

GENDER AND MATHEMATICS REVISITED

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This paper is an outline of the approach I am taking in my PhD research on gender and maths. This issue has been widely debated since the 1980s when second wave feminisms started to have an impact on education, and concern was expressed about the relative underachievement and under-participation of girls in maths. In this paper I situate my work in the context both of the previous research and of the current educational and political climate, in particular the boys' underachievement debate and the marketisation of education. I argue that looking at students' choices to do or to reject maths and the nature of student identifications with maths through their narratives is a productive way of moving forward thinking in this area.

INTRODUCTION

The gender gap in maths performance in this country, while still marginally in favour of boys, is continuing to narrow (Smithers, 2000; Gorard *et al.*, 2001). However, the gender gap in participation in maths remains in spite of more than two decades of feminist initiatives for change. Moreover, maths becomes increasingly male dominated as we progress from sixth-form (ages 16 to 19) to undergraduate levels, and from undergraduate to postgraduate levels (Boaler, 2000). My PhD research asks why it is that girls continue to disproportionately opt out of maths, a powerful area of the curriculum that provides a 'critical filter' (Sells, 1980) into high status areas of academia and employment. I gave two reports taken from this work at BSRLM, one at the New Researchers' Day and one at the Day Conference. Since these are now both being published in full form elsewhere (Mendick, forthcoming a, and Mendick, forthcoming b, respectively), I have decided in this paper to discuss how I am exploring this research problem and why. This is something which was central to both presentations and which provoked some interesting questions. My point is that the questions researchers ask and the way they go about answering them are necessarily value laden political decisions and I am trying here to approach the methodological choices I made critically and reflexively, a process that I think should be part of every research project. I begin with the reason for selecting a research question centred on subject choice, and then examine my methodological focus on narrative.

THE EDUCATIONAL POLITICS OF CHOICE

By focussing on what subjects people study and why, on how they experience the learning process, and on what they do with the knowledge gained, my work encompasses a broader view of educational achievement than does the current narrow emphasis on examination results. It is the current obsession with performativity that is reducing complex problems in the area of gender and education to a single debate around boys' 'underachievement', a debate framed in oppositional terms. This

obsession is also evident in the rhetoric of a class of new managerialists who propound a school effectiveness discourse that is:

Undertheorized in relation to issues of inequalities, they are technician and managerialist in their approaches to schooling; their primary reference point is competitiveness in the global economy; and their primary method is constant testing, often associated with league tables of successful and unsuccessful schools. (Epstein *et al.*, 1998, p. 8)

However, although results dominate political and media discourses on education, 'choice' is a powerful signifier in these discourses because of the way that parents and students are framed, as consumers within the educational marketplace. The problem with this notion of choice is that it exists within the liberal political paradigm, in which choices are seen as individual decisions based on 'natural' talent, which ignores the structural constraints that have an affect at the conscious and unconscious levels. As Shaw (1995, p. 107) has remarked "the most striking feature of subject choice is that the freer it is, the more gendered it is". And this polarisation is part of the lived experience of the 33 ethnically diverse 16 to 17-year-old maths students who I interviewed for my research. However, when I asked them why they think it is that boys and girls tend to choose different subjects the most common responses, from both sexes, are: to be unable to offer any explanation, to tell me that they had not been aware of it until I had pointed it out to them, or to ascribe the differences to individual interests. These young people do not appear to have a language with which to talk about the way in which choices can function to reproduce social inequalities. My research problematises this notion of 'free' choice and looks at the way:

Social regulation can function, not only in a sense through overt oppression, but rather through defining the parameters and content of choice, fixing how we come to want what we want. (Henriques *et al.*, 1984, p. 219)

The insight that choices are one of the ways in which structures of domination and oppression are maintained was one that underlay second wave feminist initiatives in maths education. It is useful to consider the question of why gender polarisation in subject choices persists in spite of these efforts.

THE GENDER POLITICS OF CHOICE

The research stimulated by the debate on gender and mathematics education during the 1970s and 1980s looked at the role of stereotyping in curriculum materials and in the views of teachers, parents and peers, the organisation of schooling, male dominance of classroom space, and female lack of confidence and maladaptive patterns of attribution (see Burton, 1986, for a discussion of this research). From this research and theorising many schemes grew up attempting to persuade more girls to do maths, science and technology. Many of these implicitly assumed that girls were making the wrong choices and hence set out to change girls so that they would make better ones. Such an approach is obviously problematic and I argue that we need to recognise female agency and help girls:

Articulate the constraints-material and social, real and perceived-on their choices...in the absence of such education, exhortations to 'broaden your horizons' and 'reach for the sky' are distorted and often even cruel. (Kenway *et al.*, 1998, p. 46)

By looking at the complex interaction of structure and agency and by critically examining the contexts in which subject choices are situated deficit explanations of girl's rejection of maths can be avoided, demonstrating that these choices are not maladaptive but instead make sense. Girls and women (like boys and men) respond to their environment, and it is this, including maths itself, which needs to change.

Situating subject choices requires attention to both the gender regimes and the mathematical ones in which they happen. It was the theoretical failure to do this that Dunne and Johnston (1994) argue was the problem with the initial feminist interventions. They divide the early research on gender and maths into three categories: work that provides a quantitative documentation of gender differences, that which offers biological explanations for these differences, and that offering sociological explanations for them. The crucial point is that while the biological determinist and the social constructionist positions appear to be radically opposed, Dunne and Johnston's critique identifies two major assumptions that they both share and leave unexamined. First:

The power and position that mathematics holds as a discipline inevitably remains inviolate in the gender and school mathematics research, where the implicit message seems to be that all will be well once sufficient (but clearly not all) girls have access to the power and privileges of maths. (*ibid.*, p. 222)

And second, gender categories are seen as natural and to pre-exist the research. For example, even some of the most radical approaches, such as those advocating single-sex schooling and a girl-centred curriculum, which extol feminine qualities and values over masculine ones, function to reinforce the idea of male and female as binary oppositional categories and emphasise gender differences over similarities. As Walkerdine (1998, p. 23) argues:

The reification of the categories 'girl' and 'boy' produces explanations which favour sex-specific characteristics, so that more complex analyses of masculinity and femininity are impossible.

Dunne and Johnston's approach is a post-structuralist one and theoretically I have found this the most useful way of engaging with the assumptions they identified of maths as legitimately powerful and gender as naturally binary, and of working with the complex dialectic of structure and agency.

USING POST-STRUCTURALISM

Within post-structuralist thinking identities are not the unified, consistent objects they are in liberalism, but are fragmented, unstable and contradictory. Davies (1993, p.13, original emphasis) contrasts a post-structuralist approach to the self with that found in socialisation theory:

Poststructuralist theory argues that people are not socialised into the social world, but that they go through a process of *subjectification*. In socialisation theory, the focus is on the process of shaping the individual that is undertaken by others. In poststructuralist theory the focus is on the way each person actively takes up the discourses through which they and others speak/write the world into existence *as if it were their own*.

Thus although people write their own script they must do this using the discursive resources available to them. I use discourse in the Foucauldian sense to refer to structures of language and practice through which objects come into being. Discourses are knowledges about objects that are powerful because they determine what can be said about something as well as who can say it, and even what can be thought or imagined. This approach does not concern itself with what is true but with how a truth functions in society, with unravelling the productive power of knowledges. For example there are discourses around maths that constitute it as a paradigm of rational thought, as ‘hard’ (as opposed to ‘easy’ and to ‘soft’) and so as an indication of intelligence, and as a necessary prerequisite for entry into financially lucrative areas of employment. There is also a discourse of cultural deviance around maths so that we get the stereotype of the nerd and the geek, along with a discourse of maths as boring and irrelevant to everyday life. These discourses help maintain maths as high status, gendered and for the privileged few. There are also discourses around masculinity, femininity, ability, schooling, and many other things, and it is these that are the raw materials for the identity work that students do through their subject choices.

CHOICES AND IDENTITY

When we choose subjects we are obliged to redefine ourselves and make a public statement about what sort of person we are, or hope to be. It is perhaps the first significant choice of identity. (Shaw, 1995, p. 113)

Choices are about identity and I am exploring these through interviews with students and through classroom observations that provide a context for the interviews. By choosing to do maths students are saying something about who they are, and in asking them about this choice I am asking them to tell me about who they are. My choice of methods for data collection and analysis are theoretically driven because I view:

The processes of interviewing and of being interviewed [as] not simply about the giving and receiving of information but at least as much about speaking identities into being, solidifying them and constantly reconstituting them through the stories we tell ourselves and each other. (Epstein and Johnson, 1998, p. 105)

Unconscious factors form an important part of this process, the “elements of phantasy, the rush of desire and/or disgust, of who we desire and who we wish to be in psychoanalytic terms, the cathexis of object choice and identification” (*ibid.*, p. 116). Exploring these unconscious factors also helps to break down the myth of rational choice that underlies the liberal position critiqued earlier.

When I began examining my interviews I embarked on a thematic analysis. However, it became clear that when looking at all the responses on a particular topic, for example what makes maths similar to or different from other subjects, it was possible to understand these responses on different levels. They could be looked at in isolation, so that some people in drawing parallels to or distinctions from maths spoke of the curriculum, and some of the teaching methods, while others focused on the atmosphere in the class or on the teacher. However, they became more meaningful when looked at in the context of the interview as a whole. To take a typical example, for one student maths' similarity to English was about the teacher, but so too were, the things she selected when asked about what she had enjoyed about maths lessons and about the difference between GCSE (taken at age 16+) and AS-level (taken at age 17+). In fact the role of the teacher permeated her account of school maths. It thus seemed that each interview could be examined more productively as an integral whole through one or more central strands that threaded through many of the responses. I am now developing stories from each of the interviews that interweave the respondent's voice with my more explicitly analytical one. I do not think that my stories reveal the truth embedded in the data, as perhaps a grounded theory approach would suggest, but see them as being an act of creative invention on my part and so intimately connected to my own beliefs and identifications, and in particular my commitment to consider the political possibilities of the stories I tell. When complete the stories are returned to the students who inspired them in order to get their responses to my readings. These stories aim to capture the way students, through a complex process of negotiation and identification, are positioning themselves relative to maths. This is a process in which gender, along with class, 'race' and sexuality, is an important part.

My work spotlights the role of gender. Gender is a central part of anyone's identity, for all socially competent members of society must demonstrate that they have located themselves relative to the binary oppositional categories of male and female. Their subject choices are one of the ways in which they can do this, and these choices can be seen as a form of 'gender category maintenance work' (Davies, 1993), a performance of masculinity or femininity. Something made necessary by the fragility of our identities, the way they are always in process and never complete and so must be continually worked on. I hope that looking at this process through narratives will help us write new stories about maths and about gender.

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