

LEARNING MATHEMATICS: PERSPECTIVES OF AUSTRALIAN ABORIGINAL CHILDREN AND THEIR TEACHERS

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Two key stakeholders in enhancing and building Aboriginal children's capacity to learn mathematics are teachers and the Aboriginal children themselves. In Australian schools it is often the case that the two groups come from different cultural backgrounds with very differing life experiences. This paper reports on an ethnographic study and focuses on the beliefs of Aboriginal children and their teachers about learning mathematics. It suggests significant issues that teachers need to acknowledge in providing appropriate learning environments for Aboriginal children.

BACKGROUND

Australian Aboriginal societies are both person-oriented and information-oriented, emphasising the personal and relational connections between “teacher” and “learner”. This is the society that Aboriginal children experience for their first 5 years. For many of these Aboriginal children school is very different to their life experiences before entering school. They are often confronted with new issues that impact upon their learning. Within the classroom there are often differences in the language of the Aboriginal children and the teacher, the learning styles of Aboriginal children, the teaching styles and in the expectations, understandings and appreciations of the Aboriginal child and the teacher (Howard, 2001; NSW Department of Education and Training, 2004). Aboriginal children are learners in two worlds. Their mathematical programs have to both appreciate and utilise the Aboriginal child's context, community, skills and knowledge (Howard, Perry, Lowe, Ziems, & McKnight, 2003). But do they?

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 in the mathematics classrooms of Aboriginal children, pedagogy “will tend to reproduce social inequalities of achievement and subordinate individual development to social domination” (Teese, 2000, p. 8). Banks (1993) suggests that “the ethnic and cultural experiences of the knower are epistemologically significant because these factors influence knowledge construction, use and interpretation” (p. 6). Many Aboriginal children struggle with school mathematics and this brings about high anxiety, worries of failure and feelings of inadequacy (Frigo & Simpson, 2000). Educational policy and decisions that affect Aboriginal children's mathematical learning are best made through consultation and data

collection involving Aboriginal people (Mellor & Corrigan, 2004). This paper reports on the voices of Aboriginal children and their teachers as they talk about the learning of mathematics in primary school classrooms.

DATA COLLECTION

Data for this paper were collected as part of a 9-month ethnographic study involving Aboriginal students, their parents, Aboriginal educators and non-Aboriginal teachers living in a remote rural community in New South Wales, Australia. The study investigated the espoused beliefs about the nature and learning of mathematics in Years 5 and 6 of a primary school in Tremayne, a farming town dependent upon wool, wheat and cotton. The town's population comprised thirteen ethnic groups with the two significant groups of people being Aboriginal and non-Aboriginal. The town has had a history of recurring conflicts between the two groups. Some Aboriginal people would suggest that the overt racism within the town had been replaced by a subtler, covert form of racism that affected how Aboriginal people were accepted in the town. The last twenty years has seen improvement in medical, legal and educational facilities provided for and administered by Aboriginal people.

Ellen Road Public School was a two stream primary school, with a staff of nineteen teachers [18 non-Aboriginal; 1 Aboriginal] and an enrolment of 412 students, 32% of whom were Aboriginal. The school had three Aboriginal Education Assistants with specific roles and responsibilities in Aboriginal education. Over a period of 6 years, the lead author had come to know the community and be known by the teachers and Aboriginal educators working in the school. Mathematics classes within the school were graded with the higher ability class of Year 5/6 comprising 30 students, one of whom was Aboriginal. The lower ability class had 25 students, 12 of whom were Aboriginal.

Conversational interviews were held with all participants, then transcribed and analysed using a grounded theory approach. Teacher interviews involved the five non-Aboriginal teachers on Years 5 and 6. Student interviews involved all Aboriginal students [13 girls; 8 boys] in Years 5 and 6 who were given parental permission to be part of the study. Sixteen categories of responses were determined. In this paper, one of the categories-the learning of mathematics-is considered from the perspective of Aboriginal children and their teachers. Pseudonyms were used for all participants and locations.

RESULTS - TEACHERS

While this category reported the espoused teacher beliefs about mathematics learning, there was not a general focus on Aboriginal children. This seems paradoxical given that there were Aboriginal children in the teachers' classes and that they acknowledged that these children were not learning to their potential.

Motivation

Teachers raised factors such as motivation, attentiveness and the apparent unwillingness on the part of some of the Aboriginal students to learn and their own resultant frustration when the children did not respond to a prepared lesson. One teacher raised the concern that both Aboriginal and non-Aboriginal children did not want to think or work out mathematics problems. They preferred doing stencils where it was all written for them.

I don't know why but a lot of these children are unmotivated, both Aboriginal and non-Aboriginal. They don't want to think either. They like to do the easy things but they don't want to do anything that requires thinking and working things out. They like doing stencils because it's all there for them but they don't like writing things. (Mrs Allan)

I have a few in my group who might not be attentive. There are some kids who tune out, don't listen, and then don't know how to do something. I'd get cross because they hadn't been listening. You try to make things motivating but some kids get excited about mundane and boring things. You think of something you think is exciting and they look at you and say, "Do we have to do that?" (Mrs Allan)

Maturity

One teacher talked about the timing of learning and that it might be related to maturity and learning readiness.

You can see that they're really different in their eyes. It's just not evident. I think it's a maturity thing with a lot of kids, maths. It's like reading that you can introduce things at certain times and it's the wrong time and if you just leave it and don't worry about it 6 months down the track it might fit in and they just weren't ready for it. (Mrs Cotter)

Thinking

One teacher, initially, doubted if all children were capable of thinking mathematically. However, she espoused the belief that they all have the ability to some degree and acknowledged that Aboriginal children try hard in their mathematics to please the teacher. Another believed that many children were unwilling to attempt mathematical problems and that society was not teaching children perseverance.

Some have a lot and some have none. No they all have some. Some kids are too keen to please you rather than do their work. Some kids apologise when they get things wrong. They say they're sorry because they are trying so hard to please. (Mrs Martin)

I just thought they had more thinking ability than what came across. I know they had the basics. They have all the skills but I obviously haven't extended them enough into the thinking. That's why we have to finish the curriculum earlier so that we can go into that. By the time you deal with the basics and do some extension you don't always have a lot of time to do the thinking. (Mrs Cotter)

The problem solving...and seeing the different ways that they can do it. They don't often...what's the word, tunnel vision. I think society, I blame them, doesn't teach them perseverance. I don't think that's something that they can get from school. A lot of

children say I can't do it and straight away don't want to do it. I think that's the old style way of society. (Mrs Cotter)

Prior learning

A new teacher to the school felt she had been given little information on the mathematics the children had learnt previously. She did not know if the children had been allowed to use materials in their learning of mathematics, did not know the past mathematical school experiences of the children and thought that past teachers in mathematics lessons may have been quite strict on the children.

I think I try to do this with them in mathematics and I don't know if they've ever been allowed to use materials. They must have been like that all the way through so the teachers have kept them under the thumb. I don't really know what goes on in the infants. This is my first year. (Mrs Jones)

Cross cultural learning

One teacher talked of issues related to cross-cultural learning.

They talk about different learning styles for Aboriginal children. I don't know sometimes if I'm catering for them because a lot of Aboriginal children don't appear to go well with maths. Sometimes you wonder why? Then you get a good kid and you think this person is special and you shouldn't have to think of that. Then you have other kids who perform well in class and you put a test in front of them and they just do poorly. I don't know why. If I sat down with them they would be able to do it. I don't know if it's the concentration, they have to sit still or what it is. (Mrs Allan)

RESULTS – ABORIGINAL CHILDREN

The Aboriginal children 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 commented that "some people think I'm dumb and I try to prove that I'm not dumb by listening and listening." When Dennis learnt mathematics, he depended on watching, believing that "the teacher shows you how to do it and you just watch her the right way to do it." Natalie tried her hardest in mathematics except on those days when she was not in the mood. She expressed her beliefs on how she learnt mathematics.

Yeah. Well I just mainly listen and keep my ears open so I can learn more than what I've already learnt cause I may think that I haven't learnt enough so I need to learn more so just listening to the teacher and stuff.

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...get in trouble. Teacher says if we don't do it he'll just make us.

*Interviewer: How does it get into your head?

*Richard: The teacher learns me. The teacher learns us.

Vivian believed that “the teacher teaches us” and that what the Aboriginal children have to do is “listen and learn”. Lynda believed that her learning “just popped into her head as the teacher was talking.” Tom believed that he learned mathematics through “getting teached.” Lucy was very good at her times tables and when asked how she had learnt them she responded, “I just practised them. Sir says them with us some times and then I practise.” Susan was sure of how she learned mathematics.

*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.

Meryl believed that she learnt mathematics through listening to the teachers, her dad and to other Aboriginal children. She became annoyed when other Aboriginal children misbehaved “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 they muck up anyway.” Natalie believed that her teacher taught her something new most days “because she is understanding and she knows what you’re talking about and she helps you out a lot.” Judy liked learning new mathematics but thought she knew a lot of what was being taught. Susan also liked learning new mathematics because “you don’t get to learn things every day of the week.” Natalie believed that there was more mathematics to learn than any other subject, especially in high school, and that it was going to get quite hard. Lynda talked about mathematics getting harder in high school.

*I: Do you think maths is going to get easier or harder?

*Lynda: Harder cause when you get older and you get a bit good at maths they put you in a higher maths group and you might not be able to do it. I can do some of the top maths class’ work.

DISCUSSION

Teachers believed Aboriginal children’s levels of attention, motivation and willingness to learn were important factors in the learning of mathematics. There was an espoused belief about the influence of children’s maturity and that the timing of learning mathematics would impact upon how quickly children would learn. Only one teacher, Mrs Allan, talked specifically about varying learning styles and wondered if she was catering for the Aboriginal children because “many just did not appear to do well in mathematics”. She did not know if it was concentration or confidence or whether the Aboriginal children just did not think they would perform well so did not try. Not knowing the mathematical learning backgrounds and

experiences of the students had implications for both the children's learning and the teacher's teaching. There were teacher feelings of pressure, frustration and personal annoyance in having to cover the mathematics curriculum content, reducing the amount of time to concentrate on helping the children develop their mathematical thinking. Teachers raised the importance of and yet the apparent lack of children's motivation and perseverance in thinking mathematically, particularly in problem solving. Perhaps if lessons were more interesting, relevant and tangible, and less reliant on the use of mathematics textbooks and stencils in Years 5 and 6, Aboriginal children may well be encouraged in their mathematics thinking (Matthews, Howard & Perry, 2003).

The Aboriginal children were most able to express their views and beliefs about learning mathematics. When learning mathematics, the Aboriginal children believed in the importance of listening, watching and working out the mathematics on paper. The teacher was the main source of Aboriginal children's learning of mathematics. The Aboriginal children also believed that the teacher puts mathematics into their heads through writing it down. Mathematics could also be learnt through textbooks and by redoing incorrect work. The Aboriginal children were not aware of their own mathematical competencies, strategies and problem solving abilities they used when learning mathematics. It would be purposeful for teachers to take time to discuss and enable Aboriginal children to identify the learning tools they utilised in their learning of mathematics.

Aboriginal children find learning mathematics hard, that there was more to learn in mathematics than any other subject and that they could not do some parts of mathematics even though they knew a lot. If Aboriginal children have negative beliefs about mathematics and themselves as learners of mathematics, then appropriate mathematics programs and teaching strategies need to be developed to help overcome such views (Howard, Perry, Lowe, Ziem, & McKnight, 2003). Such mathematics programs, that accentuated the children's life experiences and contexts, would bring a relevance to their learning resulting in increased motivation and engagement, because Aboriginal children really liked learning new things in mathematics.

These data suggest that even though there were significant numbers of Aboriginal children in their classes, teachers were not considering them and appreciating their cultural needs in the mathematics classroom. Teaching and learning suffer when the cultural needs of a specific group of students are not addressed. Teachers have to become aware of and appreciate the cultural diversity and hence the cultural conflict that can occur between the teacher, Aboriginal children and the mathematics curriculum content. Such cultural conflicts are critical elements in the reasons why Aboriginal children are not achieving to their potential in learning mathematics (Bishop, 1994; Kemp, 1999). If there is a mismatch in the set of beliefs between children and teachers towards the learning of mathematics and the interactions within the mathematics classroom, mathematics anxiety and frustration for both will occur.

If teachers view mathematics only as rule learning they will not consider how children learn mathematics (Battista, 1994). As Aboriginal people and teachers become more aware of the effect on mathematics learning of cultural diversity, structured professional development, policy and planning will need to occur for appropriate mathematics curriculum and teaching practices to develop (Howard, 2001; Mellor & Corrigan, 2004).

CONCLUSION

The reality is that Aboriginal children are often poor and from families where the economic support for children's learning of mathematics may not be available and where mismatches between school and home expectations may exist. Teachers cannot devise appropriate educational programs for marginalised children on their own. They have to be "devised in consultation with adults who share their culture" (Delpit, 1988, p. 296). Aboriginal children bring a cultural heritage and context into schools and mathematics classrooms that can be implemented into effective mathematics curriculum activities for all children. The ideas of disadvantage and deficit linked to Aboriginal children's learning need to be replaced with beliefs about their competencies.

In co-operation with Aboriginal people, teachers need to become more aware of individual's learning styles to foster appropriate learning environments in mathematics classrooms. Such co-operation between the community, children and teachers can help bridge the difficult social and learning experiences that many Aboriginal children face in the mathematics classroom. Rather than making "the learner [Aboriginal student] fit the system, a preferred focus is on how the system can better meet the learner's needs" (Frigo & Simpson, 2000, p. 6). If some Aboriginal children have negative beliefs about mathematics and themselves as learners of mathematics, then appropriate mathematics programs and teaching strategies need to be designed to help overcome such views.

The lack of a mathematics curriculum that emphasises Aboriginal children's experiences, culture and traditions is viewed as a barrier to achieving mathematics equity amongst varying cultural groups (Tate, 1995). An inclusive mathematics curriculum is needed that supports and empowers teachers to consider how they value the experiences, cultural background and language that Aboriginal students bring into the mathematics classroom (Frigo & Simpson, 2000). Aboriginal educators, Aboriginal children, parents of Aboriginal children and teachers should collaborate to:

- talk about, reflect upon and make decisions about appropriate actions that need to take place within schools and homes to enhance Aboriginal children's mathematics learning;
- assist teachers in discussing and identifying ways in which Aboriginal children learn mathematics.

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