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Reflections on an Aboriginal Homework Centre: Progressive Pedagogies and Ethnomathematics

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Introduction

Students' social backgrounds, their cognitive development at school and its assessment are three inter-related educational issues. They apply as much to mathematics as any other subject. The history of mathematics education has been largely one of formal pedagogies justified by decontextualised knowledge and skills. This presents a significant challenge for educators who advocate learner-directed pedagogies which contextualise knowledge and skill. This is also a major issue for Aboriginal education, where students' social backgrounds engender unique educational needs. The following article reflects on some recent research and identifies some specific implications for an Aboriginal homework centre.

Wiltja

In the South Australian Wiltja Homework program, students come exclusively from schools on Aboriginal lands in the far north of the State (two students are Western Australian). That sets their general education apart from the students at the metropolitan secondary school they attend during the day. In their evening homework groups, they alone attend and are grouped on the basis of their year-level placements at the secondary school and sometimes by gender. Although gender separation actually reflects hostel segregation and the friendships made as a result, it also conveniently avoids the need to make arbitrary decisions about separating potentially large and unmanageable groups.

During homework sessions (ninety minutes for Year 8, two hours for the rest; four evenings for Years 8-10, five evenings for Years 11-12), students usually move freely around the tutorial area, often to collect resource materials but also to talk to others. Because of space restrictions two groups work in a second building away from the rest, who work together at separate tables in a large dining hall at the residential hostel. Sometimes portable partitions are used by some tutors to separate their groups from others. The atmosphere is generally relaxed, but busy.

Mathematics homework is largely governed by the need to keep apace of the secondary school's curriculum. (There are now plans to introduce a

special literacy program into homework. Although it will not be part of the set homework, it is still an extension of their school work.) Occasionally, homework tutors provide some extension work when the opportunity is available. Mathematics homework services a traditional, text-based program.

For Aboriginal students, coming from school systems from their traditional homelands, the Wiltja program is an opportunity to experience a mainstream education. This is in fact the sole purpose of their coming to Adelaide, agreed to by parents, the education authorities in the homelands, the State education ministry and the metropolitan school they attend. So there is little in the way of alternative approaches to what is offered in the secondary school's curriculum, itself governed by the national mathematics curriculum and which, in Years 11 and 12, must ultimately also satisfy the criteria of South Australian senior school certificates.

Progressive Pedagogies and Ethnomathematics

Mathematics education research continues to remark on the disadvantages of traditional pedagogy (Boaler, 1997). Students continue to be grouped, in one way or another, according to their abilities, with their mathematics experiences usually restricted to textbook-governed instruction. In advanced classes, anxiety and fatigue have been found to be common among students as they struggle to keep apace of the rapid presentation and accumulation of new procedures. In other classes, boredom, indifference and disillusionment are common as students are passively instructed in decontextualised information. In fact, all of these experiences are often shared by students across the mathematics ability spectrum.

Recent research, local and international, has examined the value of progressive pedagogies for mathematics. It is claimed they enable students from a larger range of backgrounds and initial levels of mathematical abilities to do well. This includes both males and females, but also children from different socio-economic groups, as well as Aboriginal children (Boaler, 1997; Bucknall, 1995). In fact, two distinct fields of inquiry converge here: learner-directed and project-based, or simply progressive pedagogies on the one hand, and ethnomathematics on the other. Granted their veracity and significance, what should be done?

In an Aboriginal homework centre time is limited by the demands of set homework to the point where it seems almost impossible to modify pedagogy. Two hours per night — and a mere ninety minutes for Year 8 — hardly conduces to mathematics of the type researchers have argued is beneficial. But it is always possible to use the same amount of (limited) time in different ways. The general destination can still be the same — completion of set homework — but the route can be altered and the experience improved.

Still, traditional chalk-and-talk instruction, including drill and repetition has certainly received support from some Aboriginal educators. Potter (1994: 5), for example, claims that trends in a different direction have failed to teach adequately mathematics and science to Aboriginal students. But this might be a superficial basis for an attraction to traditional methods, since even rote learning can be done badly. There are other grounds, however, for considering traditional methods which are worth exploring briefly.

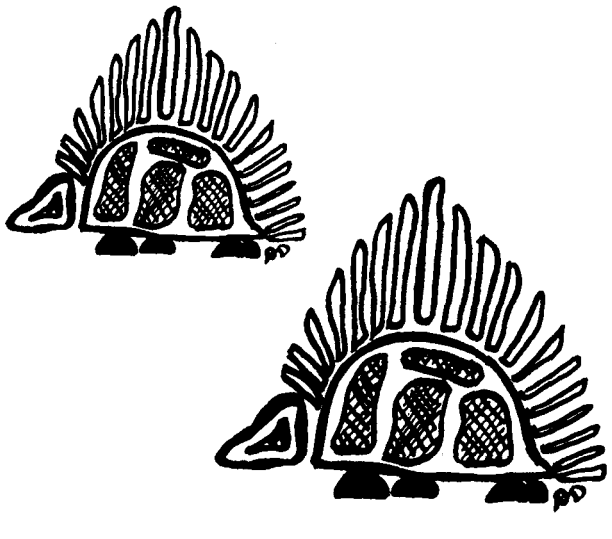
Potter provides an ethnomathematics perspective on the issue. She claims that a 'traditionally non-literate culture has a strong understanding of learning things by memory' and that 'we should be building on ... [Aboriginal] students' strengths' (Potter, 1994: 5). Potter (1994: 5-6) declares that she has 'come to see rote learning of multiplication tables ... as a form of meditation or mantra. The oral traditional of Aboriginal students meant that all knowledge had to be committed to memory'. Further, students will only develop their confidence at school if they have grasped the fundamentals early enough. The last point is implicitly corroborated by Boaler's (1997) research in England. She studied two secondary schools — one using traditional mathematics pedagogy, the other a freer, flexible, experiential approach. She concluded that the greater gains in understanding across gender and socio-economic groups emerged in the latter. Now it is interesting to note that, whereas two types of secondary schools were involved, all of the students actually came from primary schools where mathematics was taught in a traditional mode. Thus, in the absence of explicit

controls in her research for any effects of prior pedagogies on the success of subsequent ones, traditional primary school mathematics might have acted as a helpful foundation even for subsequent progressive arrangements.

Applying ethnomathematics to mainstream students' activities, Potter (1994: 5) notes that in general they possess a firmer grasp of 'decontextualised' knowledge and, thereby, of scientific methodology. Drilling and rote fits them to a world which values 'immediate recall of vital information', not only in science but also in industry and all kinds of employment which require repetitive tasks (Potter, 1994: 4). In this connection, Potter mentions the Aboriginal council of Yirrara College in Alice Springs, who voted to go to the Lutherans for a missionary education. Similarly, Aboriginal students join the South Australian Wiltja program in order to experience a mainstream education. There are potential benefits and costs for Aboriginal education associated with such decisions. I describe some of these below with a view to identifying some alternatives for a homework centre.

Benefits

By emphasising mainstream modes of thought and practice, whether exclusively or in part, Aboriginal education can go some way towards imparting the knowledge and skills necessary for empowering students within the dominant culture. Better able to understand what other Australians do and how, their social alternatives will increase. Whether at Yirrara or the Wiltja program, such a pragmatic stand can make good sense.



The increased alternatives available could include devising ways to use mainstream thought and practice to the advantage of Aboriginal cultures. Educational technologies, such as computers and the Internet, can act as a link between different Aboriginal communities, their teachers and their leaders, as well as those communities and other Australians. Thus, mainstream social structures can become pragmatic vehicles for cultural autonomy, self-assertion and self-determination.

Costs

Chief among the problems for Aboriginal education, something which is implicit in Potter's approach, is that mastery of mainstream knowledge and skills can lead to changes in uniquely Aboriginal cultural values. The Internet, for example, opens not only the possibility described above as a benefit, but also the possibility of greater cultural drift. It is important to keep this in mind, if only to acknowledge it as a potential outcome. There might be ways to prevent this, but even then it should be acknowledged that some preventative measures could be counterproductive. For example, the type of information consumerism exemplified by the Internet might clash with Aboriginal spiritual notions that access to some knowledge marks a right of passage that can only be selectively entrusted under special conditions. The Internet commodifies knowledge by turning it into mere information, accessible simply by virtue of having funds to purchase the right hardware and software. Used for one set of reasons, such tools as the Internet and even ordinary libraries, can have unintended consequences. Controlling access to them might, depending on the degree and duration, prevent some unwanted outcomes but at the cost of some preferred ones.

Another potential cost can arise with the accuracy of the descriptions given of mainstream thought and practice. For example, Potter claimed that repetitive tasks dominate scientific and industrial work, making them essential for success in a world which values industry, science and commerce. That is true, but trivial. Repetition certainly exists from the production line to brain surgery, from kindergarten to preparing a doctoral dissertation. But so does attention, concentration, effort, sociability and creativity. Ultimately a balance has to be struck, otherwise progress halts. Crucially

for mathematics education, much academic mathematics, once depicted as a noble aesthetic but impractical pursuit, is now dominated by attention to applications; in short, practical usefulness. The only remaining and still critical dichotomy is the ancient one between good and bad mathematics (Golomb, 1998).

If efficient repetition is all, or nearly all, then mathematics students need have no more character and insight than a pocket calculator. This is why Boaler (1997) comes closer to the mark: understanding mathematics really is about solving problems creatively; which means accumulating a range of rules, procedures and skills in the process of tackling interesting, contextualised problems. Still, Boaler is not always clear on this herself, giving the impression at times that rules, principles and skills can always be mastered through practice on problems. No repetition and drill are necessary. Her own research and others' whose she cites, at any rate, do not prove this (Boaler, 1997: 107-108). The point for Aboriginal education is that any decisions to master elements of mainstream thought and practice must start from accurate analyses and interpretations.

School and Homework Centres

Mathematics education for Aboriginal students can certainly benefit from incorporating progressive, contextualised pedagogies. Traditional methods alone seem unable to provide the depth of understanding required for extending mathematical skills to life outside of the classroom, or even of sustaining interest and success within it (Boaler, 1997). For many students, by the end of schooling, these methods have left mathematics where it started — in the textbook. Referencing the study of mathematical rules, principles and skills to students' surroundings and encouraging them to explore such relationships, is one way to help overcome this limitation. Pedagogy can build on those parts of everyday speech, for instance, which involve mathematics (e.g. quantitative and spatial references) and weaken 'the boundaries that isolate mathematics to a certain time on the timetable each day' (Bucknall, 1995: 29).

This might not always be possible, however, in complete isolation from some practice on discrete, decontextualised tasks — memorisation through repetition and drills. But that does not mean that references to social contexts cannot be developed at some point, or gradually as foundation knowledge and skills develop.

Mathematics in school hours has the greatest opportunity for fostering the type of learning deemed desirable by recent researchers working on gender and social class, as well as ethnomathematics. Certainly timetable constraints can be manipulated either by entire faculties or individual teachers to escape from an exclusively traditional pedagogy. Still, Bennett *et al.* (1976) years ago showed that school teachers can successfully resist progressive styles, and certainly mathematics teaching everywhere has remained and is under pressure to remain stubbornly traditional (Boaler, 1997: 125-126, 145-146). Thus, we cannot be sanguine that research will lead to innovations in school mathematics.

Thus, homework centres seem destined to perpetuate the school situation, both because of the directives issued by the latter and the time available. But if they combine the activities of set homework with a more stimulating, contextualised pedagogy, homework tutors can achieve two things. First, they can fulfil their contractual obligations to supervise and assist with completion of homework. This achievements matters, since fear of failing here is a common reason for resorting to mere drills and coaxing at the expense of discussion, elaboration of issues and illustration of solutions with reference to familiar everyday situations. To some extent new national curricula have tried to move away from a heavy textbook emphasis, but they cannot prevent a resort to it whenever time and other constraints come to the fore. Another inhibition to experiment arises in programs such as Wiltja which Aboriginal students attend in order to do precisely what mainstream city students do. Deviation from this may rankle authorities, so caution must be exercised. Any changes should occur over and above the set requirements, not in place of them.

The second advantage of making homework more than mere fulfilment of set homework, is that when students develop insights hitherto absent from their school learning, pressure can be applied back on curriculum development in the school. Being one metropolitan school only, this means

that for a homework program such as Wiltja's, exchanges of ideas can be rapid and even informal — perhaps even based on one year group alone in order to instil confidence in teachers and students. Certainly homework-based development will be slow due to the short times allotted, but over a semester or one school year some changes can be effected. Each section of the school mathematics curriculum can be reviewed in advance and the requisite alterations to pedagogy for each term's homework discussed and prepared beforehand. As long as tutors are mathematically trained, a constant but piecemeal, cautious and reviewable program of change is feasible. One of the key advantages of a homework centre is that staff-student relations are informal. In the right circumstances, this can be a stimulus to innovation.

Conclusion

The point of measuring educational success in school and external assessments is to evaluate student performance on subject-based tasks, not to test how neglect of social background can undermine it. Mathematics is no less free from this problem, than is any other subject or field of studies.

If ethnomathematics and progressive pedagogies can help ensure valid measures of mathematical ability, then they should be used. A general and worthy aim of modern schooling is to prepare people for a complex and precarious world, not only in employment but also in personal and cultural domains. Any humane pedagogy which helps achieve this outcome ought to be considered and adopted, even if only partially and inconsistently. There are no good reasons for not trying.

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