Mātauranga and Pūtaiao: the question of 'Māori science'

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Abstracts

Ka hoki atu te pepa nei ki te tohe mō te 'Pūtaiao Māori': ko tētahi taha e kī ana ko te Mātauranga Māori tētahi momo pūtaiao taketake nei nō mua mai; ko tērā atu taha e whakahē ana i taua kerēme. Ko ngā taha e rua e kaha whakapono ana ki ā rāua ake tohe, e kaupare ana hoki i ā tērā atu taha. Ki ētahi mātanga, ehara tēnei tohe i te wānanga noa iho nei, ko tētahi tauira ko ngā kaiako pūtaiao o ngā kura e pēhia nei e te haepapa kia eke ā rātou tauira Māori, e mahi nei hoki i raro i ngā kaupapa here o te ao mātauranga kua whakaaweawetia e te whakaaro kia pōwhiritia tēnei mea te ahureatanga ki ngā wāhanga katoa o te marautanga ā-kura.

This paper revisits the 'Māori science' debate: on one side, the claim that Mātauranga Māori is a traditional indigenous Māori form of science; on the other, the denial of such a claim. Both sides strongly believe in their arguments and reject those of the other side. This debate is more than simply academic for some practitioners, for example, school science teachers, who are increasingly held responsible for the achievement of their Māori students, and who are working under education policies influenced by ideas of including cultural content in all areas of the school curriculum.

Introduction: researching the 'Māori science' question

This article revisits the simple question: is there such a thing as Māori science? This question is phrased in simple terms to enable me to undertake a philosophical inquiry of maximum clarity. It is important to note that this is a theoretical question, while remaining cognisant of its underlying significance to conversations in national science funding. But the situation 'on the ground' is far, far more complex than can be captured in this 'pure' question stated in bald terms, as simply as possible. This article draws on my 25+ years of experience in Pūtaiao, which suggest there is no right or wrong answer to the question of 'Māori science'; the question can never, therefore, be considered finally settled. The aim of this article is to provide a balanced synopsis of the arguments for and against the concept of 'Māori science' in hopes of making a useful contribution to the current discussions.

One answer to the question of 'Māori science' is that yes, mātauranga Māori is a traditional indigenous form of science from Aotearoa (Peters 1993); the other answer is a firm no (Nola & Irzik 2005). Many who deny the concept of 'Māori science' regard it as nonsense, and part of the growth to dangerous levels of 'anti-science' attitudes in society (a clear statement of this position was made in Matthews 1995). Supporters of both answers seem sure of their grounds, not realising it is not a question that can be answered with scientific certainty. This apparently simple question of whether or not 'Māori science' exists is actually extremely complex and invokes considerations at many levels, from epistemology to politics. Claims have been made on both sides that the opposition's views are blinded by politics or privilege. This debate is one specific instance of a larger philosophical debate between universalism and relativism (Herrnstein Smith 2005; Putnam 2004). But the 'Māori science' debate is not only academic: it can have real effects in the work of school science teachers, for example, who are increasingly held personally responsible for the achievement of their Māori students under current policies (Ministry of Education 2011). Similar policies are also being taken up for tertiary-level science teaching. The aim of this article is to delineate the reasoning used to defend the two answers or positions, and in the process clarify the nature of 'Māori science' and the applicability of this concept.

This research aligns with Kaupapa Māori principles (Smith 2012) and post-qualitative approaches to inquiry (St. Pierre 2018). For example, I include insights from my experience as a teacher and developer of Pūtaiao in schools – an auto-turn positioning me as an insider-researcher, a position supported by the principles of Kaupapa Māori research methodology especially in its philosophical and ethical aspects (further discussed in Stewart 2017a). This article draws on previously-published research on Māori science education, but covers more territory than extensive literature reviews would allow.

In 1993, when I started teaching intermediate and secondary Pūtaiao (the Māori word for 'science' – capitalised when referring to the Māori-medium school subject) I was devising the curriculum and accompanying lexicon as I went: te reo Māori was the primary language of the classroom, but I had to plan all the content: topics, texts and activities, and above all an underpinning model of the subject that made sense both in Māori terms and in science terms. At the time there was no curriculum or resources – all

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that happened later. I have written about these experiences elsewhere (Stewart 2010, 2011a).

I began from the traditional accounts of Rangi and Papa (Father Sky and Mother Earth) and their many godly children, including Tāne (god of the forest), Tangaroa (god of the oceans), Tāwhirimātea (god of winds) etc., who act as guardians and metaphors for knowledge of the different elements and domains of the natural world. Since Māori knowledge includes 'the gods' or knowledge of spiritual realms, while science does not, I drew a diagram in which mātauranga Māori (Māori knowledge) is a large circle, and science is a smaller circle inside it. This differs from the more typical 'Venn diagram' model with two intersecting circles used to show the overlap between science and Māori knowledge (Roberts 1998; Simon 2003). The benefit of my 'superset' model of the relationship between science and mātauranga Māori is that it makes all of science, not only in some domains such as ecology, relevant to Māori and Māori school students.

The question of whether or not Māori knowledge is a science became important in planning to teach Pūtaiao, but Māori science education is one of the few scenarios when the question of 'Māori science' arises outside the academy (McKinley *et al.* 1992). The question of 'Māori science' has traditionally been of little relevance as perceived by the scientists themselves. In this sense, the 'Māori science' debate is notable for the disjunction between its large theoretical heft and its tiny base of practical and perceived importance.

The next section summarises and considers both sides of the binary question, is there such a thing as 'Māori science'? The third section briefly sketches the relevance of this debate to current policy debates in science education and public science funding, and the conclusion considers the larger educational potential of the 'Māori science' debate.

Reviewing the question of 'Māori science'

Any discussion about whether or not 'Māori science' exists faces the prior difficulty of succinctly but adequately defining science. Much literature on multicultural science education, including the majority of papers on the 'Māori science' question, falls into the trap created by this difficulty. The 'Māori science' debate (and, more generally, the 'multicultural science' debate (Hines 2003) encompasses complex questions in philosophy, science, culture, identity, technology and politics, so it is hardly surprising that much of the published commentary is flawed and falls apart on closer examination. Standard disciplinary philosophy of science would say, for example, that reason 1 listed below is about technology, not science, and that reason 2 is based on an inadequate concept of science as 'nature study'. Nevertheless both reasons have some merit, and are often rehearsed as arguments in favour of the concept of 'Māori science'.

The case for 'Māori science'

These lists, distilled from my years of research into Pūtaiao, summarise the main reasons for and against the proposition that mātauranga Māori counts as science:

1. Traditional knowledge enabled Māori ancestors to live and flourish in harmony with the natural world in Aotearoa, employing sustainable technologies such as kūmara pits and harakeke (flax) fishing nets and lines.
2. Many items of traditional Māori knowledge are based on accurate, detailed observations of macroscopic natural phenomena (plants, animals, astronomical patterns, etc.), capable of generating data of scientific validity and interest.
3. The cosmogenic Māori nature narratives work together as an overarching paradigm of knowledge, replacing in that role the science framework of theories and commitments that underpins the modern/Western worldview (Roberts *et al.* 2004).
4. Māori knowledge is not necessarily restricted to the three-dimensional reality of the laws of physics, and therefore may have access to wisdom that Western science has disallowed within its canon.
5. The original meaning of the word 'science' comes from the Latin word meaning 'knowledge' so on grounds of epistemic fairness, mātauranga Māori deserves to be recognised as valid knowledge, i.e. as a form of science, in its own right.
6. Mātauranga Māori can also be understood as a critical Māori viewpoint on science and its applications in society in Aotearoa-New Zealand – for example, as a Māori critique of scientific racism and justifications for colonising damage done to Māori people, culture and environments.
7. Mātauranga Māori sometimes seems to know more than science about very complex phenomena, such as the essential nature of a human being, or the mysteries of reality: mātauranga Māori has values and metaphors that can provide fresh views on epistemology, or philosophical questions of knowledge.

The case against 'Māori science'

1. The laws of science apply equally at all times, in all places, to all human beings; in other words, science is based on universalism (or universalist philosophical commitments).
2. Resulting from the above point, science is an acultural (or trans-cultural) form of knowledge, so to place a cultural modifier (such as 'Māori') before the word science is incoherent i.e. makes no sense.
3. Science knowledge is based on empirical experimentation and testing using well-established methodological norms (the 'scientific method') i.e. science tests itself against empirical reality.
4. Science knowledge has well-defined criteria and a vast archive of experience that ensure it adheres to the highest epistemic standards and is the 'best' possible knowledge about reality available to humans.
5. Science knowledge is subject to ongoing revision as empirical knowledge advances; in other words science is 'fallible knowledge' that changes over time in ways that orthodoxy or faith-based knowledge does not.
6. Scientific research is subject to the scrutiny of a community of peers, and this community ultimately decides the current status of scientific knowledge on any topic.
7. Science enabled the rapid advances in human knowledge and its applications that characterised the post-Enlightenment rise of modern European culture

across all facets of human endeavour, to a previously unprecedented size, level of sophistication, and global dominance.

Is there such a thing as 'Māori science'?

The problems with the first two reasons for 'Māori science' have already been noted above. Reasons 3 and 4 are less common but are sometimes presented as arguments in favour of 'Māori science' (Roberts *et al.* 2004), though most scientists reject these two claims because any system of knowledge that does not adhere to the key science theories and philosophical commitments is, by definition, not science. Reasons 5, 6 and 7 in favour of the concept of 'Māori science' are more complex. Regarding reason 5, to argue that 'Māori knowledge' is a science by definition changes the meaning of 'science' so begs the answer "it depends on what is meant by the word 'science'". If **any** recognisable form of knowledge is 'a science', then yes, so is Māori knowledge or mātauranga Māori. In addition, in the anthropological sense of a body of natural knowledge fit to cross oceans and sustain the life of an identifiable human culture, perhaps Māori knowledge does deserve to be considered a 'science'.

Reason 6 gets entangled with nationalistic myths, promulgated in a deliberate philosophical attack on Māori knowledge (Jackson 1992) and embedded in scientific knowledge as 'the truth' about Māori and about the national history of the country. As part of the dominant story of the nation told in the media and school curriculum, these myths feed the imaginary of national identity: of what it means to be from Aotearoa-New Zealand. There is no reason to think scientists should be any more immune than the general public to these subtle curricula of colonisation (Stewart & Buntting 2015). Their lack of recognition that renders them invisible also renders them powerful – this is the power of discourse: discourse as power (Foucault), and the absent presence (Derrida).

The short answer to the question of whether there is such a thing as 'Māori science' is therefore 'it depends'. It depends on what is meant by 'science' and it depends on the purpose for asking the question. It is not an unqualified yes: it is **not** the case, for example, that there is a base of traditional Māori knowledge that can replace the standard school science curriculum – or at least, not with the same outcomes that mean 'success' in the current system. The idea that scientific data can be swapped for oral texts and so forth is clearly ridiculous. Argument 7 for Māori knowledge works better as an argument in favour of 'Māori philosophy' rather than 'Māori science'. All knowledge including science is based on a philosophy of knowledge, but the two words, 'science' and 'philosophy' have different meanings, so the concept of 'Māori philosophy' does not imply that there must be 'Māori science' apart from in the restricted senses noted above.

The criteria of science and laws of nature may be universal, but there is a very large gap between epistemic ideals and the way science plays out in society. As a human product, science is subject to human failings and weaknesses, including the influences of non-scientific ideas such as sexist or racist ideas. For example, the colonisation of Aotearoa was carried out under the banner of a now outdated form of science, which included ideas such as the 'Family of Man' in which Māori people were considered 'less evolved' and hence biologically inferior to British (White) people (McKinley 2003). Darwin's then-new theory of evolution was famously mis-applied to humans to argue that Māori as the 'inferior race' would naturally die out (Stenhouse, 1999; Te Ara - The Encyclopedia of New Zealand, 2018).

The term 'Māori science' can be used with irony to critique the term 'Western science' that is itself necessitated by well-intentioned but illogical terms such as 'Indigenous science' (and its cognates including 'Māori science'). The unmarked word 'science' means or implies 'Western science' and terms such as 'Māori science' are provocations of this unmarked meaning and its implications. Clearly it is equally as facetious to speak of 'Western science' as it is of 'Māori science'. This terminological comparison highlights the fact that science is, essentially, a Western form of knowledge. Here I capitalise Western to highlight that it is a cultural term; local in the same sense as 'Māori', not universal – in other words, I use a capital letter for Western to **demote** the concept from the universal (normalised, i.e. uncapitalized), to point out its majoritarianism.

Reasons 3, 4, 5 and 6 against 'Māori science' are more a matter of degree than of kind, and do not provide robust grounds for arguing that science is completely different from Māori knowledge. The argument about 'scientific method' is outdated: a relic still found mainly in school textbooks. Reason 7 about the power of science and its applications is undeniably true, but heavily loaded, since it is now impossible to read such a statement without awareness of the catastrophe about to engulf humanity that has grown like a cancer from that power, made possible by what is described as Western philosophical blindness (Peters & Mika 2018) in which science has become enslaved to wealth.

Policy implications for science education and public science

The question of 'Māori science' is a political football in which the uninformed nature of debate tends to entrench rather than overcome oppositional attitudes on either side. The implications for science education continue to grow in urgency, as classroom teachers are being held increasingly responsible for Māori student achievement, and education policy seems trapped in the unproven belief that 'adding Māori knowledge' to the curriculum is the answer to long-standing Māori lack of achievement, which is particularly severe in science (Stewart 2017b). These pressures add to a growing base of support, even among English-medium schools and teachers, for the dubious value of translating science into te reo Māori. Science translated into te reo Māori has become synonymous with 'Pūtaiao' at the expense of any notion of 'Māori science' as a different form of knowledge, with a different philosophical basis (Stewart 2011a, 2011b). Reduction of Pūtaiao to 'science in Māori-only' supports a call for Māori philosophy (Stewart 2014).

Public science funding is the second main 'site' or real-world context of the 'Māori science' debate, dating back to a major report in the mid-1990s on the interface between science and mātauranga Māori, as part of the re-structuring of public science management and funding. In retrospect, the neoliberal reform process stimulated a round of academic debate on the question of 'Māori science' (Dickison 1994; Lomax 1996). I read these papers as part of the writing group

for the first Pūtaiao curriculum document. Since 2005, the Vision Mātauranga policy (Ministry of Business Innovation & Employment 2018) has guided inclusion of Māori knowledge in research, but scientists still seem unsure about how it applies to their work (Royal Society Te Apārangi, 2018). There is a current discussion about including Māori knowledge in university research and teaching, which is still ongoing. More detailed discussion of Māori knowledge in publically-funded science research is beyond the scope of this article, but the point is that Vision Mātauranga and the Pūtaiao curriculum are two polices that represent real-world sites where the question of 'Māori science' is particularly relevant.

Conclusion: the educational value of the 'Māori science' debate

The question of 'Māori science' is more of a nexus of semantic, philosophical and political arguments, rather than a simple yes-or-no question. Whether Māori knowledge 'counts' as science is more of a provocation than a research question to be answered; it has no simple or 'correct' answer, as the 'right' answer depends on what is meant by 'science', and the purpose of the question.

The debate about Māori science, in other words, is a specialised form of the wider debate about the nature of science (Chalmers 2013). Understood as more of a *political* than an *epistemic knowledge* claim, the concept of 'Māori science' is also a post-colonial critique of science (McKinley 2001), which can also be called 'Kaupapa Māori science' (Stewart 2010): a concept intended to sharpen rather than usurp ideas about the accepted foundations and canons of science knowledge, while remaining critically aware of science's past and current enslavement to naked power, in the form of money and social privilege.

Perhaps the best way to regard 'Māori science' is as a conundrum: the two words juxtaposed in the term represent incommensurable forms of knowledge. This disjunction creates a nexus of conflicting ideas, which acts as a provocation and an opportunity for learning, of particular importance to the self-knowledge of science and research in the national academy of Aotearoa-New Zealand. Although this article is not based in the contemporary empirical milieu, it is motivated by the danger in rushing to a final and definitive answer on whether or not Māori knowledge is a science, which could altogether miss the educational opportunity and gift presented by the provocative concept of 'Māori science'.

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