

Horse Power or Empowerment? Mathematics Curriculum for Maori – Trojan Horse Revisited

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European mathematics is offered to indigenous people around the world, 'gift-like', as a passport to success and future development. Most Maori believe in this idea; but some ask at what cost, both culturally and intellectually. The promotion of mathematics may be ethnocentric, but it is not, we believe, offered with malice. The bearers are probably unaware of the inherent dangers as the receivers (Barton and Fairhall, 1995, p. 1).

This paper seeks to revisit the notion that on the one hand a mathematics curriculum for Maori in the Maori language can be a cause for celebration, progress in the journey towards empowerment. While on the other hand it has the potential, like the Trojan horse, to 'destroy the conceptual basis of Maori culture' and language (Barton and Fairhall, 1995, p. 1).

The publication of a national mathematics curriculum statement in Maori (Te Tahuhu o te Matauranga, 1996) heralded an historical event in the public education of Maori. This statement was followed by the development of curriculum statements in the other six essential learning areas and acknowledged the official status of Maori language in Aotearoa and also recognition of a 'parallel' system of education for Maori.

Following on from the effects of over 150 years of colonisation, Maori whānau (extended families) who wanted more for their children than the mainstream state system were providing began their own education system in the 1980s and 1990s. Kohanga Reo (early childhood learning nests), Kura Kaupapa (Maori total immersion schools), Wharekura (secondary schools), and Whare Wananga (tertiary institutions) were established by Maori outside the state system. Subsequently, after various lengthy negotiations on both sides, and Acts of parliament (eg the 1989 Education Act) these Maori total immersion educational institutions came under the umbrella of the Ministry of Education.

In this paper questions will be raised about the intentions and aspirations of both the state and Maori communities in supporting the national mathematics curriculum statement in Maori. Were these national curricula in Maori about supporting Maori aspirations for tino rangatiratanga (self determination) or was the intention a continued assimilation agenda? Also addressed will be the likely outcomes for Maori of having a mathematics curriculum in Maori.

These issues will be discussed on two levels – the political/economic level, and the cultural level. It will be argued that the state's intentions can be interpreted at a political/economic level and that the outcomes for Maori are likely to be a deepening of the assimilation agenda of the past one hundred and sixty years. Maori aspirations can be interpreted from a cultural level and while it may be argued that the outcomes for Maori will be renaissance and maintenance of their language, a dialectical tension exists that sees a potential Trojan horse situation that urges serious reconsideration of the following questions:

Is academic mathematics as taught in classrooms around the country an optimal path for contemporary Maori development and future aspirations? Or has the European techno-rational ethos been embraced, Trojan-like, as an inevitable part of modern life, and thereby destroyed the conceptual basis of Maori culture? (Barton and Fairhall, 1995, p. 3).

Development of Mathematics in Formal Settings

Various writings to date have discussed mathematics for Maori from pre-European times (Barton and Fairhall, 1995; Riini and Riini, 1993), the development of formal mathematics from early pre-European contact through to more contemporary bilingual mathematics teaching (Barton, Fairhall, & Trinick, 1995; Nathan, Trinick, Tobin, & Barton, 1993; Ohia, 1990, 1993; Te Puni Kokiri, 1993). Research on mathematics in total immersion settings however is still in its infancy (although see the work of Aspin, 1996; Trinick, 1999).

According to the research in the 1980s, findings on the outcomes of bilingual mathematics teaching revealed a major effect in an improvement in self esteem and attitudes of Maori students (Ohia, Moloney, Knight, 1990). This research also suggested that there was potential for the academic excellence by the Maori learners within the unit, "but this potential has yet to be realised" (*ibid*, p. 156). Maori parents' aspirations during this period appeared to be retaining students in secondary school education and the learning and maintenance of te reo Maori. If this was the outcome, with mathematics learning secondary then so be it (Wagemaker, 1988). In our experience, and according to Durie (2001), Maori parents who send their children to be educated in te reo Maori are no longer satisfied with merely achieving Maori language fluency, what they expect from education are the "best possible outcomes" and "zero tolerance of educational failure" (Durie, 2001, p. 6).

The question is then asked will mathematics teaching in te reo Maori both increase Maori language fluency and enhance the mathematical achievement of Maori learners?

Political/Economic Context

Education cannot be separated from culture, history, politics or the economy as they are bound together (Adams, Clark, Codd, O'Neill, Openshaw & Waitere-Ang, 2000). Education therefore becomes a site of struggle and compromise (Apple, 1996, Smith, 1997). Various groups compete for the power to define their knowledge as dominant or legitimate in the context of the school, with the result that minority groups' knowledge is usually devalued and silenced in the curriculum. The state plays a role in this process through the imposition and legitimation of the national curricula, national testing, and through its agents such as ERO, an inspectorial body of the state.

The neo-liberal-based reforms of education in the late 1980s and 1990s in Aotearoa New Zealand witnessed the withdrawal of the state from people's lives. This withdrawal was to enable freedom in the market place so individual consumer choice could be maximised. Devolution of responsibility for education to the community reinforced these notions of freedom and choice. While freedom and more choice could be seen as enabling Maori to gain more opportunities in their aspirations for self determination or empowerment, in reality argues Apple (1998) this could be giving 'false hope'.

The right to choose one's own school or education provider assumes that everyone is equal to make decisions in the education market place. Choice however is linked with ability to pay, as well as being informed about what is available. Maori, according to the

statistics (Te Puni Kokiri, 2000), fall well below their non-Maori counterparts in areas such as education, health, housing, and in the job market. Therefore they are unequal in the market place thus limiting an ability to pay for the best choice.

Additional to this notion of choice is availability. According to Apple (1998:23) the “labour market will increasingly be dominated by low-paying, repetitive work in the retail, trade, and service sector”. Among the top 10 occupations that account for the most job growth in the next decade will include positions that do not require high levels of education (eg truck-drivers). Given that mathematics is a requisite for many occupations (Ohia, 1993) the question could be asked why bother teaching high level mathematics to those who are unlikely to end up in high level occupations?

Despite this assertion about the labour market, and possibly as a result of on going submissions to the Minister of Education by Maori educators, a decision was made that a Maori mathematics curriculum document would be written following the mainstream mathematics document. Ohia (1993, p. 110) suggests this move “counters previous assimilationist policies”.

However as Maori had previously exited the public education system in the 1980s, other interpretations are possible. It could well be argued that funding Maori to have a parallel mathematics curriculum could be seen as the more powerful dominant group legitimating its authority and buying the loyalty of Maori by giving them what ‘they’ want – curriculum documents written in Maori. The New Zealand Curriculum applies to “all New Zealand Schools, including kura kaupapa Maori...” (MOE, 1993, p. 3) and it “provides clear learning outcomes against which students’ progress can be measured” (MOE, 1993, p. 24). Therefore it could also be interpreted that the curriculum documents in Maori are an important tool to “enable a form of accountability” “while at the same time providing mechanisms that aid managerial surveillance” (Carpenter, 2001, pp. 127, 128). In other words, to control teachers and make them accountable for public money.

There is always tension. The bottom line is, public education is not just about how children learn. It’s about what society wants out of its expenditure if you like, its investment (MOE Project Manager in McMurchy-Pilkington, in progress).

Apple (1998), in discussing the complexity of the reforms, claims that there has been an alliance with neo-conservatives who mourn the ‘decline’ of the traditional curriculum and stable communities with common values and people who ‘know their place’. Neo-conservative policies include a ‘return’ to higher standards, national curricula, standardised testing and a revival of western traditions and patriotism. “Behind it as well – and this is essential – is a fear of the ‘other’” (Apple, 1998, p. 26) and a sense of cultural pollution. Apple (1998, p. 26) claims that the conservative English-only movement pushes for a re-orientation of curricula and textbooks that characterises “a particular construction of the western tradition” of like-minded people who share common values and norms.

Under the contract to construct a mathematics curriculum document for Maori, one of the non-negotiable conditions was that the learning outcomes and the structure of the document were to be the same as the mainstream mathematics curriculum (McMurchy-Pilkington, work in progress; MOE, 1992). Therefore if the mainstream mathematics curriculum is based on a western tradition underpinned by assumptions of mathematics as the ‘truth’ with share norms and meanings, the same could be said of the Maori document. Both documents it could be argued view mathematics as apolitical and acultural. There was no allowance that there could be philosophical or structural differences in the Maori document. In fact the completed draft had aspects of it rewritten by Te Taura Whiri (Maori Language Commission) because the learning outcomes were not directly translated from

the mainstream document. The writers had attempted to interpret and make more explicit the underlying mathematical concepts.

Now when it got to the Ministry, the Ministry was unhappy that we had not directly translated the learning outcomes. We had translated the concept of each learning outcome. The Ministry then contracted the Taura Whiri to rewrite all the learning objectives, in other words translate the English ones. (Lead writer of Maori mathematics curriculum, in McMurphy-Pilkington, work in progress).

This could be seen as another example of the state's intention to control 'the other', while seeming to be giving over some power and autonomy to Maori. It is also evidence of the promotion of mathematics as ethnocentric, and an attempt to "destroy[ed] the conceptual basis of Maori culture" (Barton and Fairhall, 1995, p. 3). In the development of the mathematics curriculum Maori were tightly controlled by the state, even to the extent that deviations from the mainstream 'western' document were not tolerated. Certainly there was limited opportunity to even consider "the conceptual basis of Maori culture" let alone deviate from the language of the learning outcomes.

Cultural Context

Bishop (1996, p. 33) argues that western mathematics is "one of the most powerful weapons in the imposition of western culture". It can be seen from the above section that there was little opportunity for Maori to even consider a non-western cultural basis for mathematics. It appears that mathematics is still being used as a weapon in the imposition of western culture. This raises the question then, were there any gains for Maori in having a mathematics curriculum written in Maori? What were the costs? Were there any dangers?

There is no doubt that culturally and professionally there have been some gains for Maori. We have seen the development of Maori vocabulary and resources to support mathematics teaching. With the curriculum documents written in Maori language we have seen a shift in orientation to language and learning in bilingual or immersion educational settings away from a deficit model to seeing the language Maori children bring to class with them as a resource (Baker, 1993). Language is now viewed as a resource rather than a problem, "to be drawn on to facilitate meaning-making and access to new knowledge and/or a new language (Adler, 1998, pp. 1-9).

Many Maori teachers have been engaged in professional development surrounding the document. More recent initiatives have included Maori teacher professional development for national monitoring (Flockton & Crooks, 2000), exemplar development, and the early numeracy project for Maori medium schools and Kura Kaupapa Māori.

There is now a reasonable pool of Maori people involved in Maori medium education discussing, critiquing and reflecting on Pangarau (mathematics). There is discussion about how we might best represent mathematical knowledge in Maori contexts and teachers are beginning to discuss what is traditional Maori mathematics and what does it look like? There is a focus on how Maori traditionally explained their world, and the differences and similarities from a Maori and a Western perspective, for example what mathematical elements are evident like locating, counting, explaining, measuring and designing (Bishop, 1996). These discussions are making mathematics educators look at mathematics not as an absolute body of truth but rather as a tool to explain how we view the world and to make our lives easier.

Maori educators are also starting to look at and understand how Maori children think mathematically, and where the language impinges on mathematics and vice versa. Having a curriculum document in Maori has legitimised and supported this process and there has been some financial resourcing for this purpose. The initiatives that support the

implementation of the Pāngarau curriculum statement are providing a common forum to talk about and critique pangarau (mathematics).

However there have been some costs and there are some dangers from a cultural perspective. Both of these centre generally centre on linguistics and the epistemology of mātauranga Maori.

Many Maori teachers in Maori medium contexts are second language learners of Maori. More often than not they have learnt school mathematics in English. It is important to note however there a few graduates coming through from Kura Kaupapa Māori into preservice teacher education. It will be interesting to identify the mathematics discourse used by this group. For many teachers when communicating mathematics tend to think in English and translate the mathematical concepts using English language forms. Mathematics is frequently communicated in English in the active, i.e. 3 times 2. This form is followed in the Maori translation

toru whakarea rua (3 x 2) .

Whakarea however is an action and an instruction. Traditionally this language form was spoken in the passive i.e.

whakareatia te toru ki te rua

Modeling further complicates this language form when teachers adopt the English language mathematical model when using Maori. In English three times two is often demonstrated by saying;

show me 3 groups of 2 things

However in Maori *whakareatia te toru ki te rua* implies two groups of three things. Although the English and Maori word order is the same, the underlying mathematical model is the reverse.

Traditionally Maori number was seen as a verb or an adjective. Since colonisation Maori number has become a noun rather than a verb, primarily because of trade and the adoption of the Western mathematical system. For example when talking about number teachers often give numbers physical representations, i.e. pass me the two.

In many ways what Maori teachers are taking on board now as pangarau (mathematics) is in fact western knowledge translated from English. This brings into question the authenticity of the knowledge from a Maori epistemological perspective. Because a resource is in Maori it may be assumed by teachers as being authentic but this may not necessarily be so. For example in a diagram of traditional Maori compass the units of the compass are all uniform. For a Maori compass, positions would depend on geography, bird migrations, and climatic elements in particular winds. Therefore compasses differed from region to region. Another example is the Maori terms used in the calendar and days of the week. The terms for the months are authentic but are now used following the current Western calendar. Traditionally Maori months of the year were based on the rising and falling of stars and other celestial phenomenon. Terms for days of the week as such did not exist but Maori used and followed the nights of the moon.

This raises a big issue in regards to the place of authentic traditional knowledge in a national curriculum document. In writing such a document for Maori questions can be raised about the intellectual property and ownership of the knowledge. Questions to ask would centre around public or private domains. Can Maori knowledge located in a curriculum be bought and sold as a commodity? Who has rights to Maori knowledge? Is it all public or does some belong to the private domain of hapu or iwi? Traditionally in Maori society the 'right to know' was related to birth rather than everyone having a right to know. A further dilemma ensues from this and that is if Maori traditional knowledge is not taught

in schools today where else would it be taught with extensive urbanisation of Maori whanau?

Where Are We Currently?

Currently Maori have a mathematics curriculum document in te reo Maori (Maori language). Does it have a Maori knowledge base or does it come from a western tradition? It would be true to say, that like the science (Putaiiao) curriculum, what we have is a curriculum based on a western tradition that has been translated into Maori (McKinley & Waiti, 1995). Some of the contexts and the exemplars are from a Maori perspective, but the concepts and ideas are underpinned by western thinking.

While we might be getting development of te reo Maori vocabulary, traditional Maori knowledge and tikanga is still not being tapped in the teaching of pangarau.

We would argue that in mathematics teaching for Maori the two information systems are not being used or extended equally. Therefore children learning pangarau may be restricted in the way they can think, both culturally and mathematically about the world. We might be 'doing' mathematics but we are not using two knowledge systems or ways of thinking. Thinking mathematically about the world for Maori is essentially still from a western perspective. This it could be argued is therefore a deepening of an assimilation agenda. Was that the intention of the state in laying down the requirements for the writing team? It certainly was not the agenda of the Maori community.

Politically there has been a significant change in MOE with regards to Maori medium pangarau development. The policymaking and the practice have shifted. We as Maori are 'allowed' to have more freedom in our development – no longer were we obliged to have exact translations in the last two curriculum documents (eg Nga Toi and Hauora). But we believe attitudes within MOE have not shifted a great deal. While there is not the same 1992 requirement that everything has to be the same, albeit in another language, there is still a Eurocentric attitude. The talk has shifted from 'translating', to a new discourse. Requirements are to 'culturally redevelop' the English, western based material and translate it 'to support the learning of Maori learners'. Maori are still being controlled and contained within a western framework.

It appears that although policy making for Maori has had the appearance of shifting from Maori friendly to Maori centred in the past decade (Johnston, 1999, p. 80). Maori views and aspirations are "made to conform to an already defined structure and framework", which "in effect neutralise Maori involvement, participation and interests" (*ibid*, p. 84). We were involved in the development of a mathematics curriculum for Maori but it was not on our terms.

Maori parents have also shifted. They are not just focusing on language proficiency for their children. They also want cognitive understanding so their children can stand tall in both worlds. Although it is fair to say some of them are still anti pakeha as they are still suffering backlash from the effects of colonisation. Maori parents want to know what are the achievement gains of their children over time. They want to know what areas their child is finding difficult, and how they can help them improve over time.

Linguistically we have made some big gains, both our children and our teachers, from the teaching of mathematics in Maori. However our knowledge of authentic Maori knowledge is lagging behind. If we think of a rope and its various strands, we could say some of the strands are stronger than others. To have an effective rope, each of the strands needs to be as strong as each other and to support each other.

We have to strengthen our understanding of mathematics both from a western and a

Maori perspective. Currently we are largely getting a translation of western ideas. We could say we are essentially not any closer to Maori epistemology than we were 10 years ago while we continue to teach from a western based document. Our linguistic strand may be strong but cognitively we still have a long way to go.

Summary

We maintain that the promotion by the state of mathematics for Maori is still ethnocentric, and still techno-rational. The mathematics curriculum for Maori is more about controlling Maori teachers and preparing Maori for a job market.

Our contention is that we are seeing changes both at a linguistic level and at a conceptual level. There needs to be teacher development and ongoing research and discussion on where changes are occurring and what is underlying these changes. We need to ask if these changes are a usual part of a developmental continuum or are they the outcomes of colonisation. If these changes are a normal part of learning and developing another language then we're not worried. However we need to be clearer about the issues and separate out the two – colonisation and growing living languages.

As receivers of this curriculum document we are beginning to really understand the tensions and dangers. We need to disseminate these ideas and continue the ongoing debate so our practice is informed. We need to support such forums as NAMSAT for ongoing networking, debate and sharing. We need to ensure our practice, our research and our discussions inform the curriculum stock take. We need to fight for a Maori strand in organisations such as NZAMT and MERGA. Our debates and sharing should involve classroom teachers as well as 'academics' and in turn these need to inform our teaching and underpin resource making, policy, curriculum.

We believe the givers of the curriculum (MOE and politicians) have made some shifts. There is an awareness of our differences and some recent developments are less ethnocentric (eg the NEMP process, and the Early Numeracy Project). At times there is a feeling of partnership, but mostly there is a feeling of Maori Friendliness rather than Maori Centeredness.

We as Maori educators need to engage in ongoing critical examination and debate about the curriculum. As professionals we "must question and constantly reflect on the ideological bases and the theoretical underpinnings of curriculum" (Carpenter, 2001, p. 131). If we don't want to be assimilated by Trojans then we need to be continually alert to 'gifts' that are offered to us.

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