Towards building an Indigenous Science Tertiary Curriculum

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Abstracts

Ko te Koronga tētahi kaupapa mō te rangahau Māori kounga nei, e tū nei i Te Whare Wānanga o Ōtākou (https://www.otago.ac.nz/te-koronga/index.html). E rua ōna wāhanga: ko te Graduate Research Excellence tētahi, ko te Indigenous Science Research Theme tērā atu. I Aotearoa nei, e ai tonu i te Whare Wānanga o Ōtākou, he āputa nui e tohu nei me whakatipu ō te Māori pūkenga, ōna āheinga hoki, ā-rangahau nei, ki ngā pūtaiao. He tauira, i Ōtākou ko tōna 3% o ngā pouako katoa i te Division of Sciences he Māori, ka mutu, ehara i te mea ka rangahau ngā pouako Māori katoa i ngā take whakawhanake Māori. Mō Te Koronga, ko tō mātou whāinga matua ā-rautaki ko te whakatipu i te tokomaha o ngā pouako Māori e hāngai ai ki te taupori, me te aro kehokeho pū ki te whakapakarihia o te mātauranga me te pūkenga Māori. E tutuki ai ngā whāinga e pā ana ki te whakawhanakehanga Māori i tā Te Whare Wānanga o Ōtākou Māori Strategic Framework 2022 (MSF), ngā whāinga ā-kaupapa here o te motu, ka mutu ko ngā whāinga o te hapori Māori anō hoki, kua whakatauria e Te Koronga kia whakatipu i te hunga pouako Māori kia hāngai ki te taupori (ko tōna 15%), kia whakapakari hoki i te mātauranga me te pūkenga Māori i ngā pūtaiao. E whakatinanahia ai ēnei whāinga, e rua ngā rautaki e horaina nei: ko te waihanga mai i tētahi kaupapa matua hou mō te pūtaiao taketake, mō te mauri ora rānei, nō roto mai i te Division of Sciences ka tahi, me te whakawātea mai i ētahi tūranga mahi mauroa mō te pouako Māori ka rua. Ka aro pū tēnei tuhinga ki te rautaki tuatahi. Ko tēnei kauapapa matua hou mō te pūtaiao taketake: ka whakangungu i ngā atamai, Māori mai, Pākehā mai hoki, ki ngā rohenga o te ('ngā' rānei) pūtaiao taketake; ka whakapakari i ngā āheinga ā-pouako puta noa i ngā momo akoranga mā roto mai i te waihangatia o tētahi wāhi ake hou

mō te whakaako i te pūtaiao taketake/mauri ora; ka waihanga i tētahi marautanga hou kaupapa Māori nei, ka aro tonu hoki ki ngā 'ōritehanga' o te mātauranga taketake me te whakaaro Pākehā; ka takoha atu ki ō te hapori Māori hiahia, ki ōna wawata hoki mō ngā pūtaiao e whirinaki nei ki ngā hoahoatanga Māori o nāianei, ki ngā āheinga hou hoki ka puta, ka whakatutuki anō hoki i tā Te Hīkina Whakatutuki rautaki ko Vision Mātauranga Policy, Diversity in Science, me ō Te Whare Wānanga o Ōtākou whāinga i te Māori Strategic Framework.

Koinei te tuhinga tuatahi o ngā mea e rua nā ngā kaituhi: ka kōrero tēnei tuhinga o te Special Issue tuatahi i te take tonu o tētahi wāhi whakaako mō te pūtaiao taketake/mauri ora. Ko tōna hoa haere ka tāngia ki te Special Issue tuarua, ka aro pū tonu ki tētahi mehanga i Ōtākou, ki te hanganga mai o tētahi marautanga pūtaiao taketake, ki ngā momo whakaakohanga o te marautanga anō hoki kua whakatakotoria.

Te Koronga is a Māori research excellence kaupapa (mission) based at the University of Otago (https://www.otago.ac.nz/te-koronga/index.html). It is composed of two parts: Graduate Research Excellence and the Indigenous Science Research Theme. In New Zealand, there is a significant need to grow Māori research capability and capacity in sciences and particularly at the University of Otago. For example, at Otago approximately 3% of all academic staff in the Division of Sciences are Māori and not all Māori staff necessarily research on Māori development issues. For Te Koronga, our top strategic priority is to grow Māori academic staff numbers to population parity with a clear focus on building Māori expertise and capability. In order to meet the objectives related to Māori development for the University of Otago Māori Strategic Framework 2022 (MSF), as well as national policy goals, and importantly Māori community aspirations, Te Koronga have set an aim to increase Māori academic staff numbers to population parity (approximately 15%) and to increase Māori academic expertise and capability in sciences. To realise these aims, two strategies are offered: firstly, to create a new indigenous sciences or mauri ora (flourishing wellness) major within the Division of Sciences and secondly to create Māori academic tenure track positions. This paper will focus on the first strategy. A new major in indigenous science will: train Māori and non-Māori scholars in the fields of indigenous science(s); build staff capacity across the disciplines through creating a new dedicated teaching area of indigenous sciences/mauri ora; create new curriculum that is kaupapa Māori-led as well as at the 'interface' of indigenous scholarship and Western ways of thinking; contribute towards Māori community needs and aspirations in sciences that build on current Māori networks as well as new opportunities that emerge and will address Ministry of Business, Innovation and Employment's Vision Mātauranga Policy, Diversity in Science strategy and Otago University's Māori Strategic Framework goals.

This is the first of two papers by the authors: this paper in the first Special Issue will address the rationale for an indigenous sciences/mauri ora teaching area. Its companion paper will be published in the second Special Issue and will focus on an Otago-based solution of creating an indigenous science curriculum as well as proposed pedagogies for the curriculum.

Introduction

Te Koronga is a Māori research excellence kaupapa based at the University of Otago. Te Koronga is composed of: Te Koronga Indigenous Science Research Theme and Te Koronga Graduate Research Excellence Programme (Jackson *et al*. 2015, 2016, 2017. Our moemoeā (vision) is Mauri Ora. Mauri ora is flourishing wellness. Our kaupapa (mission) is Māori research excellence based on the aspirations of Māori communities underpinned by a Kaupapa Māori approach. This paper describes the ethos of Te Koronga which is based on an ancient incantation to locate our kaupapa within Māori and indigenous ways of knowing. The national political context in relation to policy and strategic objectives within the research and science system is highlighted including the opportunities that exist for Māori. The local environment is outlined, specifically focusing on the University of Otago, the academic institution that hosts Te Koronga, and highlighting the issues of Māori academic staffing within the Division of Sciences. The core kaupapa (underlying focus) of this paper is to highlight the systemic issues and realities of Māori academic staffing in sciences in Aotearoa (New Zealand) and the focus of the companion paper is to offer a solution that is locally based but may have implications for other institutions nationally and internationally.

Ethos of Te Koronga

Te Koronga derives its name from the opening phrase of the first karakia (incantation) used for entrance into the whare wānanga (ancient schools of learning). Karakia is a form of ancestral scholarship that is an integral part of fostering a Kaupapa Māori space; a strategy for anchoring scholars to (re)focus their attention to pathways of academic research excellence (Jackson *et al*. 2015). In Te Koronga we recite, we practice, and we discuss and deliberate on the content and intent of karakia in our modern space. We discuss how we can draw upon mana atua (power derived from the gods) to imbue our space and our minds. To consider ancestral wisdom is part of the process in maintaining the integrity of our aspirations within the academy. The kaupapa (core purpose) is grounded in the phrase, 'te koronga', whose philosophy is derived from karakia and mōteatea (chant) meaning to both yearn and to strive for higher forms of knowledge. It is our contention that a kaupapa-based programme, with a requisite space, is required within the academy to allow Māori to reach their potential.

The Māori search for, and acceptance of, higher forms of knowledge has its roots in the stories associated with the kete wānanga (baskets of knowledge) and whatu kura (stones of knowledge) (Marsden 1992). These three baskets and two stones were retrieved from the highest reaches of the heavens from the space occupied by Io-matua-kore (Supreme Being) and placed in Whare Kura, a lower level in the heavens, in reach of mere mortals. It is from these baskets that our ancestors derived their knowledge and constructed whare wānanga to transmit this knowledge from generation to generation. The acquisition and preservation of knowledge has always been part and parcel of pre-European Māori society and an essential element of physical survival and cultural integrity of tribal identity. Tribal lore can be found embedded in whakapapa (genealogical traditions), karakia, mōteatea (Ngata & Jones 2006), whakataukī (proverbs), pēpeha (cultural paradigm for marking identity) (Mead & Grove 2003), and pūrākau (cultural narratives) (Lee 2009) and is underpinned by the concept of mana: the notion of preserving the cultural integrity of tribal identity.

Tribal knowledge is periodically passed down from one generation to the next using a variety of methods; some of those methods required the enculturation of chosen acolytes trained in the discipline of memory retention (Hakopa 2011)

over a long period of time in institutions known as wānanga (Marsden 1992; Royal 1998). The wānanga concept has its roots in the exploits of Tāne-nui-a-Rangi, one of the sons of Ranginui (Sky Father) and Papatūānuku (Earth Mother) who is reputed to have scaled the heavens and returned with the kete wānanga, two stones or whatu kura and the 'blueprint for the constructing the *whare wānanga* to house this sacred knowledge' (Hakopa 2011, p. 12, italics in original). The idea that our ancestors pursued sacred forms of knowledge and built structures to house and pass on this knowledge has implications for us and how we challenge and grow students, academics and our programmes within the academy. What we are concerned with in the first instance are the tools required to access higher forms of knowledge and secondly, creating a space within the academy where we can develop the necessary skills to wield those tools.

The phrase 'te koronga' is borrowed from a karakia used at the opening session of the ancient institution known as wānanga and is used widely in karakia and waiata. In this karakia, te koronga is described as an ardent desire towards higher learning.

The implication is to seek (desire) after the sacred paths of Tane; to become better informed and as skilled as the ancestor Māui (tikitiki-ā-Taranga). With this working definition of Te Koronga, what follows is a description and analysis of the national political milieu of research and science within Aotearoa with a focus on opportunities for Māori.

National policies and strategies for Māori research in sciences

New Zealand government policies, strategies and science funding requirements requires all researchers to consider how outcomes affect Māori. A key driver has been the Vision Mātauranga (VM) policy (Ministry of Research, Science & Technology 2007), which the then Minister of Science approved in 2010, and was subsequently implemented by the Ministry of Business, Innovation and Employment (MBIE) following Ministry restructuring in 2012. VM is designed to unlock the 'innovation potential of Māori knowledge, resources and people' (Ministry of Research, Science & Technology 2007, p. 1) to benefit New Zealand. The VM policy has been applied by most government science funding agencies, e.g. MBIE including National Science Challenges (NSCs), Centres of Research Excellence (CoREs) administered by the Tertiary Education Commission (TEC), Marsden Fund administered by the Royal Society and Crown Research Institutes (CRIs) to address Treaty of Waitangi obligations by ensuring that research must consider Māori needs and perspectives, and also reduce inequities and barriers for Māori to access resources. However, some government agencies have reduced VM requirements, for example the Health Research Council requires applicants to respond to Māori needs and recommends applicants become familiar with the VM policy, whereas other agencies do not always have VM requirements, e.g. Callaghan Innovation (see for example https://gazette.govt.nz/notice/id/2018-go4863 and https://gazette.govt.nz/notice/id/2018-go4864). Alongside VM, the New Zealand Health Strategy (Ministry of Health 2016) and Diversity in Sciences (Ministry of Business, Innovation & Employment 2018a) statements highlight that health and science systems need Māori leadership and expertise for better outcomes.

VM broadly includes research requirements that agencies use to meet Treaty obligations and reduce inequities for Māori. Implementation of VM has created the need for more Māori researchers, with Te Reo Māori (Māori language), tikanga (protocols/cultural practice) and science discipline skills within Aotearoa New Zealand. For VM to be embedded in science, a commitment for change is essential within each science funding agency and research institution at governance, leadership, grant-assessment panels and within research teams. Funding allocation solutions are diverse to meet each field's needs, with some challenges commissioning Māori research teams to address gaps in scope (Ministry of Business, Innovation & Employment 2018b), whereas others have allocated half of their funding to address research priorities co-developed by Māori communities, service providers, end users (e.g. kaumātua and/or Māori businesses) and Māori researchers.

Nationally a larger pool of excellent Māori scientists is needed who cover social sciences, life sciences and physical sciences, who have expertise in kaupapa Māori, qualitative and/or quantitative methods to meet opportunities that NSCs and other science-funding agencies offer. Important to note is that:

> *Te Kupenga o MAI: The National Programme for Māori and Indigenous Postgraduate Advancement exceeded its original target of supporting 500 Māori students to complete their doctoral qualifications and this is an extraordinary feat. However, if those graduates are unable to secure work that allows them to practice their disciplines and if universities are not actively committed to building and retaining a critical mass of indigenous researchers, then the outcome will be a lot of very highly qualified unemployed or under-employed Māori graduates, many of whom have high levels of student debt to repay (Kidman et al. 2015, p. 91).*

The opportunities are significant. Between 2019 and 2024, the Government has committed $422 million to fund NSC research programmes (Ministry of Business, Innovation & Employment 2018b). Given current trends, it is likely that more opportunities will arise for Māori scholars throughout other science funding streams.

Research agencies are commended for increasing the expectations of VM implementation. Given that the VM policy was developed in 2010, it needs to be refreshed to acknowledge standard practice in 2019, and also raise VM requirements to better meet Māori aspirations. MBIE and Marsden score VM sections, and an application must obtain a good score (4 out of 7) to be awarded funding. The HRC utilises a similar scoring process, but has a distinct Rangahau Hauora Māori strategy and investment stream (Health Research Council of New Zealand 2010). The next step is to ensure that funded researchers annually report VM progress. This is essential for researchers to ensure that adequate Māori personnel, expertise and time are included in research teams. The VM section is sometimes addressed by saying the team will recruit a Māori postgraduate student. However, when no recruitment and support strategy is detailed and

there is no evidence that the team has supported a future Māori scholar through to thesis completion, this statement is meaningless. Similar issues relate to PhD graduates being employed at a lower status, such as Research Assistant or Assistant Research Fellow. Reporting on VM progress will mean that both successes and failures will be identified, enabling funding agencies to reward teams that positively implement VM and better manage those who do not.

Aotearoa needs to increase Māori science capacity and capability, but the current academic situation presents significant challenges to achieving this goal (McAllister *et al.* 2019). Māori academics must balance diverse and competing calls on their attention, in ways that are specific to the post-colonial context for these academics. Māori researchers often find their time divided into small FTE allocations on many projects that cover diverse methods and subject matters. Often, they are low-FTE co-investigators whose role is to help other researchers make their projects more competitive for funding rounds. This service reduces the amount of time that these individuals can devote to honing their own research skills and programme, building an experienced team, and being recognised as a science leader of a specific discipline. The only remedy is to build capacity within research communities. Māori scholars need to be appropriately resourced financially and given appropriate time allocations for the leadership roles that they fulfil and the essential additional skills they bring to the research team. Māori scholars mentor tauira Māori (Māori students) into the research team that are essential for capacity building, a key component of VM and Te Koronga's vision.

Māori researchers also face specific economic challenges. Kidman *et al.* (2015) highlight the change in circumstances for Māori academics for early career academics compared to their older colleagues, e.g. previous familial attendance at university but also the possibility of higher student debt which impacts decisions to have children or buy houses. There is also less certainty surrounding employment prospects, permanent academic contracts, and a sense of isolation in departments where there is only one Māori academic; even though there is a growing number of Māori PhD graduates completing their study. These issues are supported by Ministry of Education figures in 2018 that demonstrate that there were only 495 Māori academics compared to over 10,000 non-Māori (https://www.radionz.co.nz/news/national/366304/maori-academics-isolated-and-lacking-in-numbers). There are also frequent requests for Māori academics to support other projects beyond their normal workload. This often leaves Māori academics at a crossroad; despite it being outside their normal requirements, there is often an inherent obligation to ensure that the mātauranga shared is tika (correct).

Māori academics also have a parallel set of priorities (Kidman *et al.* 2015, p. 11) that focus on whānau, hapū (subtribal) obligations and 'these relationships are frequently disregarded or unseen within the academy but they are a critical element of the 'invisible' intellectual labour of Māori researchers who require these networks and alliances in order to do their work' (Kidman *et al.* 2015, p. 84). Kidman *et al.* (2015) argue that 'this situation reflects a wider structural dysfunction within the institutions of higher education in New Zealand that, to date, has only been partially addressed by formal mission statements and institutional strategies aimed at recruiting and retaining Māori and Pacific faculty' (p. 13).

All of these challenges derive from Māori researchers' unique and vital roles in two worlds. For Māori academics to thrive, these worlds must be brought together in academically and culturally meaningful ways that are holistic in focus on indigenous science; rather than subdivide attention. An indigenous science curriculum would nurture the next generation of Māori scientists who have the skills and knowledge to work at the interface between Te Ao Māori and Western science approaches.

University of Otago policies and strategies for Māori research in sciences

The University of Otago is the academic institution that hosts Te Koronga so this section provides context for the recent state of the host institution's policies and strategies for Māori research in sciences. The University of Otago's Strategic Direction is guided by a set of 10 core values and 7 strategic imperatives (University of Otago 2013). Commitment to Treaty-based partnership, with Ngāi Tahu as its principal partner and with other iwi and Māori groups as appropriate, is among the core values. The University's Māori Strategic Framework (University of Otago 2017) sets goals that elaborate how Divisions and Departments should respond to the University Imperatives in ways that support Māori and Māori ambitions.

Delivering on University and Māori goals is challenged by the low number of Māori academic staff in the sciences. In the Division of Sciences in 2018, of the 77% of staff who disclosed their ethnicity, 3.3% identify as Māori. In the Biomedical Sciences the number is even lower; of the 74% who disclosed their ethnicity, 1.8% identify as Māori. Viewed by job family, these percentages represent 7 Māori academics engaged in some form of teaching across the 22 departments, centres and schools that make up both the Division of Sciences and Biomedical Sciences. Not all of these people are employed full-time in these roles. Kidman *et al.* (2015) highlight that 'formulating equity and diversity plans is a good start but unless there is a serious and genuine commitment to working in partnership with underrepresented groups to create inclusive institutional structures, little will change' (p. 92).

Coordinated intra- and inter-Divisional effort across is required to respond to University Imperatives and to meet the MSF goals. There are two reasons for this. First, Māori ontology is grounded in interdisciplinary science. Deepening and broadening the Māori curriculum and supporting Māori students in culturally resonant ways is necessarily an interdisciplinary activity. Second, the small number of staff with the knowledge and experience to support this kaupapa are dispersed across the divisions. Facilitating connections among Māori staff, and others with an interest in diversifying their knowledge and teaching practice, is a culturally meaningful and expedient approach to growing the curriculum and supporting both student and staff success.

Realisation of potential opportunities (unlocking innovation potential)

Meeting its MSF goals requires the University of Otago to grow its capacity and capability to deliver Māori content across its diverse science curricula. Doing so will create new opportunities for staff and students. Recruiting, training and graduating new generations of Māori and non-Māori students who are prepared to work respectfully and responsively in indigenous, interdisciplinary contexts will position the University as leader and innovator in science education.

At Otago, Te Koronga provides a framework for mātauranga Māori (Māori epistemology) in the sciences, through its paired focus areas of Graduate Research Excellence and the Indigenous Science Research Theme. Within Te Koronga, students are mentored to express tikanga Māori in their work and to develop their own interdisciplinary kaupapa. Researchers make connections that help them to connect across traditional disciplinary and epistemological boundaries. This is the ideal framework in which to develop new courses that meet the needs of students who want to learn in an indigenous, interdisciplinary context. Otago's Ecology and Applied Science programmes, in which a core set of papers are augmented by electives that allow students to specialise in ways that are meaningful to them, are examples of the interdisciplinary approach to science education.

Many essential ingredients are already in place but connecting and growing them are a significant challenge. Māori science could be taught in two ways: in explicitly Māori science papers and as Māori science content integrated into other papers. The latter category includes papers that cannot be correctly taught without Māori content and papers where such content would strengthen a course. New Māori staff will be required to better support existing teaching and mentoring, to training current staff to engage with mātauranga Māori in new ways and to offer new papers. We continue with the specific solution in the companion paper in the second Special Issue.

Conclusion

Te Koronga aims to provide a space within the academy that privileges Māori research excellence. One of the strategic aims of Te Koronga is population parity for Māori academics/ increasing Māori research capacity and capability, and to address the significant needs within Māori communities in relation to sciences. While there are national and locally based policies and strategies, in reality, these are yet to be translated into academic institutions with any increase in Māori academic staffing numbers nor expertise in Māori research in sciences. There are significant challenges for iwi, hapū, whānau and Māori communities which can be supported through a deliberate and intentional focus on growing Māori academic excellence within sciences. The academy is in a state of crisis for Māori staffing and there is no short-term reprieve from this reality. Many of the authors are Māori researchers and researchers with expertise in working alongside Māori and we are determined in our collective approach in undertaking science and research in a different way; in ways that reflect the aspirations of our communities in the pursuit of mauri ora.

Tēnei tātou te koronga

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