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Systems Thinking and indigenous systems: native contributions to obesity prevention

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Abstract

Much has been written about the impact of chronic conditions on post-colonial indigenous populations. Much less, however, has been written about indigenous knowledge and how it may help tackle poor health statistics among indigenous populations. This article describes two approaches to obesity prevention that are grounded in Mātauranga Māori (Māori worldview), both of which challenge the "person-centred" approach so prevalent in Western approaches. These approaches were mapped using Systems Thinking tools, specifically causal loop diagrams, to test whether or not these tools could be used to "translate" indigenous approaches in a way that retained the integrity of their particular worldview and provided a tool to help those communities reflect on their practices in a way that led to new insights. Systems Thinking was found to have many overlaps with Mātauranga Māori, and the use of system thinking tools provided mutually beneficial learning opportunities for both the researchers and the communities involved.

Keywords

Whakapapa, Mātauranga Māori, Systems Thinking, causal loop diagrams

Introduction

Much has been written about the impact of chronic conditions, such as heart disease and diabetes, on indigenous populations in countries where they have been historically marginalised by colonisation (Morrissey, 2014; Naqshbandi, Harris, Esler, & Antwi-Nsiah, 2008). Much less, however, has been written about indigenous knowledge and how it may help tackle poor health statistics among indigenous populations (Agrawal, 2010). Furthermore, most of the literature on health care is written from a perspective that puts the individual at the centre (Nuno, Coleman, Bengoa, & Sauto, 2012; Stiggelbout et al., 2012; Wagner et al., 2005), which puts it in conflict with much of indigenous knowledge. Mātauranga Māori, the worldview of the Māori peoples of New Zealand, does not put the individual at the centre of their thinking (Rochford, 2004). In fact, "person-centred care" is so central to the Western understanding of what constitutes effective health care that it goes largely unquestioned. It is a metaphor that governs how we think about, design and implement health services. But it is a metaphor only; the patient does not literally sit at the centre of a health system (Lakoff & Johnson, 2003). This article challenges the dominant individual-centred focus, not by removing the individual but by placing him or her within a web of connections. What sits at the centre of this perspective is not the individual, but the interactions between the individual and the context within which they live. Mātauranga Māori puts these connections at the centre, not individuals.

The purpose of this article is first to describe how two communities have approached the well-being of their young people in initiatives that are grounded in Mātauranga Māori, using the techniques taken from Systems Thinking. In doing so, we also hope to communicate the value of indigenous approaches more broadly and test the value of Systems Thinking as a "bridge" between two knowledge bases:

> *He Whakaaro: "Kahore he aha i hangahia, i puta noa mai ranei, kia noho wehe i tenei ao. Ahakoa matangaro, ka rangona te mauri*
>
> *"Nothing in this world was created, or simply emerged, to exist in isolation. Even the invisible can be detected by its impact [on something else]."*
>
> Rev. Tukaki Waititi—Master Carver.

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The first part of this article describes what is meant by indigenous knowledge systems and the implications they have for both minority and mainstream health interventions. It also describes the similarities between system thinking and indigenous perspectives and how Systems Thinking can provide a bridge between two cultural knowledge bases, and in doing so inform each other. The second part of this article describes a project, funded by the Global Obesity Prevention Centre at Johns Hopkins University (Grant No. 4U54HD070725) conducted in two Māori communities in New Zealand, that uses Systems Thinking methods to understand innovative, indigenous approaches to obesity prevention in those communities. This part of this article adopts the stance of science *and* traditional knowledge in what Fikret Berkes refers to as the co-production of knowledge (Berkes, 2009, p 151).

Indigenous knowledge and systems and thinking

Mātauranga Māori in common with many indigenous knowledge systems has at its centre the concept of lineage connections. These connections go beyond connections to people and include connections to places, to events, to a particular time or era and, most importantly, to ideas. Māori see the origins of the world through these genealogical connections, referred to as whakapapa, placing each individual within a web of interactions that have evolved through time, impacted by lived experiences and changing environments throughout the course of history. Ultimately, it is these connections that enable well-being to emerge. Mātauranga Māori describes a uniquely Māori understanding of the universe providing insight into understanding the existence of and relationship between all animate and inanimate things and applying this insight in the pursuit of wellness. This knowledge is then arranged and ordered in layers through a system of ancestral ties referred to as whakapapa.

For Māori, like many indigenous groups, identity is intrinsically entwined within this web. So central is this web of connections that it is often "personified," so that even physical forms take on "personal" characteristics that inform its relationship to the people that are connected to it. For indigenous peoples, therefore, it is critical to understand the relationships that occur between these "personified" environments and the outcomes that result from their connections with people. When the knowledge of this web is strong, it nourishes individuals. When it is weak, or torn apart, the individual suffers. This is consistent with research conducted among First Nation peoples in Canada and Indigenous Australians that shows that connection to culture has significant health benefits (Durey & Thompson, 2012, p. 4).

In contrast, the Western worldview, since Plato, sees humans as distinct from the world around them (Taylor, 2011). Plato posited a dualism that separated us from the natural world. Christianity built on this to create a separation between the physical and spiritual worlds, between our body and our soul, and Descartes gave the Christian concept scientific credibility by separating mind and body. This dualism, originally described by Plato nearly 2,500 years ago, is a central metaphor of Western thinking and still largely unchallenged today (Lent, 2017). For Māori, this separation does not exist. Instead, they see that all things are ". . . imbued with a physical aspect as well as a spiritual aspect, with all things possessing a *Mauri*, or life force, reflecting its spiritual aspect" (Rochford, 2004). As Durie (2004) points out, this "strong sense of unity with the environment" is a defining characteristic of indigenous peoples. This feature of Māori knowledge, linking all things together, underpinned by a holistic, relational and temporal worldview, is much closer to the views of contemporary Systems Thinking, with its emphasis on symmetry and emergence within complex webs of interaction (Capra & Luisi, 2014).

Systems Thinking (Meadows, 2008) has a strong focus on the connections that affect, and are affected by, the interactions within the web and has been used to develop frameworks for designing chronic disease interventions in Māori communities (Oetzel et al., 2017). A systems perspective puts great emphasis on understanding the relationships between the components of a system, as it is the pattern of these relationships that determines the characteristics and properties of system behaviour. It is in this focus on relationships and the meanings attributed to these relationships that we see common ground linking Systems Thinking and indigenous Māori knowledge. They are two different bodies of knowledge, each with a long social and cultural history, but their commonalities, we believe, provide the opportunity to support and enrich each other. The following section focuses on how Systems Thinking was used to illuminate how two communities used their indigenous knowledge to respond to and adapt to contemporary issues.

An indigenous approach to health

As described above, a key argument put forward by indigenous knowledge systems is that health, and ill-health, emerges out of both the nature of the environment within which the individual lives and the individual's connection with that environment. The two cases discussed below are of communities that used an indigenous approach to health, Atua Matua, developed by the first author, which focuses on enriching a person's understanding of and connection to their specific environment.

The first community is a rural Māori language immersion school in Kaikohe, in the northern part of New Zealand (Te Kura Kaupapa Māori o Kaikohe), that has been using the Atua Matua framework (below) to enrich their physical activity curriculum. The second community is a health organisation in Uawa (Tolaga Bay) on the east coast of the North Island of New Zealand (Te Whare Hauora o Te Aitanga a Hauiti). In Kaikohe, the context of the study was a school and the focus was on the role of the curriculum to helping to reduce obesity. In Uawa, the context was a health organisation and the focus was on a Government-funded health programme, "Healthy Families NZ," which had a strong focus on obesity prevention.

A Māori health framework: Atua Matua

The Atua Matua Māori Health Framework is an indigenous approach to health that focusses on pre-European Māori concepts of Atua or personifications and guardians of specific environments. Consequently, these "Atua" form a body of knowledge, that is, environmental science, that when pursued can provide incidental human health outcomes through travelling to, engaging with, transferring to others and seeking depth of understanding of specific environments (Atua). In doing so, the pursuit of environmental knowledge removes the deficit-based approach often associated with indigenous health and often used to defend the introduction of health interventions into Māori communities, for example, you (Māori) are at high risk of diabetes and, therefore, need physical activity or nutritional advice in order to survive. Instead, an Atua Matua approach shifts the focus of environmental knowledge as an applied pursuit, for example, an understanding of the ocean through the medium of surfing cannot be "learnt" as a theoretical approach—the ocean (or environmental representative) must be allowed to immerse you physically, spiritually and psychologically numerous times before an attempt at surfing can be made. Therefore, the process of aiming to learn environmental knowledge at a high level can allow an individual to be relieved of guilt and blame and replacing it with an aim to pursue environmental knowledge in order to surf.

The Atua Matua Māori Health Framework is an attempt to provide a set of environmentally based concepts (Atua) to help people (Matua) move from an individually focussed model of health to a whakapapa-wide approach that builds upon an indigenous knowledge rather than some personal health deficit. It does this by bringing the local Atua, whether they be a significant mountain, river, bird, insect, person or idea, into the present context. For example, learning about the local diet and the reasons such a diet was prominent in a given community. Thus, "healthy eating" shifts from a discussion about what I should or should not eat, based on the nutritional composition of particular foods, to an understanding and pride in a heritage understanding of food and its wider values, meanings and usages.

One particularly interesting example of Māori environmental explanations that contribute to human outcomes within Atua Matua is explained in the tatai whakapapa (environmental connection) between Haumia Tiketike, Rarauhe, Aruhe, Monehu, Te Aitanga Pepeke and Rōtane. Haumia is the Atua of uncultivated food, Rarauhe the Bracken Fern, Aruhe the starch root, Monehu the spores from which insects arise, Te Aitanga Pepeke being the insect world from Rarauhe and Rotane being a specific example of a stick insect from which core strength examples can be obtained, that is, the pursuit of the insect, study and transferral of movement from Rotane in a bush environment into copying the movements of Rotane (much like grasshopper in Kung Fu). This pattern of following Atua (of uncultivated food in this example) into applied forms of that knowledge allow innovative approaches to improving Māori health.

Methods

Systems Thinking, with its strong set of tools to map how interactions play out in any given specific context, gave the researchers the initial idea that it may have some relevance to the Atua Matua approach, being able to provide explicit descriptions of the connections that were being made by the approach, that could then be used to communicate the approach in a way that did not require a deep understanding of indigenous knowledge. Group Model Building (GMB; Hovmand, 2014; Vennix, 1996) was the method adopted to describe the approaches used in both communities.

In Kaikohe, the GMB focused on their use of Mātauranga Māori to guide the development of their curriculum and how that contributed to the physical, psychological and spiritual well-being of their students. We ran three workshops with a core group of eight; the school principal, three senior lead teachers, two students and the two cultural advisors to the school, that is, elders. In Uawa, GMB was used to explore two distinct areas. The first was their decision to enter teams in the world Waka Ama (outrigger) championships in Hawaii in 2017 and how that could be used to contribute to a healthy community, rather than it being viewed simply as a sporting event for their top athletes. The second area of focus was their "Kai Atua" project, which was focused on changing people's understanding of and relationship with food. The system maps were developed over a series of four workshops with the lead health manager at Te Aitanga a Hauiti, three senior staff from both Mangatuna Kura and Tolaga Bay Area School and three students from Tolaga Bay School.

In both cases, we built the introductory model after listening to their descriptions of what they were doing, what their goals were and what some of the challenges they were facing in achieving those goals. This meant that the communities' first "in-depth" look at causal maps was in relation to their important issues, not examples taken from another context. Feeding back the initial model provided the opportunity to describe causal loop diagram's (CLDs), how they were constructed and what they were trying to describe. Furthermore, while this was taking place, the researchers were able to obtain immediate feedback on how well, or not, they had reflected the community's stories in the CLDs.

The following sections describe how these outputs were produced in Kaikohe and Uawa and what the response to the maps was.

Results

The initial meeting at the Te Kura Kaupapa Māori O Kaikohe (Māori immersion school in Kaikohe) was with the principal, three teachers, the administration manager and two of their kaumātua (elders). The purpose of the meeting was to introduce one of the research team (D.R.), describe the research project and discuss its potential relevance and usefulness to the kura (school). At this meeting, the project was described by the researchers as having two goals. The first was to map the schools' efforts to implement Atua Matua, using CLDs,

and to see if that could be done without losing the integrity of their particular Māori perspective. The second objective was to see if the process of developing and engaging with the CLDs added any value to their efforts to understand and implement Atua Matua. The result of the first meeting was that the school agreed to join the project and a meeting was set up for the following week.

At the second meeting, an initial framing question was put forward as a starting point for the model development. The question was

> *What are the factors that are going to influence people in engaging in better levels of physical activity and improved nutrition?*

The above question reflected a non-indigenous perspective, including the idea, common to research in this area, that physical activity and nutrition are the core factors driving obesity. It was quickly rejected and changed to

> *How can Mātauranga Māori influence Waiora?*

Immediately, the researchers were forced to come at the issue from a uniquely indigenous perspective and come to grips with the scope and meaning of Mātauranga Māori and Waiora (well-being). At the very least this meant that obesity could not be isolated from the broader context of health. While there is no direct translation, and attempting to describe concepts across languages and cultures is fraught with difficulties, at the very least Waiora, from a European perspective, had to incorporate physical, mental, cultural and spiritual health, acknowledging that the divisions between them, implied in the English language, did not fit the integration inherent in Waiora.

There are two points of significance here. The first is that the focusing question used Māori language concepts, so that what was being said had a number of nuances and subtleties that the researchers had to manage. While such translations are always difficult, a reasonable starting point is to read the focusing question as "How can Mātauranga Māori [a specific indigenous way of seeing and acting in this world], influence Waiora [physical, psychological and spiritual wellbeing]." A second significant point arising out of this is that the focus of the question goes well beyond obesity. For the participants, focusing on the problem of obesity was simply repeating what has been done many times over, describing the problems that Māori communities are having and the need to change exercise and nutrition behaviours. They did not want to go over what they saw as "old ground."

However, obesity was not ignored but rather, consistent with both the Māori and Systems Thinking perspectives, it was put in its proper place, that is, as an emergent property of the system. The people in Kaikohe wanted to describe that indigenous system, in this case their school curriculum, and how it would deliver Waiora, and reductions in obesity would follow. This was very much in line with the work that they had done using the Atua Matua Framework over the last few years. Atua Matua, like Systems Thinking, has

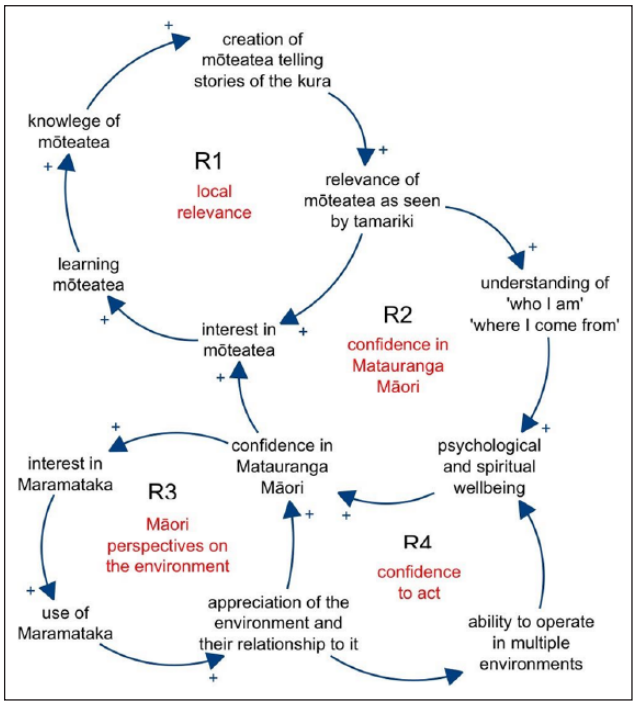

Figure 1. Initial causal loop diagram, Kaikohe (Tamariki = children, moteatea = traditional chant, kura = school, maramataka = Maori calendar/almanac).

an underlying theory of change that argues for structural change. That is, change will occur when the structure—pattern of relationships—in the system changes. In this context, it argues that obesity is the result of causes and conditions that have, over time, isolated Māori from their historical and cultural history. Reconnecting Māori through an Atua Matua approach to indigenous systems of knowledge in innovative and engaging ways will result in a different set of emergent behaviours, specifically behaviours that do not lead to obesity. The CLD that emerged out of this meeting is shown in Figure 1.

CLDs are tools for mapping causal relationships in sets of linked feedback loops. In Figure 1, there are four interconnected feedback loops. To take R1 (local relevance) as an example, "learning mōteatea" increases "knowledge of mōteatea", which in turn enables them to become involved in the "creation of mōteatea telling stories of the kura (school)". This increases the "relevance of mōteatea as seen by tamariki (young people)", which increases "interest in mōteatea" which feeds back to further increase "learning mōteatea". The "+" sign on each arrow indicates that an increase in one variable increases the variable it is influencing. The converse also applies in that a decrease in one leads to a decrease in the other. So, for example, less time spent "learning mōteatea" would lead to less "knowledge of mōteatea", which in turn leads to less involvement in the "creation of mōteatea telling stories of the kura". This sequence of causality continues around the feedback loop. The "R" in the label of each feedback loop indicates that it is a "reinforcing" loop in which a change in any direction is reinforced throughout the loop so that, for example, more learning sets off a chain of causality that feeds back to reinforce further learning.

This particular map was the focus of discussions in meeting 3. It was quickly grasped by the Kaikohe group and was seen to reflect what they were aiming to do. Discussing the specific elements of the CLD was relatively easy as it was describing aspects of their own world, making the understanding of the core concepts much easier. They quickly engaged with it and started refining the model. The model was seen to be describing their work and they quickly acknowledged that it would also help them communicate their ideas to others. During meeting 3, the model was modified considerably and the group started talking about how it could be used to increase their Board's understanding of what they were trying to achieve through Atua Matua. Furthermore, following the meeting, a number of them worked in more detail on the whiteboard and sent the researchers the result of their work later that evening (Figure 2). That work was incorporated into a new version of the CLD that was presented and discussed at the final meeting (meeting 4).

The CLD that emerged out of the discussions in meeting 3 and the additions developed by the group on a whiteboard following that meeting is shown in Figure 3.

Meeting 4 focused on the details of the CLD and how it could be used to both communicate what they were doing to others and to refine their own thinking. As one person commented, it provided them with a framework for the development of their own "localised curriculum," that is, a framework to translate national curriculum requirements into their own specific district-centred circumstances. This was important for them as they saw themselves as innovators, and communicating that innovation to others was not always easy.

Figure 2. Adding new concepts to the CLD.

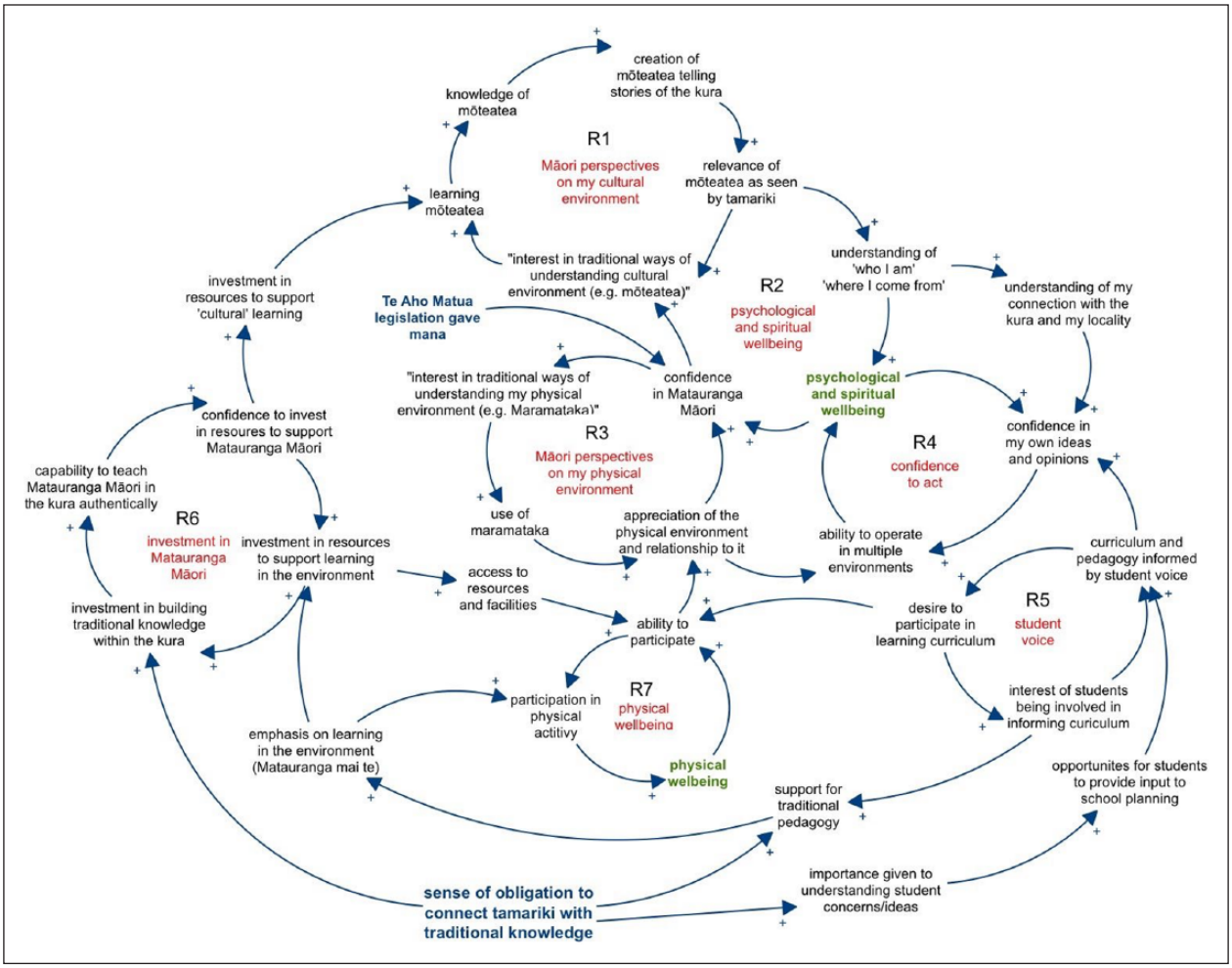

Figure 3. Modified CLD—Kaikohe.

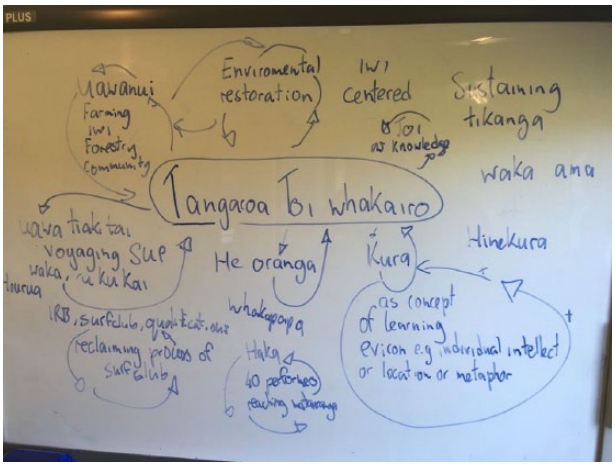

Figure 4. Key issues in Uawa.

Within this CLD are seven key feedback loops that were central to what they are trying to do through the Atua Matua approach. R1 focused on using traditional story forms, *mōteatea*, to tell contemporary stories. This not only supported psychological and spiritual well-being, R2, but also increased confidence in Mātauranga Māori, R3, as a valid knowledge system that could inform contemporary concerns. The use of traditional knowledge systems such as *maramataka*, a seasonal Māori calendar, enriched their understanding of the physical environment and interest in participating in it. This had an immediate impact upon physical activity, R7, which was enhanced by *Mātauranga tai te*, an emphasis on learning in the environment. R2, with its focus on *psychological and spiritual well-being*, also gave students more *confidence to act*, R4, which was enhanced by R5, efforts by the school to include students in curriculum development activities.

Community 2: Uawa

The initial meeting at Te Whare Hauora o Te Aitanga a Hauiti in Uawa involved the CEO, Chair, IT support, a senior staff member leading one of their major projects, "Healthy Families" and a community leader. As with Kaikohe, the purpose of the initial meeting was to introduce the research team, describe the research project and discuss its potential relevance and usefulness to the organisation. At this first meeting, they also used a whiteboard to describe the issues they were facing in Tolaga Bay (Figure 4).

An interesting feature of these whiteboard jottings is not just the extensive use of the Māori language but also the extensive use of "feedback loops." Although the term "feedback loops" was not used, nor were the conventions associated with CLDs, it is clear that they already saw the world in terms of connections and mutual causality. Here was a clear example of the similarities between Mātauranga Māori and Systems Thinking.

The conversation at that first meeting was wide-ranging and resulted in an invitation to attend a meeting that evening, in the local school, which was discussing the coaching programme for the Waka Ama (outrigger canoe) team who

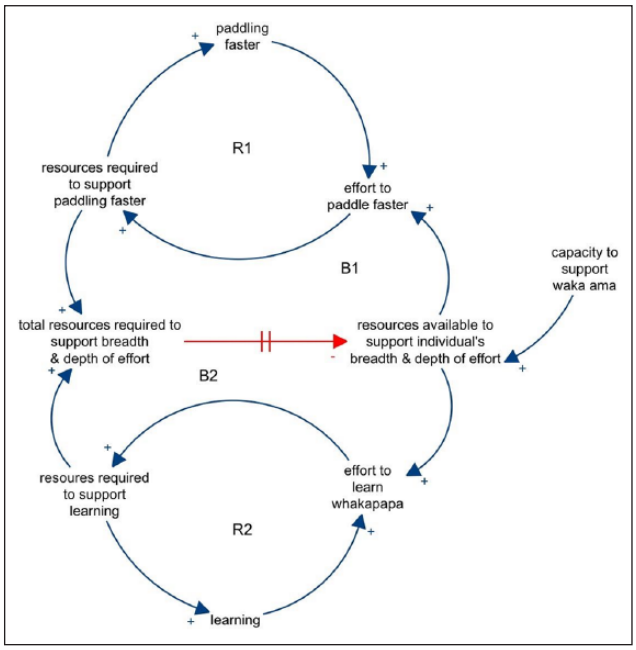

Figure 5. Waka Ama version 1.

were being entered into the world championships in 2017. As with Kaikohe, these initial meetings provided the researchers with extensive information about what the community was trying to achieve and what the issues were that they were trying to address. A CLD was presented at the second meeting the following day, which represented an attempt to capture the key themes in the previous night's meeting discussing the Waka Ama programme. The CLD is shown in Figure 5.

This CLD uses a well-known system structure, commonly referred to as "tragedy of the commons," in which competition for a scarce and common resource leads to all losing out. In this case, it was competition for the scarce teaching and coaching resource from those whose focus was on the physical attributes and practices needed for elite athletes to "paddle faster" and those who thought that focus, motivation and desire to "paddle faster" would be enhanced by incorporating cultural learning, through Atua Matua, into the programme. The participants at the meeting thought that this CLD captured that key tension in the community and engaged with the map to develop it further. The enhanced version of the map is shown in Figure 6.

The key feedback was that the CLD was helpful in articulating an underlying tension that needed to be addressed, especially if the programme was to achieve its broader goals. More specifically, in their small community, there are only so many waka paddlers, so many coaches and limits on the amount of funding. To split the resources would end in all interested parties being disadvantaged. The CLD also pointed to the long- and short-term consequences. Unless young people in the community developed a strong connection to place they were unlikely to stay, or return to support their community if they left to study, work or travel. Thus, putting the Waka Ama coaching onto a broader cultural bases was seen as not only

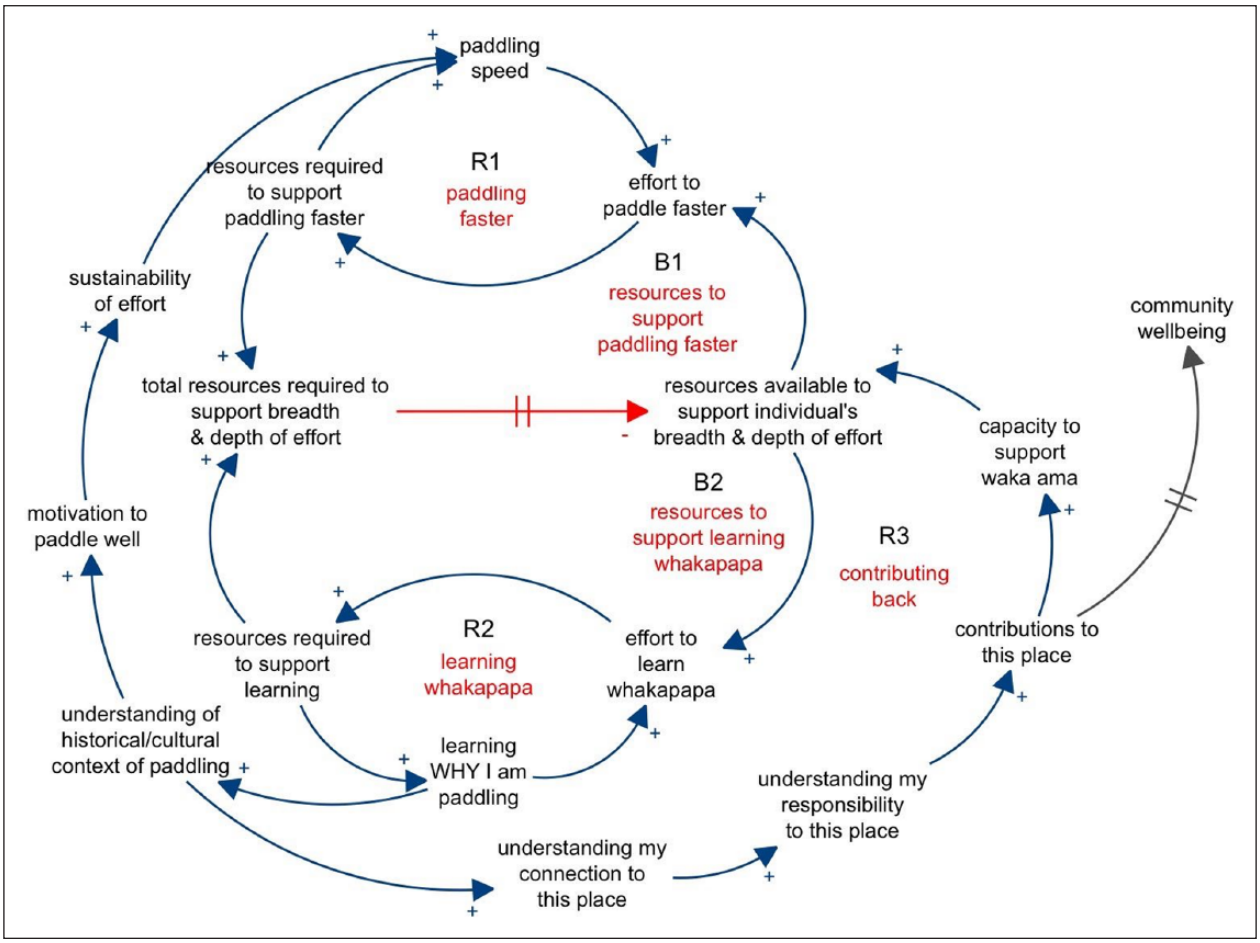

Figure 6. Waka Ama version 2.

providing great motivation to "paddle faster" but also put in place the necessary knowledge to support a lifelong connection to their community, which would be needed if the community was to survive into the future.

Following these discussions, the authors were invited to come back for an additional meeting to discuss its application to "Kai Atua," a project which was focused on changing people's understanding of and relationship with food by linking it back to cultural values and practices. The first part of the meeting focused on the potential for using Systems Thinking to help build capability across Māori providers and educators in the region. Following the initial discussion, time was spent developing a CLD focusing on the issues they were facing in their Kai Atua project. The initial CLD is shown in Figure 7.

The immediate result of this process was for the Healthy Families project leader to think more closely about the overall scope and goals of the project as the process of building the CLD raised a number of significant issues for him. One consequence of this was an invitation to run a hui (meeting) with a wider range of providers in Gisborne, the regional centre, to provide them with a basic understanding of the core ideas in Systems Thinking and the perspective it gave to the Kai Atua project. The meeting was held later that year and provided the basis for the Healthy Families NZ project to work with the local health board to develop an obesity strategy for the region, using GMB methods to help develop an initial strategic framework.

Discussion

This research project was unusual in that it was not structured around a need expressed by a group of people, and the use of GMB to address that need. Instead, it was a research team requesting two communities, who were using innovative approaches to obesity prevention, to share their expertise and allow the researchers to describe their work in the form of a CLD. This process had a number of interesting results.

First, within the two communities described above, CLDs provided a powerful language for telling the systems stories of indigenous groups in ways that retained the integrity of their particular worldview.

Second, both communities indicated that the process provided them with new insights into the work they were doing. Using an "external" language, different to the language used by the group, allowed them to "stand back" and critically look at their work. In Kaikohe, the CLD was presented to their new Board as a way of explaining what they were engaging with. In Tolaga Bay, the Waka Ama CLD helped articulate issues they intuitively knew they had to

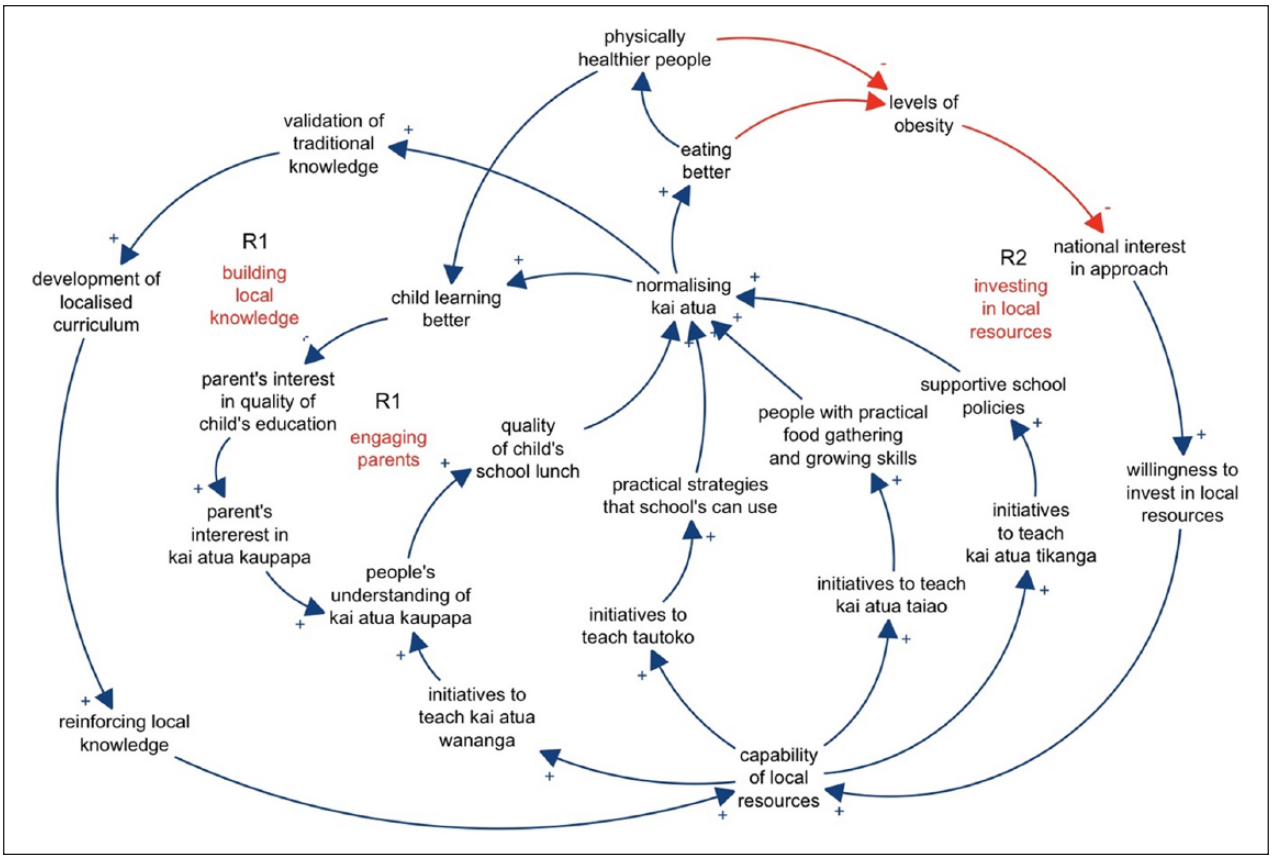

Figure 7. Kai atua CLD.

address and the CLD allowed their community to "name" their issues and "address" them. The Kai Atua CLD helped the project leader develop a richer understanding of the scope and aims of the project and involve others in developing their plans further. Furthermore, the work provided the basis for a regional meeting on obesity and subsequently a joint project in which the Tolaga Bay Healthy Families project combined with the District Health Board to develop an obesity strategy for the region.

Third, the process was seen by the researchers and the communities as providing mutually beneficial learning opportunities and has reinforced the desire in both communities to value and trust in their own unique versions of pursuing health.

Donella Meadows (2008) a leading practitioner and researcher in Systems Thinking once stated (p. 7),

> Modern Systems Science, bound up with jargon, computers and equations, hides the fact that it traffics in truths known at some level by everyone. Translate the language, and it is often possible to make a direct translation from system science to traditional wisdom . . . . The fundamental concepts of a systems approach are connectedness, relationships and community—concepts which are the essence of a deep spiritual awareness.

In a world where ideas about "valid" knowledge are becoming narrower and more divisive, we believe, like Donella Meadows, that by valuing the common ground between Indigenous Knowledge and Systems Thinking, both can be heard more clearly and, as a consequence, innovative approaches, such as the ones described in this article, can be valued and assessed on their own terms. Furthermore, we hope that our initial efforts to describe these innovations using Systems Thinking tools will enable people without a deep cultural knowledge to appreciate the value of what is being done in both communities and more generally to appreciate the value of approaches that are grounded in the cultural knowledge of the people involved.

Limitations and further research

In both of the communities in which this project took place, Mātauranga Māori is strong, providing the lens through which people see and act in the world. These are people with feet in both camps, able to operate effectively within both Western and Māori paradigms. This was helpful, in that we were working with people who are very knowledgeable of their cultural heritage and able to articulate many of those ideas to a non-Māori researcher. However, it is also a limitation in that we do not know if the approach would work as well with communities who are less well versed in their indigenous culture and/or less articulate in describing it. One of our hopes is to undertake similar work in urban communities whose "web of cultural connections" is not so strong, and whose belief in and understanding of their own traditional knowledge is often tentative.

Despite this limitation, however, we have shown that the tools of Systems Thinking, in these examples the use of CLDs, can describe health innovations, designed and

implemented from a uniquely indigenous perspective, in this case Mātauranga Māori, and do so in a way that respects their particular worldview. Furthermore, the approach also developed models that provided the communities with a mirror that they could use to reflect on what they were doing and thereby modify it.

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