Official pedagogic identities from South African policy - some implications for specialist mathematics teacher education practice[1]

Diane Parker
University of KwaZulu-Natal, Pietermaritzburg, South Africa.
parkerdc@ukzn.ac.za

In South Africa the National Curriculum Statements for FET Mathematics (DoE, 2003) together with the Norms and Standards for Educators (DoE, 2000) are key policy documents that provide the official basis for mathematics education reform and for the construction of new pedagogic identities. I use a framework based on the work of Bernstein (1996, 1999, 2000) to theorise the construction of pedagogic identities. I use this to build on Graven's (2002) description of the new *official* pedagogic identity of the SA mathematics teacher and raise questions related to teacher knowledge and the challenges of developing specialist mathematics teacher identities through initial teacher education programmes.

Introduction

The past decade has been characterised by major transformations in South African society. There has been a concerted effort by the state to radically transform the Apartheid educational terrain through new policies and practices. A major *political* project has been to radically transform the pedagogic identities of teachers working within the system and to produce new teachers who meet these transformation ideals.

A major concern of education reform is to change "the bias and focus of official knowledge" and to construct new *pedagogic identities* in teachers and learners. The new pedagogic identities emerge as reflections of differing discursive bids "to construct in teachers and students a particular moral disposition, motivation and aspiration, embedded in particular performances and practices" (Bernstein, 2000: 65).

New policy statements overtly give details of the *kind* of teacher and learner envisaged by the new curriculum:

> … (T)eachers and other educators are key contributors to the transformation of education in South Africa. The National Curriculum Statement Grades 10-12 ... visualise teachers who are qualified, competent, dedicated and caring. They will be able to fulfil the various roles outlined in the Norms and Standards for Educators.

And

> The kind of learner ... is one who will be imbued with the values and act in the interests of a society based on respect for democracy, equality, human dignity and social justice as promoted in the Constitution. … (L)earners emerging from the Further Education and Training band must … have access to, and succeed in, lifelong education and training of good quality; demonstrate an ability to think logically and analytically, as well as holistically and laterally; and be able to transfer skills from familiar to unfamiliar situations. (DoE, 2003: 5)

These quotes, from the introduction to the National Curriculum Statement (NCS) for FET[2]Mathematics (grades 10 – 12), give a symbolic picture of 'ideal' teachers and

[1] Acknowledgement: This work is supported by a grant awarded by the National Research Foundation (South Africa) under the Thuthuka (Researchers in Training) programme: GUN 2052952 – Mathematics Teacher Education.

[2] South Africa schooling is divided into 'bands'. The General Education and Training (GET) - grades 1 to 9, and Further Education and Training (FET) - grades 10 to 12.

learners. They point to the vision of the kind of *moral disposition, motivation and aspiration* desired in teachers and learners by the SA state and more generally by SA society. The role of teachers as agents of transformation is clearly articulated. The NCS for Mathematics goes on to describe some of the *particular performances and practices* in which these should be embedded, and indicate both the nature of mathematical knowledge to be acquired and how it should be acquired and assessed.

Other policy, the Norms and Standards for Educators (NSE, DoE, 2000), describes what it means to be a 'competent professional educator' in South Africa. It provides a vision of a professional teacher who is able to integrate a complex set of seven teacher roles with social, economic and moral responsibility. The roles include being: mediators of learning; interpreters and designers of learning programmes and materials; leaders, administrators and managers; scholars, researchers and lifelong learners; community members, citizens and pastors; assessors; and subject specialists. The NSE describes in generic terms the 'applied and integrated competences', that constitute the roles. These are: foundational competence (knowing that / what), practical competence (knowing how); reflexive competence (knowing why), integrated so that teachers know *what* to do, *why* it should be done, *when* to do it, and *how* to do it in the moment of practice.

The NSE and NCS project a *symbolic image* of what is expected of mathematics teachers in the new reformed system. This is an *official* image of a desired pedagogic identity, a policy image and not a constructed reality. The *competent professional mathematics teacher* for post-apartheid South Africa characterised in the image is expected to be produced though curriculum reform in teacher education. Teacher education thus faces a major challenge: to produce new teachers in this new image through newly designed pre-service and in-service teacher qualifications, and so, to institutionalise the 'bias and focus' of official knowledge.

In the next section I describe the context of teacher education reform in SA. I go on to briefly theorise the notion of 'pedagogic identity' and provide an analysis the *official* pedagogic identity of FET mathematics teacher in SA as projected by the policy. I discuss this in the light of debates in the field around knowledge for specialist mathematics teaching and teacher learning. Tensions between different demands produce challenges for mathematics teacher educators in relation to the way in which they could construct their curricula. How they select and privilege knowledge and practices for teacher learning, will have consequences for the construction of a specialised identity of 'mathematics teacher' in and for SA within this new context.

The context of teacher education in SA

Teacher education has undergone rapid transformation that has included a delocation and relocation of pedagogic practices from colleges of education regulated and controlled by the state, to relatively autonomous Universities and Technikons located in the higher education sector. This movement has created a space for mathematics teacher educators/ researchers and mathematicians to play a major reform role by designing new curricula (criteria) for the development of new *mathematics* teacher identities.

In the terms of the NSE the 'specialist role' is marked out as the "the overarching role into which the other roles are integrated, and in which competence is ultimately assessed" (DoE, 2000: 12). In terms of initial qualifications for FET mathematics

teachers, there is no prescription of what ought to be taught, how it ought to be taught, or what *'the disciplinary basis of content knowledge, methodology and relevant pedagogic theory'* (DoE, 2000: 28) is in substantive terms. It is left up to the teacher educational professionals to produce the criteria for the specialisation. The policy sees FET teaching as a *specialist domain* and specifies the possibility of providing single subject (discipline-based) qualifications. This produces the possibility of focussed qualifications.

There are two ways to qualify as a FET mathematics teacher in SA. A 3-year general formative degree with at least 2 years study in mathematics, followed by a professional certificate in education (PGCE), or, a new undergraduate Bachelor of Education (B.Ed) which integrates the academic and professional components into a 4-year degree. I am interested in the possibilities inherent within the field for the development of *initial* mathematics teacher identities through a specialist B.Ed programme, particularly in the potential for different forms (modalities) of specialised curricula to produce different forms of 'specialist consciousness' (Bernstein,1996, 2000) in mathematics teachers.

In South Africa, there are multiple dimensions to this task. As Adler (2004: 6) points out, we work in a "socio–cultural and political context deeply scarred by apartheid education". In the field of mathematics the unequal distribution of knowledge and 'ability' is starker than in most areas of the school curriculum, and is a product of unequal opportunities under apartheid. The National Strategy for mathematics and science (DoE, 2001: 12) highlights the dismal performance of black African candidates in mathematics. In the interests of transformation it is necessary to create access routes into mathematics teaching for students who would not normally 'make the grade' for entry into university mathematics courses. This is a major challenge for teacher educators: it is not only necessary to develop an identity as 'mathematics teacher', it will also be important to develop an identity as 'able mathematics learner'.

Theorising Pedagogic Identities: official and local

For Bernstein pedagogic identities are 'forms of consciousness'. Any particular reform represents an *approach to regulating and managing change*, moral, cultural and economic, which are expected to become the lived experiences of teachers and students, through the *shaping of consciousness*. (Bernstein, 2000)

For Bernstein, the power (classification) and control (framing) relations of any pedagogic practice regulate the acquisition of pedagogic identity. The selections of knowledge(s), performances and practices and their evaluation rules (criteria for recognition and realisation[3]) relay a particular social order and way (mode) of knowing and being, whether explicitly or tacitly. The acquisition of the specialised consciousness produces particular *orientations to meaning* – ways of recognising and realising what is constituted as the 'legitimate text'. This comes "to have the force of the natural order and the identities that it constructs are taken as real, as authentic, as integral, as the source of integrity" (Bernstein, 1996:21).

[3] Briefly, 'recognition rules' are the criteria (special relationships) for making distinctions – for distinguishing the speciality of a thing/ a practice/ a specialisation/ a context – what makes it what it is – they are 'rules' for recognising the 'legitimate text'. 'Realisation rules', are the means for creating and producing the special relationships internal to what is recognised as the 'legitimate text' i.e. being able to (re)produce/ create the speciality in practice. (Bernstein, 1996, 2000)

For Bernstein (2000) local identities are social identities, constructed through social location. These vary with age, gender, social class, occupational field and economic and symbolic control. They are not necessarily stable positions and shifts can be expected depending on maintaining the discursive/ economic base of the identity. This fits with Castells (1997) concept of identity as a source of individual meaning and experience that should be distinguished from social 'roles'. Roles are defined by norms structured by institutions and organisations of society, whereas identities are sources of meaning for the actor, constructed through a process of individualisation. Identities organise meaning and roles organise functions. Meaning is the symbolic identification by social actors of the purpose of their actions.

This helps point to the difference between an *official* pedagogic identity and a *local* pedagogic identity of a teacher. The official pedagogic identity is constructed through descriptions of what 'ought to be' based on particular projections by institutions of the roles, knowledge codes and social modes individuals ought to take up (official knowledge). Local pedagogic identity is constructed sociologically in local educational and historical contexts. Thus while official teacher identities can be designed on the basis of 'teacher roles', local teacher identities cannot – teacher identities emerge, enabled or constrained, within the pedagogic context (Graven, 2002a).

In this understanding local pedagogic identities are not individual (cognitive) attributes, neither are they simply constructed politically or as a result of a curriculum prescription, they are constructed through an interplay of the 'voice-message' system (Bernstein, 1996), an interplay between official and local knowledge and practices within an educational community. Thus the 'legitimate' text (e.g. what is accepted as 'good mathematics practice ' and 'good mathematics teaching practice') is constructed through a relay between transmitters (e.g. specialists in the field of teacher education) and acquirers (novice teachers). Thus teacher identity is embedded in the social practices of a community with "a particular social order" and develops through relationships "of reciprocal recognition, support, mutual legitimisation and finally through negotiated collective purpose" (Bernstein, 1996: 73).

The *official* pedagogic identity projected from SA policy

Policy documents can be analysed to identify the particular 'bias and focus' of official knowledge and to examine the official pedagogic identities they project, and therefore to unpack what it might mean to produce the *kind of teacher* expected. This should be critically reflected on in terms of research in the field to produce a local resource for the construction of curricula for specialising forms of consciousness. A clear picture of the projected official pedagogic identity requires a detailed document analysis. Here I only have space to give a sketch of some characteristics of this policy image from SA.

Graven's (2002) analysis of the official pedagogic identity projected SA policy base, focuses on senior phase general education teachers (grades 7 – 9), and effectively illuminates some of the main differences in the 'outgoing' roles of teachers and their future 'incoming' roles as designed within the new education system. Rather than focusing on generic aspects, she develops this specifically in relation to the mathematical demands of teacher learning. She shows that there is a movement in thinking about teaching and learning within SA education from a performance-based to a competence-based pedagogy, and from a collection to an integrated knowledge

code. She uses this together with an analysis of specific curriculum statements for the mathematics 'learning area' to identify four different *orientations to mathematics*, and from this four *mathematical roles* teachers are expected to fulfil, each with its own mathematical demands. These are summarised as: mathematics for critical democratic citizenship; mathematics as relevant and applicable to aspects of everyday life and local contexts; mathematics for its beauty and intrinsic value, and as a way of communicating in, thinking about and viewing the world; and, mathematics as conventions and skills to master in order to gain access to further studies. I agree with her analysis and have used her framework to extend the analysis to the new NCS for FET mathematics.

The NCS (DoE, 2003: 9) projects an image of mathematics as practice - a "human activity" practised by all cultures – that enables *creative and logical reasoning*. It sees mathematical knowledge as constructed by "observing patterns, with rigorous logical thinking, … lead(ing) to theories of abstract relations". It is thus a way of seeing and thinking about the world systematically and using abstract structured principles. Further it is "developed and contested over time through both language and symbols and by social interaction and is thus open to change". Mathematical problem solving is seen as a key element which "enables us to understand the world and make use of that understanding in our daily lives".

Conceptual progression in the discipline is emphasised and some of the more overtly political and more controversial integrated aspects of the original GET version are de-emphasised. The FET curriculum is specialised, and the focus is on the discourses of abstract and applied mathematical knowledge, and structures and processes for entry into further studies in the mathematical sciences (i.e. mathematics, applied mathematics and mathematical statistics). Mathematical literacy is not an overt focus of this curriculum. This NCS promotes the notion of mathematical activity as a knowledge field, rather than a single discipline (Bernstein 1999).

Much of Graven's (2002) analysis still holds for the FET NCS: There is a shift in philosophy - mathematics is seen as a human activity and fallibilistic discipline, and mathematics learning is seen as relational and meaningful in its own right, and useful and meaningful to life. There is a shift in approach to mathematics teaching – a socio-constructivist, learner –centred, discussion-based approach is advocated. There is an extended role for mathematics education: it empowers learners to make sense of society, provides access to further studies in the discipline and to extended future careers; it enables them to respond "responsibly and sensitively to personal and broader societal concerns" and to engage "responsibly with quantitative arguments relating to local, national and global issues"(DoE, 2003: p10). There are also shifts in the contents to be taught.

There are some very important differences between the contents of the new NCS and the old curriculum. The curriculum is organised in terms of 4 major outcomes and the contents are distributed across the outcomes in a non-linear fashion and linked through processes or ways of reasoning rather than being defined as topics. There are some entirely new foci e.g. much of synthetic geometry is incorporated under 'space and shape and measurement', as are aspects of trigonometry. The old focus of formal Euclidean Geometry as been muted (although aspects are still incorporated) and new kinds of geometry have been introduced, e.g. transformation, spherical and 'taxi-cab' geometry. The mathematical processes leading to the need for proof and the

construction of arguments leading to proof are the focus of activity and not the formal structured proofs themselves. The curriculum is just as focused on the processes of mathematical thinking and mathematical proficiency (Kilpatric et al, 2001) as it is on the actual contents and products of the discipline. Other new knowledge areas include data handling which was never dealt with before. Both descriptive statistics and aspects of probability are included. There are areas of applied math that are expanded (specifically financial mathematics and economic applications) and another new area, that of mathematical modelling. The historical development of mathematical concepts and processes is promoted as a resource for teaching and learning.

This is not a reform curriculum that is based on 'generic' knowledge and a 'watering down' of mathematics, rather it seems it is a curriculum that is very concerned with mathematics and mathematical ways of being and seeing. The new mathematics teacher needs to be competent in these extended curriculum areas – she needs to develop a number of pedagogic identities, each related to a specialist knowledge discourse: an identity as mathematician; applied mathematician and statistician. In addition to acquiring the criteria (recognition and realisation rules) for these specialised forms of consciousness, she needs to develop a specialised pedagogy in relation to each "for the complex task of transforming this knowledge into appropriate opportunities for learning in school" (Adler, et al, 2002: 151).

Whereas the earlier curriculum was very much product oriented working on the basis of 'received' knowledge (Boaler, 2002) this curriculum is not - it is more practice oriented and focused on producing "connected" knowledge". It focuses on the practices of mathematics (e.g. investigating, making conjectures, justifying, generalising etc.) rather than simply the skills (e.g. factorising) and the products (e.g. 'laws' of exponents'); and on making meaning not only though problem solving contexts, but also within the structure of mathematics itself. The implication is that teachers' mathematical identities should constructed as 'connected' (ibid.), 'mathematically proficient', and particularly, they should have 'productive dispositions' (Kilpatric, et al, 2001) towards mathematics and be able to engage in a 'dance of agency' (Pickering as used by Boaler, 2002).

These changes represent major shifts for most prospective mathematics teachers whose mathematical identities were constructed under an 'old' (outgoing but still existing) education system (Graven 2002). Teachers need to implement these new ideals in their classroom practice. This means that will need to develop new images of 'good practice' for mathematics teaching (recognition rules), and new pedagogic identities (forms of consciousness) that enable them to carry out these practices (realisation rules). Teacher educators will need to construct curricula for producing these outcomes.

Conclusion

Acquisition of the recognition and realisation rules for a specific practice (say learning mathematics or teaching mathematics) will depend on the evaluation rules of the pedagogic discourse – the criteria of what is seen to be the 'legitimate text'. So a different specialised consciousness could be acquired depending on the selection and organisation of knowledge contents, what is recognised as legitimate knowledge and practice and the pedagogic modes of its transmission. (An example of this in relation to mathematical learning identities is seen in Boaler's (2002). In the study both sets of students were 'successful' at mathematics. But the modalities of practice were

constructed differently and produced different mathematical identities: both in terms of what they *recognised* as 'legitimate' mathematics and in terms of *how* they *realised* this in practice, and therefore the *personal relationship they developed with the discipline*).In this paper there is no space to elaborate the arguments I make to justify the position I take on the above. All I have space to do is to summarise some tentative conclusions of my initial analysis (a working hypothesis) based on research in the field.

In the context of designing initial 4-year education programmes there is a danger: much of the work in the literature relates to in-service work, or initial teaching where the teacher has already developed and identity as 'able mathematics learner'. In the SA context this needs to be part of the initial education programme. In the field, learning mathematics (becoming a mathematician) is often conflated with learning to teach mathematics (becoming a teacher of mathematics) and practising as a mathematics teacher (becoming a mathematics teacher). For example, Ball and Bass's (2000) criticism of the 'fragmented curriculum' of teacher education programmes in terms of the difference between working as a mathematician (compressing knowledge), which they seem to want to discard, and working as a teacher (decompressing knowledge) which they want to privilege. Another example is Ensor's (2000, forthcoming) work which is concerned with teacher's mathematics education (and teacher education) practices and not teachers learning mathematics.

I argue that practising *mathematics teaching* (learning a professional practice) and *practising mathematics* (learning mathematics – a disciplinary practice) are two distinctly different types of activity related to distinct knowledge discourses (Bernstein, 1999). I argue that initial mathematics teachers require *both*, particularly in times of reform where *new* mathematical learning identities *and* teaching identities need to be formed. Although these are connected discourses, I argue they should *not* be learnt at the same time since they work in opposite directions (as Ball and Bass (2000) so clearly show with their discussion on compressing and decompressing knowledge). I also argue for a third distinct discourse, created in the growing research domain of mathematics education, which focuses on developing knowledge about teaching and learning mathematics (learning mathematics education).

Thus there are three different mathematically related pedagogic identities that a novice teacher needs to develop. An identity as mathematician[4] (learning mathematics – becoming a mathematician); an identity as a student of mathematics education research (becoming someone who is interested in pursuing studies in math education and learning from research); and, an identity as a mathematics teacher (becoming someone who can utilise their knowledge of mathematics, mathematics education and education more generally to help learners develop productive mathematical identities that keep them interested and motivated to learn the discipline at higher levels). In each case recognition and realisation rules for 'legitimate' knowledge and practice need to be developed, and knowledge resources and practices need to be selected for this purpose. Each of these identities is a product of access to *a different knowledge discourse* - each with its own ways of thinking and doing (practices), and different organisational structures (vertical and horizontal) and grammar (strong or weak) (Bernstein, 1999). Each one needs to be *designed*, with careful consideration given to the criteria for the selection of the privileged reservoir for recognising the practice and

[4] meaning - mathematician, applied mathematician, statistician.

repertoire for realising the practice (using an adaption of Ensor's (2000, forthcoming) language). It is not only important *what* is selected but also *how* it is made available.

In the context of curriculum reform in SA, teacher educators with an interest in producing specialist mathematics teachers have a responsibility to contest for space and time in their under graduate curriculum. To argue for the specialised focus, to compete for resources, to project their particular 'bias and focus' into the official pedagogic identity projected form their institutions. To research and produce criteria so novice teachers may acquire these specialist *mathematical* identities and practices – so that they can recognise them and put them into practice. The modalities of practice and knowledge discourses selected and co-ordinated in the 4 year degree curriculum *do matter* and may have profound effects on the construction of new specialist mathematics teacher identities for and in SA.

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