

## Te Poutama Tau: A Case Study of Two Schools

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This paper reports on a case study of two schools that have achieved positive outcomes in the Te Poutama Tau project. The outcomes are based on student achievement in the diagnostic assessments and feedback from the numeracy facilitators supporting the project. Te Poutama Tau aims to lift teacher capacity and raise student achievement in numeracy in Māori-medium education. The results of these case studies may help to inform schools, numeracy facilitators, and policy initiatives in order to support the future implementation of Te Poutama Tau and other professional learning experiences in Māori-medium and kura kaupapa Māori.

### Background

Te Poutama Tau is a professional development programme focusing on numeracy for teachers in Māori-medium schools and classrooms. It involved approximately 30 schools in 2005. It is a component of a key government initiative aimed at raising student achievement by building teacher capability in the teaching and learning of numeracy. Te Poutama Tau is based upon the Number Framework developed for New Zealand schools. The Framework is divided into two key components – knowledge and strategy. The knowledge section describes the key items of knowledge that students need to learn. The strategy section describes the mental processes that students use to estimate answers and to solve operational problems with numbers. It is important that students make progress in both these sections of the Framework.

This study examines a range of factors that have supported two kura in their achievement of very positive outcomes in the Te Poutama Tau project in 2004. Māori-medium mathematics education is still very much in its infancy, so it is important to identify key factors that promote student achievement.

The few studies to date in Māori-medium education highlight a range of factors that support and encourage student achievement. Studies by Hohepa (1993), Smith (1999), Bishop & Glynn (1999), and Bishop, Berryman, & Richardson (2001) note that culture plays a key role and that effective teachers create caring relationships and structured, positive, and co-operative teaching and learning environments. Other studies, particularly Glynn, Berryman, & Glynn (2000), highlight the importance of the nature of the relationship between home and school in determining effective student learning and achievement. Studies by Christensen (2003, 2004) note the issue of student language fluency on achievement. Christensen (2004) argues that there is a strong link between students' proficiency levels in te reo Māori and their progress through the stages in the Number Framework. He notes that there is significant correlation between language proficiency and performance in the diagnostic interview (Christensen, 2003, p. 27). What is not known at this point in time is what impact the teacher's own language proficiency has on student learning and achievement in Māori-medium education.

Māori-medium education, particularly the factors that contribute to student achievement, is a developing area of study. Hopefully, this small study will confirm the results of the earlier studies and provide additional data to support Māori-medium schools and associated policies and initiatives.

## Methodology

The major component of this research is a qualitative case study of two schools. The two schools were chosen on the basis of the results of their students' performance in the diagnostic interviews and feedback from the Te Poutama Tau facilitators.

### *Case Study*

In this research, each case study is a study of a social unit (a kura) that attempts to determine the factors that led to its success in the Te Poutama Tau project. The case studies provide a unique example of real people in real situations, enabling readers to understand ideas more clearly than simply presenting them with abstract theories or principles. Case studies can establish cause and effect. Indeed, one of the strengths of case studies is that they observe effects in real contexts, recognising that context is a powerful means of determining both cause and effects (Nisbet and Watt, 1984). Sturman (1999) argues that a distinguishing feature of case studies is that human systems have a wholeness or integrity to them rather than being a loose connection of traits. Furthermore, contexts are unique and dynamic, investigating and reporting the complex, dynamic, and unfolding interaction of events, human relationships, and other factors in a unique instance.

There are several types of case studies (Yin, 1984) and they can be identified in terms of their outcomes, including exploratory (as a pilot to other studies or research questions), descriptive (providing narrative accounts), and explanatory (testing theories). This particular case study is both descriptive and explanatory.

### *Data Collection Strategies*

In the Te Poutama Tau project, students were assessed individually at the beginning of the project, using a diagnostic interview, and again at the end of the year. The diagnostic interview was designed to provide teachers with quality information about the knowledge and mental strategies of their students and to assist in the location of each student's position on the Number Framework. The results for each student, classroom, and school were entered on the national database. The database shows the progress that students made on the Number Framework from the initial to the final diagnostic interviews. Participating schools were ranked in terms of their mean stage gain overall.

There was a cluster of schools and/or classrooms that achieved similar results. Schools who participated in Te Poutama Tau did so either as whole schools (in general, these were the kura kaupapa Māori and special character schools) or Māori-medium units (classes in English-medium schools). Initially, it was decided to concentrate on only two schools. This decision was based primarily on manageability of the data and the process, assuming that if there were more schools, there would be less time available to investigate the results of each one. Secondly, two schools provided the opportunity to identify the common factors that may have contributed to their positive outcomes.

The two schools selected for the case studies, kura A and kura E, were chosen on the basis of their very positive mean stage gains, and they also were able to provide bigger data samples to minimise the chance of "one-off" spikes and dips. The advice of the Te Poutama Tau numeracy facilitators for the two schools was also sought in order to gain their perspectives on the implementation of Te Poutama Tau in these particular schools. In both cases, the numeracy facilitators confirmed the case study schools' positive attitudes and commitment to the project.

As a key component of the research methodology, consideration was given to relevant and appropriate approaches to working in Māori immersion and kura kaupapa Māori schools. Once the two schools were selected, the principals were sent a letter informing them of the rationale and aims of the project. This was followed by a phone call to organise a visit to the school and to establish the identity of the researcher, in order to establish positive relationships and to confirm the schools' willingness to participate. Māori-medium schools have tended to be resistant to research projects that do not benefit the school directly or Māori-medium education in general. In this instance, the principals could clearly see the benefits of the project and were very positive about being involved.

The two principals and those teachers from the case study schools who were involved in the 2004 Te Poutama Tau project were also sent questionnaires (see Appendix A), essentially to promote thinking and discussion on the following questions:

- What role did the socio/cultural and demographic features of the school and its community have on the positive outcomes of the project?
- Did the relationships between the school and its local community, including links to the local iwi and hapū, also influence and or impact on outcomes?
- Did the experience and qualifications of management and teachers, particularly in relation to pāngarau (Māori-medium mathematics), also influence outcomes?
- What were the attitudes and involvement of school management and teachers in Te Poutama Tau?
- What was the effect of the Te Poutama Tau project on classroom practice?
- What are the teachers' reflections on the implementation of Te Poutama Tau?

This was followed up by a personal visit (kanohi ki te kanohi) to discuss issues relating to mutual benefits of the project, to outline the research process, to establish cultural legitimisation, and, of course, to discuss the research questions. Most of the interaction with the interviewees was carried out in the medium of Māori to validate and to establish the commitment of the researcher to the importance of te reo Māori to the kura.

Each teacher was interviewed for 15 to 20 minutes. This was followed by an interview with the principal. The interview responses and the reflections of the staff involved in Te Poutama Tau are discussed in the following section.

## **Results**

### *Case Study 1: Kura A*

Based on feedback from the participants, this initial section examines the brief history of the school and its relationship with its whānau community. This kura is located on the outskirts of one of the bigger cities of Aotearoa in a semi-rural locality and currently has a decile rating of 3. Some of the students attending this kura are drawn from all parts of the city, but in general, the majority live close by. Initially, the whānau established a kōhanga reo, then, subsequently, a kura (primary school) to cater for the needs of the kōhanga reo graduates. Essentially, parents desired the continued development of te reo and tikanga Māori for their children. The kura opened in the early 1990s in a garage, which illustrates the whānau commitment to the language revitalisation cause. The kura was subsequently relocated to a high school and eventually to its present site in 1994. Subsequently, the whānau developed educational activities that branched out into a range of community services operating from a Māori perspective.

The kura is dedicated to whole-brain, holistic, and accelerated learning that connects students to learning for life. The overall vision of the kura and the whānau is to provide quality education from early childhood through to adult education. The school aims to provide an environment that nurtures and develops the students' self esteem whilst holding fast to the taonga of their tūpuna, te reo me ngā tikanga Māori. The kura caters for children and whānau who have an active commitment to te reo Māori and its continued development as a national language of Aotearoa.

Students and parents are required to participate in an initial interview to clarify the school's expectations, particularly in the area of students' te reo Māori language competency. Parents are required to sign an initial parental agreement, which clearly makes explicit the expectations of the kura and its community.

The principal and teachers highlight the close relationships the kura has with the community, the local hapū, and the marae. The whānau is expected to work closely with the school and support students and staff. It is also expected that whānau develop their own knowledge and understanding of reo and tikanga independently and by attending wānanga organised by the school.

### *School and project leadership*

The Te Poutama Tau facilitators and the teachers noted on a number of occasions the key role of the principal in curriculum leadership in general and her influence on the success of this professional development project. The principal had been teaching for a number of years, including 11 years in the role of principal, and was highly instrumental in the development of this particular kura from its conception. She closely monitored the students' progress in the project and provided a range of support strategies to staff, including release time to organise support resources. In her view, the school made significant progress in the project. She intrinsically believed all students could achieve success in mathematics. The teachers did comment, however, that not all students had positive attitudes to pāngarau prior to the Te Poutama Tau project.

The principal argued that successful practice not only required positive attitudes and knowledge of the subject but also an environment that was conducive to effective learning. In her view, this required "great classroom management" and the development of "good relationships" with and between students.

### *The role of the teacher*

The teachers who participated in Te Poutama Tau had spent most, if not all, their teaching career in this particular school. In all cases, their qualifications were general teaching qualifications with no specific emphasis on teaching pāngarau. They had participated in previous mathematics workshops based on Montessori methodology.

Class sizes were between 15 and 20, with multiple age groups in each class. In general, the teachers judged the majority of students to be fluent in te reo Māori.

Teachers identified the Te Poutama Tau professional development model as critical to the successful student outcomes. A key feature of the model was the development of their own content and pedagogical knowledge. An additional feature of the model was the collaborative nature of the project, in particular, the development of a community of teacher practitioners who could share ideas and resources and support one another in implementing the project. The teachers also identified the importance of associated support mechanisms of the project, including

the Te Poutama Tau facilitators and the teaching resources. The critical role of support resources has also been identified in studies by Christensen (2003, 2004) and Trinick (2005b). This is easy to understand, considering the paucity of Māori-medium resources across other curriculum areas.

### *The Number Framework*

Teachers consistently referred to the support and guidance provided by the Number Framework: not only did it provide clear progressions of learning for students, but also, with the major shift to emphasising the teaching and learning of strategies, teachers felt their own content knowledge had improved.

The teachers themselves had high expectations of their students and believed the school and its management provided a clear vision and set high, but realistic, targets of achievement for students.

### *Case Study 2: Kura E*

This kura is also relatively new and mirrors the experiences of a number of other schools involved in the revitalisation of te reo Māori in the late 1980s and early 1990s. The catalyst for its development was the concerns parents had for their children when graduating from kōhanga reo. Essentially, these concerns were based on a number of factors, including language loss and the feeling of disempowerment of the parent group.

Consequently, parents associated with the kōhanga reo set up the kura, with minimal state support, in a city council building. The kura was subsequently relocated in 1995, with the majority of its student population made up from two contributing kōhanga reo. The school has a close relationship with the contributing kōhanga reo and a large number of whānau had children in both institutions.

The school has a decile rating of 5 and is located on the fringe of one of the bigger cities. The school has close links to local hapū but also identified the fact that many students were from other tribal areas. The interviewees highlighted high parental expectations for their tamariki. All the parents/caregivers are interviewed to ensure that parents/caregivers commit to the philosophy of the school and its expectations, and vice versa.

### *School leadership*

The facilitators and the staff identified the Principal as playing a key role in the positive outcomes in pāngarau for the kura. The Principal had an excellent grasp of Te Poutama Tau and its aims and was therefore able to support the staff in the development and implementation of the project. She provided valuable criticism of the programme to ensure positive student outcomes.

### *The Number Framework and the professional development model*

As noted in the previous case studies (Trinick, 2005b), the interviews noted the Number Framework as a key factor. The Framework provided much more explicit information on the key content, teaching strategies, and language models. In the absence of the range of resources that exist for English-medium schools, this is critical for Māori-medium schools.

In English-medium education, there are large communities of mathematics practitioners, for example, teaching colleagues, advisors, and resources developers. All these various individuals and groups provide support to the class teacher directly and indirectly. In comparison, this community of practice is very small in Māori-medium education.

Teachers also appreciated the “in-class modelling” and the subsequent feedback from the facilitator and/or their colleagues. They believed they were open to changing aspects of their teaching after observing and trialling the strategies (Ministry of Education, 2006). The teaching and learning model provided by the project also provided significant guidance (Hughes, 2002).

Teachers involved in the project noted its positive impact on their classroom management. The consistency of learning routines provided more stable learning environments, with students taking more control over their own learning.

The interviewees all noted the positive crossover from Te Poutama Tau into other areas and strands of the pāngarau curriculum. For example, concepts learned in numeracy, such as multiplying and dividing by 10, made converting between measuring scales easier for a number of students.

Teachers identified a range of factors that supported the achievement of successful outcomes for students in pāngarau. One of the critical factors was the linking of Te Poutama Tau to the school’s strategic planning to develop high standards of literacy and numeracy for all students. The plan consisted of a range of key interrelated components, such as the setting of clear targets for improving student achievement. The school set the target that all year 4–6 students will make gains in the grouping and place value aspect of the Framework by the second diagnostic assessment. A range of review mechanisms were put in place to answer questions such as “Have we met the target?”, taking note of trends, strengths, and weaknesses and their contributing factors. These were followed up with a list of recommendations on “Where to next?”

Reporting to parents involved showing students’ current strategy and knowledge stage and gains during 2004. Reporting to the community involved showing the mean student stage gains in 2003. Finally, reports to the Board of Trustees included comparison of school performance to national norms.

Additional components of the plan to support the targets included comments on the teaching and learning programme development and/or focus, staff and personal professional development, key agencies to provide support, community involvement, and finally a resourcing plan.

### *The teachers*

The staff’s experience in a teaching role ranged between 3.5 and 11 years. Some had spent the majority of their teaching years in this particular school, while others had only recently joined the teaching staff. Their teaching qualifications were general teaching qualifications with no specific specialisation in mathematics. However, all the staff had achieved in mathematics to a high level in secondary school, which partly explains their positive attitudes to teaching pāngarau.

Classes ranged in size from 20 to 30, with a number of age groups in each class. Teachers rated the majority of students as fluent in te reo Māori. There was mixed student attitudes to pāngarau, but the teachers noted a large number did not like it prior to Te Poutama Tau. Subsequently, the success that students achieved in the project assisted in fostering more positive attitudes to pāngarau for the majority of students.

The teachers highlighted the changes that occurred in their own teaching practice, particularly in the teaching of strategies. They utilised the various activities provided in the resources to get students to think both critically and creatively.

The teachers believed they had been very well supported by school management, but there was a strong feeling that there was a need for ongoing professional development in mathematics beyond their involvement in the Te Poutama Tau project.

## **Results and Discussion**

While it is difficult to isolate individual items, the outcomes of this study suggest that the following key points that the two kura have in common contributed to the positive progress of the students in the Number Framework. It would seem also the following points cannot be seen in isolation from each other.

### *The Sociocultural and Demographic Features*

The schools were middle- to low-decile, with the parents and caregivers coming from a variety of professions and occupations. With such a small sample, it is difficult to identify the impact of the parents/caregivers' own professions and socio-economic status on student achievement in the case study schools. However, the unifying bond throughout both school communities is based on the desire and aspirations of these school communities to revitalise Māori language, knowledge, and culture. These aspirations are manifested in the philosophies and principles of Te Aho Matua that underpin the various sociocultural practices of both schools. A key component of Te Aho Matua is the need for the school and its community to work closely together on aspects such as developing the curriculum. A number of studies have noted the key role of parental involvement in the education of their children to achieve positive educational outcomes (Hohepa, 1993; Bishop, et al., 2001).

### *Key Relationships*

The discussions with the interviewees suggest that the positive relationships between the facilitators, the schools, and the school management that were established as part of the project were critical to student outcomes. In both instances, the facilitators had established strong links with the schools and the local communities. They closely identified with teaching colleagues in the project schools, and in many cases had built up professional development profiles in their communities over a period of time. In general, the facilitators worked alone in their regions as Māori-medium facilitators.

The case study schools shared practices that worked for each of them and drew strength from each other. As well as collaboration between schools, there has been frequent collaboration among the teachers, who provided peer support and mentoring for each other. A key factor that has been identified in the development of successful programmes is the establishment of an effective learning environment in which participants have opportunities to share ideas and to develop supportive long-term relationships with their colleagues (Timperley et al., 2003).

### *School and Curriculum Leadership*

Both principals participated in the professional development programmes with the teachers, working alongside staff to develop a shared sense of purpose and direction. By modelling desired dispositions and actions, the principals enhanced the rest of the school's belief in the project and in their own capacities and enthusiasm for change. The lead teachers also played a significant role in the implementation of the project and were well supported by the Te Poutama Tau facilitators.

### *Development of New Knowledge and Skills*

There is little argument that what a teacher knows is one of the most important influences on what happens in a classroom and ultimately on what students learn. Recent research confirms that teachers' knowledge of subject matter, student learning, and development and teaching methods is critical to teacher effectiveness (Higgins, 1999; Bobis, 2000; Bishop, Berryman, & Richardson, 2001).

The Te Poutama Tau professional development model consisted of a series of national professional development workshops for facilitators who, in turn, developed a series of workshops for participating schools and teachers. These workshops focused on the mathematical content of the Number Framework and the interconnection between concepts (for example, the relationship between multiplicative thinking and solving ratio and proportion problems). For teachers, the Framework provided a much more explicit picture of the required content and how students progress through the content. This point is closely associated with the setting of goals and the monitoring of performance.

Teachers of Māori-medium mathematics have an additional challenge with regard to support materials in the medium of Māori. Many of the facilitators and participating teachers are second-language learners of Māori language, and the support provided by these materials is critical to success. Māori-medium mathematics language development is relatively recent and, for some areas of the Framework (for example, ratio and proportion), there are no established patterns of discourse. Interpreting content is challenging for those who are not very proficient in Māori language and/or not familiar with the discourse. Therefore, Te Poutama Tau also supports facilitators and teachers to develop appropriate Māori language models. In some cases, this requires the development of new terminology. Māori-medium educators are also concerned with language revitalisation and development and, consequently, the linguistic aspects of the programme have been an inevitable subject of discussion and debate, centred on syntax, semantics, and issues of tribal dialect (Christensen, 2003).

### *The Role of Student and Teacher Beliefs*

Teachers' beliefs and prior experiences affect what and how they learn (White, 2002; Smith & Lowrie, 2001; Beswick & Dole, 2001). This is particularly so in mathematics where there have been substantial changes in philosophies over the last 10 years or so. In the case study schools, teachers were open to changes in teaching practice if it improved student outcomes. The pedagogical approaches associated with Te Poutama Tau required teachers to develop learning experiences and to communicate in ways that guided learners to construct their own mathematical knowledge and understanding.

Prior to Te Poutama Tau, a number of teachers and students had negative attitudes towards pāngarau. Despite their professional training, many teachers still lack confidence, based on memories of their own mathematical learning experiences. In the case study schools, teachers and principals felt there had been significant change over the duration of the project in teacher and pupil attitude to pāngarau. Much of the change on the teachers' part was that they could see the positive outcomes and thus felt more inclined to change their practice.

For students, the ways in which numeracy was taught in the project eased many of their anxieties and increased knowledge and confidence. For teachers, the focus on students' development of mathematical thinking also provided an opportunity for teachers to develop their own understanding. In general, these factors have all contributed to a positive change in attitude to

mathematics exhibited by many of the teachers and facilitators in the Te Poutama Tau project (Christensen, 2003, 2004; Trinick, 2005b).

### *Understanding of Outcomes of Practice for Students*

It has been argued that the professional knowledge and skills of the teacher have a direct link to student achievement, behaviour, and attitude (Parsons, 2001). The Te Poutama Tau project provides teachers with diagnostic tools such as the diagnostic interview that give them quality information aligned to the Number Framework about the knowledge and thinking strategies of their students.

The case study schools used the data they sent to the national database to establish targets for planning and reporting. The data was used to group students according to ability and to set achievement targets for the year. The principals and lead teachers closely monitored the school performance during the year, setting clear goals for teaching staff. The goals were evaluated throughout the year.

As a result of the project, the principal and staff focused on student learning, including the development of positive attitudes as well as the knowledge and strategies of the Number Framework.

### *Reflective Practitioners*

There is widespread agreement among teacher educators that encouraging teachers to reflect on the success of their teaching is a necessary first step towards change (Cobb, 1986; Artzt & Armour Thomas, 2002; Higgins, 2003). Teachers need to be encouraged to be reflective and to analyse their own practice. They also need opportunities to reconstruct and develop further knowledge and pedagogy around teaching and learning in order to be effective “agents of change” (Stokes et al., 1997). Change takes time and needs to be related to classroom practice. Teachers also need to be committed to the kaupapa (event) to perceive a need for change (Fullen, 1993).

Feedback from the case study interviewees suggests that the participants constantly reflected on their practices in relation to the pāngarau teaching programme. Teachers, with facilitator support, videoed and reviewed some of their teaching practices. The principals were constantly critiquing and reviewing the programme to ensure benefits for the learners.

### *Needs of Participants*

Teachers working in Māori-medium contexts are faced with a number of challenges, including lack of resources, workload, content, and language. As noted previously, many of the teachers are second-language learners of Māori and trained in English-medium pre-service teacher education programmes, although this is changing as Māori-medium teacher education has grown. Many Māori-medium teachers teach all curriculum areas across multiple levels and ages and also perform multiple roles in their schools and communities. These roles include participation in community events, for example, sporting and cultural events, and administrative roles within the family and tribe (iwi).

Teachers in the case study kura considered the time spent with other teachers in planning and learning was most valuable and felt that this professional development module had eased their workloads in the long term. For teachers, the Number Framework has provided a much more explicit picture of the required content and related student progress. The Framework also

provided clear links to the Māori-medium pāngarau curriculum statement. Significant ranges of print and electronic resources have been developed to support the project, often modified as a result of teacher feedback ([www.nzmaths.co.nz](http://www.nzmaths.co.nz)). The project has also provided opportunities for parents and whānau to be involved in their children's learning in positive ways (Trinick, 2005b), thus developing stronger relationships within communities.

## Summary

The outcomes of this study suggest that the following key points have contributed to the positive progress of the students in the Te Poutama Tau project. It would seem also that the following points cannot be seen in isolation from each other, but in combination. It is also important to note that these factors are also consistent with the 2004 case study schools (Trinick, 2005b).

- The leadership provided by the principal and the lead teacher was one of the key elements in the success of the Te Poutama Tau project in these two case study schools.
- The principals, lead teachers, and staff closely monitored the school performance during the year, setting clear goals for teaching staff. The goals were evaluated throughout the year. As a result of the project, the principal and staff focused on student learning – not only the knowledge and strategies of the Number Framework but also the development of positive attitudes.
- For teachers, the Number Framework provided a much more explicit picture of the required content and how students progress through the content. This point is closely associated with the setting of goals and the monitoring of performance.
- Both kura had a commitment to teaching and learning in the medium of Māori, but it is not clear in this research of the impact of the level of proficiency of the students on progress through the Number Framework.

There may well be features of the two case study schools unique to each of the schools that contributed to the positive results. Although the two schools follow the Te Aho Matua philosophies, they are different in their histories, their staff, and their relationships with their local communities.

## Future Research

There has been minimal research done in New Zealand on Māori-medium schooling as noted in the introductory section. Therefore this report recommends:

- Developing a set of criteria to identify successful schools in Māori medium and profiling a range of successful schools. This report is limited in that it focuses only on the mean stage gains in the Numeracy Development Project as a success indicator, when in fact there are a considerable range of success indicators.
- Examining effective strategies that teachers use in the various curriculum areas and the quality of the relationship between student and teacher. This study is limited in that it does not explore the effective teaching and learning strategies used by teachers to improve achievement.

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