

Maori mathematics education: The challenge of providing immersion programmes for preservice Maori primary teachers

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With the rapid growth of Maori language schooling in New Zealand in recent years, and the development of a Maori mathematics curriculum, there has been considerable demand for Maori primary teachers who are both fluent in Maori and competent in teaching mathematics. Trying to meet this demand has proved a real challenge. This paper outlines and discusses a number of factors faced by Maori mathematics teacher educators in preparing preservice Maori teachers for the primary classroom.

Introduction

In between 1973 - 1978 the number of native speakers of Maori in New Zealand had declined to approximately 70,000 (out of a Maori population of 300,000) (Benton, 1981 pp 15). So critical had the number become that Maori was deemed to be a dying language. At the same time, the level of education among Maori had also been declining since the early 1900s. Since language contributes significantly to identity, and hence hope for the future, several measures have been initiated by Maori to try to reverse the language decline and improve Maori educational achievement. These include the development of Kohanga Reo (language 'nests') for preschool Maori children, Kura Kaupapa (Maori immersion) schools, and a Maori mathematics curriculum (Ministry of Education, 1996). Already the Maori language renaissance has been successful in developing the self-esteem, self-worth and performance of children in these schools, but while the development of language fluency is admirable the development of sound mathematics concepts and processes among such children is highly debatable - as I explain further below.

The Maori mathematics curriculum, known as *Pangarau - I roto I Te Marautanga o Aotearoa*, is modelled closely on *Mathematics in the New Zealand Curriculum* (Ministry of education, 1992). However, the document is written in Maori and attempts to embrace Maori contexts and learning experiences that will suit Maori. This provides some hope, given McMurchy-Pilkington's (1997) finding that Maori children are capable of mathematical thinking and reasoning outside the formal European schooling context. This curriculum document is used by teachers in Kura Kaupapa Maori schools, and in Bilingual Units and immersion programmes within mainstream schools. Today, 13% of Maori primary school children attend such programmes, and the figure is growing.

With respect to mathematics, there is a real sense of urgency to improve the achievement of Maori children. The recent TIMMS Report (Garden, R. 1997) revealed that at the eight to nine-year-old level the performance of New Zealand children was in the bottom third of the international sample. It appears that Maori and Pacific Islands children in New Zealand have contributed disproportionately to this result. Gehrke, for instance, has calculated that if these children were excluded from the New Zealand sample then New Zealand's mean score would have risen to about halfway in the table of country results (Biddulph, Gehrke, Taylor and Carr, 1997). The effect of Maori children's relatively poor performance in mathematics, of course, is that they are eventually denied entry to many of the high status professions and occupations which require a high standard of mathematics achievement as a prerequisite for entry. This, as Ohia has pointed out, is not acceptable to Maori. "In mathematics, Maori people desire to achieve the same outcomes as non-Maori learners and to the same standards" (Ohia, 1993 p 113). New Zealand as a country is also the loser when the mathematics potential of Maori children is not developed to the fullest extent possible.

A key factor in developing the mathematics potential of Maori children is an adequate supply of Maori teachers who are fluent in Maori and competent in teaching mathematics. Meeting the demand for such teachers falls on the shoulders of teacher

education institutions such as the Auckland College of Education, and the School of Education at the University of Waikato. And meeting the demand has proved a considerable challenge for Maori mathematics teacher educators. Some hint of the difficulties is revealed by Nathan and McMurchy-Pilkington at Auckland.

...we have a responsibility to re-introduce the students to mathematics in a way that challenges their belief about the subject, challenges their mathematical "being" and allows them to develop an alternative view of mathematics, a view that includes a human face to mathematics and its development. (McMurchy-Pilkington, 1997, p.3)

They found that changing Maori student teachers' perceptions of mathematics was crucial to helping them feel more confident about teaching mathematics.

This paper identifies a number of factors that mathematics teacher educators need to address in their efforts to meet the demand for a growing number of quality Maori primary teachers of mathematics. Many of these issues are not new. Several years ago Ohia realised that,

A focussed teacher - training package will need to be developed to increase the facility of mathematics teachers to speak and write the Maori language . In this way, a true connection will be made between mathematics and the Maori language and people. (Ohia, 1993, p.111).

Ohia added,

Maori developers are no longer talking about just adding Maori concepts to mathematics, but reconstructing the mathematics programme to align it with the Maori language, culture and qualities to achieve the same outcomes and standards, (Ohia, 1993, p.111).

At the same time Fairhall stressed that the learning of mathematics in Maori "depends upon Maori people; there are no others" (Fairhall, 1993, p.122).

Source of data

Data for this paper were collected through systematic observation of and discussion with a group of 23 Maori student teachers in their first and second year Rumaki (Maori immersion) mathematics education programmes which I taught in the second semester of 1997 and the first semester of 1998. Field notes of the observations and discussions were kept. Prior to that I had been teaching in a bilingual unit in an intermediate school and so was keenly aware of what student teachers needed by way of fluency in Maori and mathematics understanding if they were to become effective teachers of Maori children in Kura Kaupapa schools, or in bilingual or immersion programmes in mainstream schools.

Issues

My observations indicate that Maori student teachers involved in the Rumaki programme usually work collaboratively in a genuine atmosphere of helping each other learn. There is little notion of competitiveness, and they often act within "tikanga" (customs) of Maori culture. Perhaps this is because they remain together for the majority of their teacher education courses, or because many are mature adults who bring to their studies a range of life experiences and wisdom. Whatever the reason, many do not have fond recollections of their own schooling, are convinced that Maori children today deserve better, and hence are fairly highly motivated. These are the positives which provide strength to the Rumaki programme, but there are also factors which provide a real challenge.

1. Significant variation in the quality of student teachers

Because of an acute shortage of Maori speaking teachers and Maori role models in schools, there has been vigorous recruitment of Maori into primary teacher education programmes. However, given the limited number of Maori in New Zealand who are fluent in the language, together with the relative lack of achievement

of many Maori in mathematics, the Maori applicants who have been persuaded to consider primary teaching constitute a very diverse range, in several respects.

Language: Only one in five of the Rumaki group I have taught were fluent in Maori when they arrived on campus. Those who entered with little or no Maori fluency will be expected to teach 100% in Maori when they enter the teaching profession at the end of their three or four year teacher education programme. If they don't then they could find that some of their pupils are more fluent speakers of Maori than themselves. To assist in this regard, the 80% without fluency are required to take Maori language courses where they have 'options' in their diploma or degree programme.

The real issue for mathematics teacher educators is how to help such student teachers develop the understanding needed to teach mathematics in Maori at the same time as many of them are trying to learn the language. There is no simple answer to this, although it may help if the mathematics education courses are taken later in the teacher education programme rather than in the first two years as at present. This would enable the students to concentrate on learning the Maori language in their earlier years in the programme. On the other hand, there is some expectation in schools that the Maori student teachers will have some competence in teaching mathematics when they go out into schools on teaching practice. There is a dilemma here that needs further consideration.

Mathematics understanding: Many of the Maori student teachers bring to their courses negative feelings about mathematics, and a lack of understanding of the major concepts and processes that primary children can be helped to develop. It is extremely difficult to help them overcome such feelings and gain the understanding needed in the one and a half courses allocated in the Rumaki programme at Waikato. There is certainly a need to change their perceptions about mathematics education, as Nathan and McMurchy-Pilkington found. Unfortunately, although student teacher motivation is high, there is not the space in the Waikato programme, as it is presently arranged, for them to undertake additional mathematics education courses. Effectively they are being asked to completely change their perspective on mathematics education, upgrade their own mathematics concepts and processes, learn the Maori terms for these, and develop the ability to teach the mathematics, perhaps critically, within the context of living Maori culture. It is a big ask. My fear is that through lack of preparation time, our Maori student teachers will graduate without feeling secure about teaching the Maori mathematics curriculum in the way intended.

Study experience: Often it is years since many of the mature Maori students have done any serious study and in such a tight programme where they have to do considerable reading and study to promote their professional development in Maori mathematics they find it quite difficult. Many of the Rumaki students appear to be starting way behind their counterparts in the regular mathematics courses. The result is that, as their mathematics teacher educator, I have had to provide them with much more help and support than I do the students in my mainstream mathematics education classes. This poses another dilemma: such help and support require time, which is also in short supply. In other words, providing mathematics education courses for Maori students in the Rumaki programme requires greater resourcing than mainstream courses.

2. Community expectations

As if the Maori students in the Rumaki programme didn't have enough to contend with, some are under considerable pressure from family and community expectations that they do well. This is a burden that they just have to bear as often family and community, especially small rural communities, are supporting them financially and otherwise through the years of their teacher education programme so that they will return and work within the community. Although community expectations provide a motivating force, when they combine with the pressures of the

Rumaki teacher education programme itself they can begin to have a negative impact and interfere with the students' ability to process course work. It would be much better if the programme were flexible enough to allow some students to take courses at a pace more suited to their developing professional competence.

3. Delivering mathematics education courses within a Maori framework

I have found it quite a challenge to model a Maori mathematics education perspective for Rumaki students, especially those who are far from fluent in Maori and who tend at first to translate Pakeha (English) concepts and ways of thinking into Maori words. For example, I need to give further consideration to promoting team teaching, a supportive, non-competitive whanau environment, contexts relevant to Maori that incorporate tikanga (customs) and are suitable for the student teachers and children, and to achieving a balance between traditional and modern contexts.

In conjunction with this, I am also very conscious of the need to help the students overcome their very real anxiety about and fear of mathematics. Helping them to develop a more positive view of mathematics can take a very large part of course time. Developing in our students a Maori mathematics perspective, fluency in the associated language, and a positive feeling about learning and teaching in an integrated, holistic way is something which I recognise as desirable but not easy to achieve. With respect to this, I am reminded of Barton's (1993) view that Maori mathematics education may incorporate the functions of present mathematics but not necessarily resemble it. Similarly, the delivery of Rumaki preservice teacher education programmes in mathematics may well need to be different from mainstream mathematics education programmes.

Final considerations

The challenge of providing appropriate mathematics teacher education immersion courses is both time consuming and energy sapping. The main preoccupation at present is with trying to get the Maori student teachers up to a minimum level of competence. What is needed of course is a longer term strategy to encourage the best teachers to consider undertaking post graduate qualifications (degree courses for those who have completed a diploma only, honours courses for those working on a degree, and masters and doctoral studies for those with a degree) so that they can take leadership positions within Maori education generally and Maori mathematics education in particular. I am aware that at present Maori with higher qualifications tend to be enticed away from schools to work in universities and government agencies, but we need to look beyond this shorter term position.

It is also time to begin to address the mathematics achievement of the 87% of Maori children who are taught in mainstream classes. What can be done for these children is problematical because little is known at the moment about the difficulties they experience learning mathematics, or the difficulties teachers experience trying to help them learn. This is an area where there is a need for research that will identify such difficulties and explore effective ways of overcoming them. It may be, for instance, that strong links have to be drawn between the home life of Maori children and their learning in mathematics. Whatever the findings, such research could then inform mathematics courses for preservice and practising teachers.

As part of this push for development, there seems to be a need to raise the expectation of all mathematics educators, Maori parents and the children themselves that Maori children can succeed in mathematics.

Likewise, further development of mathematics education courses for Maori teachers, such as the student teachers in the Waikato Rumaki programme, could also benefit from relevant research. A systematic, indepth research approach is now needed to investigate these issues, and ways in which they are being or might be addressed. Research of this nature could obtain a variety of data. For example, data on who the trainees are, their level of fluency and their views of mathematics need to be sought. Lecturers and tutors of the rumaki programmes need to be identified.

Data about the level of fluency and mathematical experience of lecturers and tutors could also be monitored.

Data could be obtained in a variety of ways. For instance, both qualitative and quantitative means could be used to track an intake of student teachers, initially during their first year, but then longitudinally over the period of their degree course. A series of hui/meetings with some of the main preservice immersion training providers could also be held to discuss, debate and further clarify the issues.

Within such a research programme, the nature of Maori research and approaches that are acceptable within a Maori format would need to be adhered to. Such approaches may vary from region to region, but it is possible that they could be combined with common western approaches to research. Acceptable research methodology is something that itself needs to be investigated.

Research of the kind outlined has the potential to ensure effective delivery of Rumaki preservice mathematics education programmes, which in turn would benefit Maori children in Rumaki schools.

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