Cite as: Edwards, J. & Jones, K. (1999), *The struggle for a socially-just pedagogy: an ethnographic study of a mathematics classroom*. Centre for Research in Mathematics Education Working Paper. Southampton: University of Southampton.

The Struggle for a Socially-just Pedagogy: an ethnographic study of a mathematics classroom

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This study is based in a social-constructivist framework, interpreted through the lens of feminist and other emancipatory writing. The researchers combine ethnographic and action research methods to explore the activity of a teacher working in what she views as a 'constitutively oppressive' context. The focus is on examining how successful the teacher can be in recognising and valuing a variety of forms of knowing while working within a curriculum context that appears to privilege one particular form of knowledge. The study was designed and carried out through collaboration between teacher and researcher. It illustrates how the teacher is mostly successful in generating a connected form of knowing for her pupils, albeit at the expense of her continuous struggle against the constraining influence of what she experiences as formidable external pressures.

Introduction

An important strand in research in mathematics education indicates that students in the mathematics classroom come to understand what it means to do mathematics through the practices into which they are socialised (see, for example, Steffe *et al* 1996). This socialisation process is mediated by the pedagogical intent of the teacher, which, in turn, is influenced by the curriculum framework in which the teacher is expected to work. If the teacher is attempting to develop a socially-just (or inclusive or emancipatory) pedagogy, then she is intent on recognising and valuing a plurality of forms of knowledge and ways of knowing (Solar 1995). Yet external factors may serve to privilege certain forms of knowledge (and knowing) and this may make the task of ensuring the achievement of all students all the more difficult.

It was the impact on an experienced teacher of mathematics in the UK of the form of statutory curriculum framework prescribed by the UK Government at national level, together with associated legislation to engender competition between schools, that provided the motivation for this study of classroom practice. It was the experience of this successful teacher that these external requirements were making it more difficult for her to promote a plurality of forms of knowledge and ways of knowing in her classroom.

Given these external pressures on the teacher, the classroom research we describe in this paper examines how successful the teacher can be in recognising and valuing the variety of forms of knowing. The particular results we discuss here come from a collaboratively designed and carried out ethnographic study of the classroom practice of an experienced teacher of mathematics. It illustrates how the teacher is mostly successful in generating a connected form of knowing mathematics for her pupils, but that this is at the expense of a continuous struggle by the teacher against the constraining influence of the formidable external pressures.

Theoretical Framework

We developed the theoretical framework for the study from work in feminist and other emancipatory endeavours. The particular component applied to the research described in this chapter comes from the work of Becker (1995), who has developed a model of mathematics

teaching around what have been referred to as 'women's ways of knowing'. Becker describes her pedagogical approach as promoting 'connected' thinking. She identifies the dualisms set out in Table 1, which she refers to as "separate" and "connected" ways of knowing.

Separate knowing	Connected knowing
Logic	Intuition
Rigour	Creativity
Abstraction	Hypothesizing
Rationality	Conjecture
Axiomatics	Experience
Certainty	Relavitism
Deduction	Induction
Completeness	Incompleteness
Absolute truth	Personal process tied to cultural
Power and Control	environment
Algorithmic approach	Contextual
Structure and formality	

Table 1: "separate" and "connected" ways of knowing.
(Source: Becker 1995, p 167, after Gilligan 1985)

Becker, in response to these dualisms, argues that 'connected' thinking demands a model of 'connected' teaching. There are seven main elements to her model, each with a set of related factors which define the need for a different means of teaching. The first element, 'Voice', requires that education occurs in the context of conversation so that learners are able to gain a sense of self and develop their own authority as learners. This implies the use of group problem-solving, class discussions, student-designed projects in an environment where the teacher does not give the answers. The second element, 'First-hand experience', builds on intuitive understanding, thereby validating learners' knowledge base. This necessitates an active and experiential approach, rather than passive learning. Similarly, the element 'Confirmation of self as knower' depends on learners becoming constructors of knowledge and rule makers. Teachers are expected to listen to learners' reasons and respect their ideas. The fourth element, 'Problem-posing' focuses on process rather than outcomes, allowing learners to see uncertainties and understand knowledge construction. Struggling for a solution and focusing on explanation are seen as a valid means of learning. Giving learners alternative modes for discourse by answering questions with questions provides another element 'Believing versus doubting'. The element 'Support versus challenge' allows learners to become more independent. Their present understanding is validated while accepting new challenges. Finally, the element 'Structure versus freedom' generates the need to give guidance/mentoring without imposing tyrannical expectations. This means that teachers can follow a prepared curriculum while allowing for explorations.

This gender-inclusive model for teaching and learning reflects the different ways students learn and includes elements such as those laid out in Table 2.

- open-ended, problem-based learning
- social and environmental curriculum contexts
- collaborative team approaches
- diversity of teaching and assessment approaches

Table 2: elements of a gender-inclusive model for teaching and learning
(source: Lewis, 1996, p207-208)

In developing this research study we found that this outline of a socially-just pedagogy best fitted the classroom approach being enacted by the teacher chosen for this study, and it was her reflections on this theoretical model that motivated the teacher to take part in the research.

Methodology

Researchers in mathematics classroom research are recognising the inadequacies of traditional research methods to describe, interpret, and analyse the complexities of the social, cultural and learning environment of a regular classroom. Examples of attempts to tackle this classroom complexity include work by Hoyles, Healy and Pozzi (1994) and by Yackel and Cobb (1996).

The approach we adopted in this study was informed by feminist methodology, which is based on the understanding that all research standpoints are perspectival and that standard research methods are utilised within such a methodology. As Harding (1987, p2) puts it:

> A research method is a technique for gathering evidence. ... feminist researchers use just about any and all of the methods, in this concrete sense of the term, that traditional androcentric researchers have used. Of course, precisely how they carry out these methods of evidence gathering is often strikingly different.

In addressing our main research question of how successful the teacher is in recognising and valuing the variety of forms of knowing, a focus that is exclusively or even predominately on the actions of the teacher (as is the case in much other research on pedagogy) would not allow complete insight into the effectiveness of the teacher. The focus has to be both on the teacher and on the pupils and how their classroom work is influenced by the actions of the teacher.

The methodological approach adopted for this research draws from ethnographic and action research procedures to provide a richly textured study of an experienced teacher of mathematics. As Hammersley and Atkinson (1995) say, "ethnographic research is concerned with producing descriptions and explanations of particular phenomena" (p 25). Such an approach seeks to ensure that the teacher is a participative voice in the study rather than solely the object of study. In Lester's terms, the aim is to pursue a "dialogical conversation in order to generate practical knowledge in specific situations" (Lester 1998 p205).

Data was collected in the form of audio recordings of whole-class and small-group interactions taken over a period of eight weeks with a Year 9 mathematics class (13-14 year olds). A Year 10 class (14-15 year olds) a Year 7 class (11-12 year olds) were both also recorded for some of their lessons over a period of two weeks. In addition, observation notes were made of the teacher's classroom practice, and the teacher generated narratives of her actions, thoughts, and reflections.

Data Analysis

This range of data (teacher-generated narratives and classroom observation notes) was analysed for evidence of the seven elements of Becker's model for connected teaching using both the sixteen descriptors for the 'importance for connected teaching' and the 23 descriptors for 'connecting teaching in mathematics'.

The teacher-generated narratives were analysed for evidence of the influence of external pressures on the development of her pedagogic practice. Such external influences included the specification of the prescribed National Curriculum in the form of disembodied content, a system of national testing based on timed, pencil and paper tests, league tables of school performance, an inspection system that grades teachers, and, most recently, nationally determined target setting for student performance in national tests.

In her self-generated narratives, the teacher writes that her pedagogy is "affected by deeply held feminist and anti-racist views, and a commitment to the provision of genuine equal opportunities, fuelled by seventeen years of teaching in inner-city multi-ethnic schools". She says that "the separation of areas of mathematics into attainment targets [through the structure of the UK national Curriculum] makes the planning for learning significantly more difficult, possibly less effective and certainly less enjoyable". She also details the restricting effect of national testing, and comments on the reduced opportunities for cross-curricular work due to tightly-defined subject boundaries. She says that "it is now more difficult to find support (and a time commitment) within schools to promote equal opportunities, though the opportunity remains to do so in the classroom".

Despite these pressures, analysis of the classroom data provides evidence of all seven of the main elements in Becker's model of connected teaching. In addition, evidence from the small-group talk within the classroom demonstrated 13 of the 16 components within the 'importance for connected teaching' strand of the model.

Discussion

In this section we provide some reflexive comments on the approach adopted for this study and the worth of the findings. The collaborative approach was designed to improve the validity and reliability of the study, and hence the trustworthiness of the findings. The claims being made here have been subject to open negotiation, which Lester (1998, following Schwandt) claims leads to practical wisdom. Such practical wisdom may, according to Lester, provide a guide to future deliberative action. It is a concern for making positive change in the classroom that has guided this research. While it remains the study of a single teacher, the generalisibility or usefulness of the study may only emerge in the extent to which it informs further studies of the struggle to develop a socially-just pedagogy.

Yet the approach did place considerable demands on the teacher involved in the study. There are also somewhat unresolved ethical issues to do with identifying aspects of the research setting when the teacher involved is quite rightly jointly involved in publication of the research. Relying on teacher's narratives is also a relatively recent methodological development, although in this case, such reliance was only one component of the data. The choice of audio rather than video recording was based on the less intrusive nature of audio equipment. On the other hand, such a decision was dependent on teacher as collaborator in accurately identifying pupil voices.

It should be stressed that the classroom setting for this study and the evidence provided by this setting are reflexively related. There is the possibility of tautological reasoning in the claims made for the evidence in that each can only be interpreted in relation to the other. However, as Steffe (1991) argues, a constructivist classroom, by its very nature, requires a naturalistic enquiry research method. Similarly, Smith's (1987 p84) argument that "the inquirer must be located in the same critical plane as the subject of research" justifies the feminist research perspective. It is within this framework that this study is undertaken and the evidence analysed.

Outcomes

Empirical studies of socially-just and feminist pedagogic models in mathematics education reported in the literature are, to date, mainly at University level (Barnes and Coupland 1990, Isaacson 1990, Rogers 1995, provide some examples). Those which are at secondary level are either in science education (Roychoudhury, Tippins and Nichols 1995) or from remedial mathematics programmes (Morrow and Morrow 1995).

This study provides evidence of the impact of a socially-just and feminist pedagogy on student learning within a secondary school mathematics classroom. In particular, we show how such a pedagogy is mostly successful in supporting a connected form of knowing mathematics in the students in the teacher's classes. Such success, however, is very dependent upon the teacher shielding her pupils from what she sees as the repressive nature of a statutory curricular framework that privileges a restricted form of knowing mathematics that mitigates against the success of all pupils in mathematics.

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