

Creating Strong Achievement Gains for Māori Students in English-medium Mathematics Classrooms

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This case study examines the responsiveness of classroom practice to Māori students' needs in two Wellington English-medium primary schools through the eyes of two senior-level and two junior-level teachers and their Māori students. Particular attention is paid to the characteristics of the teachers selected by their facilitators and principals because they produced strong achievement gains for Māori students and to the role that the wider school environment played in supporting culturally responsive practices. The study identifies three key characteristics – the school environment, the pedagogy, and the teachers – and provides evidence that involvement in the Numeracy Development Projects had provided a context for good teaching practices to be revisited in mathematics learning.

*Ehara taku toa i te toa takitahi engari he toa takitini.
My strength is not that of a single warrior but that of many.*

Background

Māori success is Aotearoa New Zealand's success.

(Ministry of Education, 2007, p. 4).

Ka Hikitia – Managing for success: The Māori education strategy 2008–2012 (Ministry of Education, 2008), while recognising the progress and changes that have occurred in education over the last decade, seeks to shift thinking from that of addressing problems and disparities to that of utilising and building on Māori potential and opportunities. One way towards achieving this aim is to tailor personalised learning for individuals. The Numeracy Development Projects (NDP) are structured in such a way that it is possible to be deliberate in identifying and consequently analysing data for Māori students. Schools are being encouraged to investigate this data and to create programmes that will ensure the success of their students.

As stated by Timperley, Wilson, Barrar, and Fung (2007, p. 92), "Success is achieved with the right kinds of support in the right kinds of circumstances." The "right kinds of circumstances" begin with using an evidence base to challenge teachers' existing beliefs. Successful interventions are those that develop a theoretical basis for promoting practices and recognise the complexity of the relationships between the teacher's subject knowledge, pedagogy, and assessment and how the students learn. "Teachers need tools that allow them to be responsive to the needs of their own students" (Timperley et al., p. 92).

Anthony and Walshaw (2007) discuss the importance of productive interaction between people in enhancing skills and knowledge and impacting on identity and disposition. They also identify positive, culturally based strategies for teaching diversity, particularly in regard to Māori students learning mathematics (Anthony & Walshaw, 2007). Their evidence links pedagogical approaches to achievement outcomes and also to social and cultural outcomes. This study explores how such strategies look in practice for Māori students.

The study builds on previous investigations into bicultural practices in mathematics education (Averill & Te Maro, 2003; Averill, Anderson, Easton, & Hynds, 2004a, 2004b; Anderson, Averill, Easton, & Smith, 2005; Averill, Anderson, & Easton, 2007; Higgins with Parangi, Wilson, & Klaracich, 2005; Te Maro, Averill, & Anderson, 2005). The purpose of this investigation is to examine, through the eyes of teachers and students, classroom practices that are responsive to the needs of Māori students. The study focuses on the characteristics of the teachers who produce strong achievement gains for Māori students in English-medium primary classrooms. Specific attention is paid to the part the school plays in recognising, developing, nurturing, creating, and utilising the characteristics of successful teachers of Māori students. The first part of the paper presents the methodology and an overview of the student results for the two participating schools. The latter part of the paper examines evidence gathered from interviews and from the school environment more generally that illuminates practices that are culturally responsive for Māori students.

Methodology

Two Wellington city schools (both decile 3), where about one-third of the students are Māori, were selected for this study because their Māori English-medium students were identified as achieving well, based on Numeracy Project Assessment (NumPA) data. Facilitators identified the schools and the teachers within those schools as having a classroom climate and/or an appropriate culture that encourages Māori students. The researchers used information from data and the feedback and perceptions of the facilitators and principals in their investigation of these schools, teachers, and classrooms.

The participants included the two schools' principals (one Māori, one non-Māori), two teachers from each school (all female, one Māori and three non-Māori), and between three and six Māori students from each teacher's class. Each teacher was identified by their principal as working effectively in mathematics with Māori students. Two teachers taught year 1 and two taught years 5–6. The teachers varied in their levels of experience, with two having more than 10 years' experience and two under 10 years' experience. The students who were interviewed were selected by their teacher on the basis of their achievement and their ability to express their views.

The research team comprised Māori and non-Māori researchers and the research was situated in English-medium school settings, so the guidelines for Māori-centred research were a key aspect of this study. In Māori-centred research, as discussed by Cunningham and Durie (1998), both Māori and non-Māori share control of the research. Similarly, in this study, the research was conducted by a Māori and non-Māori collaborative group.

Māori-centred research also acknowledges the dual benefits of a shared approach to teaching for all students, including Māori students in English-medium institutions, and for English-medium educational institutions. The research used methods that are consistent with the principles of a kaupapa Māori¹ approach (Smith, 2002). These included drawing on established relationships (including the facilitator-school relationship and the facilitator-former teacher trainees who are now teachers relationship); taking steps to establish relationships before gathering data (for example, before sending information out to participants and during the data gathering phase, having kanohi ki te kanohi² meetings that include providing kai³); and developing a shared understanding between the researchers and the participants as to the study's aims and their contribution to improving the learning for Māori students in English-medium classrooms.

¹ Māori way of doing

² Face-to-face

³ Food

A range of data gathering methods was used in an attempt to improve the reliability and validity of the study's findings. The methods included interviews and lesson observations. Principal, teacher, facilitator, and student interviews were undertaken to gather information on perceptions of practice, the teacher characteristics that were considered to be important in improving Māori student achievement, and how schools support and develop these characteristics. Focused lesson observations, using a detailed observation schedule, were used to gather data on culturally responsive practices. Audio recordings of lessons provided additional evidence of classroom practice, mathematical thinking and teaching, and teacher-student and student-student interactions.

The Victoria University of Wellington Human Ethics Committee granted ethical approval for this research.

Ethnographic approaches in which the specific classroom sessions were considered within the wider frame of the school setting were useful for establishing the trustworthiness of the data. The research team identified characteristics that were stated as being common at both schools. These characteristics were grouped into key themes; illustrative quotes from the interviews are included as evidence to support the findings of this study.

A limitation of the study was the comparatively short time frame for gathering data – a three-day period within each school. While the facilitators provided the broad contextual knowledge of the numeracy work within each school, the data gathered represents only a small section of work from each of the schools and findings cannot necessarily be generalised to all school contexts. However, it is hoped that the key themes will provide a basis for discussion, teacher development, and further research.

Findings

All the teachers, both principals, and the facilitators offered ideas for effective teaching practice for Māori students in English-medium classrooms. In some instances, these ideas were examples of revisiting good teaching practices. Examples included having a shared school focus, using evidence/data to inform practice and development, and developing strategies to increase student talk, such as providing “think time”. There was evidence that involvement in the NDP had given a context for ideas to be revisited in mathematics learning. Three key themes emerging from the participants' responses included: characteristics of the school environment; characteristics of the pedagogy; and characteristics of the teachers. The rest of this paper will examine the wider school practices, classroom practices, and personal characteristics of teachers that contribute towards strong achievement gains for Māori students in numeracy.

Characteristics of the School Environment

The characteristics of the school environment that appear to be important for creating strong achievement gains for Māori students include: the professional development focus of the school as a whole; the capacity and disposition of staff to work as a collaborative learning community in focusing on the achievement of Māori students; the provision of a safe school environment for Māori students; and the targeting of Māori student achievement.

a. Providing a professional development focus

School 1's areas of professional development include: using achievement data to analyse groups' results and to target Māori students' achievement (as well as the achievement levels of other focus groups); developing co-operative strategies; and the NDP. Research about effective pedagogy is used to inform all staff development at School 1. School 2's professional development focus areas include home-school partnerships as well as the NDP.

b. Encouraging staff to work as a collaborative learning community

Both schools focus on whole-school professional development and have a climate of shared endeavour in making changes to classroom practice. In both schools, staff work as a collaborative developmental learning community, with teachers sharing responsibility for learning, using discussion, peer observation, and reflection to critique and develop their practice:

So it's always – it's the support of your team as well; who you're working with. Yeah, for all of us, we've been doing a lot of observations of each other, and we video our teaching. So it's getting feedback from not only our senior teachers but also our own peers. We can actually go into each other's classes and video [them], and then we can sit there and reflect on the video. (Teacher G, School 2)

c. Providing a safe school environment for Māori students

Both schools demonstrate several techniques for ensuring that the environment is safe and comfortable for Māori students, such as encouraging taonga Māori⁴ and whanaungatanga⁵.

Taonga Māori

The key aspect of reflecting taonga Māori that is evident in both schools is the use of te reo⁶ around the school environs. Examples of written te reo included circulars on notice boards; labelling for school entrance areas and other signs; and posters. In both schools, staff members speak te reo in the classrooms and in the wider school environs of the staffroom and the playground. There is evidence that both schools actively celebrate Māori language week with an extended focus on te reo. One of the teachers at School 1 commented that the students “got right into” Māori language week. A teacher at School 2 commented, “We want to look at a long-term plan for sustaining te reo across the school, so that might be – not just fostering the kids but also the staff” (Teacher G, School 2).

Māori protocols such as beginning the day with a karakia⁷ and using pōwhiri⁸ to greet visitors are firmly entrenched in both schools:

Practices of karakia are observed, and staff members didn't used to observe, you know, silence for the karakia, for example. They do now. So [that's] been a development. And one teacher's brought a lot of songs. The rest of us aren't very songy, but she's been good at bringing a lot of songs in. (Teacher J, School 1)

We have quite a lot of role models for Māori boys in particular. There are some big boys here who, when we do a pōwhiri, are very powerful. They do it themselves. (Teacher G, School 2)

A teacher at School 1 also reflected on the previous organisation of the school into whānau groupings and the impact of such groupings on taonga Māori as a basis for current practice:

We used to be organised into different whānau then; we had four whānau in this school ... The principal here then brought a very strong bicultural emphasis, and the immersion classes added a huge dimension to our school that other schools are unlucky not to have. (Teacher J, School 1)

Both schools provide opportunities for staff to develop their knowledge of te reo:

I try and use as much te reo as I have at my fingertips – to make those people for whom it is a language they've heard in their background feel that “it's cool in here”. I was always trying to use as much te reo as I have. I did a bilingual course in 1981 where I used to work, six weeks, full time, out of the classroom. And that was a great foundation, you know, for things that you can use now. (Teacher J, School 1)

⁴ Things of great importance to Māori

⁵ Relationships in a wider community

⁶ Māori language

⁷ Prayer chant to begin the day in a positive way

⁸ Formal protocol for welcoming people new to a place

Māori staff are regarded as strong role models. For instance, in School 1, one teacher commented:

You've got all those role-model kids, and now [our principal] has professionally developed himself so that he's got a lot more fluency, too. I always get a real buzz out of seeing students walk into the classroom and talk to a staff member in te reo and they answer them. And that's, for all staff, that's a real positive to see a language used like that. It's great. And I think that has spread out through the school, you know. (Teacher J, School 1)

And, you know, having a Māori male principal is a pretty good role model too, for kids from the school – and strong women teachers as well ... they obviously see people of their own culture achieving really highly in this school environment, in this particular school. (Teacher J, School 1)

A teacher at School 2 also spoke about having role models for te reo. These two schools' systems are centred around Māori staff and non-Māori staff who have strong knowledge of te reo:

We thought it was great to have all of us there to keep pushing te reo in the class, whether it be in maths or English or anything like that. But it was great because our kids in those syndicates could actually say, "Hey, there's somebody that's Māori there", because, you know, we've got a few kids that come from kura kaupapa⁹ ... [For instance] I took [one] under my wing, but I didn't need to because there are teachers in [their] syndicate that [they] could relate to. (Teacher G, School 2)

Whanaungatanga

Whanaungatanga is described by Bishop (2008) as relationships and whakawhanaungatanga as the process of establishing relationships. Metaphorically, these terms are useful for describing aspects of a safe school environment for Māori students. Evidence of practices at these two schools that foster whanaungatanga include: the availability of support (including cultural advice) from Māori staff for the students and teachers; the principal's relationship with the students, which extends into the teaching in all classrooms; the students' access to the staffroom (with the aim of reducing the barriers between staff and students); and the school community's access to the school and the classrooms. One of the teachers at School 1 described what support from Māori staff members meant to her as a non-Māori teacher:

I know that I have found [one of the Māori staff members] very supportive if I've got anything in particular about Māori cultural practices, for example, that I feel a bit unsure about. She's a very supportive staff member to go to, and I feel free to ask her anything. A few of the children have got siblings in the whānau [immersion class]. And [the Māori staff members] have been really cool about that too. A couple, two kids in my class, had siblings in the whānau [immersion] class as well and still have. There hasn't been a tug of war over those children, so I feel very supported by the two teachers in the immersion classes. (Teacher K, School 1)

d. Targeting Māori student achievement

In both schools, staff maintain a focus on the achievement of their Māori students:

We quite often discuss our Māori students' results at this school, separately from the rest of the school. So, [at] our staff meetings, quite often there'll be a section of the staff meeting when those results are presented to discuss. You know, and if we've got any at-risk children, and they're Māori students, we'll all talk about that child. We all know who we're talking about, you know. So I guess we're all pulling together and attempting. When we use graphs for the end of the term, we have a graph for Māori children, ESOL children, and then others. That's how the data is presented. (Teacher K, School 1)

Within our own syndicate, we're always talking about the achievement of the kids, and [the things that have] happened this year, we've actually planned together. And then we've gone off, taught the children, and then we do formative assessment. And then we'll take those results back, and then we'll look at the gaps. And this year, the gaps were in fractions and place values, so we actually got together and stopped whatever we were doing and just planned fractions and place value units. And so we went hard out on that. And then [after] the next two weeks, we come back again [and] look at those results again. (Teacher G, School 2)

⁹ Māori-medium schools

Well, I think the challenge is still that there's always going to be that tail of kids; you've always got that group of plodders. And maybe I still see a bit of a challenge in the transition from kindy or daycare to school. You know, we've got such huge expectations when they get here, and often it takes a long time for them to meet those expectations. And it's hard to know – I just think expectations are so important. So it's hard to know whether I [should] lower [my expectations] or keep them and hope [the kids will] come up to them. (Teacher S, School 2)

I think this school [identifies] the kids – a lot of the data that I've looked at identifies kids. You know, like, whatever tests or whatever they're doing, kids are pulled out and looked at over time, and there is definitely support put in place for kids who are failing. You know, like teacher aide support or whatever it is. So, while that's not a teaching practice, I think that's a successful practice because those kids are getting supported more. (Teacher S, School 2)

Teachers also talked about using the Number Framework and diagnostic interview results to talk with parents as well as with the students about achievement patterns:

You can see the progression. It makes much more sense to you as a teacher. What you're doing, you can see where you're going. And it's really great with the parents at Meet the Teacher night; you can talk to parents really well. [Previously] I've always struggled to explain where we were going with the parents, but with numeracy, it's excellent. And you can show them all the data, and where they are on the graph. I always bring out the GloSS¹⁰ result and say, "Look, they were here in February, and now they're here", and everybody feels good. And you can show that to the kids too. And I like the diagnostic aspect of it, too. I like that standardised assessment that you can deliver and get your results out. (Teacher K, School 1)

Characteristics of the Pedagogy

This study has found that the orientation of the teachers towards using culturally responsive actions and the building of relationships are important characteristics of the pedagogy. Alongside such orientations are the teachers' choices, the use of pedagogical strategies, and the teachers' personal qualities. The culturally responsive actions used are underpinned by sociocultural knowledge and skills. Evidence to support this includes the teachers' use of Māori protocols such as *karakia* and *mihimihi*¹¹; their awareness of the importance of saving face (exemplified by not singling out the students in a negative way); their awareness of *whakamā*¹²; their use of *te reo*; the way that they set firm boundaries and use direct instructions; their acceptance of *matua/whāea*¹³ status; their ability to consistently respond using humour; and their use of *tuakana-teina*¹⁴ and *whakanui/whakaiti*¹⁵ strategies.

Participants from both schools noted the use of teaching pedagogies that are particularly pertinent for Māori students' mathematics learning. These pedagogies are not numeracy specific but have been reinterpreted through the teachers' involvement in the NDP. They particularly enable dispositions of *whakamā*, *whakanui*, and *whakaiti* to be acknowledged and catered for. Evidence of such pedagogies are described in the following subsections.

¹⁰ GloSS or Global Strategy Stage is used to find out which global strategy a student is using to solve a number problem. For more information, see www.nzmaths.co.nz/Numeracy/Other%20material/GLOSS.aspx

¹¹ A way of greeting and letting people know who you are and where you come from

¹² In this study, we use *whakamā* in the sense of shame as well as pride

¹³ Parental, father and mother, uncle and aunty

¹⁴ In this study, we use *tuakana-teina* as a way of describing those who are at higher stages helping those at lower stages.

¹⁵ In this study, we describe *whakanui/whakaiti* as pride and humbleness, letting children know that they are doing well in a way that does not shame them.

Supports for the students' mathematical talk in teacher-led groups

The use of the “think, pair, share”¹⁶ strategy, along with other strategies for providing the students with think time, is a teaching pedagogy that was commonly noted by the participants. Providing time to think rather than expecting students to respond immediately to a question or problem is an important aspect of “saving face”.

All the participants felt that increasing the amount of the students' mathematical talk was important in supporting and encouraging the students' building of their mathematical understanding.

One teacher at School 1 described their school's interpretation of think, pair, share, which had been introduced as part of a whole-school professional development programme:

It is a school thing. It's like a think, pair, share thing – same sort of principle: talk to your partners, see what they [think] – and it gives them time to – if they had no idea, at least then they can sort of save face, I suppose you could call it. When I come along and say, “Well what do you think?”, they say, “Well we thought ...”, so it's not just them. It has been a deliberate school strategy – an engagement strategy. So that's just like the think, pair, share, it's just to engage them all, because, otherwise, you know, a lot of the time when you're in a classroom, when you ask a question, it's always those same ones who put their hands up, and the teacher always asks those people with their hands up. And it's the expectation that they too will be giving an answer, and it won't just be those ones with their hands up.

I think it's because they can hear each other's ideas, give each other opinions, and they feel a bit safer that way as well, especially if it's a pair they've chosen. Sometimes they choose their pair, sometimes I choose their pair for them. I think it's more working *with* people; it's working *with* because they – they also want to help, and they want to make sure that the person next to them also knows the answers, too, and they don't like the idea of one of them being better than the next one. So, in that way, it's more of an equal – “we've decided” or “we did those” or “I helped this person” – that's what I mean by *with*; so together – “together ownership” rather than being a “single ownership”. It's like they don't want to be singled out – in maths, anyway.

We're always in a group because our groups are [large] enough to pair up. And I think they strategically sit in their circle now, knowing [laugh] that they're going to have to talk to the person next to them. (Teacher K, School 1)

Another teacher at School 1 used the think, pair, share strategy in a slightly different way:

I'm very eager to have everybody [attempting] it. That's why I make them whisper to the person next to them so I can make their lips move; rather than have one person volunteer – and inevitably it's the same person or the same couple. (Teacher J, School 1)

A teacher at School 2 talked about an expectation that the students would be thinking about the mathematics and giving the students support to this end:

I think the most important characteristic is expectation – that you just expect of all children that they will achieve and don't let them off the hook. So making sure that, to give them that thinking space ... the others stay out of their space, basically, so that they get a chance to get there in the end. ... there are always children that need longer to think. (Teacher S, School 2)

The students also indicated that they found the think, pair, share strategy helpful when problem-solving:

She'll make us pair up with somebody who does know, and then she'll give us a few fractions to do alone, and then, if we get them right, then she'll tick them, but if we don't, then she'll just help us and will make us get them right. She gives us examples for when we're, like, stuck on a question. (Teacher K's student, School 1)

¹⁶ Think, pair, share is a strategy adopted by many educators in the field of co-operative learning to introduce the idea of “wait or think” time into the peer interaction element of co-operative learning.

A teacher at School 2 described a practice that might be portrayed as a version of how we have come to understand the term *tuakana-teina* in this context, where older students from her class went to other classes to work with younger students:

We've [earlier in the year] sent the kids in my class to help the younger kids. So, they – like, they had to choose a reward that they wanted last week, and they could choose anything, and quite a lot of them asked to do that again. So, obviously, they felt really good about being chosen to help. I think that was quite a carrot for them earlier in the year. (Teacher S, School 2)

Reframing achievement grouping

A teacher at School 2 had a strong awareness of *whakamā* and explained how she reframes the levels of achievement of the students in her class as “being at a particular stage” rather than “being in the top or bottom group”:

Some of them get *whakamā* because they can see their peers are higher than them. But I'll say to them, “That's fine, that's where they're at, but you're at this stage, and if that helps you, how do you feel about that?” [They say,] “I feel good when I know the answer.” I say, “Well you carry on. Don't worry about what he or she's doing. 'Cause, you know, they're in a different stage.” So they have to know what stage they're at. They're not in the top group or the bottom group; they're at a stage. And I have that in my room about what they can do at that stage. “So you're at this stage, and this is what you can do. So now I need to move you from there up to there.” [And they say,] “Oh, so that's what I need to do to get to there.” [And] I say, “Yeah.” (Teacher G, School 2)

Opening up the classroom to parents and caregivers

Direct and timely communication with parents or caregivers is an important aspect of addressing concerns that a teacher may have about students in their class. One teacher at School 1 described how she uses this opportunity to provide positive feedback about students as well as to manage expectations about school attendance:

I hardly ever see [some parents]. But I take every opportunity when I do see them to give them a positive vibe about school and tell them how well their child's doing. And only occasionally do I come in with, “It would be so nice if your child was at school on time.” But I think the way I address some of the needs I've felt that my Māori students have had is first of all to make a strong link with the home. So I actively promote parental participation in the class. And you saw a parent in the class this morning who asked if she could do some work; she had a bit of spare time. Not the easiest parent to have in your room, but I accommodated her, and it's a win-win. (Teacher J, School 1)

At one of the schools, the Home-School Partnership initiative was cited as being useful in raising Māori students' achievement:

But I also think, at this school, they have that parent partnership and family-whānau relationship thing happening. So the kids get games to take home, and they have parent nights and that sort of – yeah, that's been quite successful too – using what we've learnt there in the classroom and vice versa. They bring the kids, too. [Because the] parents were really positive about it. So were the kids! And it got a whole lot of new games going in the classroom because the ones who'd been wanted to show the others. It's made me aware of how easy it is to find sites and things on the Net where you can print off games – all you need is a plastic bag of dice, you know, and a piece of paper – so long as the kids know the game. But really awesome learning [is] going on at home. It's reinforcing what we're doing at school. (Teacher S, School 2)

Setting firm boundaries

The teachers also felt that it was important to set firm boundaries:

Yeah. I have very clear boundaries in my classroom, and the children know just with eye contact if they've overstepped that boundary. And I maintain that with, I feel, a very strong positive focus. So, I'm a big advocate of positive reinforcement – and I use it frequently in the classroom. (Teacher J, School 1)

Making personal connections

The teachers at both schools spoke about the importance of making personal connections, such as by openly sharing aspects of their own lives and experiences:

I think ... openness, and making connections with the students. It's a good characteristic to have, like, knowing who they are, what they do outside school as well. Those sorts of connections. It's like a family approach as well, you know. They're quite happy to come and tell you things or give you a hug – as you noticed when you left my class yesterday, you can't escape the hugs in my class. And, for some students, that's what they do at home, and to them, it's a lot of that whole family sort of situation as well, you know. So if someone doesn't have their lunch, we'll find someone else who can maybe share lunch, or those sorts of things; what they did on their weekend, you know. Today, when I mentioned my mum – how my mum did this – so, it's like we're making connections there, how we all sort of hang out and do our thing. (Teacher K, School 1)

Priority given to relationship building

The teachers talked about giving priority to relationship building with the students as well as more generally with others in their realm of work. This was seen not only as being important for developing trust but also for getting to know the students as individuals:

To know where they're at, you know, know their background. Be positive and just accept them for who they are. And treat them as individuals, because that's who they are. (Teacher G, School 2)

One of the students identified the importance of this aspect for himself:

She does help me and teach me, and I think that helps, and I *know her*. (Student T, School 2)

A teacher at School 1 explained how an established relationship with the students helps her to make learning connections so that she can safely challenge the students' ideas and promote their learning:

I felt, in the first day of school, that you try and build a relationship with that particular child. Put a lot of effort in when they first come at [the age of five] to make them trust you. I think probably all the children in the class probably trust that I'm not going to throw something at them. If they find that they're struggling with anything in the classroom, [they trust] that they won't be punished for that. They won't feel put down because they don't know something. I think they feel supported to take a risk in the classroom. I do think that most of the children are prepared to do that. Because my personal philosophy is that everyone is going to achieve. And I'll bend over backwards to try and secure that for everyone in the classroom. You've gotta make a connection with the kids. You've got to get them onside when they first start school, and then you're all right; you're sweet. Then you can challenge them. And they'll take it. But if you haven't got them onside, and you challenge them, they're not going to even, you know [try]. (Teacher J, School 1)

A teacher at School 2 emphasised the importance of building positive relationships with the Māori students and of not singling out students:

Not singling kids out unless it's in a positive way; but also, that whole thing of the kids that can do it – the experts helping the younger – the ones that aren't so strong; the relationship thing. I think that they know that you like them; it's a big deal when they're that little, or I suppose whatever age – that the adult that they're working with acknowledges them as a person; that kind of relationship thing. And also, I do quite a big thing in maths about not laughing at other kids, you know, that it's a safe place, and that if [you] can't take risks, then you're not going to be able to learn. Because that's how maths is. (Teacher S, School 2)

Developing shared responsibility for learning

Teachers in both schools looked for ways to involve their students in reflecting on the lessons. One of the School 1 teachers explained:

Making it enjoyable, that's my big aim. I make my maths fun, and often I'll go with what they want as well, you know, because I can tell if they don't like something or they don't want to do

that one. We always talk about it afterwards, "Did we enjoy it? What did we like about it? Shall we do that one again? Shall we add any other features to it?" So, I think, making it fun is one of the successes. And hands on: they can own some of the lesson as well; it's not just me being the director, and I think that helps. (Teacher K, School 1)

Teacher K's students correspondingly made many comments about helping one another and getting help from other students, such as, "Oh, like, if you don't get it, then go ask somebody, and then keep on asking somebody until you do get it." One of the teachers at School 2 explained how she shared the lesson's learning intention with the students:

I always share the learning intention first, and at the end of [the lesson], I make sure I go back and say, "Well, have we achieved that?" I'll get them to predict what they think we're going to learn about. And then we'll just go back, and we'll check; we'll sort of tick off and go "Oh yeah, we learnt that; we did that; but we didn't do that. Why didn't we do that?" (Teacher G, School 2)

Providing the students with choices

The teacher felt that it was important to give the students choice from a range of tasks and materials to help them solve the tasks, as well as choice of who they would work with:

They like the [tasks] where they can work with someone – there's a lot of working with someone, sharing ideas, playing little games with someone. So, often I give them a choice – they could do that worksheet [or be] the ones who chose the games – more often, that's not my Māori students [who chose the worksheet] because they want to work with someone rather than by themselves on an isolated little worksheet, whereas others are keen about that worksheet. So I think there's that and a lot of the hands-on stuff: see it, play with it, touch it, connect to it. (Teacher K, School 1)

Using materials

The teachers felt that in terms of the NDP, the greatest impact in terms of teaching Māori students in particular has been using materials to model mathematical problems:

I think the [NDP] work for Māori students because [there's] a lot of hands-on, visual working with people – I think that's why [they're] more successful. Whereas the old one is more textbook – here's your page; go through it. (Teacher K, School 1)

I've got a note that if what I'm doing, like, if I'm working at number properties, isn't working, I've always got the box of equipment right there to drop back into using the materials. And, you know, I'm quick to do that. (Teacher J, School 1)

Oh, [the NDP have] had a big impact because of the hands-on – especially for our Māori boys. The materials – they're allowed to use materials to manipulate and to find out what the answer is, you know, because if you just write an equation on the board, it doesn't mean anything to them. But if you show them with materials ... that's what I like about the [NDP]; you show materials first, and you hide those materials and see if they're imaging. But, you know, if they don't image, that's fine because they can still go back to the materials – and they love it. And I think that's built their confidence. Now when they're doing their independent work, some of them will still go and get the materials, but you can actually see that they're actually not needing them so much now. So they may start off with the materials, just going, you know, just to check in their mind, "Ok, so here's the materials; there's that, that, and that." And they might just use it for one equation [and then] they go, "Ok, we're fine." But you know that it's there for them if they need to go back to it. But it's really worked for the children who are at ... stage 4. (Teacher G, School 2)

The students also commented that it was helpful to have materials to work with:

She goes through it and explains it to us. She's just saying things that we could understand. She gives us sheets to cut up. It showed us how to, like, do it into, like, quarters and eighths and twelfths of fractions. She gives us examples for when we're stuck on a question. And she mostly asks one of the people in our maths group to help us. (Teacher K's student, School 1)

For some, materials may not always be a help. Teacher J's students at School 1 were asked "Which maths do you find the hardest to do?" One response was:

When we do some with beads, and it gets harder. Sometimes when I get them out, it's a bit slower – slower than the other kids because you sometimes have to count them, and if you don't, you just get them all mixed up, and then you'd have to try all over again. (Teacher J's student, School 1)

The quotes above demonstrate that the teachers recognise the use of materials as only one part of the approach articulated in the teaching model. Previous research has highlighted the risks to Māori student achievement in labelling Māori students as kinesthetic learners and in relying on the associated practice of limiting their experiences of mathematical learning to "hands-on" manipulation of materials (Alton-Lee, 2003; Higgins, 2001; Timperley & Alton-Lee, 2008).

Characteristics of the Teachers

Underpinning both the school characteristics and the teachers' pedagogies are the teachers' personal qualities. Paramount is a personal commitment to raising student achievement for Māori students through a culturally responsive orientation. Characteristics that the participants in this study identified as being important in raising student achievement included perseverance in working towards students' success in learning mathematical concepts; consistency in the ways in which they relate to others; openness to different ways of thinking about and doing things, particularly in relation to Māori; and being organised.

The teachers talked about how they were committed to working with their groups until all the members of each group had achieved the learning objective:

I guess I will go over and over. I'll go over the same material until I'm happy that the group is secure in it. Which I wouldn't perhaps do with reading. I reiterate in the classroom that they [can] only interrupt me when I'm working with a group [if they need to go to the] toilet or vomit. (Teacher J, School 1)

You had the same learning intentions right across days. I noticed particularly that group – they weren't getting it – and I could have moved on, [but I wasn't giving] up on them, but they weren't getting it, [so] let's try a different way. Basically, it's the same learning intention, we're still learning the same thing, just differently. I wasn't gonna give up. Because I also notice, often they just sit there, thinking, "Well, she's going to do something different next time. I'll just sit and wait till, you know, I won't tell her I don't understand, we can move on", but they know I'll come back to it; we're not just going to forget about it. (Teacher K, School 1)

Teacher K's students talked about how they know that their teacher will keep working with them until they understand:

We get a sheet, and [the teacher] will explain to us, and if we get confused, we just tell her, and then she'll explain it until we get it. She'll call out, and she'll give us our times table, and we'll only get 2 minutes to complete the sheet, but if we get one wrong, then we have to stay on there until we get it right. Once we get it right, we get, we get to go out for lunch. (Teacher K's student, School 1)

When asked "What would you tell teachers about how you would like to be taught maths?", a student replied:

Teaching how Whaea G teaches us, 'cos it's nice and simple, and it doesn't get you bungled up, and it's easy. It's how she speaks, she won't get frustrated if we get it wrong, and she'll tell us that you're doing a good job.

Don't discourage us, encourage us, and don't get frustrated ... and [be] focused.

Conclusion

The teachers participating in this study, who were chosen for their demonstrated successes in raising Māori student achievement, appear to have articulated practices that are multidimensional as well as being situated within a culturally responsive school environment. This finding challenges unidimensional interpretations of culturally responsive practices (Alton-Lee, 2003; Higgins, 2001; Timperley and Alton-Lee, 2008) and gives voice and substance to the whakataukī¹⁷:

Ehara taku toa i te toa takitahi engari he toa takitini.
(My strength is not that of a single warrior but that of many.)

Each teacher has received support from leadership that allows for collaborative teaching and learning communities; they have been nurtured by having colleagues and role models whom they are able to call on for support; and they have undertaken professional development programmes that have allowed them to plan and teach for the individual needs of their students.

This study has implications for principals and teachers and for pre-service training programmes. Principals need to consider implementing professional development programmes that are designed to create culturally responsive teaching programmes. Such programmes could include a climate of collaboration and support, be informed by current and relevant research, and work from an evidence base.

Teachers need to consider using the tools of the NDP to enhance the cultural responsiveness of their pedagogical practice and be aware that sharing and encouraging their colleagues to critique their practices increases the likelihood of enhancing their students' achievement in numeracy.

This study is useful in pre-service numeracy training in that it provides exemplars that demonstrate culturally responsive pedagogy and models how school leadership, colleagues, and the school environment can work together to create positive differences for Māori students.

Further investigations into the complexities of culturally-responsive practices in English-medium mathematics classrooms are necessary to meet our responsibility of ensuring the achievement of Māori students in English-medium programmes alongside their "educational success as Māori in te āo Māori, New Zealand and the world" (Ministry of Education, 2007). This is imperative when we consider that some of the students in this study did not identify as being Māori and others had confused ideas of their own cultural identity.

The students' understandings of their own cultural identity and how this can be enhanced within mathematics learning is a rich area for further research, particularly for Māori students.

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¹⁷ Proverb

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¹⁸ Leaders