Learning Mathematics: The Voices of Aboriginal Children

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Aboriginal children generally do not reach their potential in the learning of mathematics in our primary school classrooms. In order to investigate possible reasons for this, Aboriginal students in the last two years of their primary schooling were interviewed about their learning of mathematics. This paper uses extracts from these interviews to demonstrate the need for teachers to reconsider their approaches to this learning so that Aboriginal children achieve their learning potential.

"Learning is fundamentally a social process and the recognition of the social purposes of learning as well as the social learning processes through which such learning is achieved is important in the teaching of Aboriginal children" (Gray, 1990, p. 135). Without reform of school environments for Aboriginal children the danger is that we "reproduce social inequalities of achievement and subordinate individual development to social domination" (Teese 2000, p. 8).

Aboriginal children are learners in two worlds (Frigo, 1999; Watson, 1987). Competing world views "must be addressed in every school providing educational programs for Aboriginal students, when considering strategies that may be used to improve attendance and performance" (Parish, 1991, p. 18). Parents, teachers and students need to come together to generate educational programs "which both recognise and actively utilise the Aboriginal child's skills and knowledge" (Guider, 1991, p. 51). Aboriginal people possess the "source of knowledge of their own needs, their learning process and the ways in which learning takes place and the most effective ways and environments in which ... [they] learn" (Sherwood & McConville, 1994, p. 40). Educational decisions that affect Aboriginal children's learning are best made through consultation between teachers and Aboriginal people.

Teachers need "an appreciation of the cultural, social, environmental and economic factors that can seriously impair the academic potential of Aboriginal children" (Collins, 1993, p. 3). Teachers should know the students' abilities, the history of the students as well as appreciating the role language, culture, experiences, expectations and physical factors play in student learning (Forbes, 1994; Roberts, 1990). "[T]he ethnic and cultural experiences of the knower are epistemologically significant because these factors influence knowledge construction, use and interpretation" (Banks, 1993, p. 6). Teachers require appropriate training when they are placed in schools where children have different cultural backgrounds from their own. They need to be culturally aware and appreciative of children's learning needs (Bourke, Dow & Lucas, 1993).

Aboriginal societies are both person-oriented and information-oriented, emphasising the personal connections between teacher and learner. For example, in referring to Aboriginal children from traditional backgrounds, Christie & Harris (1985) cited three significant areas of difference between the Aboriginal students and the non-Aboriginal teacher: the language of the classroom; the learning styles of Aboriginal children; the differences in "perspectives, expectations understandings and interpretations" (p. 82) of what happens in the classroom. Effective teachers will value different learning styles and appreciate the context and the ways in which children learn (Schools Council, 1992, p. x).

In co-operation with Aboriginal people, the introduction of Aboriginal learning styles into mathematics classroom needs to be considered (Harris, 1984). Such co-operation between the community, students and educators can help bridge the difficult social and learning experiences that many Indigenous students face in the classroom. One example of the gap to be bridged is evident through a comparison of the views of success held by the dominant society with those held by Australian Aborigines.

> 1. Overall Society
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> The excellent child at school then successfully proceeds from grade to grade, performs well academically, is called upon by people in authority to perform tasks for them. This child conforms to the rules, accepts the teacher's answers as 'gospel', never questions the classroom milieu, and competes, striving to be the best in the school or class.
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> 2. Aboriginal People
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> The excellence in Aboriginal society is therefore not individually based, it is not competitive. The measures of excellence are few. The criteria are set by the whole. Performance is not measured during a pregnant pause or during a moment of triumph. It revolves around a person's place in that community. It revolves around a person's family. (Blair, cited in Perry, 1990, pp. 458-459)

Often mathematics success is measured as a result of examinations. When success is judged through the personal engagement in a mathematical task the student gains confidence (Gattuso, 1994). The notion of student success suggests a notion of failure and, for some students, this can be devastating (McLeod, 1992), particularly if the accepted views of success held by one cultural group reinforces failure in another. The reality is that mathematics can drive children towards school failure and that "[W]hen mathematics acts as a filter, it not only filters students out of careers, but frequently out of school itself " (National Research Centre, 1989, p. 7). There are Aboriginal children who just do not know where to start with mathematics and that brings about a high level of anxiety, worries of failure and feelings of inadequacy. This paper reports on the voices of Aboriginal children as they talk about what the learning of mathematics in primary school classrooms means for them.

Methodology

This paper draws on data collected as part of a nine month ethnographic study involving Aboriginal students, their parents, Aboriginal educators and non-Aboriginal teachers living in a remote rural community in New South Wales. Over a period of six years, the first author had come to know the community and be known by the Aboriginal educators working in the schools (Cutmore & Howard, 1995). Conversational interviews were held with 22 Aboriginal children—13 girls and nine boys—from Years 5 and 6 at one school in this community. These interviews, along with those from the other participants, were transcribed and analysed using a grounded theory approach. Sixteen categories of response were determined. In this paper, one of these—the learning of mathematics—is considered from the perspective of the Aboriginal children participants.

What the Children Said

The Aboriginal children expressed a range of beliefs about learning mathematics. Some commented on the importance of listening, others on watching and others believed that it was necessary to work out the mathematics on paper to learn how to do it. The students liked learning new things in mathematics. Brett depended on listening to learn mathematics, "I just listen and learn them and that and go back to my tables and do them

sometimes". Colin believed he learned mathematics mainly by listening but also writing it down.

Interviewer: Well how do you think you learn mathematics?
Colin: Some people think I'm dumb and I try to prove that I'm not dumb by listening and listening.
I: How do you prove that you're not dumb ?
Colin: I listen and try to get the right answer.
I: Do you learn mathematics any other way?
Colin: Writing it down and trying to work it out on paper.

Natalie believed that her teacher taught her something new in mathematics most school days "because she is really understanding and she knows what you're talking about and she helps you out a lot". Judy also believed that she learnt by listening to the teacher and at times reading her Year 8 brother's mathematics textbook. She liked learning new mathematics though she felt that she knew a lot of what was being taught.

Dennis liked learning new things in mathematics "cause you'll know more things". When he learnt mathematics, Dennis depended a lot on watching.

I: How do you learn all this maths?
Dennis: Watching and try to do it.
I: Can you explain what you mean by watching?
Dennis: The teacher shows you how to do it and you just watch her the right way to do it.

Even though Susan tried hard in mathematics at school she believed that she needed to "try a bit more". She was sure of how she learned mathematics both at home and at school.

Susan: I learn by just getting my paper and I tell mum to write out about two pages of sums. I do them and then I give them to her and tell her which ones are right and which ones wrong. The ones that are wrong I tell her and then she tells me to go back and do them again and when they're right that's how I learn. I learn at school from things that mum doesn't show me and that.
I: So how do you learn at school then?
Susan: Learn by the teacher. By the way they explain it and that and the way they talk about it and you got to listen and that.

During her interview, Sam introduced a concept of "do's and don'ts" leading to a discussion involving Tina about learning strategies.

Sam: By doing dos and don'ts. Just say you want to go and play with the equipment and you're not allowed to. That's what you want to do but they says you don't. Like if I want to go to the canteen and Miss says no sit down. Well that's a do and a don't.
I: That's what you want to do but the teacher says don't?
Sam: Yeah.
I: What's a do and a don't in mathematics?
Sam: Let us go and learn by ourselves.
Tina: Instead of just sitting there and listening.
I: So you might want to do maths on your own but the teacher says don't?
Sam: Yeah.

Meryl got annoyed when other children misbehaved because it affected her learning, "cause when someone's trying to learn something other kids don't want to learn and they don't know that you want to learn and then they muck up anyway". She revealed her strategy for trying to learn mathematics and participating in the class.

Meryl: Oh when the teacher asks us questions and whoever puts their hand up I try to listen and then when I get the idea I put my hand up and sort of answer the question.

Richard was somewhat scared to ask the teacher when he did not understand something in mathematics.

I: And do you sometimes get a bit scared asking?
Richard: Yep. Cause sometimes he'll tell me what to do and I'll forget it and I ask again and he yells at me and that.
I: Is it true that you weren't listening or you just didn't understand?
Richard: Just didn't understand.
I: Why don't you understand sometimes?
Richard: The teacher just says it real fast and you can't understand it.

He had developed the strategy of sometimes saying he was sick to avoid going to mathematics, "I just say I'm sick and I go down there to sick bay and when maths is over I go back up. I just say I've got a headache". Richard expressed a definite view of how he learned mathematics.

Richard: Teacher just puts stuff on the board and if we don't do it you get put on detention and get in trouble. Teacher says if we don't do it he'll just make us.
I: How does it get into your head?
Richard: The teacher learns me. The teacher learns us.
I: How do they learn you? You do something, what do you do?
Richard: Write it all down and do it.

Summary of Results

Space precludes us from displaying all the data concerning the Aboriginal children's statements on the learning of mathematics. However, Tables 1, 2, and 3 summarise data from these children concerning three particular issues.

Table 1 summarises children's views on the role of the teacher in mathematics learning.

Table 1
Aboriginal Students' Perceptions of the Teacher's Role in Mathematics Learning

Source	Teacher's role in mathematics learning
Aboriginal girls	There is more to learn in mathematics than any other subject
	Teachers are the main source of student's learning of mathematics
	You learn mathematics through teacher explanation
	A caring teacher and a teacher who understands what you are saying is important when you are learning mathematics
Aboriginal boys	The teacher teaches children mathematics
	The teacher puts mathematics into the children's heads through children writing it down
	Teachers need to explain mathematics
	When the teacher does not explain it the right way children become confused

Table 2 shows that the children had clear views about their own role in their learning of mathematics. Clearly, they knew why they were at school and how their mathematics learning fitted within the school context.

Table 2
Aboriginal Students' Perceptions of Their Role in Mathematics Learning

Source	Aboriginal children's role in mathematics learning
Aboriginal girls	Many children already know a lot of the mathematics that they are being taught
	Some children think they cannot do some parts of mathematics even though they know a lot
	Children find it difficult to identify the new mathematics that they learn
	Children have to understand the mathematics that is written on the blackboard or they will get confused
Aboriginal boys	Children prove they are smart by getting the right answer
	Aboriginal children find learning mathematics hard

Table 3 shows that the children had some very clear views on how and where mathematics could be learnt.

Table 3
Personal Practice Theories of Mathematics Learning

Source	Personal practice theories of mathematics learning
Aboriginal girls	The harder you try in mathematics the better you learn
	Mathematics is learnt by redoing the work that you get wrong
	Some mathematics can be learnt incidentally at home; mathematics is learnt through textbooks
	Children do better at mathematics when they listen more
	Some children learn to answer questions in mathematics by listening to the answers of other students
	Times tables are learnt through practice
	Children learn mathematics when they are given individual help
	There are different ways of learning mathematics in different schools
Aboriginal boys	Mathematics is learnt by watching the teacher to see how the mathematics is done
	Mathematics is learnt by listening to the teacher and by writing down the mathematics and working it out on paper
	Mathematics learning starts to get hard in Year 4

Discussion

The Aboriginal children commented on a variety of ways through which they believed the learning of mathematics occurred. The teacher was the main source of children's learning of mathematics. Mathematics was learnt by watching the teacher to see how the

mathematics was done, by listening to the teacher and/or by writing down the mathematics and working it out on paper. It was also believed that the teacher puts mathematics into the children's heads through children writing it down. Mathematics could also be learnt through textbooks and by redoing incorrect work. Some children learn mathematics when they are given individual help and others learn to answer questions in mathematics by listening to the answers of other students. Some mathematics can be learnt incidentally at home.

Children believed it was their fault if they did not understand mathematics, believing that mathematics was learnt by listening to the teacher. Not understanding mathematics was attributed to not having listened well enough. This view can be summarised as: 'the more children listen and the harder they try in mathematics the better they learn'. An individual's self confidence and an individual's belief in one's ability to do mathematics was seen to be important in the learning of mathematics. Students believed that marks were the indicator of how well the mathematics had been learnt. Some children believed that there were different ways of learning mathematics in different schools.

The children believed there was more to learn in mathematics than any other subject. They believed that learning mathematics was hard for Aboriginal children. Further, some believed that they could not do some parts of mathematics. Indeed, children found it difficult to identify the new mathematics they had learnt. Some children believed that they already knew a lot of the mathematics that they were being taught. Children could prove they had learnt the appropriate mathematics by giving correct answers.

The children believed that teachers needed to explain mathematics. If the teacher did not explain the mathematics clearly, children became confused. A teacher who was caring and understood what children were saying was regarded as important when learning mathematics. These Aboriginal children expressed the belief that a critical factor in learning mathematics was listening. The children liked teachers to explain mathematics. They liked learning new things and mathematics that they have done but which they had not learned completely. Their expressed beliefs displayed the complex social and cognitive issues related to their learning of mathematics. Teachers need to understand the beliefs of their students and to adapt their teaching so that these beliefs are accommodated. Unfortunately, this does not always occur with Aboriginal children.

Conclusion

To have Australian schools described as places of failure for Aboriginal children (Buckskin, 2001) and to have Aboriginal people described as the most educationally disadvantaged group of people in Australia (Aboriginal and Torres Strait Islander Commission, 1995; Kemp, 1999) has to be of critical concern for Australian citizens and government. Aboriginal children have to experience mathematics methodology and content "from the perspective of their own cultural identity" (Kemp, 2001, p. 14). To have Aboriginal children continually failing to achieve to their learning potential in mathematics has to be socially unjust. Mathematics educators have to consider this to be "unconscionable and untenable" (Secada 1992, p. 654).

Aboriginal children want to learn mathematics. They want to achieve while at the same time maintaining their Aboriginal identity. Currently, Aboriginal children are not learning to their potential and there are critical social justice implications for mathematics teaching and the curriculum. Teachers require strategies that address Aboriginal children's learning of mathematics. The evaluation of the quality and appropriateness of the mathematics curriculum for Aboriginal children continues to require attention. Core issues, including

the role of language in mathematics learning, teacher-student relationships, the learning context and specific pedagogical aspects including fun, teacher consistency and the relevance of mathematical experiences are critical elements for consideration in Aboriginal children's learning of mathematics. This paper is a beginning for such consideration.

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