30 years on: The pāngarau (mathematics) register within and beyond Māori-medium classrooms.

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INTRODUCTION

- Two key goals of Māori-medium (indigenous language immersion) education are revitalisation of Māori language and Māori cultural knowledge.
- More than a century of hegemonic social policy and English-language only schooling policy in Aotearoa/NZ has led to language and culture loss
- Majority of Māori-medium students and teachers are L2 learners of the language of instruction.
- Three decades invested in revitalising the language through avenues such as expanding the pāngarau/mathematics lexicon.
- Māori mathematical practices not revitalised to the same extent.
- This study identifies resources within the pāngarau register that facilitate uniquely Māori ways of communicating mathematically and the associated cultural knowledge.
- Digital technology is examined as a tool for supporting the teaching and learning of language, culture and mathematics simultaneously.

METHODS

- Literature, interviews and use of digital technology
- Theories of language elaboration: How is the pāngarau register negotiated, captured and shared within and beyond the classroom**?**
- Interviews: 4 Māori-medium mathematics teachers and language experts with digital pedagogical knowledge.
- Cultural Symmetry Framework used to organize and analyse the data according to: Language use, cultural knowledge understanding and development of mathematics content/concepts.

RESULTS / FINDINGS

- For many learners in Māori-medium schools, te reo Māori is not yet an autonomous language.
- There is a clear separation and division between time, place and speakers of English and Māori languages in Māori-medium education. Mixing or "code switching" of the two languages is discouraged.
- Very limited pool of language models and digital resources for mathematics in the Māori language. Mainly hard-copy.
- Teacher 1, asserted that while language change is inevitable, it is important to define which changes are desirable, or support language and knowledge revitalisation goals and which do not.

Arguably, the Māori-medium mathematics curriculum and associated teaching and learning resources, including digital resources, represent a combination of desirable and undesirable change. The curriculum and resources are based on a Western tradition that has been translated into Māori, or not translated at all, in the case of many digital mathematics resources. Even, when the contexts and exemplars are from a Māori perspective, the concepts and ideas are often underpinned by Western thinking. Māori kōwhaiwhai patterns have been used extensively to support the teaching of transformation geometry. Unfortunately, the teaching resources can have minimal, if any, recognition of Māori linguistic and cultural concerns. In this way, the two information systems are present but are not always used or extended equally.

Teacher 1: I think what it's done is expanded the Māori vocabulary while it's resurrected a lot of terms that had fallen out of use. So, I think the positives far outweigh the negatives.

Teacher 3: We taught this way [video conferencing] to the schools around the country, for nearly 15 years. But I didn't capture any of it. It would have been a useful resource if we had captured our lessons.

Teacher 2: Whakapapa (genealogy) connects (Māori) people to their world. Pāngarau (mathematics) is similar in this way. The interconnectedness, the many relations and connections within the discipline. Therefore, that is a correlation, an intellectual connection between the Māori world and mathematical pursuits.

DISCUSSION

While we may accept that language change is inevitable as are the associated shifts in cultural beliefs, values and understandings, if Māori knowledge and Māori language are to remain recognisably Māori, any language and culture changes that can be attributed to curriculum, teaching resources or pedagogy must be made with conscious intent.

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ACKNOWLEDGEMENTS

I would like to acknowledge the research participants, my PhD supervisors, Tony Trinick and Stephen May and Te Puna Wānanga School of Māori and Indigenous Studies at the University of Auckland.

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