

**Engaging with issues of emotionality in mathematics
teacher education for social justice**

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Engaging with issues of emotionality in mathematics teacher education for social justice

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Abstract

This article focuses on the relationship between social justice, emotionality and mathematics teaching in the context of the education of prospective teachers of mathematics. A relational approach to social justice calls for giving attention to enacting socially-just relationships in mathematics classrooms. Emotionality and social justice in teaching mathematics variously intersect, interrelate or interweave. An intervention, using *creative action methods*, with a cohort of prospective teachers addressing these issues is described to illustrate the connection between emotionality and social justice in the context of mathematics teacher education. Creative action methods involve a variety of dramatic, interactive and experiential tools that can promote personal and group engagement and embodied reflection. The intervention aimed to engage the prospective teachers with some key issues for social justice in mathematics education through dialogue about the emotionality of teaching and learning mathematics. Some of the possibilities and limits of using such methods are considered.

Keywords

Classroom relationships, social justice, teacher emotions, creative action methods, experiential learning, mathematics teacher education

Introduction

In this article I report on work with prospective teachers to encourage them to consider and reflect on classroom relationships and practices that can promote social justice in mathematics classrooms. It perhaps hardly needs to be stated that social justice is a complex and contested idea and/or set of practices in education (Gewirtz, 1998; Griffiths, 2003; North, 2006), including in mathematics education (Atweh, 2007). The particular approach I take here is one that emphasises the relational aspects of social justice (Gewirtz, 1998; Griffiths, 2003; Young, 1990). It is in and through relationships that social injustices are either directly engendered or at least lived and experienced; thus it is here that more socially-just relationships and practices within particular classrooms can be enacted (Angier & Povey, 1997; Boylan, 2004; Noddings, 1993; Povey, 2003; Povey, Burton, Angier, & Boylan, 1999). These relationships have three aspects: between teachers and school students, within the student classroom community, and the relationship of all to mathematics.

Developing and sustaining socially-just relationships in classrooms is emotional work (Chubbuck & Zembylas, 2008). The way that social justice and emotionality are related in the context of mathematics education can be understood in three ways: as *intersection*, *interrelation* and/or as being *intertwined*. Social justice and emotionality intersect because mathematics education involves social relationships in a social context and so issues of power and social justice are inevitably present. Similarly, social relationships are emotional relationships; emotions are socially constructed and inscribed with relations of social power. Factors such as status and social group prompt, enable and/or constrain emotional experience (Williams, 2001). Social justice and emotionality intersect when considering both is important to understanding a particular situation or to guiding action in mathematics education.

There are situations when social justice and emotionality not only intersect but are interrelated. This term points to ways that socially-unjust practices in mathematics education helps to give rise to particular emotional experiences and that particular forms of emotional experiences help to constitute injustice or are

implicated in inequitable patterns of participation and outcomes. Moreover, emotionality and social justice are also intertwined. They are intertwined because power and social control is in part enacted through control and management of emotional experience (Hothschild, 1983; Abu-Lughod & Lutz, 1990; Williams, 2001). How we speak about emotions, who can speak and in what ways, are all inscribed with relationships of power and social position (Abu-Lughod & Lutz, 1990; Zembylas, 2005).

In the next part of the article the connection between social justice and emotionality in education is discussed as a prelude to considering the implications for the professional learning of prospective mathematics teachers. The argument here is that the forms of relationships between people in classrooms is an important, if neglected, area in terms of discussion of social justice in mathematics education. I outline some of emotional aspects of mathematics classroom relationships particularly when attempting to teach in socially-just ways. I then go on to illustrate how these concerns translate in mathematics teacher education by reporting an intervention aimed at addressing these issues with prospective teachers through the use of creative action methods. In this discussion I indicate choices of the particular focus of the educational experiences and their relationship to social justice. I point to some unresolved issues both in terms of the intervention and more generally in connecting emotionality and social justice in mathematics education.

Emotionality, teaching and social justice

By emotionality I mean not only the appearance or physiological signs of emotion as in some psychological definitions, but the full range of the emotional content of a person or a situation. Emotionality includes the experience of emotions themselves, the expression and willingness to express emotion, emotional introspection and self awareness, emotional range, and the ability and willingness to engage in reflection and discussion about emotion. This article is informed by a social theoretical analysis of emotion that suggests it is intrinsically embodied and communicative:

Emotion is [a] complex, *multidimensional, multifaceted, human compound*, including *irreducible* biological and cultural components, which arise or emerge in various socio-relational contexts (Williams, 2001, p. 132, original emphasis)

Addressing teacher emotionality in mathematics involves a concern for a wide range of positive emotions including: care, compassion, empathy, a willingness and ability to engage emotionally with others, respect for others' experiences and beliefs, the confidence to take risks, and a sense of personal emotional and cognitive authority. As well as attending to the more socially acceptable emotions, social justice requires engagement with both one's own and other's more uncomfortable emotions (Chubbuck & Zembylas, 2008; Boler, 1999; Griffiths, 2003). These include emotions that arise in learners from the experience of learning mathematics such as fear, shame, anger, self-blame, or the more general emotional challenge in learning mathematics that has often been described (see for example, Bibby, 2002; Breen, 1991, 2000; Boylan & Povey, 2009; Frankenstein, 1989; Noddings, 1993) as well as teachers' emotional response to these feelings.

In understanding and exploring the emotionality of teaching mathematics we can draw on a growing body of generic literature that has explored the emotional labour involved in different aspects of teaching (for example, Hargreaves, 1998, 2000; Zembylas, 2005, 2007a) and the importance of emotionality in teacher professional development and identity (Day & Leitch, 2001; Zembylas, 2003, 2005). More generally, Zembylas (2007a) proposes that "emotional knowledge" is an important but neglected aspect of teacher professional knowledge. He points to the way in which the emotional life of teachers and school students is a process of on-going creation and negotiation that involves three intersecting planes of emotional knowledge: individual, relational and socio-political.

Taking knowledge as the conceptual lens for understanding emotionality has some risks. The focus may become knowledge *about* emotions rather than knowledge or understanding *through* emotions and emotional practices. Emotional knowledge for teaching must be emotional. Discussion of reports of research or even reflection on one's own experience need not, in the academic context, offer the sort of engagement with these issues that leads to lived, experienced and embodied knowledge, that is knowledge through and in emotions rather than only about emotions. This is one reason to use the type of creative action methods discussed below.

Addressing the emotionality of teaching from a social justice perspective is problematic in the current educational context. In seeking ways to develop teacher emotionality there is a risk of adding to a developing culture of emotional management in which emotional experience is separated from the social or cultural situation (Williams, 2001). In schools there is a growing interest in emotional aspects of learning as popularised by Goleman (1996) through his concept of emotional intelligence. However, Boler (1999) argues that recent inclusion of emotional literacy as a goal of education continues a tradition of "disciplining emotions" that maintains a view of emotions as private and individual. Emotional literacy programmes for school students may include examples that connect to social justice, such as discussion of the emotional

experience of racism, but in general offer a skill based and decontextualised view of emotions. Moreover, some are viewed as intrinsically unacceptable and needing to be managed and controlled. Zembylas (2007b) defends the importance in education of one such emotion - anger - rejecting the silencing of it "in the name of emotional intelligence" (p. 15) and arguing that it has an important "moving role in education in the sense of cultivating individual and collective political consciousness and social resistance to injustices" (p. 25). Thus the way emotionality is included in education and teaching and what emotions are included and how must be contested (Boler, 1999; Zembylas, 2007b) to ensure that the political and social dimensions of emotionality and classroom relationships are recognised and addressed. Chubbuck and Zembylas (2008), for example, report a case study of the emotional aspects of teaching for social justice of one novice teacher. They argue for linking emotionality and social justice in teacher education in ways that embrace complexity and recognise emotional ambivalence and tensions in teaching for social justice.

The case of mathematics

In this section I outline some of the key and distinct aspects of specifically mathematics education emotional knowledge that are of most importance in developing teachers who seek to create classrooms based on socially-just relationships in the context of a socially-unjust educational system. Such teachers seek to teach mathematics with "con conciencia", with consciousness (Ruiz, 2002), who interweave emotionality and a counter-hegemonic approach to classroom practice and curriculum with action for social justice and educational change

The project of creating mathematically and emotionally spacious classrooms (Angier & Povey, 1999) in which equity and socially-just relationships can be enacted calls for teachers who can support the development of school students' collaborative learning skills and initiate and facilitate mathematical learning communities. Such classrooms require an expanded set of teaching skills. For example, teaching in all attainment classrooms is challenging; it requires the ability to create rich learning mathematical environments that are accessible for all; proficiency in supporting group work; and working with school students to discuss the tensions that can arise from interdependence (Staples, 2008). Being emotionally available to others in mathematics classrooms can be challenging for teachers and students alike (Boylan, 2004). Becoming proficient in such practices is not only a matter of achieving technical competence, but requires us to put at the heart of initial and on-going teacher education the development of the same personal qualities that we might hope to be fostered in school students in a socially-just classroom.

In much discussion of 'affect' in mathematics education, emotions are seen as individual responses to mathematics or, if a social view of affect is taken, then as arising from the social interactions in a particular classroom. Given the relationship between such alienation and inequitable outcomes and participation, emotionality and social justice at least intersect here. However, studies of mathematical identity have given insight into the way in which responses to mathematics, including emotional responses, are produced through the lived experience of learners in specific social and cultural contexts and through the (restricted) discourses that are available (Mendick, 2006). Thus feelings such as frustration and boredom and the actions that can arise can be seen as a form of emotional resistance to the basic injustice of a decontextualised and disconnected mathematics curriculum. Here emotionality and social justice interrelate and intertwine. For teachers to engage with emotions as resistance an understanding of the social and cultural context and identity of learners as emotional context is needed (Chubbuck & Zembylas, 2008).

Expanding the curriculum to engage mathematically with issues of social justice such as gender or racial inequality, unequal distribution of income, sexuality or disability can lead to resentment or reveal oppressive beliefs and values. Teachers also require the confidence to facilitate and support the emotions that can arise when curriculum content is introduced that uses mathematics as a tool to understand more about emotionally charged issues such as poverty, racism and power relationships in society (Adams, Bell & Griffin, 2007). Thus teaching for social justice can entail conflict, both between school students and between students' beliefs and those of the teacher. This requires teachers who do allow the full range of beliefs in the community to be expressed, even those that may lead to strong emotional reactions in oneself and others, a role described graphically as "sitting in the fire" (Mindell, 1995). Facilitating such discussion also requires the willingness to listen to, but also to challenge, oppressive voices.

Moreover, other aspects of mathematics teaching for social justice can also make significant emotional demands. Gutstein reports dilemmas experienced in facilitating the feelings of injustice that arose in Latino students as they learnt to "read the world" through mathematics and so understood more fully the nature of economic inequity their community faced:

Well the world is not, not, a pretty fair place. It just makes me mad to see that some people have so much money that they don't even know how to spend it. And others have so little, they don't know which bill to pay off first. (Marisol, quoted in Gutstein, 2006, p. 91)

Teaching mathematics for social justice also entails the often uncomfortable emotionally demanding work of on-going questioning of one's own practices, beliefs and values and their relationship to social oppression. Similarly attempting to teach in socially-just ways in restrictive contexts is likely to give rise to frustration and the need to engage with alienation and resistance, but also to celebrating school students' (and one's own) social and/or mathematical success (see Chubbuck & Zembylas, 2008, for a case study).

A further important aspect of mathematics emotional knowledge is an understanding of the ideological nature of mathematical practices (Ernest, 1991) and the ways in which these alienate and marginalise groups of learners and impact unevenly on different groups of learners as discussed earlier. Moreover, part of the socio-political dimension is to know and understand the way in which mathematics is itself presented as a non-emotional abstract practice (Walkerdine, 1988) and the relationship between this and gendered participation in mathematics (Paetcher, 2001) and to find ways to disrupt this (Mendick, 2006).

Addressing emotionality and social justice with prospective teachers: using creative action methods

If emotionality, social justice and the relationship between them are an important area of concern for mathematics teacher education, how can teacher educators address this in the education of prospective teachers? The remainder of this article describes an attempt to begin to address this question in relation to a group of prospective secondary (high school) teachers of mathematics. This description illustrates the issues previously discussed. Regardless of a concern for social justice it is clear that becoming a teacher is a highly emotional experience. The limited research on emotionality of prospective teachers has tended to be focused in elementary education (for example, Goldstein & Lake, 1999). This possibly reflects gendered discourses that legitimate emotional engagement in relation to younger children in contrast to those that prevail in relation to teaching older children and young adults.

In contrast, interventions that address issues of social justice with prospective teachers have been more fully reported. In some cases significant programmes involving large cohorts have been integrated as central features of teacher education programmes (McDonald, 2005; Taylor & Sobel, 2000). Such programmes have tended to focus on a particular aspect of social justice - preparing teachers to teach in culturally and social diverse contexts. Evaluation of such programmes indicates that even where programmes are extensive they have uneven long term influences on teacher beliefs (Taylor & Sobel, 2000). Research or interventions connecting social justice and emotionality for prospective teachers is a neglected area in the literature. However, in a case study, Chubbuck and Zembylas (2008) analyse the experience of one novice teacher and identify the need to develop in teachers committed to social justice a "critical emotional praxis". This has three aspects: an understanding of the role emotions play in unjust systems and practices; emotional navigation of the experience of emotions as a support or hindrance to socially-just teachers; and criticality about the limits that emotional cultures in schools may mean for teaching for social justice.

Below I report on a sequence of four educational experiences with one cohort of prospective mathematics teachers. These experiences, or to use the language of *creative action methods*, enactments, were particularly aimed at connecting issues of classroom relationships, emotionality and social justice. This intervention was informed by an understanding that emotions are inseparable from teachers' moral purposes (Hargreaves, 1998; 2000). Specifically, emotional experience is connected to choosing to act in more socially just ways (Boler, 1999; Chubbuck & Zembylas, 2008; Noel, 1995; Zembylas, 2007a) or more generally change one's beliefs and practice as a teacher (Ashton & Gregoire-Gill, 2003).

The intervention used creative action methods developed initially, by Jacob Moreno one of the founders of group psychotherapy and the developer of psychodrama (Fox, 1987; Moreno, 1993; Sternberg & Garcia, 2000). Creative action methods involve the use of a variety of dramatic, interactive and experiential tools that can promote personal and group engagement and embodied reflection. Moreno's ideas and techniques are arguably much more influential than the extent to which Moreno's name and body of work is known outside psychotherapeutic circles. For example, mathematics teachers and educators who use people maths activities, particularly in data handling, are likely to be using or reinventing some of the techniques developed in Moreno's sociometry which brings awareness to group and social relationships by embodied mapping.

Although his methods were developed with a transformative intent for personal, group and social change, some of Moreno's conclusions from his sociometric investigations and aspects of his underlying philosophy today appear naïve, particularly in relationship to power and the social forces that impact on people's sociometric choices. However, the creative action methods he developed can support embodied reflection and the analysis of personal and social situations through experiential learning. They have been used to understand and analyse social issues including in a variety of educational settings (Browne, 2007; Kellermann, 2007; O Keefe, 2004; Sternberg & Garcia, 2000; Telesco, 2006). They are a powerful means of public education and democratic participation and to address the effects of oppression and collective trauma (Kellermann, 2007). Creative action methods and related techniques have been further developed as a form

of social and political action known as the 'Theatre of the Oppressed' (Boal, 2004; 2008) that is a parallel to Paulo Friere's 'Pedagogy of the Oppressed' (Friere, 1972).

Using creative action methods offers a means to "act up" (Griffiths, 2003) playfully in relation to action for social justice. Participants shape the content and form of enactments. Thus their use is congruent with the sort of democratic practices to be found in socially-just mathematics classrooms. They offer a means to explore how social forces are present in particular situations and so they hold the potential for exploring how different aspects of oppression manifest in mathematics education and thus for exploring political emotionality and developing critical emotional praxis.

Context and evaluation

The activities described here took place with 44 prospective teachers on initial teacher education courses at a large metropolitan university in the UK. The prospective teachers were following a variety of courses, including undergraduate degrees in mathematics with education, postgraduate conversion courses for graduates without a degree in mathematics and one year postgraduate courses. The prospective teachers referred to in this report were all undertaking either a common final or single 'Professional Year' which is focused on professional practice. The enactments took place in the first two weeks of the Professional Year. The student group was culturally, socio-economically and ethnically diverse. The sessions described here aimed at identifying important issues in relation to teaching for social justice and opening the question of the importance of emotionality in the classroom.

To support evaluation in the first session (First and Second Enactments) a colleague who knew the continuing prospective teachers well acted as a peer-reviewer of the session. In addition to a discussion about the process and methods used, two days after the second session (Third and Fourth Enactments) all prospective teachers were given the opportunity to give written feedback. Giving the opportunity for regular written feedback to tutors both supports on-going reflection and development and is intended to model good practice for the prospective teachers. The prompts on the written feedback did not focus specifically on the emotional or social justice aspects of the sessions in order not to pre-empt responses:

What stood out for you or was most memorable about the sessions?

How did the sessions affect your thinking about mathematics teaching and learning?

Comment on your engagement and the suitability of this type of learning experience?

A total of 35 feedback sheets were completed anonymously. Due to the small size of the cohort, to preserve anonymity information on gender and ethnicity was not included.

I used an open coding approach to identify themes in the feedback. However, the student feedback is not offered as reliable qualitative data but rather as informative of some of the prospective teachers' learning from the sessions. The material was gathered as part of the ongoing process of practitioner research to develop a collaborative learning community within which social justice is addressed. As part of this process the prospective teachers' feedback sheets and my summary were also reviewed by a colleague and shared more widely with the tutor team.

Part of the English context is the effect of a sustained neo-liberal ideology and policy in society generally and particularly in education over the last 30 years enacted by both conservative and social democratic governments. This wider political, cultural and historical situation has a number of effects. Firstly, the prospective teachers' experience of learning mathematics has generally been through closed and restricted practices. As they begin to teach they often reproduce such practices. Thus one important feature of our course is to provide opportunities to disrupt the reproduction of practices that can lead to injustice in the classroom and to promote alternatives.

Secondly, our prospective teachers' own awareness of social justice issues in education can be limited and often shows an acceptance of neo-liberal ideology (see Jackson, 2006). Some prospective teachers experience defensive fear and anger as their "complex fictions and investments" (Boler, 1999, p. 195) in the dominant paradigm are challenged. Or, if they do not experience such charged emotions, they at least experience insecurity (Noel, 1995). These investments are both in teaching ideologies and around beliefs more directly connected to social justice, for example grouping by 'ability'. In using creative action methods to open a conversation about classroom practice and issues of social justice in the classroom, I am aware that for some prospective teachers a significant forward step is to begin to consider that there is an alternative to dominant forms of mathematics teaching or that issues of social justice are involved and important.

The composition of the four enactments was developed over a period of five years with different teaching groups and has been strongly influenced by student feedback and evaluation. The trajectory of development has been to move from written reflection and group discussion to the use of the more experiential creative

action methods. The issues raised in the enactments are then taken up in other sessions to support the prospective teachers to develop strategies to begin to address these in classroom practice.

In presenting these enactments to illustrate some of the ways emotionality and social justice are related and how this can be explored in practice in mathematics teacher education, I acknowledge that they are limited in scope and content. An unresolved tension I feel in educating for social justice is that I aim for my practice to be congruent with what I hope will be the practice of the prospective teachers I work with. Just as I hope they will not impose mathematics on their students so I choose not to impose a particular view of or even a demand to engage fully with traditions of social justice on these prospective teachers. At the same time an area for further development is to find ways to connect these enactments more fully to social justice and critical mathematics education traditions. Participant response to the enactments and intervention indicates an awareness of some of the ways that emotionality and social justice intersect. There is scope for integrating creative action methods with exploration of the social justice and critical traditions in mathematics education, particularly those rooted in relational approaches to social justice and focussed on classroom practice. This could further promote a political emotionality that includes an understanding of the ways in which emotionality and social justice do interrelate and are intertwined.

There are also important ethical considerations about using methods of this sort given the powerful position a teacher educator tutor has in relation to prospective teachers. When we involve our prospective teachers in learning experiences of this sort, particularly where the aim is to offer and develop an experience of some emotional intensity, we clearly have an important duty of care. At the same time, addressing issues of social justice calls for a "pedagogy of discomfort" (Boler, 1999) which challenges and provokes.

Enactment One: Back in the classroom

The intention of this enactment is to offer a shared experience of an extreme form of the type of unjust teaching and learning practices that are found in mathematics classrooms. This enactment is inspired by and draws on learning experiences developed by Breen and Hannula (Breen, 1991; Hannula & Breen, 2001). It offers an opportunity to explore the emotional effects of different types of classroom practices. It is informed by evidence that teachers' choices of their classroom practices are influenced by the emotional effect of these practices on their students and themselves (Hargreaves, 2000; Sutton & Wheatley, 2003; Zembylas, 2003; 2005). It also offered an opportunity for critical reflection about the effect of transmissive teaching that in mathematics helps to create the "personal fatalism [and] servility" (Skovsmore, 1994, p. 189) that support later exploitation on entering the workforce.

The prospective teachers arrive in a classroom arranged, unusually, in rows and they are taught a mathematics lesson in base SHTAM (base 5 with letters substituted for digits). No explanation of the system is given. A transmissive teaching style is matched by a socially authoritarian manner with ranking and ridiculing of the 'school students'. After leaving the room the teacher comes back in a different role. The remnants of the previous lesson that are on the board are used as the starting point for an investigative approach to solving the problems, with the teacher taking the role of naïve enquirer and supportive guide. Desks are rearranged and 'school students' are encouraged to work collaboratively in a problem solving manner. This allowed a contrast to be drawn between the ways in which different classroom practices support different relationships to mathematics. In socially-unjust classrooms learners often experience mathematics as disconnected, separate and having power over one (Boylan, 2004). The negative emotional experience of powerlessness can be addressed by relocating mathematical authority to the learner (Burton, 1996; Povey, Burton, Angier, & Boylan, 1999)

The prospective teachers' experience of the two different teaching approaches was discussed. Topics reflected on included the emotions they felt in relation to different classroom practices and the type of classroom behaviours that emerged. They reflected on their own relationship to learning mathematics and different personal mathematical histories including the experience of participants from different ethnic and cultural backgrounds. Because of the important role of ability grouping has for social justice in mathematics education in the UK, reflection was encouraged on learners' experiences and practices prevalent in different sets. Discussion was guided to explore the experience of socially different groups of learners in mathematics, the issue of power in the classroom and the reasons why different practices are enacted both in terms of individual teacher choices and wider social factors. The session concluded with reflection on their values as prospective teachers and the implication of the experience for their intended classroom practice. In addition the piece itself was deconstructed with discussion of feelings about being part of the enactment.

As might be expected both in the discussion and in later written reflections the experience of the piece tended to lead to prospective teachers expressing care, concern and empathy for learners who experienced this type of curriculum, particularly for those that found mathematics challenging, and a desire to teach in a different way. However, this was not universal. Some participants identified with elements of the transmission approach urging "clearer" explanations.

Enactment Two: A teacher is like....

The second enactment continued to prompt reflection about beliefs about teachers' roles. In addition it challenged the prospective teachers to consider alternative points of view. Socially-just classroom relationships call for students and teachers to learn to listen carefully to others and to value and respect their views (Povey, 2003). If classrooms are to be spaces for dialogue (Alro & Skovsmose, 2002) about mathematics and about society then teachers have to be open to engaging with multiple perspectives. If they are to support "the development of citizens who are able to take part in discussions and are able to make their own decisions" (Skovsmose & Nielsen 1996, p. 1267), then a starting point is for teachers to themselves engage in democratic practices of listening to difference and developing cognitive empathy for alternative viewpoints. Creative action methods are particularly powerful for this as they require embodiment of perspective and so one can, metaphorically, look at a situation from another person's point of view by changing positions with them. This practices what Griffiths (2003) describes as "double vision" in her suggestions for actions for social justice.

The prospective teachers explored different similes for the roles of a teacher: a news broadcaster, a gardener, a mountain guide, a sports coach, actor, an entertainer, a doctor and an orchestra conductor. Although these similes are chosen to be accessible to the prospective teachers they are connected to different ideological views of the nature of mathematics education (Ernest, 1991). Groups of prospective teachers engaged in discussion and debate using participatory democratic forms involving spokespersons and consensus. Participants were asked to 'role reverse' when in debate with other speakers. That is, they might be asked to swap positions and so argue from another's point of view (and thus find themselves representing a different group). In addition all participants were asked to regroup themselves to sit in the place that they most disagreed with and further discussion took place with students speaking from these less personally favoured viewpoints.

At the end of the enactment the process was discussed, giving participants an opportunity to discuss the way in which the enactment was conducted and the different roles they took, for example being a spokesperson and the challenge (or otherwise) of speaking for a position other than the one they agreed with or were in sympathy with. Connections were also made with the themes discussed in the first enactment.

Enactment Three: A conversation with Louise

In this enactment the gendered nature of learning mathematics was central. An actor, Helen, played the part of Louise (a pseudonym). Louise, like many learners, had a painful relationship with mathematics and a history of distressing episodes in school (Boylan, 2004; Boylan & Povey, in press a). Louise's story exemplifies the way that the approaches to teaching mathematics considered in the first two enactments do damage to and violate learners' relationships to self, to others and to mathematics (Boylan & Povey, in press a). Ranking practices are enmeshed with learners' social and cultural identities, this harm is greatest for those who already bear more greatly "the weight of the world" (Bourdieu et al., 1999). An important aspect of this in mathematics is gendered experience. A key feature of Louise's account is the injustice she feels at the preferential treatment given to the "maths pundits" who are all boys and her alienation from "this sort of maths male world thing" (Boylan, 2004, p. 165).

An emotionally powerful and provocative monologue was constructed from an interview with her. The form of the enactment was developed from indications that a powerful impulse to change one's own practice as a mathematics teacher is to engage with what learners say about their experience of our own and others' practice (Boylan, Lawton & Povey, 2001). This piece drew on the form of invisible theatre (Boal, 2004) in that Helen was not introduced as an actor but as 'Louise'. Helen/Louise used the monologue as a starting point for a semi-improvised description of her experience of learning mathematics in schools. A conversation continued between the group and 'Louise' about her negative gendered experience of learning mathematics. 'Louise' then left the room and returned as Helen. The discussion about the enactment continued including the issue of how the prospective teachers felt about the deception. Themes from the first enactment were revisited with a focus on gender and mathematics.

We continued with an embodied analysis of the different forces and characters that shaped or played a role in Louise's mathematical lifeworld. With Helen/Louise in the centre, we began by identifying real human characters that appeared in her story. The group discussed where to position these in relation to Helen/Louise. By role reversing, Helen used her skills as an actor to support the prospective teachers in taking shapes that expressed how the group and Helen interpreted Louise's experience of these different characters. Then the social and political forces and influences on Louise's experience and on the other characters in her story were similarly mapped. For example, one student took the role of 'testing' as a key actor in the system, another a politician concerned about standards. Thus some of the possible ways in which social, political and ideological forces help shape the personal experience and emotions of learners were revealed. Such embodied mappings of the relationship between personal lifeworlds and the social can

connect experientially a concern for injustices experienced by a learner or particular learners to an understanding of injustice as socially rooted. They can also exemplify abstractions such as sexism or inequality as lived aspects of learners' worlds. Thus they may be a suitable way of developing this aspect of critical emotional praxis (Chubbuck & Zembylas, 2008).

Enactment Four: Classroom complexity

Reforming the curriculum to include more open, investigative and discursive ways of learning mathematics may not in itself address issues of equity (Gutiérrez, 2002). Thus, the fourth enactment focused on the importance of taking account of difference in the classroom as part of the project of social justice (Griffiths, 2003). Those prospective teachers on our courses who reproduce prevailing classroom practices often speak or act as if the young people in their classes are homogeneous. This enactment aimed to develop discussion of difference as socially constructed including dimensions such as gender, ethnicity, disability and social class as well as mathematical attainment. This was done in the context of considering the challenges, including emotional demands, of all-attainment teaching. All-attainment teaching is a key issue for social justice in mathematics education in the UK, given the way setting (tracking) practices offer inequitable access to mathematics in a variety of ways (William & Bartholomew, 2004). Teaching in a closed and restricted way is particularly experienced in lower sets (Boaler, William & Brown, 2000). These are sets in which students from disadvantaged socio-economic groups and some ethnic groups are disproportionately represented (Ireson, Clark & Hallam, 2002). Setting reflects the hierarchical structuring of society and may be implicated in maintaining it. It tends to marginalise those students, often working class, girls or with disabilities, who "are unwilling to engage in this hierarchical game" and risk the negative emotional experience that ranking can bring (Nardi & Steward, 2003, p. 359). Boaler (2005) has also evidenced the way in which the socio-economic position of adults who were taught in sets as children is more likely to be maintained and reproduced than peers taught in all attainment groups. There is a fundamental inequity in classrooms in which the ranking of school students is pervasive and in schools in which different classes are ranked against each other as the success of some students happens at the expense of others. In addition this enactment models for the prospective teachers the possibility of dialogue with learners' about their experience of learning and about forms of classroom practice, the sort of conversation essential in democratic classrooms.

A series of pen portraits of 12 or 13 year old school students, based on research (Boylan, 2004) were given to the prospective teachers. Each description described key features of the school student's identity, such as gender, ethnicity, socio-economic background and disability and the school students' relationship to mathematics in terms of both attainment and disposition towards the subject. In addition some information was given about their emotional relationship to particular classroom practices, for example their like or dislike of different forms of teacher questioning. Working in groups the prospective teachers were allocated two school students. For one of these they were asked to take the role of the school student and from the school student's perspective develop a description of this student's preferred learning environment, classroom practices, curriculum and so on. Additionally, for the other school student they considered the same question but this time from the role of the teacher. Teacher roles were connected back to earlier discussion of similes for teaching.

The enactment consisted of various dialogues between individual 'teachers' and 'school students' and then with the 'school students' as a whole class. After the enactment, this prompted a more general discussion amongst the prospective teachers about the relationship between classroom practices and the experience of different groups of school students and about some of the socio-political causes of these different experiences. The group discussed the complexity in the classroom not only in terms the range of differences but also the ways in which differences intersect in individuals. Here some of the emotional demands of teaching in socially-just ways were commented on by some participants.

The prospective teachers' reflections on the experience

The prospective teachers' participation in all the pieces was high, with a great willingness by some to take roles. Their written evaluation generally reflects this observed engagement. At the same time four prospective teachers reported that even if they found an element worthwhile, overall they did not like the form of learning experience. Nineteen prospective teachers identified that the sessions had an impact on their view of teaching and learning and how they intended to teach. The sessions supported the development or in some cases affirmation of a number of the beliefs and attitudes that support the sort of socially just classroom practice discussed earlier in the article: the importance of considering different students needs and the complex nature of teaching; an expanded view of the role or roles of the teacher; a desire to include more open approaches to teaching and the importance of considering the learners' experience. A particular theme was reflection on both the nature of mathematics and classroom practices:

These sessions made me question my innate beliefs about mathematics and how this should be taught. The methods of teaching I was subject to are not necessarily the most effective for all pupils.

Such a response does not of course represent a commitment to a fully developed practice for social justice; this would be far too much to expect given the limits of the intervention. However, questioning ones "innate beliefs" does represent a first step away from ideologically dominant views of mathematics (Ernest, 1991; Restivo, 1992) and of mathematics teaching and learning (Burton, 1996).

Twenty prospective teachers explicitly indicated a concern for student feelings or in other ways an empathic response. Of these twelve commented on the importance of understanding the perspective of school students, including directly responding to injustice:

I think I should be more aware of the 'pupil' experience and try to make my lessons equal and fair to everyone so no one would feel like Louise.

In some cases this was explicitly linked to the strong emotional experience of being placed in the position of a learner in a hostile learning environment:

We couldn't understand anything and it seemed to be a completely different language and the teacher made us feel stupid because we didn't understand. It really made me realise how it feels to be one of the students in the class who doesn't understand the maths, as I have never felt like this before.

In addition to emotional empathy a number made comments which indicate experiences of 'cognitive empathy': an appreciation of the intellectual position or beliefs of another. Such cognitive empathy is important for developing a dialogic conception of truth and knowledge, itself an important aspect of socially-just practice (Skovsmose, 1994).

In "the teacher is like", I liked the switch to get us to do the simile that we did not agree with. The sessions made me aware of how much one needs to think about the different views people have on teaching styles.

Louise's enactment tended to polarise responses. This was particularly so with the mapping and embodiment of aspects of Louise's' mathematical lifeworld, with some prospective teachers finding this one of the most remarkable and worthwhile aspects. They directly commented on the way in which this introduced an awareness of the all the factors and forces influencing Louise's experience. This indicates that for some prospective teachers the aim of developing greater socio-political awareness and the way social justice and emotionality are interrelated was at least partially realised.

Others found this piece without great value. Again this may be due to the way in which the enactment was conducted. With greater time to prepare, the piece might have been more improvised and so involving greater interaction. However, it is important to recognise that some prospective teachers are likely to be resistant to engagement in discussion or reflection of the emotional aspects of teaching and learning. This is potentially related to their existing mathematical identities: "It didn't seem very maths like – it was more [like] drama or English which I don't enjoy as much". However other prospective teachers also reflected on ways in which aspects of the form of the learning experience might be adapted to inform their own practice as teachers of mathematics.

Conclusion

One aim of the intervention was to create space for dialogue about the emotional aspects of teaching and the way in which mathematics classroom practices can be oppressive and alienating. To the extent that such a space was opened, the pieces were successful and of value for at least some prospective teachers. An indication that for some prospective teachers the experiences also had a longer term impact is that the pieces acted as a reference point for future conversations and discussions about pedagogy and classroom practice and values – they became part of the shared resource of the learning community.

However, it is also important to recognise what is missing from the prospective teachers writing about their experience. There are many issues of social justice in mathematics education that are not explicitly reflected in the student feedback. In terms of the social justice issues that were more centrally addressed, for example the relationship between pedagogy and student access to the mathematics curriculum or the debate about all attainment teaching, the language that the prospective teachers use is related primarily to concern for injustice as it affects the individual or particular groups of students in a class. There is little evidence in their writing of the connections made in the discussion during the third and fourth enactments that analysed the way such injustices are rooted in social relationships or to the language of theories of social justice. Thus, in their written responses at least, whilst the intersection of social justice and emotionality is acknowledged the interrelation or intertwining that were discussed after the enactments are not.

Nevertheless, beliefs about classroom practice were challenged. Some prospective teachers were demonstrably angered by Louise's mathematical experiences and linked this to a commitment to treating their future students differently, indicating that as discussed earlier this anger may have a "moving role" (Zembylas, 2007b). For some, this was in the context of only limited conscious engagement with social justice traditions. However, the language that at least some of the prospective teachers used does echo that of practising teachers who consciously see themselves as part of a current for social justice in mathematics (see as an example Ruiz, 2002). Thus the enactments or similar interventions may be important as starting points for the development of these prospective teachers as actors for social justice.

A useful analogy here is with models of ethnic-identity development in which there is movement through a number of stages from lack of awareness to a commitment to social action to address racism (Chizek & Chizek, 2002, following Tatum, 1992). Whilst discrete stages in such development models may be overly simplistic, the evidence for a developmental process in relation to action for social justice is significant. Drawing on community of practice theory (Lave & Wenger, 1991) we might consider a trajectory of participation. Engagement with particular and specific injustice can be the beginning of a trajectory that leads to increasing action for social justice and the emergence of identity as a critical mathematics educator as part of the development of a teacher's personhood.

If we acknowledge that "emotions are at the heart of teaching" (Hargreaves 1998, p. 835) then emotions need to be at the heart of teacher education. This is particularly so in mathematics teacher education for social justice, given the strong emotional relationship that many learners have to mathematics and to practices found in mathematics classrooms. If we want to prepare prospective teachers to teach mathematics as an emotional practice, then addressing issues of the relationship between classroom practice and social justice early in their teacher education can highlight some of the emotional aspects of teaching mathematics. The intervention described here provides evidence that issues of social justice and emotionality are connected in mathematics teacher education and indicates some of the ways they variously intersect, interrelate or interweave. If mathematics teacher educators want prospective teachers to engage with issues of social justice then providing a learning experience that gives space for an emotional response to these issues is essential as part of a project for social justice.

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References

- Abu-Lughod, L., & Lutz, C. (1990). 'Introduction: emotion, discourse, and the politics of everyday life.' In C. Lutz and L. Abu-Lughod (Eds), *Language and the politics of everyday life*, (pp. 1-23). Cambridge: Cambridge University Press.
- Adams, M., Bell, L., & Griffin, P. (2007). *Teaching for diversity and social justice*. London: Routledge.
- Angier, C., & Povey, H. (1999). One teacher and a class of school students: Their perception of the culture of their mathematics classroom and its construction. *Educational Review*, 51(2), 147-160.
- Alro, H., & Skovsmose, O. (2002). *Dialogue and learning in mathematics education: Intention, reflection, critique*. Dordrecht: Kluwer.
- Ashton, P., & Gregoire-Gill, M. (2003). At the heart of teaching: the role of emotion in changing teachers' beliefs. In J. Raths & A. McAnich (Eds.), *Teacher beliefs and classroom performance: The impact of teacher education*, (pp. 99-121). Greenwich, CT: Information Age Publishers
- Atweh, B. (2007). What is this thing called social justice and what does it have to do with us in the context of globalisation? *Philosophy of Mathematics Education Journal* No. 21 (September 2007) Available from <http://people.exeter.ac.uk/PErnest/pome21/index.htm>
- Bibby, T. (2002). Shame: An emotional response to doing mathematics as an adult and a teacher. *British Educational Research Journal*, 28(5), 705-721.
- Boal, A. (2004). *Games for actors and non-actors*. London: Routledge.
- Boal, A. (2008). *Theatre of the oppressed*. London: Pluto Press.
- Boaler, J. (2005). The 'psychological prisons' from which they never escaped: The role of ability grouping in reproducing social class inequalities. *Forum* 47(2&3), 125-134.

- Boylan, M. (2009) Engaging with issues of emotionality in mathematics teacher education for social justice
- Boaler, J., Wiliam, D., & Brown, M. (2000). Students' experiences of ability grouping - disaffection, polarisation and the construction of failure. *British Educational Research Journal*, 26(5), 631-648.
- Boler, M. (1999). *Feeling power: Emotions and education*. New York: Routledge.
- Boylan, M (2004). *Questioning (in) school mathematics: Lifeworlds and ecologies of practice*. Unpublished PhD Thesis, Sheffield Hallam University.
- Boylan, M., Lawton, P., & Povey, H. (2001). "I'd be more likely to speak in class if...": Some students' ideas about increasing participation in whole class interactions. In M. Heuvel-Panhuizen, (Ed.) *Proceedings of the 25th Conference of The International Group for the Psychology of Mathematics Education (PME)*, (Vol 2, pp. 201-208). Utrecht: Freudenthal Institute
- Boylan, M., & Povey, H. (In press a). Telling stories about mathematics. In L. Black, H. Mendick, & Y. Solomon (Eds.), *Mathematical relationships: Identities and participation*. London: Routledge.
- Boylan, M., & Povey, H. (In press b). Promoting equality in the mathematics classroom. In M. Cole (Ed). *Promoting equality in schools: The later years*. London: Continuum.
- Bourdieu, P., Accardo, A., Balazs, G., Beaud, S., Bonvin, F., Bourdieu, E., et al. (1999). *The weight of the world: social suffering in contemporary society*. Polity: Cambridge.
- Breen, C. (1991). Concerning Mr Smith and his (very brief) reign of terror. *Pythagoras*, 25, 31-37.
- Breen, C. (2000). Becoming more aware: Psychoanalytic insights concerning fear and relationship in the mathematics classroom. In T. Nakahara & M. Koyama, (Eds.), *Proceedings of the 24th Conference of the International Group for the Psychology of Mathematics Education (PME)*, Hiroshima, Japan, (Vol 2 pp. 105-112). Hiroshima. PME.
- Browne, R. (2007). Working assumptions of a sociodramatist. *British Journal of Psychodrama and Sociodrama*. 22(1), 33-46.
- Burton, L. (1996). A socially just pedagogy for the teaching of mathematics. In P. Murphy & C. Gipps (Eds.), *Equity in the classroom: Towards effective pedagogy for girls and boys*. (pp. 136-146). London: Falmer.
- Chizek, E., & Chizek, A. (2002). Paths to social change: examining students' responsibility, opportunity, and emotion toward social justice. *Education and Urban Society*. 34(3), 283-297.
- Chubbuck, S., & Zembylas, M. (2008). The emotional ambivalence of socially just teaching: A case study of a novice urban schoolteacher. *American Educational Research Journal*, 45(2), 274-318.
- Day, C., & Leitch, R. (2001). Teachers' and teacher educators' lives: The role of emotion. *Teaching and Teacher Education*, 17, 403-415.
- Ernest, P. (1991). *The philosophy of mathematics education*. London: Falmer.
- Fox, J. (Ed) (1987). *The essential Moreno*. New York: Springer Publishing.
- Friere, P. (1972). *Pedagogy of the oppressed*. Translated by Ramos. London: Penguin.
- Frankenstein, M. (1989). *Relearning maths: A different third R - radical maths*. London: Free Association Books.
- Gewirtz, S. (1998). Conceptualizing social justice in education: Mapping the territory. *Journal of Education Policy*, 13(4), 469-484
- Goldstein, L., & Lake, V. (2000). "Love, love and more love for children": Exploring preservice teachers' understanding of caring. *Teaching and Teacher Education*, 16, 861-872.
- Goleman, D. (1996). *Emotional intelligence: Why it can matter more than IQ*. London: Bloomsbury.
- Griffiths, M. (2003). *Action for social justice in education*. Maidenhead: OUP.
- Gutstein, E. (2006). *Reading and writing the world with mathematics*. Routledge: New York.
- Gutiérrez, R. (2002). Enabling the practice of mathematics teachers in context: Towards a new equity research agenda. *Mathematical Thinking and Learning*, 4(2&3), 145-187.
- Hannula, M., & Breen, C. (2001). Expanding researchers' ability to study student experiences. In M. Van de Heuvel-Panhuizen, (Ed). *Proceedings of the 25th Conference of the International Group for the Psychology of Mathematics Education (PME)*, (Vol 1, p. 271). Utrecht: Freudenthal Institute.
- Hargreaves, A. (1998). The emotional practice of teaching. *Teaching and Teacher Education*, 14(8), 835-854.

- Boylan, M. (2009) Engaging with issues of emotionality in mathematics teacher education for social justice
- Hargreaves, A. (2000). Mixed emotion: teachers' perception of their interactions with students. *Teaching and Teacher Education* 16, 811-826.
- Hothschild, A. (1983). *The managed heart: The commercialisation of human feeling*. Berkeley, CA.: University of California Press.
- Ireson, J., Clark, H., & Hallam, S. (2002). Constructing ability groups in the secondary school: Issues in practice. *School Leadership and Management*, 22 (2), 163-176.
- Jackson, C. (2006). Preparing initial teacher education students for single-sex groups. *IOWME Newsletter* 20 (3), 25.
- Kellermann, F. (2007). *Sociodrama and collective trauma*. London: Jessica Kingsley Publishers.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- McDonald, M. (2005). The integration of social justice in teacher education: Dimensions of prospective teachers' opportunities to learn. *Journal of Teacher Education*, 56(5), 418-435
- Mendick, H. (2006), *Masculinities in mathematics*. Maidenhead: OUP.
- Mindell, A. (1995). *Sitting in the fire: Working with conflict and diversity*. Portland: Lao Tse Press.
- Moreno, J. (1993). *Who shall survive?* McLean VA: American Society of Group Psychotherapy and Psychodrama.
- Nardi, E., & Steward, S. (2003). Is Mathematics T.I.R.E.D? A profile of quiet disaffection in the secondary mathematics classroom. *British Educational Research Journal* 29(30), 345-363.
- Noddings, N. (1993). Politicising the mathematics classroom. In S. Restivo, J.P. Van Bendegem, and R. Fischer (Eds.) *Math worlds: Philosophical and social studies of mathematics and mathematics education* (pp. 150-161). Albany: SUNY press.
- Noel, J. (1994). From awareness through emotions to action. *Journal of Teacher Education*, 6(4), 267-273
- North, C. (2006). More than words? Delving into the substantive meaning(s) of "social justice" in education. *Review of Educational Research*, 76(4), 507-535.
- O'Keefe, J. (2004). *Protecting the republic: The education and training of police officers*. Saddle River, N.J.: Prentice Hall.
- Paetcher, C. (2001). Gender, reason and emotion in secondary mathematics classrooms. In P. Gates (Ed.), *Issues in mathematics teaching*, (pp. 51-63). London: Routledge.
- Povey, H (2003). Teaching and learning mathematics: Can the concept of citizenship be reclaimed for social justice? In Burton, L. (Ed.), *Which Way Social Justice in Mathematics Education*, (pp.51-64). Westport CT: Praeger Publishers.
- Povey, H., Burton, L., Angier, C., & Boylan, M. (1999). Learners as authors in the mathematics classroom. In L Burton (Ed) *Learning mathematics, from hierarchies to networks*, (pp. 232-245). London: Falmer.
- Restivo, S. (1992). Mathematics in society and history. *Episteme*, 20. Dordrecht: Kluwer.
- Ruiz, A. (2002). 'Wanted: teachers with conciencia' In L. Darling-Hammond, J. French, & S. Paloma Garcia-Lopez, (Eds.), *Learning to teach for social justice*, (pp. 192-200). New York: Teachers college press.
- Skovmose, O. (1994). *Towards a philosophy of critical mathematics education*. Dordrecht: Kluwer.
- Skovsmose, O., & Nielsen L. (1996). Critical mathematics education. In Bishop, A. et al. (Eds.), *International handbook of mathematics education*, (pp. 1257-1288). Dordrecht: Kluwer.
- Staples, M. (2008). Promoting student collaboration in a detracked, heterogeneous secondary mathematics classroom. *Journal of Mathematics Teacher Education*, 11, 349-371
- Sternberg, P., & Garcia, A. (2000). *Sociodrama: Who's in your shoes?* Westport CT: Praeger
- Sutton, R., & Wheatley, K. (2003). Teachers' emotions and teaching: A review of the literature and directions for future research. *Educational Psychology Review*, 15(4) 327-358.
- Tatum, B. (1992). Talking about race, learning about racism: The application of racial identity development theory in the classroom. *Harvard Educational Review*, 6,21-24.
- Taylor, S., & Sobel, D. (2001). Addressing the discontinuity of students' and teachers' diversity: A preliminary study of preservice teachers' beliefs and perceived skills. *Teaching and Teacher Education*, 17, 487-503.

- Boylan, M. (2009) Engaging with issues of emotionality in mathematics teacher education for social justice
- Telesco, G. (2006). Using sociodrama for radical pedagogy: Methodology for education and change. *Radical Pedagogy* 2006.
- Vithal, R. (1999). *In search of a pedagogy of conflict and dialogue for mathematics education*. Unpublished PhD Thesis. Aalborg University, Denmark.
- Walkerdine, V. (1988). *The mastery of reason: Cognitive development and the production of rationality*. London: Routledge.
- Weiner, R. (1997). *Creative training: Sociodrama and team-building*. London: Jessica Kingsley Publishers.
- William, D., & Bartholomew, H. (2004), It's not which school but which set you're in that matters: The influence of ability grouping practices on students progress in mathematics. *British Educational Research Journal*, 30(3), 279-293.
- Williams, S. (2001). *Emotion and social theory*. London: Sage.
- Young, I. (1990). *Justice and the politics of difference*. Princeton, NJ.: Princeton University Press.
- Zembylas, M. (2003). Emotions and teacher identity: a poststructural perspective, *Teachers and Teaching: Theory and Practice*. 9(3), 213-238.
- Zembylas, M. (2005). *Teaching with emotion: A postmodern enactment*. Charlotte, NC: Information Age Publishing.
- Zembylas, M. (2007a). Mobilizing anger for social justice: The politicization of the emotions in education. *Teaching Education*, 18 (1), 15-28.
- Zembylas, M. (2007b). Emotional ecology: The intersection of emotional knowledge and pedagogical content knowledge in teaching. *Teaching and Teacher Education*, 23, 355-367.