics educators only had a moral obligation to their ITE students it may be a relatively straightforward discussion, but the dilemma is further complicated because they also have an ethical responsibility to the discipline and to school children. Mathematics educators need to ensure that the mathematics they promote is indeed mathematical (this is another issue that warrants greater discussion but space precludes it here), and that the teachers that emerge from their courses and programs have a sound mathematical pedagogy that enables children to develop mathematically. I am sure that it is these concerns that have led to the belief reform agenda in mathematics education, and it seems apparent that this programme is vital for quality mathematical learning in schools. Nevertheless, it creates an ethical bind where mathematics educators have to maintain integrity in a context where their moral responsibilities may be divided and somewhat incompatible. In a complex world people have to deal with these sorts of ethical binds regularly, and certainly in this situation the dilemma is not as simple as it has been represented, but as mathematics educators increasingly adopt a program of belief reform amongst their preservice primary teachers, it is important that they recognise the presence of these ethical issues and they take time to overtly consider the implications for their practice.

The Success of Affective Reform Agendas

Finally, I think there is an ethical responsibility for mathematics educators to research,

theorise and discuss the outcomes of ITE courses and programs designed to bring about affective change. As highlighted previously, an agenda that requires student-teachers to change their beliefs, values and attitudes is taxing for all concerned and morally difficult. That being the case, it would seem imperative that mathematics educators continue to monitor their programs to bring about affective change to ensure that the high price involved brings about worthwhile gains. On this point Wideen, et al. (1998) commented that, "...it seems pointless to seek to change the beliefs if evidence supports their enduring qualities (p. 144).

There is a growing body of literature that reports on teacher education courses and programs that were designed to bring about belief and/or attitude change (Schuck & Grootenboer, 2004). These reports are often written by mathematics educators about their own efforts to bring about affective change with their own students. However, the findings of these articles do not present an overwhelming picture of success. This is probably to be expected given the relatively new agenda for affective reform in mathematics subjects in ITE programs and indeed, the complexity of affective qualities in teaching and learning. However, much of the seminal literature of belief, value and attitude change in general suggests that success in this area is difficult, if not unlikely. That noted, I am not promoting that the agenda for affective change be abandoned as it seems too important, but I think there is a need to be rigorous and diligent in researching and theorising the process of belief and attitude change in mathematics education — perhaps more rigorous and diligent than has been the case thus far. There is a moral obligation to do so if an agenda of affective reform is to be pursued.

Personal Concluding Comments

The lament over the poor mathematical beliefs and attitudes (and knowledge) of primary preservice teachers has given rise to an agenda for affective reform in mathematics education courses. Certainly a good case has been made for mathematics educators to promote and facilitate change in student-teachers' beliefs about mathematics and mathematics teaching and learning, and their attitudes towards the subject. Personally, I concur with this view and indeed, I have been engaging in such work myself in my preservice mathematics education courses. This paper has not sought to diminish such a program, but rather it has sought to articulate and begin a discussion about the implications for the role and identity of mathematics educators, and the ethical dilemmas inherent in such an agenda. At least at a personal level, I am concerned about my ability and training to undertake a counselling-type role, and yet inadvertently I seem to have assumed such a position in some dimensions of my work with preservice teachers. Also, I suspect that I am not alone in being under-prepared as a 'belief and attitude therapist' (Boote, 2003), and so this new perspective on the identity of mathematics educators will require much thought and probably some new professional development.

While teacher education has always been value-laden and affective in nature, the more overt agenda in the affective domain has given rise to ethical issues that demand considerable and deliberate attention. The affective reform program seems to entail preservice primary teachers noting and articulating their beliefs and attitudes and then reflectively reviewing them in the light of truths, opinions and views presented by mathematics educators. At the very least, mathematics educators need to engage in a similar adventure so they not only model the desired process, but they also maintain a sense of

awareness about their own peculiar versions of what is true and what mathematical beliefs they hold dear.

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