

Marginalising practices of mathematics: Why young people opt out of school mathematics

Bronwyn McMahon, Griffith University, Australia

In developing an understanding of the potential of school mathematics as a marginalising practice, this paper draws on several issues which would seem to be important when considering why young people are opting out of school mathematics and ultimately school. Drawing on Australian and international literature this paper proposes that issues of pacing, the speed of content delivery and the linear discipline of mathematics have potential to marginalise young people. These issues coupled with classroom ethos give further weight to the contention of this paper that school mathematics acts as a social filter thereby reproducing (in most cases) the status quo. Classroom ethos has considerable potential for supporting or denying students access to learning. This is further evident in the assessment practices of school mathematics which verify notions of ability so that young people come to believe that they can or can not do mathematics. In light of these issues the key question for my research is – *who* is most likely to be the victim of the marginalising practices of school mathematics? Through the mathematics curriculum whose knowledge, culture and language are represented and how does this accord with young people as they progress through school, the workplace and society?

Within Australia and many other countries, there is a growing recognition of the importance of young people remaining at school beyond the compulsory years to enhance their employment opportunities. In an extensive study of youth and employment, Lamb (Lamb, 1997a; Lamb, 1997b; Lamb, 1997c) found that retention to Year 12 was a key determinant in gaining sustained employment. Furthermore, he found that within the subject areas within the senior years of schooling, mathematics was the key determinant for sustained employment. Within this context, this paper explores some of the issues surrounding the current situation where significant numbers of young people are not remaining at school, nor undertaking the study of mathematics. The major contention of the paper is that school mathematics is a social practice that serves as a social filter thereby reproducing (in most cases) the status quo. By examining the literature in mathematics education in terms of the marginalisation that it potentially causes, questions are posed as to ways in which young people can be best supported when they have fallen foul of these practices and experience subsequent difficulties in the transition from school to work.

The study

As the major contention of this paper is how school mathematics acts as a social filter to reproduce (in most cases) the status quo, this paper has the dual purpose of contributing to my research project into why young people are opting out of school mathematics and ultimately school. The intention of this paper is to bring to light several issues deemed important to my project and to understanding how school mathematics marginalises some students. The focal point of my study is

to examine to what extent the marginalising practices of school mathematics exclude young people from learning in mathematics. In so doing I intend undertaking a year-long qualitative study of 20 young people who have opted out of school mathematics or have opted out of school and participating in further education programs and literacy/numeracy courses to improve their skills and opportunities for the workplace. For some young people attendance is compulsory, or voluntary, while others are recommended by employment agencies. Through interviews with teachers and young people in school and TAFE colleges it is my intention to identify *how* and *why* young people are excluded in school mathematics and whether participation in education and training programs support and enhance learning for these students. Central to this would be the question of *whose* knowledge, culture and language are represented in and through these programs?

Mathematics as a marginalising practice

In a conference where social and political dimensions of mathematics education are central to debate, the ways in which mathematics education contributes to the marginalisation of a significant number of young people is understood well. Unlike our counterparts in other forums where the focus is on the individual, a forum such as this recognises the structuring practices of school mathematics. As such, it is my intention to provide an overview of the ways in which this is achieved. While I draw primarily on Australian literature since this provides the basis for my proposed study, I extend this to the international arena by supplementing the literature with international literature.

Two key aspects of mathematics as a marginalising practice should be considered. In the first instance, there is a significant body of research that identifies various aspects of mathematics problematic for learning and learners. This body of literature tends to take an apolitical stance and presents the problems as ones that can randomly occur. Considerations of assessment, language, content, pedagogy, or interventions are taken as issues without consideration of a key question for my research – *who* is most likely to be victim of these practices. Whose knowledge, culture and language are represented in and through the mathematics curriculum and how does this impact on young people's status and progress through school? It is this latter aspect that is central to my work.

In considering the practices of school mathematics, I draw on several issues that seem to be important in understanding how mathematics marginalises some young people in their study of school mathematics.

Pacing

British sociologist, Basil Bernstein, has argued strongly that pacing is a key feature of pedagogy. It refers to the speed in which subject content is delivered – in the daily lesson format but also across the spectrum of a year's work (i.e., the yearly plan). While Bernstein does not refer explicitly to mathematics in a

detailed manner, his ideas are highly relevant in mathematics. Ruthven (1987) and others have argued that mathematics is a very hierarchical, linear discipline where concepts and skills build upon each other. This is more so the case in mathematics than any other subject area. School curricula documents reinforce this ideology by sequencing mathematics in a linear and prescriptive fashion. When considering how much knowledge is to be taught in school mathematics and how this is to be organised, it is commonly seen to be a very busy subject. As such, teachers are compelled to cram a considerable amount of work into a small amount of time, making it a very crowded curriculum.

In studying classrooms in Australia, Zevenbergen (2001a) and in the UK Boaler (1997) found that students in (streamed) classrooms experienced different pacing. Both authors found that students in the upper streams were exposed to a very crowded curriculum through which the teachers moved very quickly. Students in these streams often felt that they were given little opportunity to learn mathematics. In part, they felt it was due to the high expectations of them as “bright” students and that they would cope with the work and the pace. In contrast, Zevenbergen found that the students in the lower streams were exposed to a curriculum where the daily pacing of lessons was considerably slower but that the students did not cover the same amount of content as their upper stream peers. This meant that ultimately the students in these streams were excluded from accessing higher levels of mathematics and thereby excluded from many future jobs and access to sectors in higher education. Many of the students in these classes reported feeling cheated from full participation in school mathematics. In the long run, mathematics for these students functioned to perpetuate and legitimate what is valued in mathematics against those students in the lower streams.

Ethos

Many classrooms develop a particular ethos. In his extensive study of effective schools, Hill and colleagues (Hill & Rowe, 1998) report that individual teachers make the most impact on student learning over any other variable - including school type. This research has been instrumental in reform within Australia, supporting the notion that the role of individual teachers is central to enhanced learning. In such a context, the work of Anyon (Anyon, 1997) is important to consider. Her work has been critical of how schools contribute to the marginalisation of young people in the USA. Her ethnographies of schools has shown that teachers often hold very stereotypical views of students and as such can develop practices that work against the success of students – particularly students who come from non-mainstream or non-advantaged backgrounds. Much as the seminal work of Rosenthal and Jacobsen (1969) showed, where teachers have preconceived notions of students, they are likely to interact in particular ways so as to produce, or interpret, behaviours that reinforce their views of students.

In classrooms where teachers have positive or negative views about their students, different practices will develop. In her study of US schools, Oakes (Oakes, 1982; Oakes, Gamoran, & Page, 1992) reported on the practices in schools, and mathematics, that supported the status quo. For young people in classrooms where the learning environment is supportive and exciting, there is greater opportunity for learning than where the environment is oppressive.

In considering many of the young people who are at risk of leaving school early, consideration needs to be made of their learning environments and the ethos that have developed within them. Where students have been placed in settings where there is opportunity for learning and mutual respect between teachers and learners, there is considerable potential for learning mathematics. Conversely, where students have been placed in classes where there is restricted opportunity for learning and mutualistic respect, there is considerable potential for a counter school culture to emerge. In Oakes study of streamed US classrooms, she found that students in the high streams tended to be more enthusiastic about schools (and mathematics) whereas students in the lower streams tended to be more alienated. Gamoran and Berends (1987) also found that student interactions in these classes tended to be more angry and hostile. As such the structuring practices of school and mathematics, along with the ethos that develops within a given classroom have considerable potential for supporting or denying access to learning.

Assessment and ideology

While it has been long recognised that assessment is socially and culturally biased, it remains a powerful tool in school mathematics. From a neo-Marxist perspective, assessment can produce a false consciousness where students come to believe that they are clever (or not) as a consequence of their marks. Many students who leave school early have also had many years of assessment and documentation telling them that they cannot do mathematics. Indeed, Clements (1989) argues strongly that what most students learn from their school mathematics is that they cannot do it! The assessment practices of school mathematics verify notions of ability so that students come to believe that they have a natural ability (or not) for mathematics. Furthermore, this is extended to access to many of the professions and higher education courses where students must complete a study in mathematics in spite of it being irrelevant to their study. For many of the young people who will constitute the sample in my study, they have been exposed to assessment practices for a period of ten years or thereabouts where it has been continually reinforced that they do not know mathematics. As such, they come to internalise this belief and opt out of study.

More recent studies of assessment have shown how it produces a false consciousness with students, educators, teachers and community. In their very detailed study of compulsory testing in the UK, Cooper and Dunne (1999) have shown how the practices of assessment in school mathematics produce socially differentiated outcomes. Their work shows how middle-class and working-class

students perform equally as well on esoteric (or pure) tasks but when the tasks are embedded into realistic contexts, middle-class students perform better than their working-class peers. For students and teachers, the results of testing schemes such as this are presented as objective facts. As Reay and William (1999) have demonstrated, assessment influences how students come to see themselves. In these cases, where students see themselves as strong performers in mathematics, they have a stronger sense of identity with the subject whereas the converse is also the case.

Pedagogical approaches

Again, in line with the work of Bernstein, there needs to be recognition of the pedagogic relay, where in some cases this is clearly visible so that students can see the game that is being played. In other cases, the pedagogic relay is invisible, making it difficult for some students to identify what the teacher is expecting. In many reforms in mathematics education – such as the realistic tasks cited by Cooper and Dunne (1999) in the previous section – the purpose of school mathematics has been to provide a more interesting curriculum or one that meets the needs of the wider society. For example, reforms such as open-ended tasks have been cited as being highly beneficial to the learning of mathematics, and for assessment for teachers (Sullivan & Lilburn, 1997). However, the reframing of visible mathematics – what is the sum of 12 and 14 – into an open-ended format can pose a new set of problems (Zevenbergen, Sullivan, & Mousley, 2001). In this case, posing the question of “what two numbers add up to 26?” may create a new set of difficulties for students, least of which is for them to reconstitute some of their fundamental assumptions about school mathematics. Such assumptions would include the notion that there is only one right answer in mathematics. This problem clearly violates this assumption so students need to be aware that the game plan has shifted from what they would normally see as mathematics. When considering reforms in mathematics classrooms, teachers need to be cognisant of the new demands being placed on students. In some cases where students are experiencing difficulties with mathematics, then reforms are likely to create further barriers to learning (Zevenbergen et al., 2001).

In this section, I have discussed, albeit briefly, some of the potential areas that marginalise students in schools. This is not intended to be an extensive review of issues but rather to identify some of the salient features of mathematics education that can be subversive. Further issues that have the potential to marginalise young people relate to new times and new demands in the transition from school to the workplace and the “youth” agenda of the conservative Australian government.

New times, new demands

A further consideration of the alienation of young people in and through school mathematics rests with the recognition of the New Times. Many authors contend

that we are now moving into the PostModern era which is characterised by very different social and work conditions. Wyn and White (1997) argue strongly, the threat of unemployment is used actively whereby young people are expected to conform to workplace culture. The contradiction is, they point out, that whilst education and training are a means to getting a job, the resources for schooling have not been adequate to meet these new demands. This is clearly the case when thinking about contemporary work conditions for young people. Many young people will not enjoy the lifestyles of the previous generation including a guarantee of full employment. The nature of that work has also changed considerably with the casualisation of the workforce. As such, the old skills and knowledges taught in schools and mathematics may be defunct. Instead, new knowledges and skills are needed so that young people can fulfil the demands of the workplace. In the area of numeracy, for example, many authors are claiming that new forms of numeracy (and literacy) will be needed in these new times (Zevenbergen, 2001b; Steen, 1999; Cumming, 1996). The outmoded forms of numeracy will no longer be viable forms of knowledge in this information and technological age.

Schools have been considerably less rapid in the take up of these new knowledge's and as such are at risk of providing outmoded forms of knowledge and communication skills. For many young people who have grown up surrounded by information and technology, the transition is not so dire but their learning in schools is not equivalent to their needs beyond schools. Hence, there is a considerable mismatch between what is needed and what young people are exposed to in schools. Accordingly, for many young people, there is considerable potential for them to feel that what they are learning in schools has no or little currency beyond the school boundaries.

With all the reforms and changes in schools and the wider society, it is hardly surprising that for many young people, school mathematics (and schools in generally) are not considered as highly valuable within their sphere of thinking. As such, many young people are keen to leave school as soon as possible. However, as the figures indicate, this is not a desirable option. The Australian Federal Government has implemented a variety of reforms aimed at supporting young people in their learning.

Policy

The Australian Government is in its third term of office and is a conservative government. High on its agenda is the retention of young people in education and employment, since many young school leavers are at risk in both. As such, the priority is the placement of young people into schemes that are purported to enhance their employment opportunities. The significance of these schemes corresponds with government changes in welfare benefits for young people under 17 and a unified Youth Allowance which is claimable on a means test and providing they have completed Year 12. Effectively, the end result is most middle-class young people miss out, but so too young people who have not

completed Year 12. It is the latter group who is the target of my study. Those who do qualify for Youth Allowance, after six months are required to participate in the Work for the Dole program or return to education.

The government's intention is to stop the culture of entitlement they claim is increasing in young people. As a result, support for young people who are unemployed is now provided within a framework known as "mutual obligation" whereby they are required to participate in education and training programs i.e., Job Placement, Employment and Training programme (JPET), Literacy and Numeracy Training (LANT), Work for the Dole, and Community Development Employment Projects (CDEP) (DETYA, 2000). Consequently, there are a gambit of reforms, and a proliferation of employment and training agencies that many young people are compelled to attend to undertake further study in order to be able to retain their government allowance.

A number of these schemes involve placing young people back in educational institutions and into programs aimed at supporting their levels of literacy and numeracy. However, as Lindfield-Ide (2000) found in her study of the mandatory participation in literacy and numeracy programs for unemployed young Australians, these programs focus on "back to basics" and workplace literacies at the exclusion of a broader range of literacies. Given the target group of my study, "back to basics" and workplace literacies may not be enough for these young people. Since it is likely they have been the victims of the marginalising practices of secondary schooling and possibly primary schooling, whereby advancement through school has been by default and age increment rather than by academic achievement. Furthermore, the problems for these young people may well be exacerbated by difficulties at home, leaving school and or home at age fifteen, trouble with the law and indulging in drugs and alcohol. These programs purport to serve the interests of young people, but they may well be serving the interests of those in control therefore maintaining the status quo of disadvantaged groups of young people.

Discussion

Given the growing recognition of young people remaining at school beyond the compulsory years of schooling to improve their employment prospects, there are significant issues that need to be considered. Several of these issues have been offered in this paper and although not complete provide some insight into the marginalising practices of school mathematics. Furthermore these practices also serve as a basis to my research into the implications for young people, who, for many reasons are choosing to opt out of school mathematics and eventually school at a time when employer demands require improved levels of literacy and numeracy. The question for my research of *why* they are choosing to opt out needs further consideration. As a consequence of this question schools need to examine their practices and *why* the young people who attend them are experiencing the marginalising practices of school mathematics. Furthermore, *how* they are excluded, and the short and long-term implications of such

exclusion need examining. These questions provide a framework to my study and support the contention of this paper that school mathematics is a social practice that serves as a social filter thereby reproducing (in most cases) the status quo.

The issues drawn on in this paper serve to develop an understanding how mathematics can be seen to be a marginalising practice for young people. Although discussed briefly these issues bring to light the difficulties young people are experiencing through their schooling. For some young people exclusion from school mathematics may result in opting out of school altogether only to find they are further marginalised because of their lack of workplace skills and competencies. This is highlighted with new times and new demands that young people are confronted with. If they do not possess adequate literacy and numeracy skills to meet the demands of the workplace their prospects for employment are significantly reduced. Thus, young people and in particular those from disadvantaged and working class groups are at risk of becoming the casualties of schooling and the industry-driven labour market. Given this situation, the Australian government is attempting to address some of the issues of retention in education and employment. This is demonstrated through the proliferation of education and training facilities that young people are compelled to attend and undertake. In this context, what is needed to be known is whether these retraining facilities support and enhance learning for these young people particularly when they are already the victims of the marginalising practices of school mathematics. If they do support and enhance learning for young people, *what* are the characteristics that make them work? If they do work *how* can schools, teachers and program providers provide “success outcomes” for young people? Furthermore, *how* are these programs conveyed to ensure “successful outcomes” for students? Given time frames for programs and the diversity of needs of students how are educators supporting young people in gaining employment?

References

- Anyon, J. (1997). *Ghetto schooling: A political economy of urban educational reform*. Wilson VT: Teachers College Press.
- Boaler, J. (1997). Setting, social class and survival of the quickest. *British Educational Research Journal*, 23(5), 575-595.
- Clements, M. A. (1989). *Mathematics for the minority: Some historical perspectives of school mathematics in Victoria*. Geelong: Deakin University Press.
- Cooper, B., & Dunne, M. (1999). *Assessing children's mathematical knowledge: Social class, sex and problem solving*. London: Open University Press.
- Cumming, J. (1996). *Adult numeracy policy and research in Australia: The present context and future directions*. Melbourne: Languages Australia.
- DETYA. (1999). *Preparing youth for the 21st century: the policy lessons from the past two decades*. <http://www.dest.gov.au/archive/ministers/kemp/ks230299.htm>.
- Gamoran, A., & Berends, M. (1987). The effects of stratification in secondary schools: Synthesis of survey and ethnographic research. *Review of Educational Research*, 57, 415-435.

- Hill, P. W., & Rowe, K. J. (1998). Multilevel modelling in school effectiveness research. *School Effectiveness and School Improvement*, 7, 1-34.
- Lamb, S. (1997a). *Completing school in Australia: Trends in the 1990s*. Melbourne: Australian Council for Educational Research.
- Lamb, S. (1997b). *Longitudinal study of youth labour markets*. Melbourne: Australian Council for Educational Research.
- Lamb, S. (1997c). *School achievement and initial education and labour market outcomes*. Melbourne: Australian Council for Educational Research.
- Lindfield-Ide, S. (2000). *Mandatory participation in literacy/numeracy programs for unemployed young Australian: whose interests are served?* Canberra: Adult Literacy and Numeracy Australian Research Consortium.
- Oakes, J. (1982). The reproduction of inequality: The content of secondary school tracking. *The Urban Review*, 14, 107-120.
- Oakes, J., Gamoran, A., & Page, N. R. (1992). Curriculum differentiation: Opportunities, outcomes, and meanings. In P. W. Jackson (Ed.), *Handbook of research on curriculum: A project of the American Educational Research Association* (pp. 570-608). New York: Macmillan.
- Reay, D., & William, D. (1999). "I'll be nothing": Structure, agency and the construction of identity through assessment. *British Educational Research Journal*, 25(3), 343-354.
- Rosenthal, R., & Jacobsen, L. (1969). *Pygmalion in the classroom*. New York: Rinehart & Winston.
- Ruthven, K. (1987). Ability stereotyping in mathematics. *Educational Studies in Mathematics*, 18, 243-253.
- Steen, L. A. (1999). Numeracy: The new literacy for a data-drenched society. *Educational Leadership*, October, 8-13.
- Sullivan, P., & Lilburn, P. (1997). *Open-ended maths activities: Using "good" questions to enhance learning*. (Reprinted 1998 ed.). Melbourne: Oxford University Press.
- Wyn, J & White, R. (1997). *Rethinking youth*. Sydney: Allen & Unwin.
- Zevenbergen, R. (2001a). Is Streaming an Equitable Practice?: Students' Experiences of Streaming in the Middle Years of Schooling. In J. Bobis, B. Perry, & M. Mitchelmore (Eds.), *Numeracy and Beyond: Proceedings of the 24th Annual Conference of the Mathematics Education Research Group of Australasia*. (Vol. 2, pp. 563-570). Sydney: Mathematics Education Research Group of Australasia.
- Zevenbergen, R. (2001b). Numeracy: Youth and New Times., *Second Annual Conference for the Middle Years of Schooling Association*. Brisbane: Middle Years Schooling Association.
- Zevenbergen, R., Sullivan, P., & Mousley, J. (2001). Open-Ended Tasks and Barriers to Learning: Teachers' Perspectives. *Australian Primary Mathematics Classroom*, 6(1), 4-9.