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“AIM HIGH - BEAT YOURSELF”: EFFECTIVE MATHEMATICS TEACHING IN A REMOTE INDIGENOUS COMMUNITY¹

Tom J Cooper
Queensland
University of
Technology

Annette R Baturu
Queensland
University of
Technology

Elizabeth Warren
Australian Catholic
University, McAuley
Campus

Edlyn J Grant
Queensland
University of
Technology

In 2004, a young, non-Indigenous, second-year teacher in a remote Queensland Indigenous community developed a mathematics Unit based on an “Aim High - Beat Yourself” theme he developed to overcome the perceived unwillingness of his students to achieve in both sport and school. This paper investigates the apparent effectiveness of this Unit and draws inferences for mathematics teaching and learning in Indigenous communities. It describes the research and teaching contexts in which the Unit was developed and the students’ responses to the Unit. The paper provides further evidence for the efficacy of integrating mathematics learning with more generic programs that build pride, confidence and self worth in Indigenous students and challenge them to perform (Sarra, 2003).

Motivated by the educational disadvantage of Indigenous students (Bortoli & Creswell, 2004; Long, Frigo, & Batten, 1999), the researchers undertook a research project² in outback Queensland with teachers and teacher-aides in schools with Indigenous students to improve mathematics learning outcomes. Indigenous students’ performance in mathematics at the Year 3 level in Queensland varies on average at least two years from non-Indigenous students (Queensland Studies Authority, 2004). This lower performance can reinforce notions concerning racial differences in intelligence and contributes to a perceived lack of self worth (Durodoye & Hildreth, 1995). As well, being innumerate can be profoundly disabling in every sphere of life including home, work and professional pursuits (Orrill, 2001).

This paper describes the activity of a teacher (called Jim for this paper) in a small remote community school whose “Aim High - Beat Yourself” approach to mathematics teaching and learning appeared to have a profoundly positive effect on his students and on the community. Implications are drawn from this practice for effective teaching of Indigenous students.

Indigenous learning of mathematics. As mathematics reflects white middle-class culture (Walkerdine, 1992), learning mathematics in remote communities can be problematic for many Indigenous students who can perceive mathematics as a subject where they “must become ‘white’ to succeed” (Matthews, 2003, p. 1), challenging their Indigenous identity (Pearce, 2001; Howard, 1998). Teachers tend to have low mathematics expectations of Indigenous students, blaming low performance on absenteeism, social background and culture (Cooper, Warren, & Doig, 2004; Sarra, 2003), and to devalue Indigenous cultures as primitive and simplistic (Matthews, 2003).

To ameliorate this cultural clash, there is a move towards contextualisation which incorporates Indigenous culture and perspectives into the pedagogical approaches to mathematics education (Cooper, Baturu & Warren, 2005a; Matthews, 2003). Contextualisation is being seen as the way to overcome the systemic issue of Indigenous marginalisation with respect to mathematics learning (Cronin, Sarra & Yelland 2002; Board of Studies, 2000) and to instil a strong sense of pride in the students' Indigenous identity and culture (e.g., Cronin et al, 2002; Sarra, 2003).

There is ambivalence about the capacity of schools to be effective with contextualisation. Non-Indigenous teachers with little understanding of Indigenous culture have difficulties with contextualisation, causing some of them to reject it in favour of familiar approaches (Howard, 1998; Board of Studies, 2000; Connelly, 2002). Some teachers in the region believe that Indigenous culture has no place in mathematics (Cooper, Baturu & Warren, 2005b). The modern history of Indigenous cultures is one of subservience to Western culture (Kawagley, 1995) which has two consequences: the first is powerlessness and the social problems of modern Indigenous communities (Fitzgerald, 2002); the second is Western ignorance of Indigenous culture and the development of stereotypes (Matthews, 2003).

While it is difficult to determine the stereotypical basis of research findings, one thing is clear – a teaching program can dramatically improve Indigenous students' mathematics learning outcomes if it reinforces pride in Indigenous identity and culture, encourages attendance, highlights the capacity of Indigenous students to succeed in mathematics, provides a relevant educational context, and challenges and expects students to perform (Sarra, 2003). Indigenous students' low performance in mathematics appears to be because of failures to make mathematics culturally appropriate and systemic beliefs that the gap in educational outcomes between Indigenous and non-Indigenous Australian students is 'normal' and that educational equality for Indigenous Australians is either not achievable, or only achievable over a long period of time (MCEETYA, 1999).

RESEARCH CONTEXT

The project in which Jim was a participant explored remote primary Indigenous students' learning of mathematics for three years (2002 to 2004) in order to determine and document effective ways to teach mathematics to these students and to professionally develop teachers and teacher-aides. It was based on the expectation that schools must make a difference to Indigenous students' mathematics achievement and should seek strategies to enhance their mathematics learning (Cataldi & Partington, 1998). Although the schools in the region with Indigenous populations attract teachers who are nearly always non-Indigenous, young, inexperienced and commonly leave after two years (Warren, Baturu, & Cooper, 2005a), the teacher-aides, in contrast, are Indigenous, older, more experienced, have strong commitment and connections to the local community and should therefore be the key to teaching success in a school with Indigenous students (Clarke, 2000). The research project (Cooper et al., 2004; 2005) found that teachers lacked mathematics and pedagogic knowledge for Unit development,

and that aides were untrained, under-utilised and not seen as partners in facilitating mathematics learning. To assist the teachers and aides with contextualisation of mathematics instruction in relation to local culture, community involvement was also an imperative. Reshaping interactions between Indigenous aides, non-Indigenous teachers, Indigenous students, and the local community was a major focus of this project.

TEACHING CONTEXT

Learning space. The Indigenous community in which Jim taught was relatively homogenous with community members predominantly belonging to the tribe who lived in the area. Adult employment levels were very low necessitating a reliance on welfare, leading to some of the problems described by Fitzgerald (2002) as endemic to remote Indigenous communities (e.g., alcohol and substance abuse, low health, transient population) but noticeably less than in other communities. A particular strength of the community was its attitude to schooling and to youth behaviour. The Elders and the community in general believed that school was important resulting in student attendance close to 100%. The community believed strongly in sport, and travelled as a community to all school sporting activities.

At the time this paper describes (2004), the school had lost students and there were two classes. The Years P-3 teacher (“Kay”) was an Indigenous member of the community while the Years 4-7 teacher was Jim. The principal was new and young with no experience of leadership, having been a classroom teacher for only a few years before this appointment. There were fewer teacher-aides than the year before, with Jim having one Indigenous teacher aide (“Ruth”).

Beliefs and attitudes. Jim’s first teaching post was in this community (2003-4). He was trained in Brisbane over 2000 km away so this community was a ‘culture shock’ for him in terms of its isolation, small population, and cultural make up. Similar to many “white” teachers of Indigenous students, he believed that the best way to teach mathematics was “hands-on” activities with a purpose (so that it is not “pointless or just abstract to the kids”) (Cooper, Warren & Doig, 2004) in small group rotations. He believed that consistency in language and activity between the teaching staff was essential: “all the staff need to have the same language to be spoken so it doesn’t confuse, and teach the same thing and not rush ahead with extra stuff”. He believed that it was important for students to be responsible for their own learning and that it was his role to build confidence and motivation to achieve this.

Jim felt that Indigenous students were motivated and supported by their families, but also believed that “the kids out here look for the easy answer, rather than look for the process” and that “some kids get lost” when there are abstract concepts and problem solving that have several steps. He saw a need to set expectations “you know they can reach”. He was concerned that his students seemed to forget previous mathematics instruction so he believed he had to overlap ideas in his sequencing. He believed Indigenous students were “very much about what is in front of them” and saw goal-setting as the major difference between Indigenous and non-Indigenous students –

“getting the kids to aim beyond what is in front of them – to beat themselves”. He believed that community involvement was important for learning stating, “I think ... there is a close connection between the child’s background and culture.” Rather than perceiving deficits in his students’ community (Cooper, Warren & Doig, 2004), Jim used the strength of the community focus on sport to support his thematic unit of work.

The teacher aide, Ruth, had been at the school for 15 years. She had no qualifications but had worked with many teachers. She showed a lot of initiative with the students, always willing to take responsibility with respect to students’ behaviour and always encouraging them to work. Jim used her to maintain the lower-performing students’ attention in situations where they may become distracted, and for contextualisation in areas with which she was familiar: “I am always talking to [Ruth] about the plants because she knows the plants”. He described Ruth as having good rapport with the students and being a good support for him: “she shows a lot of initiative to reach the kids ... they are willing to take risks with someone that they are comfortable with”. However, he was also aware that her weaknesses in mathematics meant that sometimes she did not maintain consistent language and taught ideas for which the students were not ready.

FINDINGS

For the project, Jim developed and undertook a Unit in Chance and Data which would: (a) be cooperatively planned and taught in partnership with his teacher aide, Ruth; (b) cater for Indigenous students in terms of providing culturally appropriate contexts for the instruction; and (c) involve members of the local Indigenous community in developing and implementing the classroom units. Jim was able to integrate the mathematics Unit into the “Aim High - Beat Yourself” approach to teaching he was developing for all his instruction.

Design of the Unit. Jim’s attitude towards integrating Indigenous culture into his teaching was interesting. He had taken it into account in his literacy program: “and looked at some different, some aboriginal words and then looked at their meanings and they wrote the aboriginal words into a sentence which they thought was hilarious”. The Indigenous Years P-3 teacher, Kay, took his class every Friday for lessons on local Indigenous culture. The school also celebrated Aboriginal week with a camp in which local Elders taught the students about bush survival skills and food and local animals. Jim felt that this activity meant that he should not explicitly bring culture into his mathematics teaching: “See, I tried to avoid, I honestly try to avoid the culture side of it because there’s so many other people who could teach it better”.

Jim’s position was that it was not the overt aspects of Indigenous culture that had to be the focus of his teaching but rather the covert and tacit aspects. In this, he had identified something akin to the notion of *shame* which the literature (e.g., Nichol, 2002; Board of Studies, 2000) argues makes Indigenous students act so that they do not stand out from the group by either obviously failing or succeeding. Unlike the literature, Jim’s experience of this cultural impact was mainly in terms of failure. Jim’s answer to this situation was to get the students to focus on “beating themselves” not each other, to

ignore winning and losing and to focus on doing their best. He started by reshaping the students' view of winning:

they'd always get to the end of the race, ... who won? ... I said that person won because they're the tiredest. ... if you haven't tried your hardest, you haven't won.

Jim used sport to introduce his "Aim High - Beat Yourself" approach:

I keep trying to challenge them, and to push themselves ... I use Cathy Freeman [an Australian Indigenous Olympic Gold medal winner] as an example ... she trains by herself, so how does she win? ... she's got to beat herself

In planning meetings, Jim proposed adding graphing from the Chance and Data syllabus strand to the "Aim High - Beat Yourself" Measurement and Sport Unit that he had started earlier in the year. By getting the students to graph their own sport times and distances, he could combine Sport, Measurement, and Chance and Data; and by restricting the graphs to comparisons of students' measurements against their earlier measurements, he could reinforce the "beat yourself" approach. He believed that this combination would enable the motivation of sport to be integrated with the "hands-on" of measurement and the personal focus of graphing and comparing within each student's performance.

... I want to motivate them, so I started with measurement, then we could go out and do measurement outside and stuff like that ... cause if there's any way you can motivate these kids, and build their confidence, it's through sport, ...

Jim planned to extend the graphing and the "Aim High - Beat Yourself" approach to literacy and numeracy, for example, to graphing the number correct in a basic-facts drill activity. He involved estimation and checking in the activities and used drawings to record what was being measured.

Student responses. Jim reported that his students' mathematics performance was low (even though their attendance was high), a situation we observed in the previous year when another teacher had Years 5 to 7. He realised that the Indigenous students' low performance was more a problem of resources available to the school rather than his teaching ability; he remained hopeful:

... I know if I try to compare what the kids are achieving compared to kids from Brisbane that have got that really rich environment, both home and at school, you know like it'd just be depressing, you'd think that you're a total failure but then at the same time you know that you're not because the kids are still learning ...

He was unsure of the correctness of his "Aim High - Beat Yourself" approach for mathematics, simply wanting to know "if I'm on the right track." He was unhappy with his students' progress on graphs, particularly with respect to scales:

... they're used to collecting data, but the graphing ... they're good when you're there with them, but ... to let them go and say you work out the measurements to up the side, they're just like, no idea.

However, he had evidence of the success of his approach in sport:

There's another girl from another school that has been flogging them all of their lives anyway so this 800 metres ... they went off with this girl and as usual she got way out in front. And usually what would happen in the past, they'd just give up ... This year, with teaching them "Aim High - Beat Themselves" ... our girls just kept running and by the halfway through the second lap, they'd passed her!

This sporting success happened across all the athletics races and led to a change in the community. In previous years, when Jim had tried "to push the kids", parents had complained to him to make him "back off", but this year, as his approach had produced success in sport, parents began to support him and his approach – and not just in sport; parents were stating their support for high expectations in education in general. As well, examples of transfer from sport to academic had started:

... this boy that's running well, I got his confidence up by praising him with his running and I knew he was smart in the class but he wouldn't do anything and then all of a sudden he thought, I'll have a go and he jumped 12 levels in a term ...

On top of this, the students' graphing skills had picked up and they became proficient in gathering data and constructing tables and better at drawing graphs for a variety of purposes, including their own mathematics performance. Jim believed that the graphing had been particularly successful in changing the students' attitudes.

FINAL COMMENTS

There is not the space in this paper to draw all the inferences from Jim's teaching, although three are fairly obvious:

First, although his teaching approach was inspirational, "first-year-out" teachers should not be the teaching staff of remote Indigenous schools where four Year levels are in each class. In particular, the incentive used to attract teachers to remote communities, that in two years they would receive enough points to have priority in transfer to any school in Queensland, is not supporting Indigenous learning. Rather than producing a continuous turnover of inexperienced teachers, more support must be given to ensure teachers who start to make a difference can stay in the community. Having gained sufficient points from his two years, Jim left the community at the end of 2004 for a school in Brisbane. A new "first-year-out" teacher has taken his class.

Second, Jim's success reinforces findings elsewhere (e.g., Sarra, 2003) that Indigenous students' mathematics performance can improve if instruction: (1) is integrated into generic programs that focus on building pride, confidence and self worth in Indigenous students and challenge them to perform, (2) involves and impacts on the community in general as well as the school, and (3) takes account of Indigenous culture, particularly its strengths, in a positive manner. Jim's initial focus on sport took advantage of an important component of community life. His "Aim High - Beat Yourself" approach allowed high expectations to exist with practices that enabled the students to achieve success without shame. His focus on students' own practice and his redefinition of winning as "doing your best" circumvented an aspect of Indigenous culture that has made it difficult for Indigenous students, and people in general, to achieve in the

competitive aspects of Western culture. It is particularly important for mathematics as it is a subject where success and failure are very public.

Third, Jim's experience also provides some indication that involvement in a generic program is necessary but not sufficient for improving Indigenous students' mathematics outcomes. Jim had introduced graphs on grid paper as a way of recording data but his students had not explored the meaning of scale through early work with squared paper. Therefore, although they used graphs in many situations, the students remained uncertain with respect to scale. Contextualisation, student identity and community support are undoubtedly important for Indigenous students to achieve success, but proficient teacher mathematics and pedagogic knowledge is still required for effective mathematics learning.

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