



TOI TANGATATM

MĀTAURANGA MĀORI AND SYSTEMS DYNAMICS: WHERE
OLD WORLD COLLIDES WITH THE NEW

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FOR TOI TANGATA

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INTRODUCTION

In April 2015 I was placed on a ministerial advisory panel for developing recommendations for youth obesity. In the same month I attended a symposium entitled “System Science Approaches for Obesity Prevention”. During this symposium, I attended a paper on the application of System Dynamics (SD) to understand and inform obesity prevention. At the end of the presentation and from what I had learnt during my time on the ministerial advisory panel, I felt I was finally able to understand what this ‘systems stuff’ was all about. It occurred to me that they were talking about Whakapapa. Those thoughts began a learning journey that developed into a specifically Māori approach to systems that uses Mātauranga Māori (indigenous knowledge) coupled with ‘whakapapa’, as a connection to Systems Dynamics knowledge.

System Dynamics focuses much of its attention on the connections between the parts of a system, as from a systemic perspective, the nature of those connections, especially when they feedback upon each other, are major drivers of systems behaviour. Alternatively, Mātauranga Māori, or Māori worldview has, at its centre, the concept of whakapapa. Whakapapa is often mistaken for genealogy, but it is much more than that. It is about connections; connections to people, to place, to ideas (explained in more depth later). Individualistic perspectives do not sit well within Mātauranga Māori, rather, a perspective that sees each person sitting within a web of connections, a web that supports and nourishes the individual, and a web that can be lost if it is not nurtured. For Māori, their very identity is intrinsically entwined within this web of connections, within their whakapapa. SD was seen in this context, as a potential way of describing a specific set of connections that were consistent with Mātauranga Māori.

BACKGROUND

Systems Dynamics, and especially for its part in addressing youth obesity, has seven major components including; **Biology, Behaviour, Social Networks, Culture, Policy, Economics and Environment**. Whakapapa has some similar components that can be used to address obesity but they are expressed in a number of different ways: **Environmental Knowledge, Connection to Environmental Knowledge, Learning Metaphor from Specific Environment, and Application**. Much like SD, a whakapapa approach has a hierarchical structure in that the overarching environmental connections are paramount i.e., Meteorological, Water or land based with human expressions considered least important. For example, in recent decades there has been a significant shift to health systems being patient centred. In a systems based approach, regardless of whether SD or whakapapa, the patient moves into being an incidental benefactor of understanding their role within an environmental and hierarchical approach. In effect, whakapapa and SD suggest that individuals do not exist in isolation but rather are part of many different systems, such as, environmental, economic, political and social systems.

Likewise, a Whakapapa approach/SD approach is important so that we do not run the risk of unsustainable solutions. In most instances, recruitment and sustainability in health and education interventions, and particularly for those in Māori communities, are made sustainable by the higher level connections to a particular district of which the individual is a tribal member. That is, Māori will travel great distances and expend considerable energy in; kapa haka, waka ama, mau rākau and takaro tāwhito if those activities are district centred. Likewise, systems approaches, like whakapapa, help predict secondary and tertiary effects as part of a bigger picture, i.e., across generations from an environment to a tribal member. Whakapapa/SD also allows some insight into the unintended consequences by showing examples of similar activities at earlier times or environmental examples that look at larger scale samples as learning models.

A whakapapa approach gives examples of relevant knowledge transitions from mātauranga to mōhiotanga to māramatanga (and sometimes in other combinations) i.e., knowledge, engaged knowledge, applied knowledge. Lastly, SD and whakapapa improve the turnaround times for interventions through less time and resource use that is often associated with trial and error approaches. Often systems/whakapapa approaches bridge the gap between superficial suggestions and deep solutions.



Illustration: Group of Aitanga o Hauiti tribal members engaging in an; applied version of whakapapa - copying the movements of Wheketoro (octopus), practicing the principles of Mūtorere mathematical problem solving and improving their flexibility simultaneously.

SYSTEMS DYNAMICS

In this section a more thorough explanation of Systems Dynamics is provided. In the contemporary world of Systems Dynamics, SD has been used to address a number of complex system-based areas, such as; transportation systems, ecological systems, manufacturing systems, meteorological systems, financial systems and aerospace systems. Systems Dynamics also utilise modelling and various forms of causal loop diagrams that help support the predictions made. Modelling begins with looking at the need for a specific outcome or idea to be realised e.g., what to consider when designing a study. This is followed by some form of retrospective investigation looking at, for example, earlier data or previous research. The retrospective component is then followed by a prospective phase that considers, for example, generalisability, cost, ethical or legal issues and who or what it is you are studying. These three processes culminate in a new policy or practice that has been achieved through modelling the potential impact. Sometimes Group Model Building or Social Group Model Building are also used. These model building processes can be made up of multidisciplinary teams or by using mathematical and computational modelling to represent a system. From here, the important factors and relationships are estimated, data collection is prioritised and various test policies can be trailed. Finally, the stakeholders are informed and the intervention is implemented.

In essence, systems science is about exploring complex systems in order to make sense of its various components, their interrelationships, and behaviours. It is critical to understand the components of a system and their interrelationships, as they form the systems characteristics and properties. These are properties that can only be observed at a systems level, and not as a reflection of the individual components themselves (Pronk & Narayan, 2016). For example, a forest only emerges when trees are grown together, it does not and cannot emerge from an individual tree. This is a key feature of systems science in that it is a useful approach for understanding the structure and behaviour of a system. The

mechanisms through which systems science seeks to understand phenomena can be both qualitative and quantitative, witnessed through Social Group Model Building at one end of the qualitative spectrum through to computational modelling at the other end of the quantitative spectrum.

Five steps to Systems Dynamics

1. Problem articulation
2. Formulation of a dynamic hypothesis
3. Formulation of a simulation model
4. Testing, and
5. Implementation

List of Systems Requirements.

From the List of Five steps to Systems Dynamics, step 1 (problem articulation) we define the problem, identify the key variables, specify time frames, and identify any emerging themes. Step 2 (formulation of a dynamic hypothesis) develops a hypothesis about how the feedback structure of the system behaves through causal mapping. During step 3 (formulation of a simulation model) the structure of the model is specified, converting the causal diagram into a quantitative, computer simulation model. In step 4 (testing) the simulation model is validated using various tests, before the intervention is implemented in step 5. This approach is about not getting too distracted with the variables of a system, and focusing instead on qualitative connections.

A strength to systems science is that modelling of this type can identify the power and impact particular variables have within a complex system. This level of awareness about a system recognises how multicomponent, multilevel interventions have produced positive results, and why others have not. Of course

this is based on the strength, validity (measures what it says it does), and reliability (repeatability) of the constructed model, which leads to one of its limitations. Systems Dynamics is only successful when the boundaries of a particular problem are clearly identified. If the framing of the variables is identified by the participants only, then the validity and reliability of the model will be negatively affected because all of the relevant stakeholders have not been included. Interestingly, Māori epistemologies enable a holistic view of occurring phenomena that improves validity.

WHAKAPAPA

Whakapapa is often translated as genealogy and expressed as an individual's family tree; however, whakapapa is not only much more wide reaching but can be 'verbified' to become an action. As a philosophical construct, whakapapa implies that all things have an origin, and that ontologically, they come into being through the process of descent from one or more ancestors (Roberts, 2013). This system of understanding extends beyond our human relationships to those that originate in specific environments. Therefore, whakapapa genealogically binds everyone to their natural world, and to all occurring phenomena within a dynamic, layered, and interrelated system. This is a key concept of whakapapa that links all things together, underpinned by a holistic and relational worldview. However, this relational system of understanding cannot exist in isolation. Whakapapa is merely the organising paradigm of Mātauranga Māori or Māori knowledge (Communication 2016: Te Miri Rangi - Whakapapa Fridays).

Similarly, Mātauranga Māori is a body of knowledge that connects to our ancestors across time. It is a body of knowledge that has evolved, been impacted by the lived experiences and changing environments and has been exposed to the course of history. Mātauranga Māori has been defined as 'the knowledge, comprehension or understanding of everything visible and invisible existing in the universe' (Williams, 2001). There are varying Māori tribal views of the origin of knowledge, in one tradition, the atua Tāne climbs up into the heavens and retrieves the three baskets of knowledge. The three baskets are known as te kete tuatea (basket of light), te kete tuauri (basket of darkness) and te kete aronui (basket of pursuit) (Best, 1973). Mātauranga Māori is therefore a product of these three baskets, retrieved from the heavens and bestowed upon the world by Tāne.

In relation to humankind, it is through such beliefs that all forms of knowledge, known and unknown, are understood to come into existence. Through human interactions with Mātauranga Māori, knowledge can then be re-interpreted, understood and applied. This is exemplified by the following *whakatauki* (proverb);

Tuā te whakātu ka mohio,

Ma te mohio ka marama,

Ma te marama ka matau,

Ma te matau ka ora.

From discussion cometh understanding,

From understanding cometh light,

From light cometh wisdom,

By wisdom cometh life everlasting.

(Harawira, 2014)

This describes the connection that exists between knowledge, understanding and wellbeing from a Māori perspective. It highlights the relationship between Mātauranga Māori that exists in the world, to its observation and perception by humankind, leading to a level of understanding and wisdom. Taken together, these stages ultimately enable wellbeing to emerge. Mātauranga Māori thus provides insight into understanding the existence of all animate and inanimate things, and applying this in the pursuit of wellness. This knowledge is then arranged and ordered in layers through a system of whakapapa. It is important to distinguish here that whakapapa is not Māori knowledge, nor does it create new Māori knowledge, but rather it is the organising system that arranges the various theoretical and practical concepts inherent in Mātauranga Māori (Conversation 2016: Te Miri Rangi - Whakapapa Fridays).

A strength of whakapapa is determined by its ability to make these linear (descent) and lateral (kinship) connections. These identified connections and relationships have been developed over generations of observation and passed down to successive generations through oral mediums and cultural products such as tatau whakapapa (genealogical connections), mōteatea (chants), whakatauki (proverbs), karakia (incantations), and tākarō (games), to name a few. As an example, whakapapa can describe the relationship between the night sky and the appropriate gardening activities to undertake i.e., maramataka. When the star known as Whānui (Vega) appears during the months of April and May, the kūmara crops are to be lifted and stored before the arrival of winter. In this case, whakapapa is about identifying the relationship between the star Whānui and the kūmara in relationship to time. There are a multitude of such examples that explain the relationships that exist in nature. Bonds were thus formed through whakapapa in order to recognise, transmit and record these relationships between such phenomena. Over the generations, Māori became so well adapted to their natural environment they developed a system of living in harmony with those laws that enable Māori to thrive (Price, 2010). Despite the development of whakapapa as a system for detailing and understanding the relational nature of phenomena, it has its limitations.

A key component of whakapapa is that it seeks to organise Mātauranga Māori, and as such, the experiences of colonisation have led to large amounts of traditional knowledge being lost. Therefore, whakapapa occasionally has pockets of missing information. However, with the understanding that whakapapa is merely the system through which Mātauranga Māori is organised, here lies the potential for Mātauranga Māori to regain lost information. This occurs through triangulation of information e.g., a review of the oldest tomes of Mātauranga Māori, verification in the Journal of Polynesian Society, anecdotal conversations with kaumātua (elders) on the topic and practice of the process in an applied context. Where these components overlap we at least have a starting point for the pursuit of authenticity. What is critical is the elimination of the notion that Māori knowledge is

stagnant and unable to evolve and adapt.

In understanding the construct of whakapapa it must be seen as a system of defining connections between various environments that express themselves through contemporary Māori. Whakapapa is a relational framework for explaining the genealogical connections that exists between all aspects of the Māori world, both seen and unseen. It is the organising element that enables Mātauranga Māori to be explored, understood and realised. Although restricted by the content in which it seeks to arrange, whakapapa also fosters the conceptualisation of new knowledge. Fundamentally, whakapapa enables one to explore the myriad of phenomena that exists in the world, and position it in relation to other phenomena and consequently explain the emergence of the individual.

ATUA MATUA AND WHAKAPAPA EXPRESSION

A particularly well known and knowledgeable elder, Tukaki Waititi, once told me that 'whakapapa is the Māori form of rocket science that preceded Pākehā arrival'. It would appear that the role of whakapapa and Systems Science has been underestimated or at least poorly defined in terms of its potential contribution to Māori health and Education. Atua and to a lesser degree, kaitiaki and tipua, represent a significant platform from which to engage with health and education interventions. To clarify, there is a significant difference between 'Te Atua' and 'Ngā Atua'. Te Atua communicates ideas on creationism and 'God' while Ngā Atua is a Māori explanation of the multitude of environments that exist, and, despite the misinterpretation of non-Māori (missionary) definitions of 'gods'.

Another definition is that atua are ancestors that have continuing influence over iwi Māori (Moorfield, 2011). The easiest way to define Atua is that they are environmentally based ancestors that encapsulate a range of characteristics from environmental locations of stars, water and earth through to personal attributes such as; skin colour, height, muscularity, physiological preferences, intellectual processing style and behavioural tendencies i.e., Systems that explain a connection between the environment and the individual. As environmental ancestors, atua have defined our ability to survive by challenging, sorting, defining and reconstituting which attributes are required to prosper in particular environments that dominate a geographical area. Many have heard the analogy 'You are what you eat', whereas this approach suggests 'You are where you come from'.

ATUA MATUA CONTRIBUTIONS TO SYSTEMS DYNAMICS

The information embedded within the Atua Matua Māori Health Framework has been out of circulation for close to a century. It is not surprising people haven't seen it before or know how to apply the concepts. The information within is not new but new old.

That system is as follows:

Mātauranga	Knowledge
Whakapapa	Connection
Huahuatau	Metaphor
Whakatinanatanga	Application

Atua Matua Framework

The first concept of Mātauranga/knowledge suggests much in that it describes not only which body of knowledge we are engaging with but literally the environment the knowledge is being interpreted through e.g., Te Ikaroa is an atua that can personify the Milky Way constellation, or it can literally mean the constellation itself. Likewise, Te Ikaroa lets us know that it is the body of knowledge from the stars and not those associated with water or land. Alternatively, it can connect to a philosophy on knowledge being stored in space as stars representing ancestors. Te Ikaroa can also represent an upper level of knowledge that is sometimes referred to as the kauae runga or a process for understanding the movement of time at night or to navigate by. Therein lies the beauty of being able to show causal links between environments and especially as a vehicle or medium that can transfer ideas. Atua may be seen as half of a solution that requires an interaction with something else to cause an outcome. In fact, it is the Tatai (interaction) that is the interesting part.

The Whakapapa/Connection is aimed at showing what our connection, as a people, is to a specific environment, and consequently the knowledge from that

environment. More importantly, if we want to improve health or education, then the pursuit of knowledge should be the centre piece and show how, as Māori, we can connect to that environment through understanding how that places operates. For example, if we were to treat the environment as 'family' through showing a 'connection', we would see far less destruction because we might understand that we are polluting ourselves when we pollute the environment. Furthermore, whakapapa shows multiple levels and various systems that interact with each other culminating in the effect that we may be hoping to align with or conversely hoping to avoid i.e., the whakapapa from Rongo Maraeroa explains our potential for peaceful outcomes as a reflection of the personality type of Rongo Maraeroa, whereas the whakapapa from Mataaho ends in Auahitūroa and Hine Nui te Pō, which suggests the potential for death from engaging with smoking is significant.

The Huahuatau/Metaphor concept is concerned with explaining how our connection or whakapapa relationship to an environment can be interpreted in multiple ways e.g., engaging with a maunga can give physical fitness but it can also be used as a metaphor for explaining patience, steadfastness, discipline or any number of human attributes that we can learn from maunga. Huahuatau lends itself to interpretation as a subjective process in that each individual will see different things due to the lens that their particular environment has shaped, in fact we can do little but see our world other than through the dominant metaphor that has caused our particular world view. Another way of thinking about metaphors from the environment is becoming more aware of what an environment is trying to 'tell us' i.e., what is the environment and our connection to it, a metaphor for. For example, the Waikato river is a large body of moving water in the upper central North Island but it is a metaphor for leadership because of the numerous number of bends where chiefs would locate themselves hence 'Waikato taniwha rau, he piko he taniwha, he piko he taniwha - The Waikato river of many chiefs, at every bend another chief'.

The Whakatinanatanga/application is the final phase, that is, taking the first three concepts and turning it into an applied outcome. Oftentimes we don't ask 'why' we are doing a particular exercise other than for what personal gain may be achieved. Conversely, some Māori communities that do ask is so they can determine the practical benefit e.g., finding a food source. Therein lies the irony, physical activity and nutrition changes will often fail if the motivation is to improve health. Unlike the pursuit of knowledge which leads to self realisation, physical activity for the sake of physical activity is not sustainable, for if it were, Māori would have maintained a pre-European physique. Alternatively, using personal gain as the motivation reduces recruitment i.e., some individuals will not engage if the outcome only affects them individually and not their entire family. While these two examples are anecdotal the contemporary physical expressions do little to refute these claims.

If, however, we look at Haumiatiketike, Haumia is an atua of the land, we are connected through our use of aruhe/fern root that we used for its' carbohydrate content, Haumiatiketike is a metaphor for fertility through ferns and insects and through the insect Rōtane (stick insect) the form of Rōtane can be used to train the human form of core conditioning. While this process, when provided with examples, can seem simple, it does take some practice and especially where mainstream models have predominated previously. For many the switch back to a whakapapa approach requires the removal of conditioning toward 'why' engagement with health as a knowledge pursuit, may have some beneficial aspects.

The development of the Atua Matua Māori Health Framework has been completed as part of the ongoing Māori renaissance that has progressed Te Reo Māori, Māori education and curriculum development to name but a few. The Atua Matua approach is also an attempt to complement the Kaupapa Māori health models; Te Whare Tapa Wha, Te Wheke, Ngā Pou with an iwi driven tribally specific model of health. Atua Matua is also an attempt to provide a set of

environmentally-based concepts that could help Māori move from the current individually focussed, deficit, mainstream model of health to a more productive Māori ancestral framework. In this capacity, Atua Matua is more consistent with other Māori practices that have hierarchical constructs, not unlike those used in Systems Dynamics. In relation to the Atua Matua Māori Health Framework, this means putting environmental knowledge before that of the individual with health and physical activity becoming incidental outcomes.

SYSTEMS DYNAMICS MEETS WHAKAPAPA MEETS ATUA

MATUA

Systems science and whakapapa approaches share an understanding of the interrelated nature of phenomena. This shared understanding is underpinned by a systems dynamics framework that helps investigate the nature and behaviour of related and unrelated components. Although both approaches share this similarity, the way in which these relationships are understood differ. From a systems dynamics perspective, the interrelated components of a system can either increase or decrease the interactions between each other. Also, Causal loop diagrams help to demonstrate these connections. The following is a pilot study that myself and Dr David Rees conducted through funding provided Johns Hopkins University, Baltimore.

This paper explores the value of using SD, specifically causal loop diagrams, to tell the stories of two innovative Māori communities in New Zealand, who are, in quite different ways, using Atua Matua to improve the health of their young people. A key argument put forward by the Atua Matua design is that health, and ill-health, emerges out of both the nature of the environment within which the person lives and that person's connection with that environment. An approach to health based on Atua Matua focuses on enriching a person's understanding of, and connection to their specific environment, keeping in mind that the use of environment in this context encompasses not just the physical environment but also the psychological, social, cultural and spiritual.

The first community was a rural Māori language immersion school in Kaikohe, in the northern part of New Zealand (Te Kura Kaupapa Māori o Kaikohe), that had been using Atua Matua to enrich their physical activity curriculum. The second community was 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 was a school and the focus was on the curriculum, In Uawa, the context was a health organisation and the focus was on a Government funded health programme with a strong focus on obesity, 'Healthy Families'.

Atua Matua, as an approach to health that focuses on the context within which people live and how they interact with that context, has a number of significant similarities to SD, which is also heavily focused on context and the interaction of key factors in that context. Atua Matua, with its strong focus on the environment, has some similarity to health approaches based on the 'Social Determinants of Health'. However, because the Atua Matua approach focuses on whakapapa, that is the connections with that environment, and the two-way processes inherent in those connections, it goes beyond simply saying that the environment affects health. The existence, or absence, of an environmental aspect does not in itself impact health, rather, health outcome is a consequence of the person's understanding of and interaction with that environment, and not the existence or lack of existence of any specific environmental factor.

SD, with its strong set of tools to describe and 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 that could then be used to communicate the approach in a way that did not require a deep understanding of Mātauranga Māori but a strong sense of the process that whakapapa could provide. The result was that in Kaikohe, the work focused on using the Group Model Building (GMB) approach to articulate their use of Mātauranga Māori in the development of their curriculum, and how that contributed to the physical, psychological and spiritual wellbeing of their students. In Tolaga Bay we used GMB to explore two distinct areas. The first was their decision to enter teams in the world Waka Ama 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.

As the project was not focused, at least initially, on building GMB capability within the communities, the introductory model was built by Dr Rees, 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 model provided the opportunity to describe Causal Loop Diagrams (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 describes the series of meetings held in Kaikohe and Tolaga Bay.

The project was described as having two goals. The first was to map their efforts to implement Atua Matua and to see if that could be done without losing the integrity of their particular Māori perspective. If this could be done 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 initial framing question was:

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

This reflected a Western perspective, including the perspectives common to much research in this area, that is, physical activity and nutrition. However it quickly got changed to:

How can Mātauranga Māori influence Waiora?"

So, immediately the researchers were forced to come at the issue from a uniquely Māori perspective. Dr. Rees, especially, had to come to grips with the scope and

meaning of Mātauranga Māori and Waiora. At the very least this meant that we, the researchers could not isolate obesity 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 necessarily fit the core ideas inherent in Waiora.

There are three points of significance here. The first is that the focusing question is using Māori language concepts, so that what was being said had a number of nuances and subtleties that the facilitator, in this case Dr. Rees, was going to have to come to grips with, and not assume a simple literal translation. While such translations are always difficult, a reasonable starting point is to read the focusing question as, "How can Mātauranga Māori [a specific Māori 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'.

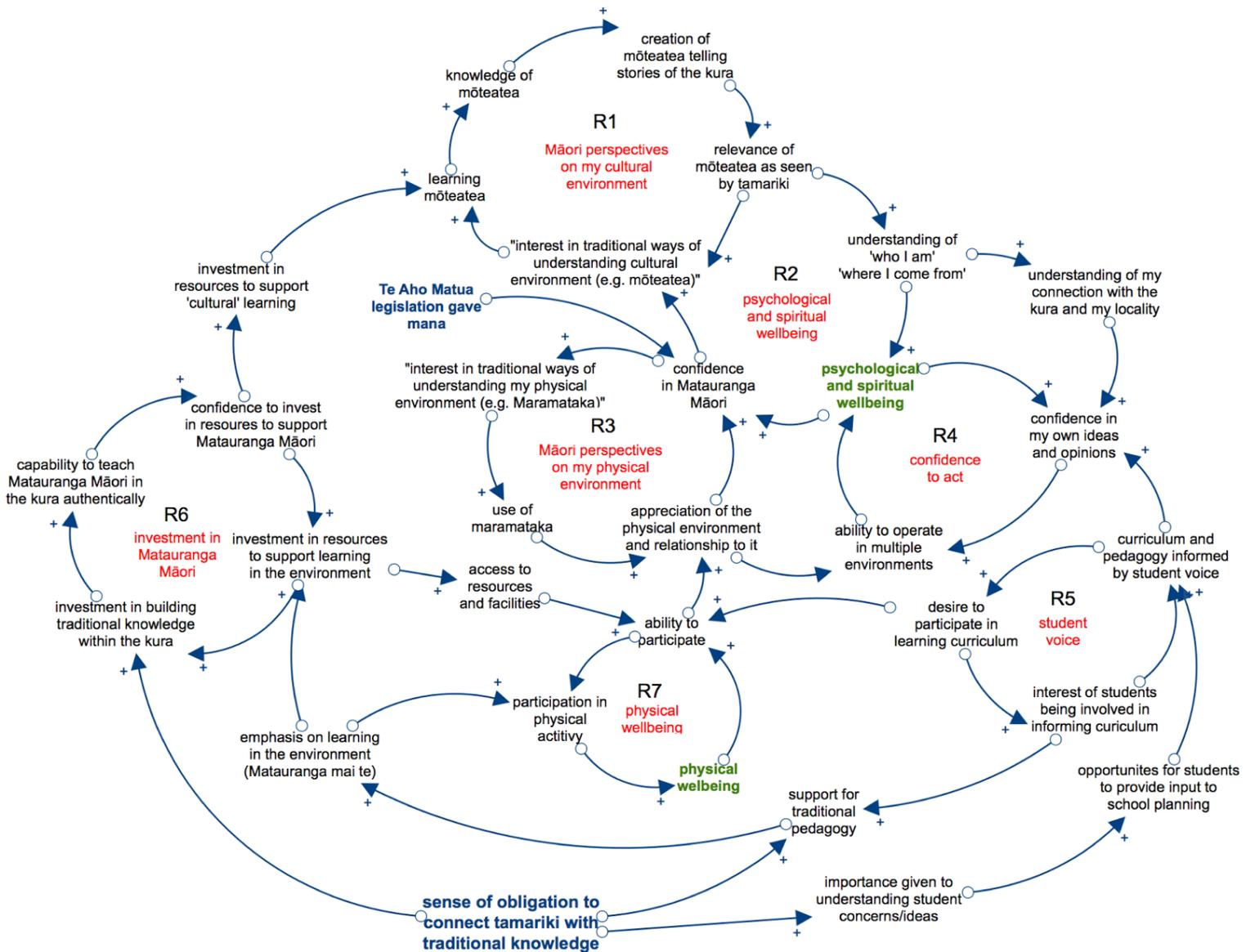
Importantly however, given that this project was about applying systems thinking to obesity, they had put obesity in its proper place, that is, as an emergent property of the system. They wanted to describe that system, Mātauranga Māori, and how it would deliver Waiora, through, for example, lower levels of obesity. This was very much in line with the work that they had done with Dr Heke over the last few years. Atua Matua, like systems thinking has an underlying theory of change embedded in its' emergence. That is, in this context, obesity is the result of causes and conditions that have, over time, isolated Māori from their historical and cultural history. Reconnecting Māori to this history in innovative and engaging ways will, suggests Atua Matua, result in different set of emergent behaviours,

specifically behaviours that do not lead to obesity. The focusing question is consistent with this systems view of change. Interestingly, it was also agreed upon, that, obesity as a concept, embedded deficit thinking and limited their ability to innovate if they were expected to address a 'problem'. Therefore, the group decided to focus on what opportunities to express their strengths would look like, and especially as those Māori who had survived the plethora of attacks on their indigeneity.

Dr Rees was able to listen closely and draft up an initial map that captured his understanding of how the school was applying Atua Matua and how it linked to the focusing questions. It also enabled Dr Rees to learn that there was a strong desire within the school to extend the current scope of Atua Matua, which was largely around physical education and 'environmental studies' more broadly.

CAUSAL LOOP DIAGRAM KURA O KAIKOHE

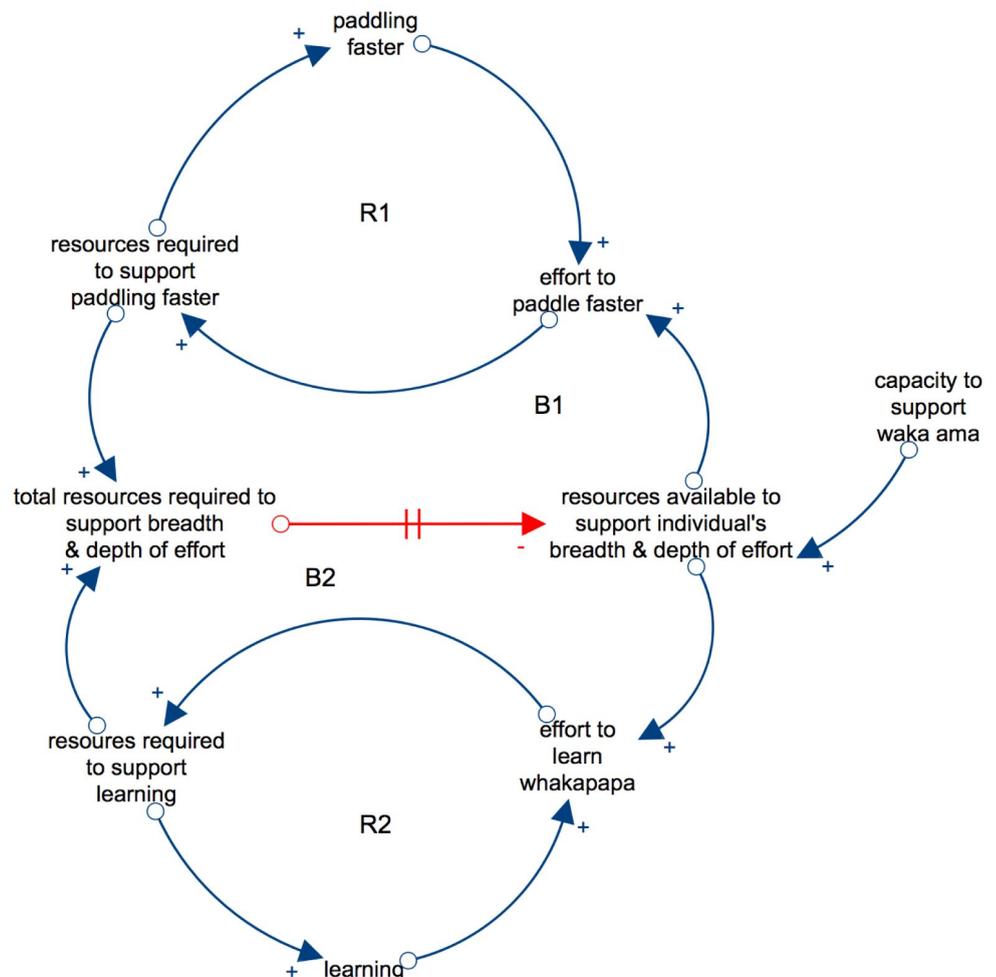
The second attempt at drawing a causal loop connection was so they could use it to both communicate what they were doing to others' and to refine their thinking. As one person commented, it gave them the framework for the development of their own 'localised curriculum', that is a framework to translate national curriculum requirements into their own specific district centred circumstances.



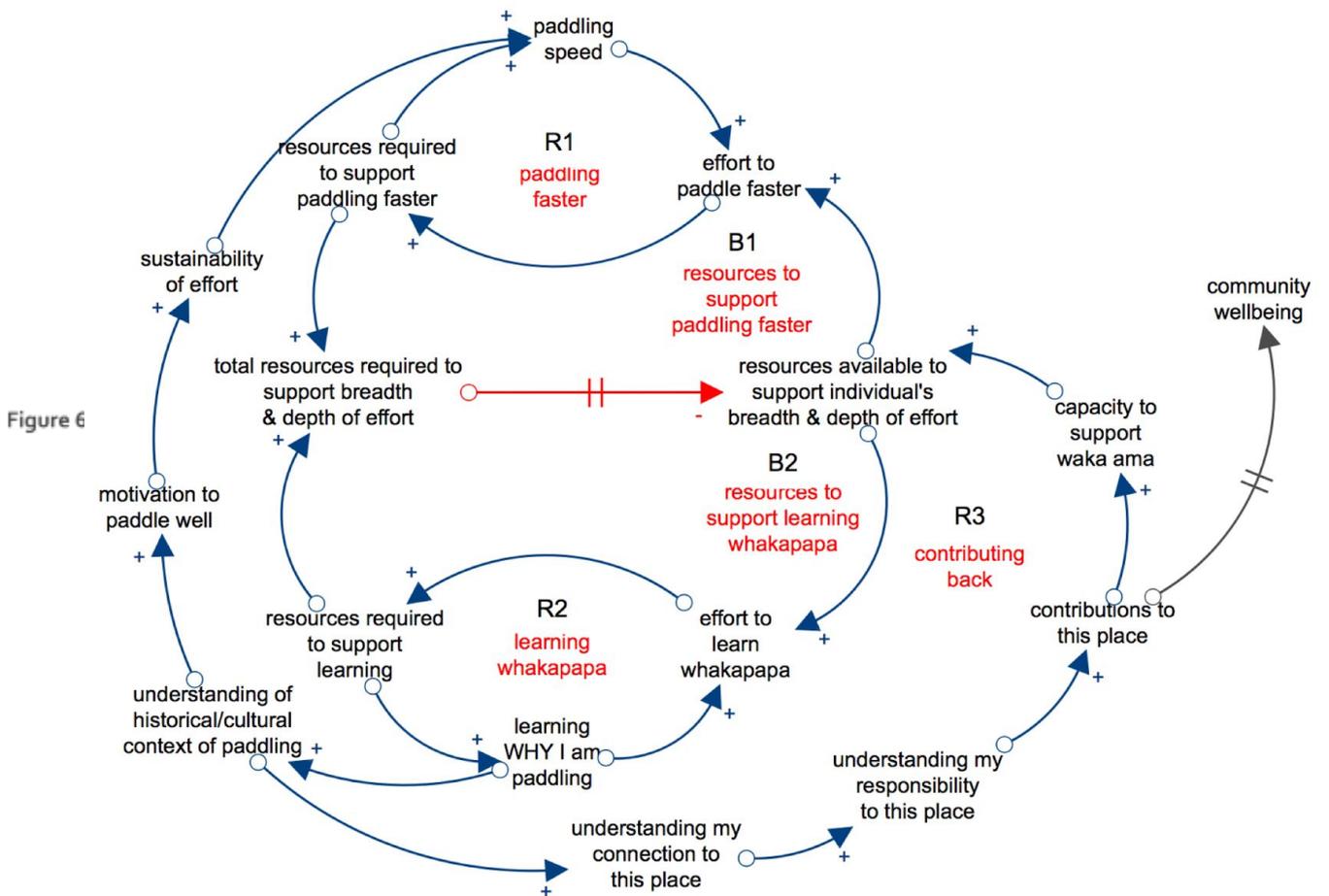
Causal loop diagram phase II Kura o Kaikohe

The initial meeting at Te Whare Hauora o Te Aitanga a Hauiti in Tolaga Bay involved the CEO, Chair, IT support, a senior staff member leading one of their major projects, at 'Healthy Families' and a community leader. As with Kaikohe, the purpose of the initial meeting was to introduce Dr. Rees, describe the research project and discuss its potential relevance and usefulness to the organisation. The conversation 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 team who were being entered into the world championships in 2017. As with Kaikohe these meetings provided Dr Rees 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 below:

Causal Loop Diagram Te Aitanga o Hauiti



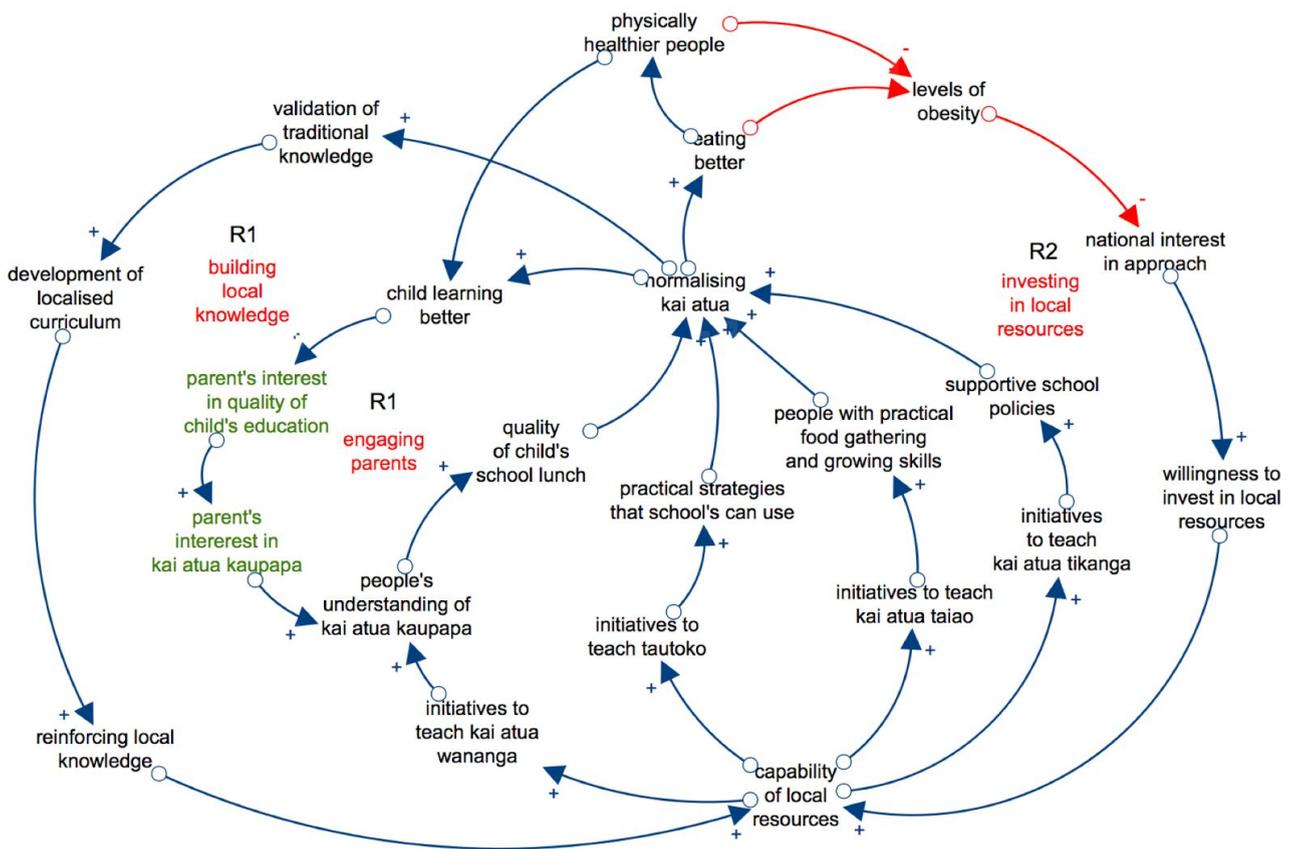
At the second meeting the focus was on the previous night's Waka Ama gathering and the resulting CLD. This was discussed and modified to incorporate a greater emphasis on its' potential to contribute to community development.



Causal loop diagram Phase II Te Aitanga o Hauiti

The key feedback was that the CLD, based on the 'Tragedy of the Commons' archetype, was helpful in articulating an underlying tension that needed to be

addressed, especially if the programme was to achieve its broader goals. Following the discussions the authors were invited to come back to discuss its application to 'Kai Atua', a project, which was focused on changing people's understanding of and relationship with food. The first part of the meeting focused on the potential for using SD 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 below:



Causal loop diagram Kai Atua at Te Aitanga o Hauiti

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. One consequence of this was an invitation to run a hui, with a wider range of providers in Gisborne, the regional centre. This was because the 'Healthy Families project involved 8 Iwi

across the region and the project leader felt it was important that other leaders should have a basic understanding of the core ideas in SD and the perspective that it gave to the Kai Atua project.

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 (Group Model Building) 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.

The results were, that at least 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. Furthermore, 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. As noted above Kaikohe presented the CLD to their new Board as a way of explaining what they were engaging with and consequently, trying to achieve. In Tolaga Bay the Waka Ama CLD helped articulate issues they intuitively knew they had to address but by having it expressed explicitly they could 'name' it and 'address' it. 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.

Quite likely, a number of other important aspects that were highlighted by both groups need discussing as well. One was that the intentional movement away from deficit thinking allowed engagement with new approaches and ideas, namely Systems Dynamics. Secondly, the striking comparisons between System Dynamics and Mātauranga Māori were significant indicators that both groups had authentic and rational approaches to health that paralleled non-Māori thinking. In relation to this point though, it was shown that this process allowed the existence of

Māori thinking in isolation without requiring validation through non-Māori practices and as mutually beneficial learning opportunities. Furthermore, the inclusion of SD has led to the desire amongst both groups to value and trust in their unique district versions of pursuing health in the somewhat unusual paradigm that removes 'people' as the main pursuit of health and replaces it with knowledge about the environment that forms and shapes the human expression and resultant incidental health benefits.

ATUA MATUA MĀORI HEALTH FRAMEWORK

Atua	Matua
1. Atua star, water, land connections	13. Matua interpretations of Hau, Wai, Kai
2. Atua as Personifications	14. Matua interpretations of whakatauki, haka, waiata
3. Atua as Guardians	15. Matua connections to an environment
4. Atua Male Forms	16. Matua interpretations of time frames
5. Atua Female Forms	17. Matua interpretations of process
6. Atua multiple forms of Tāne	18. Matua connections to tinana, wairua, hinengaro
7. Atua disputes as social commentaries	19. Matua Specialist training for specific domain
8. Atua as tribal variations	20. Matua environmental skill acquisition
9. Atua to Tipua	21. Matua regional specialist
10. Atua to Kaitiaki	22. Matua family variations
11. Atua form in Maui, Tawhaki, Rata, Tiki	23. Matua gender differences
12. Atua expression through cultural lens	24. Matua the individual

1. Atua as celestial, oceanographical & terrestrial connections - A Māori world view of health, regardless of iwi, is interpreted through atua and their connection to stars, water or land.

2. Atua as personifications - Little is known about the differences of roles for atua in terms of representing a domain or providing guardianship for a domain e.g., Tāne as personification of birds.
3. Atua as guardians - The alternative to personification of a domain is the guardianship e.g., Punaweko guardian of land birds.
4. Atua male forms - While there are eight well known male atua there are an additional 60 or so other male atua that are not well known e.g., Uru te Ngangana, Huru Manu.
5. Atua female forms - Like the unknown male atua, female atua forms are even less well known e.g., Parawhenuamea as the goddess of fresh water.
6. Atua multiple names of Tāne - Tāne not only has a large number of specific names but he also fulfils multiple atua roles of knowledge, separation and the forest world.
7. Atua disputes as social commentaries (Ngā Pakanga Atua) - Atua disputes or battle were held up as examples of appropriate or inappropriate behaviour e.g., Tūmataunga consuming his brothers children as an example of origin of nutrition.
8. Atua as tribal variations - Iwi specific atua can provide a wide variety of social commentaries from which physical activity, nutrition and health initiatives can be interpreted as iwi centred preferences e.g., Uenuku god of war can be used in Waikato region.
9. Atua to Tipua - The shift from atua to tipua is one level below atua but with similar teaching opportunities e.g., the role of Taniwha in the Waikato region.
10. Atua to Kaitiaki - Like tipua, kaitiaki represent a lower level environmental connection compared to tipua e.g., sharks.
11. Atua form in Maui, Tāwhaki, Rātā, Tiki - Iwi centred variations of part atua and part human representations.
12. Atua expression through cultural lenses - The connection between atua and culture is used as a means of understanding the natural Māori world.

13. Matua interpretations of Hau, Wai and Kai - In order of whakapapa relevance and hence contemporary consideration; kai (food) contributes to oranga tangata (human health) but can be withheld for several weeks before death, Wai (water) can be withheld for several days before death, however Hau is required within minutes before death becomes likely. Therefore a focus on the most immediate of our personal needs is a logical approach.

14. Matua interpretations of whakatauki, haka, waiata, mōteatea, karakia, pakiwaitara - These forms are metaphors for the role of health, physical activity or life skill development opportunity.

15. Matua connections to an environment - The selection of a specific environment (atua) and how that environment lends itself to health or physical activity highlights the matua or human perspective e.g., coastal Māori that have a preference for the sea.

16. Matua interpretations of time frames - The rationale for how long a physical activity or health initiative should last e.g., interval training based on wave action.

17. Matua interpretations of process - How an initiative is conducted e.g., at night in one on one process to emulate the movement of the Mosquito.

18. Matua connections to tīnana, wairua, hinengaro - Expressing physical activity and the pursuit of health in terms of a physical, psychological and spiritual dimensions.

19. Matua specialist training for appropriate domain - This level is concerned with specialist training to reflect a domain e.g., diving for Pāua.

20. Matua environmental skill acquisition (fitness) - Strength and conditioning training to reflect an atua, tipua or kaitiaki e.g., prone hold to copy stick insect form.

21. Matua regional specialist - Environmental differences e.g., Tuhoe forest vs Waikato.

22. Matua variation at a whānau level - At a family level particular skills develop beyond those around them e.g., eeling in a particular river.

23. Matua differences at a gender level - Connections to particular activities that have become specialist fields e.g., female divers in Ngāti Pōrou.

24. Matua as an individual - Interesting in that 23 levels are considered before getting to an individual versus mainstream programmes that start with the individual i.e., the Atua Matua Maori Health Framework - a shift away from being human centred.

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