

Te Whare o Oro:

**A mātauranga Māori framework
for understanding the roro**



Andre McLachlan, Tahlia Kingi,
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He kupu whakamōhio: Preamble

This publication uses mātauranga Māori (Māori knowledge systems, Māori knowledge) as the foundation for understanding brain structure and development. Kupu whakarite (metaphors and similies) are a common form of oral tradition in te ao Māori (the Māori world) that are used to support tangata whenua (Indigenous people of Aotearoa New Zealand, literally: people of the land) to apply existing knowledge to new areas of concern. The whare tūpuna (ancestral meeting house) is offered as a metaphor to explore the structural development and function of the brain, including the impact of trauma on its development.

The ongoing revival of mātauranga Māori, rooted in oral traditions, aims to ensure the flourishing of Māori (Indigenous people of Aotearoa New Zealand) as Māori and addressing the inequities Māori experience across all sectors of society. This publication draws on available mātauranga (knowledge) from written and oral sources to contribute to the resources available for Māori working in the health and education sector. Metaphorical use of the whare tūpuna, a unique structure embedded in complex design and function, allows for a deeper understanding of the brain as a complex structure with unique construction, roles, and functions.

Te Whare o Oro model incorporates Te Whare Tapa Whā (a Māori model of health and well-being) in focusing on the healthy development of tamariki (children) Māori. It identifies the structural features, roles, and whakapapa kōrero (genealogical narratives) of a whare tūpuna, using traditional kupu whakarite of the whare tūpuna as a tupuna body. We focus on the roro (brain) and tāhuhu (ridgepole of an ancestral house, spinal column) as representations of the central nervous system of the whare tūpuna. We then extend this kōrero (narrative) by aligning

the whakapapa kōrero of the pou (post, pole, pillar) of the whare tūpuna, which holds up this central nervous system, to understanding brain development. Finally, the heke (rafters) of the whare tūpuna are used to respond to the impact of trauma identified within the pou.

This publication is part of a larger research programme (Te Roro: A mātauranga Māori study), part of the National Science Challenge, and in collaboration with Aging Well. It is written to provide an alternative way of conceptualising the structure and functioning of a developing brain that has been impacted at different stages, for example, pre-birth, birth, and early development. This publication provides a framework based on kupu whakarite Māori to enable discussion and exploration of ways of viewing, discussing, and nurturing brain development, founded on mātauranga Māori.

The next stages of this research programme involves the development of: an interactive learning model to support engagement and wānanga (method of learning and exchanging knowledge) on neurodevelopment; terms from a Māori child-development perspective that guide kaiako (teacher) and whānau (family) in understanding the role, strengths, and challenges of each area of the brain; and, an interactive way to engage kaiako and whānau in identifying strengths and challenges in each area, and identify Māori approaches to stimulate development and healing in response to these.

He kupu whakaūpoko: Introduction

The term *oro* (sounds, vibrations), in the name of the model *Te Whare o Oro* (The House of Oro), is used in various ways, which are applicable to neurodevelopment. *Oro* can mean *thicket* or *tree* and is the material provided by Tāne Mahuta (deity of the forest) to build the whare tūpuna. Neural pathways are likened to thickets (dense groups of small trees). *Oro* can also mean *sound* or *rumble*, reflecting neural communication in the brain (beta, alpha, theta, delta and gamma waves). Another meaning of *oro* is *to hone* or *to intentionally shape*, as in teaching and supporting someone in their development. As a brain develops and refines its neural pathways, pruning and shaping occurs, strengthening some paths while leaving others weakened and removed (Levitt & Eagleson, 2018).

Te Whare o Oro was first discussed by the lead author, a clinical psychologist and father of tamariki who experience neurodivergence, in an impromptu manner during a discussion at a local primary school in 2020. He was attempting to explain the needs and behaviour of his son. The model was further developed as a model for understanding trauma, and in 2021, was used in a research project by the lead author addressing Fetal Alcohol Spectrum Disorder (FASD). The lead author is also a student of whakairo (carve, carving) and, therefore, the mātauranga he holds, and those of his friend and mentor Mike Matchitt, and of other well-known tohunga whakairo (master carver) such as Dr Takirangi Smith and Dr Pakaariki (Paki) Harrison are interwoven through the discussions in this publication.

The model and concepts within have also been further developed through wānanga with the co-authors of this publication, clinical psychologists, Dr Tahlia Kingi and Dr Waikaremoana Waitoki. This publication has been written for a Māori audience and published by Māori research institute, Te Atawhai o Te Ao. We aim to provide the foundational understandings to interpret and work with Te Whare o Oro model. The reader

should have an existing level of cultural knowledge to understand and extend on the model. This publication is presented in four sections; each section ended with a noho puku (reflective, sit still, reflect) section with key points and questions for the reader to reflect upon mātauranga Māori, the roro, tamariki development, and our roles as whānau and educators.

Section one begins by defining and discussing mātauranga Māori to outline the frame of reference for the whakaaro (think, thoughts) that follows. This includes definitions and discussion about several areas important in understanding the brain, including a brief discussion on pūrākau (story, narrative) referencing the roro and issues relating to the tapu (consecrated) and mana (prestige) of the roro.

Section two provides a brief history and overview of the function of the whare tūpuna and the application of the whare tūpuna in models of health. This will lay the foundation for discussing the structure of the whare tūpuna in relation to brain structure and development.

Section three introduces the structure and sequential development of the brain. This includes a description of neuroanatomy, discussion on the impact of different trauma on neuroanatomy, and introduction into the Neurosequential Model of Therapy (Perry, 2004) and Polyvagal Theory (Porges, 2009; 2022), two approaches used by Māori neurodevelopment educators in understanding and responding to neurodevelopmental needs.

Section four connects each section together into a framework for understanding and exploring neurodevelopment—Te Whare o Oro. Recommendations for future research and use are also provided.

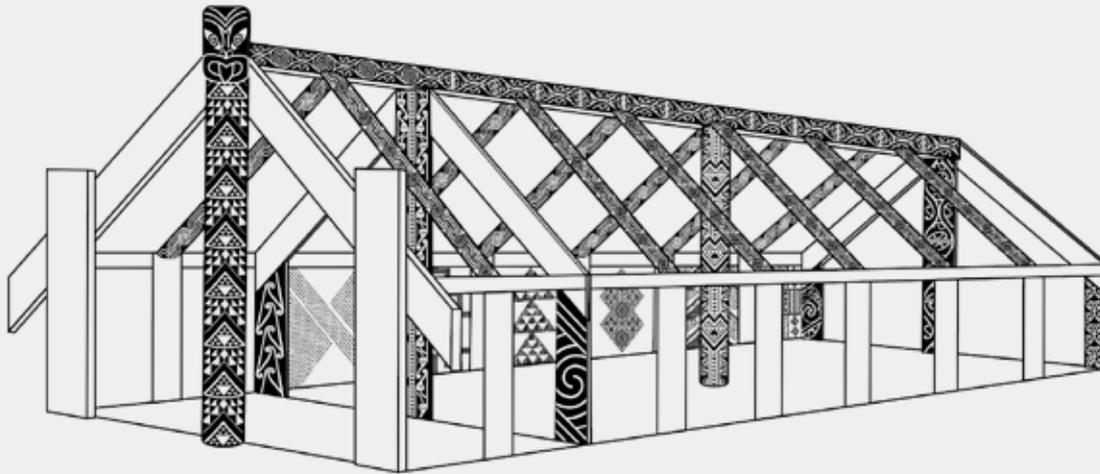


Figure 1: Te Whare o Oro

Mātauranga Māori

Mātauranga Māori refers to what we know, how we know what we know, and the relationships amongst the things what we know. Mātauranga Māori also refers to the Māori way of thinking, doing, and acting, while recognising the importance of Māori histories, knowledge, and language (Doherty, 2009). Central to mātauranga Māori is the interconnected nature of knowledge:

Tangata whenua truth is not an objectified, definitive truth but a recognition of relationships and interconnectedness which defines the uniqueness of things and individuals. (Smith, 2000, p. 59)

Māori knowledge in science, technology, arts, language, social, and eco-systems is imbued and transmitted within an oral culture, including through traditions such as waiata (song, sing), pūrākau, whakataukī (proverbial sayings), and whaikōrero (speech making); and in the arts such as whakairo and raranga (weaving). These traditions naturally engaged with and sustained the deep relationships and interdependent harmony between people, ngā atua Māori (Māori gods), tūpuna (ancestors), and the taiao (environment) (Smith et al., 2021; Wirihana & Smith, 2014).

As tangata whenua of Aotearoa, Māori are a diverse group, with each tribe and region holding different oral traditions and houses of learning. For example, within the iwi (tribe/s) of Tainui waka (canoe), Tāwhaki

(deity of knowledge seeking) was associated with climbing the heavens to retrieve the three baskets of knowledge; in many other iwi histories, it was Tāne-nui-a-Rangi (deity of ascension). McCrae (2017) states that these differences reflect a licence to recompose, where the content of waiata or the characters within stories could be renamed by the orator to represent something important to the audience.

Smith (2000; 2019) provides an in-depth description of knowledge, learning, and insight into concepts related to the brain–body connection, based on his own learnings and archival research. Knowledge of different dimensions (celestial and earthly) is related to the processes in the human body. This connection between celestial and earthly knowledge is described as kauwae runga (the upper jaw – all things celestial) and kauwae raro (the lower jaw – all things terrestrial) knowledge. Māramatanga (enlightenment, clarity) and mōhiotanga (knowing, knowledge and methods of knowing) are also noted to be connected to this kauwae runga and kauwae raro system (Marsden, 2003).

The kauwae runga is associated with cosmological knowledge, including creation, ngā atua (deity, supreme beings), astronomy, the heavens, ancestors, and the unseen elements (Smith, 2019). Kauwae raro encompasses a range of concepts, including tāngata (people), whakapapa (genealogy/relationships to all things), koha (offering), utu (reciprocity/balance),

kaitiakitanga (protection and nurturing), tikanga (protocol and process), and tuakana (older relation in the same generation), and teina (younger relation in the same generation).

The roro and its senses (eyes and ears) are associated with te kauwae runga in the gathering of knowledge. However, whakaaro and memory are associated with te kauwae raro and are said to take place within the body, particularly the puku (gut, stomach, entrails, centre) where mōhiotanga can occur (Smith, 2000). This transformation of māramatanga to mōhiotanga is noted to be processed through intuition and being in a state of tau (settled), where memories and understanding are formed:

Intuitive, instinctive knowledge and desire associated with knowing and learning is associated with the ira tangata [humankind], Papatūānuku [Mother Earth] and the ngākau [heart, emotions belonging to the heart], the stomach and the central region of the body. (Smith, 2000, p. 58)

Smith (2019) gives further examples of the role of the body in processing information and 'forming a knowing' by referencing the formation of memory within the tinana (body). Recalling memories also triggers a response specifically within the ngākau. The ngākau is noted to be the seat of emotions and is located around the puku or lower organs such as the ate (region of our kidneys and liver). The kīwaha (saying) said to express affection towards a person, *Te tau o taku ate*, literally 'the love of my internal organs' or 'the love of my life', is an example of the connection between organs and emotions.

Smith (2019) also asserts that, according to a Māori worldview, deep contemplation and reflection occur within the ngākau and not the roro. If knowledge remains in the roro rather than being grounded in the ngākau, it is said to be temporary, short-term, and easily lost. Once settled in the ngākau, knowledge is understood as mātau (knowledge, knowing, intelligence, embodied

knowledge). Disturbing this latent state of mātau evokes a recollection, which Smith describes as mā (a memory or recollection).

Ngā kura huna o Rua

There are several concepts related to thinking and deliberation, often connected to a type of learning or to different atua (deity, supreme beings). These reflect styles of thinking and the value related to these concepts. Ngā Kura Huna o Rua is a style of learning referenced in discussions about early and traditional wānanga whakairo. This style of learning is attributed to the atua Rua-te-pupuke (the origin of carving wood). Tohunga whakairo, Harrison (n.d., as cited in Aranga, 2009), described it as a structured learning system:

It appears to have been a system which functioned to condition initiates into a way of seeing and being in the world. It was the equivalent of the Māori university or institution of higher learning. (p. 118)

The Rua, described by Harrison, depicts a repository or storepit held in the mind of the tohunga (an expert) and represented in waiata, weaving, and carving. Yet, only the initiated, many of whom have now passed, could interpret it. Aranga (2009) lists and defines 13 of these Rua (some of which are described here), including Rua-i-te-mahara (power of thinking and memory, the postulation of thought), Rua-i-te-whaihanga (of building or constructing, the postulation of creation), and Rua-i-te-kōrero (personified thought, the postulation of spoken word). Hanara (2020) expanded the list to include 23 different forms of Rua. Smith (2000) discussed Te Whānau-a-Rua (the family of cognitive beings), which refers to Rua's association with memorised knowledge, particularly whakapapa kōrero. Like other scholars who have examined Rua's concepts, Smith also emphasised the presence of various stages and types of Rua that bear similarities to western notions of thinking.

Pūrākau referencing the roro

From a mātauranga Māori perspective, understanding the brain starts at its cosmological connections. Atua are often represented as celestial bodies with roles and responsibilities, representing a connection to the operation of the world and the environment. Therefore, mātauranga holds a cosmological (creation), celestial, and human function and association.

According to the Māori creation pūrākau, following the separation of the first parents, the female element was needed to procreate the world. After an unsuccessful search for the female element, Papatūānuku directed Tāne (deity of humankind) to the rich earth formed at Kurawaka (the original home of humankind), where her menstrual blood had collected. At Kurawaka, the first female, Hine-ahu-one (the first human woman in Māori history, made from clay), was formed from the earth enriched with the mauri (life force) of Papatūānuku. Hine-ahu-one was the embodiment of humanity and the ancestral mother of humans. Tāne's siblings also contributed to her creation, for example, Tāwhirimātea, the god of weather and winds, provided Hine-ahu-one with lungs.

The twins Rō Iho (one of the twin deities of the brain) and Rō Ake (one of the twin deities of the brain), in providing a roro, gave the left and right hemispheres to Hine-ahu-one. Rō Iho and Rō Ake also recited karakia (incantation) to empower Tāne to provide the breath of life for Hine-ahu-one (Whatahoro, 2011). As twins, Rō Ake and Rō Iho are connected and the names are combined in the term *roro*. *Rō* (inside, internal), meaning *inside* or *interior*, is also a preposition indicating place, position, or time. *Rō Iho* and *Rō Ake* are also double prepositions (two prepositions that show specific information about relationships): *iho* (from above/downwards) means in the direction below (downwards), and *ake* means in the direction above or forward. As atua, Rō Ake and Rō Iho highlight understandings of the right and left hemispheres of the brain, the kauwae runga and kauwae raro systems of knowledge, and the importance of the connection between the brain and body.

In other traditions, the twins Rongomai-tahanui and Rongomai-taha-rangi (deities responsible for hearing and listening) are credited with gifting the right- and left-side of the brain and consciousness to Hine-ahu-one (Melbourne, 2009), while others believe that the twins provided her with ears. Rongomai-taha-rangi, Rongomai-tahanui, Rō Iho, and Rō Ake have been viewed as poutiriao (spiritual guardians that take the form of posts) with celestial roles and responsibilities. Rongomai-taha-rangi can be found to the right of the Milky Way and Rongomai-tahanui to the left (Best, 1922). Rō Iho and Rō Ake, along with the eldest brother, Uru-te-ngangana, were regarded as guardians of the sky realm which is the lowermost level of the heavens (Best, 1922).

Tapu and mana of the roro

When discussing the head, the issue of tapu and noa (unconsecrated) is brought to the centre. Within te ao Māori, the head has always been referred to and treated as the most tapu part of the body as it holds a person's defining features, particularly the brain which possesses the skills, attributes, characteristics, and personality of that person. *Tapu* is commonly referred to as being sacred or separate. Tapu is linked with mana and wairua (soul, spirit, spiritual, spirituality), and reflects the potentiality for power and the mana of spiritual powers (Shirres, 1997). Noa, on the other hand, is commonly referred to as unrestricted or safe. Noa is seen as the counterbalance to tapu. The act of whakanoa (to make safe) is facilitated by those things that represent noa, such as food (usually cooked), water, karakia, and the vital roles of women. Bringing noa in contact with tapu objects without a correct and safe process can breach tapu, creating imbalance and at times illness. The act of whakanoa is often done to balance something that is highly tapu or out of balance, in which case a skilled and knowledgeable tohunga is needed (Barlow, 1991).

The tapu nature of the brain and the general head area is reflected in many tikanga Māori. For example, for some Māori, it is seen as offensive to pat someone on their head, to pass food (an object which is noa) over someone's head, or to place items associated with our head, such as a hat or hair tie, in an area where food is prepared, stored, or served. Other cultural practices include being careful not to use the same cloth to wash the body and then the head, and washing dish cloths separately from cloths that are used to wash the body. Another common cultural practice is not sitting on pillows (Sullivan & Hakopa, 2017). Some also consider it inappropriate, due to the tapu, to display images of someone's brain as part of an education programme (such as medical school). Drawings are preferred instead:

Observing the head in the learning environment of a laboratory, is like looking at the life of an aged loved one, whose face and head is at the mercy of my own hands. Something about the experience feels wrong. The head is home to personality, knowledge, and the entirety of who that person was. (Sullivan & Hakopa, 2017, p. 12)

While there are many cultural customs associated with being considerate of the body in relation to the head, it is important to note that not all Māori follow these practices. An important feature of Māori hygiene practices are the embedded health implications, as bacteria and viruses can contaminate surfaces causing people to become unwell. During the COVID-19 pandemic, for example, public health messages highlighted concerns about safety that echoed Māori understandings of hygiene through the practice of tapu and noa.

The developing brain of a pēpi (baby/child) is acknowledged as tapu. From the time of conception, it is said that ira atua (all deities) knowledge is instilled within the kukune (foetus, embryo) through the pūmotomoto (fontanelle), also referred to as *me* or *ruawhetū* (a hollow in the skull of the foetus, the intersection of the transmission of sacred knowledge). This links to the kōrero above regarding Ngā Kura Huna o Rua and Te Whānau-a-Rua, that allude to different stages and types of knowledge, and to celestial knowledge of whetū (stars):

When the eyes in the foetus form and come to life, ira atua knowledge connects and the foetus is considered a functional human being, with the ability to engage external knowledge. (Smith, 2019, p. 10)

Smith (2019) cites the lines from an oriori (a chant composed for and sung to infants) 'Ka whakawhetū tama i a ia', directly translated *Thus, like the stars, o son, were you conceived* and refers to a child being enlightened by the stars in reference to the ira atua knowledge passing to pēpi via the pūmotomoto. This oriori highlights both the tapu nature of children, their value within te ao Māori, and the consideration given to the developing brain. Oriori are chants composed by older whānau members of a pēpi. They can form the first sounds a pēpi hears after it is born and speak of the whakapapa and tribal history of that pēpi:

Oriori instilled in the child the principle of tapu and those listening are constantly reminded that children are tapu, linking the child and their mana back to the Gods and acknowledging the spiritual beginnings of the child. (Rameka et al., 2016, p. 6)

Best (1914) observed our tūpuna's belief that a pēpi receives nourishment through the pūmotomoto, which he referred to as rua kai (food pit, food holes, apertures). He noted that when the fontanelle of a pēpi closes, it can no longer receive nourishment within the womb and begins to prepare for birth. The pūmotomoto is also the name of a long flute that is used to play directly into that area until the time the child's pūmotomoto closes (Nunns & Thomas, 2005). Mōteatea (traditional Māori rhythmic chant), whakapapa, pakiwaitara (stories and narratives), and pūrākau were also spoken and sung as oriori to unborn babies, newborn pēpi, and children.

Noho Puku – Key points and questions for consideration

Mātauranga Māori	Tamariki development
<ul style="list-style-type: none"> • Mātauranga Māori is transmitted through oral traditions and reflected in the stories and characteristics of nature and ngā atua. • Oral traditions are delivered in a way that maintains the mātauranga and adapts it to the audience, the kaupapa (topic) and speaker. • The roro has connections to many atua, including Rō Ake and Rō Iho. These names give insight into the functionality of the brain. • The head and roro are considered tapu. 	<ul style="list-style-type: none"> • Concepts that highlight the connection between the brain and the body include the different forms of knowledge and knowing (māramatanga and mōhiotanga) and structured forms of knowledge (kauwae runga, kauwae raro, and Rua). • Knowledge can become embedded in the tinana. • Knowledge not grounded in the tinana is temporary. • Pēpi learn at all stages of their development via mātauranga-Māori-informed practices.
Questions for reflection	
<ul style="list-style-type: none"> • What pūrākau, waiata, oriori or activities do you share/facilitate that express the stories, attributes and lessons of the atua? 	<ul style="list-style-type: none"> • How does the difference between learning and knowing inform how you teach or create opportunities for tamariki to process, memorise, and understand new knowledge?

Whare tūpuna

Wharenui (large house), *whare whakairo* (carved house), *whare rangatira* (chiefly house), and *whare tūpuna* are names used interchangeably for a large meeting house that sits on a marae (complex of buildings and courtyard belonging to hapū). This publication uses the name *whare tūpuna* to be explicit about the connection to tūpuna and tūpuna knowledge. As discussed earlier, mātauranga Māori is often best sourced and understood from within pūrākau. Whare tūpuna are mentioned in pūrākau, such as the story of Rua-te-pupuke, the progenitor of whakairo who battled Tangaroa (deity of the oceans) and took carvings from Hui-te-ana-nui (an underwater fortified village), the whare tūpuna of Tangaroa.

Ancestral whare tūpuna are large buildings that follow a fairly standard construction, structure, and function within te ao Māori. Whare tūpuna take a central place on a marae ātea (courtyard). The marae ātea is the communal or ceremonial courtyard extending from the front of the whare tūpuna and can include a collection of buildings in close proximity, such as the wharekai (dining hall and kitchen), wharepuni (sleeping house), kōhanga reo (language nest), perhaps a church, and an ablution block. The marae is a key part of the whānau, hapū (subtribe), and iwi collective identity and action, where relatives gather to mourn their deceased, to celebrate, and to debate political issues. Marae are also used for educational purposes, or as a safe space in the event of a natural disaster or emergency:

Consequently, the marae can be interpreted as a dynamic, Māori-ordered, metaphysical space, embracing the fundamental kin-based values of whakapapa [genealogical ordering of the universe according to mana descent and whanaungatanga kinship] and tikanga where rights of access, especially in times of ritual, continue to be proscribed or prescribed solely by kin leaders. Moreover, these core values—whakapapa and tikanga—encapsulate what it essentially means to be Māori. (Tapsell, 2002, p. 142)

The whare tūpuna is a metaphor for the human body and is often a personification of a tupuna of an iwi or hapū. The use of a whare tūpuna as a metaphor elicits thoughts and memories of history, identity, connectedness, and collaborative effort (McLachlan et al., 2019). The whare tūpuna is a site of architectural, artistic, and cultural expressions for Māori (Waigh, 2009). The whare tūpuna is a helpful metaphor for understanding the role and function of the roro. “Traditional whare whakairo [carved meeting house/s] provide the clearest examples of a traditional Māori cognitive process and understandings of how memory was located and perceived within the human body” (Smith, 2019, p. 8).

The construction of whare tūpuna has been noted to be one of the earliest Māori movements of cultural revitalisation (Prendergast, 2012). Whare tūpuna were heavily influenced by the arrival of colonists and the church:

...the whare whakairo has featured prominently in these attempts at cultural revival, where early whare whakairo were built to maintain the mana of the people, a reaction to the rise of European dominance and the symbolism of the church. (Prendergast, 2012, p. 26)

One of the earliest carved whare tūpuna that still exists is Te Hau ki Tūranga (carved ancestral house from the Ōrākaipū pā). This was built by a renowned Rongowhakaata carver and rangatira (chief) Raharuhi Rukupō. In 1867, the whare was forcefully confiscated

by the Crown for the Colonial Museum in Wellington. Over a 150-year period, the whare was housed in three different museums (Waigh, 2009).

Early whare tūpuna were said to be smaller and less intricately carved. Waigh (2009) citing Captain James Cook and Joseph Banks, described a 10-metre long whare tūpuna that had fully carved interior posts. With the advent of steel tools and houses, and church halls built by missionaries, whare tūpuna became larger and more elaborately carved (Waigh, 2009). During the 1800s and early 1900s, the growth of carved whare tūpuna expanded due, in part, to settler-colonial fascination with collecting Māori objects. Forty-nine meeting houses were built in the 1880s and a further 99 were built between 1890 and 1920.

The early re-emergence of whare tūpuna building was supported by people such as Te Kooti Arikirangi Te Turuki, who was a Māori Christian prophet and leader of the Ringatū (a faith movement started by Te Kooti Arikirangi) movement. He was said to have been a student of Raharuhi Rukupō and may have also worked on Te Hau ki Tūranga (Sissons, 2010; Waigh, 2009). The development of whare tūpuna was also supported by Anglican church communities building marae complexes including church and whare tūpuna on the east coast of the North Island (Sissons, 2010). Sir Apirana Ngata (1874-1950), former member of Parliament and prominent leader, established the New Zealand Māori Arts and Crafts Institute in Rotorua in 1926. He is widely recognised for his role in promoting Māori culture, encouraging whare tūpuna construction through government development programmes, and fostering skilled Māori carvers (Prendergast, 2012; Waigh, 2009).

“The whare whakairo was so important in Ngata’s model of Māoritanga, he worked hard to ensure the necessary knowledge and skills were available to communities wanting to build one of their own” (Grant & Skinner, 2007, p. 41). In 2009, Waigh pointed out that the whareniui called Te Hau ki Tūranga served as Ngata’s model for both carving and building whare tūpuna.

Structure of the whare tūpuna

Whare tūpuna are often described as physical manifestations of male tūpuna or a representation of waka (vessel for transport). On the East Coast, Ngāti Porou (tribe on the East Coast of Aotearoa New Zealand) whare tūpuna are often named after female tūpuna (Ellis, 2016). Te Āti Haunui-a-Pāpārangi on the Whanganui River refer to whare tūpuna as an upturned waka (Skinner, 2019).

The experience of walking into a whare tūpuna is described as walking inside an ancestor or meeting face-to-face with your ancestors (Ellis, 2016; Prendergast, 2012; Waigh, 2009). This description reinforces the value and special place of the whare tūpuna as a storehouse of mātauranga Māori. In approaching the whare tūpuna, the front presents many of the features of Māori ancestors. The koruru, the carved figure on the apex of the whare, is referred to as the head of the ancestor. The amo (bargeboard support on an ancestral house), the two standing pou (posts) on either side of the whare, are the legs. The maihi (front bargeboards of an ancestral house) are the arms and at the end of these are the raparapa (carved ends of a barge post), the fingers. The raparapa are seen as the welcoming outstretched arms of the ancestor (Ellis, 2016).

The mahau is the verandah area of the whare tūpuna. In the front wall, there is often a window which has been called the eye, and the door is the mouth of the whare (Ellis, 2016; McNeill, 2009; Prendergast, 2012; Waigh, 2009). The whole mahau has been referred to as the roro or brain (Ellis, 2016), however, more precisely, the roro is seen as the tāhuhu (ridge pole) that projects from the front support beam of the whare tūpuna to the front of the verandah. This often has carvings depicting Ranginui (Sky Father) and Papatūānuku (Prendergast, 2012). Tāwhirimātea, the atua who remained with his father Ranginui after his parents were separated, is known to visit and reside on the unprotected outside of the whare tūpuna within the mahau (Smith, 2019).

The journey through the whare tūpuna reflects different aspects of cosmology and whakapapa. The

inside of the whare tūpuna is referred to as the poho (chest) or ngākau of the ancestor (Prendergast, 2012; Smith 2019). Ranginui is represented as the roof and Papatūānuku as the floor of the whare tūpuna. The inside of the whare tūpuna has elements of tapu that require protocols that are generally applied such as not eating food inside and removing footwear before entering (Sissons, 2010).

The lintel positioned above the entrance to the whare tūpuna serves as a symbolic representation steeped in cultural significance. Within this context, it commonly references two prominent figures: Rongo and Hine-nui-te-pō. The inside of the whare tūpuna is referred to as Te Whare-o-Rongo, the domain of Rongo. This is in reference to the pūrākau of the atua, Rongo-mā-Tāne (deity of peace and cultivated food), holding close to his mother, Papatūānuku, during the conflict with his siblings during the parental separation (Smith, 2019). Rongo-mā-Tāne is the atua associated with kūmara (yam, sweet potato) and cooked food, an important aspect of rituals such as whakanoa.

Rongo, recognised as the offspring of Papatūānuku is closely associated with attributes related to healing, peace, and peace-making. Rongo's role as the custodian of knowledge related to healing and peacemaking comes from his siblings who occupy the darker spaces at the back wall of the whare. Rongo is often associated with the pou tokomanawa of the whare. Rongo has the ability to move between the worlds of darkness and light (Takirirangi Smith, personal communication, November 3, 2023), his abilities reveal the interplay of light and darkness as knowledge is accessed and formed.

In parallel, Hine-nui-te-pō (formerly known as Hine-tītama), represents the transition between the world of the living and the deceased. Metaphorically, she also represents the world of light and darkness. She primarily resides within the realm of darkness. As the first-born child of Tāne-nui-a-Rangi and Hine-ahu-one (the earth-formed maiden), Hine-tītama is the first human. Growing up, Hine-tītama did not know who her father was. As an adult, and by this time in a relationship and a mother herself, she asked her mother who her father was. Hine-ahu-one replied, "ask the corners of the house". Hine-tītama could only guess that Tāne



was also her husband. In her shame and anger, she left the earthly world and changed her name to Hine-nui-te-pō. She became the guardian, or maiden of the underworld (Paama-Pengelly, 2010). Hine-nui-te-pō is responsible for the well-being of all her mokopuna, or grandchildren who pass away. Throughout the day, she retreats to the back of the whare, where her influence is believed to foster deeper, internally focused healing (Takirirangi Smith, personal communication, November 3, 2023). As night descends, Hine-nui-te-pō moves towards the front of the whare and takes on the role of safeguarding and watching over the wairua, or spirit, of individuals as it travels during their sleep (Smith, 2019).

The tāhuhu is the central support beam of the whare tūpuna, representing the spine of the ancestor (Ellis, 2016). It is covered with representations of ancestors and decorated with patterns that reflect whakapapa.

As depicted in this whakataukī:

E iri ana ngā pūrākau o te whare i te tāhuhu, ko te pātaka kōrero o te whare tūpuna.

The stories of the house are hanging in the tāhuhu, the library of the meeting house. The tāhuhu also represents the main whakapapa line of the ancestor, with the head of the founding ancestor at the front of the whare tūpuna, and lines of descent represented along the length of the spine. “This explains the symbolic importance of the ridge-pole as a concrete representation of the lineage of the tribe, essential for validating claims to land ownership and political status” (Prendergast, 2012, p. 32).

The tāhuhu were hoisted onto the main two weight-bearing pou, the poutāhū and pou tuarongo, which were dug deep into the ground (see Figure 2) (Paama-Pengelly, 2010; Prendergast, 2012; Treadwell, 2017).

In addition to its role as a tātai whakapapa (genealogical lines, genealogical table), the tāhuhu also had a practical aspect, as the size and length of the one piece of rākau (tree, wood) determined the length of the whare tūpuna. Early nineteenth century large whare tūpuna were recorded as having tāhuhu that weighed approximately 1,000 kilograms. Raising these ridgepoles required the significant effort of a number of people (Treadwell, 2017). Once erected, the roro and tāhuhu are supported by four pou:

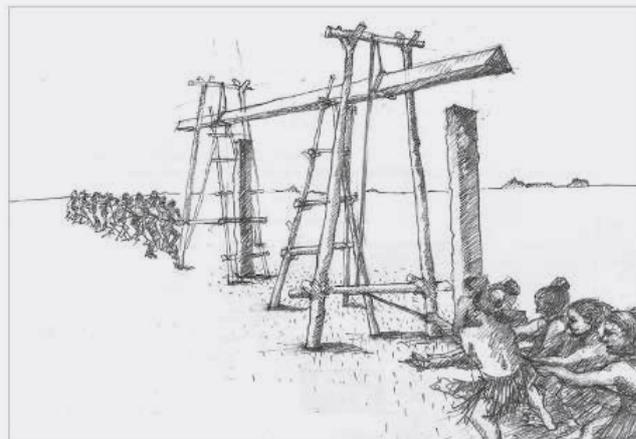


Figure 2: Hoisting the tāhuhu (Treadwell, 2014, p. 98, image used with permission)

1. pou tuarongo (back wall post in an ancestral house),
2. pou tokomanawa (centre post in an ancestral house),
3. pou tāhū (front wall post in an ancestral house), and
4. pou kaiāwhā (post at the front of an ancestral house).

There are some differences in the design of whare tūpuna, for example, some have two central posts and others do not have a post in the mahau (Prendergast, 2012).

The heke, or ribs, of the whare descend from the tāhuhu and join the walls of the whare tūpuna. These heke (rafters) may be decorated with kōwhaiwhai (painted patterns to ornament an ancestral house) patterns and span from the tāhuhu to the tops of pou pou (post/carved slab) on the walls. Each pou pou can represent more recent ancestors (Ellis, 2016) as well as functioning to hold up the walls and the roof. These pou pou are also commonly known as tūpuna whakairo (ancestral carvings) and pou pakoko (effigy). These slabs are placed evenly along the walls of the whare tūpuna and are carved to represent the ancestors and their deeds. Ellis (2016) commented that a close inspection of the carving revealed that the carver inscribed aspects of the life story of our ancestors. “They did this first by depicting an actual person, and second, by including different types of surface patterns that would amplify who they were” (Ellis, 2016, p. 450).

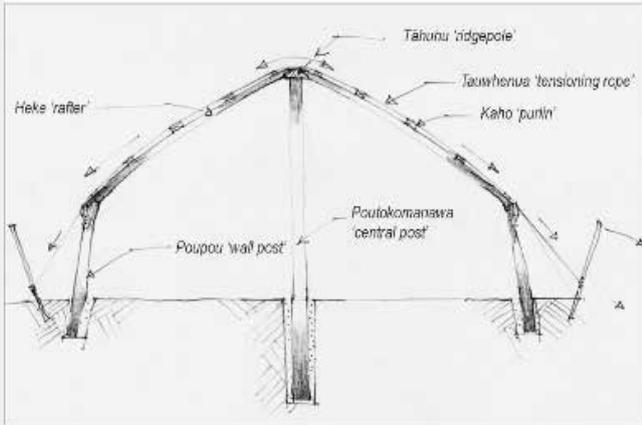


Figure 3: Schematic cross-section of the compressed arched frame of the whare (Treadwell, 2014, p. 96, image used with permission)

The association between the whare tūpuna and the roro is also expressed at the point where the heke rest on grooves on the poupou, referred to as a form of pūmotomoto. The term ruawhetū is also used. This continues the whakapapa line from Ranginui along the tāhuhu down the heke and into each ancestor, which is firmly embedded in Papatūānuku (Smith, 2000).

The pakitara (side wall/s of a house) were supported by the thick carved poupou, each up to a metre wide, dug into the ground, and leaned inwards to counter the thrust of the heke (Paama-Pengelly, 2010). Then a tensioning process via the tauwhenua (cables) brought these together (see Figure 3). Tukutuku (traditional Māori latticework) panels, woven harakeke (a type of flax native to Aotearoa New Zealand) panels, are positioned between the carved poupou on the walls of the whare tūpuna. Like the carvings, tukutuku panels continue the graphic representation of oral traditions. They convey a complex language of visual symbols, complementing and connecting the pūrākau, take pū (values), and moemoeā (dream, dreamscape, aspirations) represented in the poupou and acting as mnemonics or memory devices that provide cues for oral traditions (Smith, 2000).

Application of the whare tūpuna in health concepts: Te Whare Tapa Whā

Māori health is diverse and holistic reflecting mātauranga-Māori-informed ways of achieving hauora (wellness/health). The most widely used model for

Māori health is Te Whare Tapa Whā (the four dimensions of well-being) developed by Sir Mason Durie in 1985. The whare tūpuna as a model of well-being is clearly reflected in Te Whare Tapa Whā, where the house represents a human being. Te Whare Tapa Whā uses the symbolism of a whare tūpuna to reflect the interconnected nature of four components of health. These have been referred to as either the four walls of the house or the four cornerstones. Other Māori academics have also incorporated a fifth element, the whenua (land/placenta) and taiao (environment) (Glover, 2005; Pitama et al., 2007). In Te Whare Tapa Whā model, illness is seen as 'a manifestation of a breakdown in harmony with the wider environment' (Durie, 1998, p. 71), an imbalance across the four taha (side, element) in someone's life, or a breach of tapu (Durie 1985, 1998). Te Whare Tapa Whā was developed due to a dissatisfaction with a reductionist approach to health that did not consider the whole person within their social and cultural context (Durie, 1985). Well-being or health is seen as balance across the four taha, providing strength, balance, and harmony in a person's life and social and cultural context.

Durie (1999) further extended the whare tūpuna metaphor to incorporate dimensions of time and space that operate in the engagements that take place and are represented on a marae, including the process of calling visitors onto a marae (pōwhiri – welcoming ritual) or performing death rituals (tangihanga – funeral rites). He described these encounters as incorporating psychological and spiritual domains such as tapu and noa (the domain of safety), whaikōrero (the metaphorical domain), tauparapara (incantations) and karakia (the domains of interconnectedness), and tūhonohono (connection, connecting) the domain of synchronicity).

Within Te Whare o Oro, Te Whare Tapa Whā is repurposed to represent pou kokonga (corner post of an ancestral house), which guide the healthy development of tamariki. The four corner posts are:

1. taha hinengaro (mental and emotional well-being),
2. taha tinana (physical well-being),
3. taha whānau (family and social well-being), and
4. taha wairua (spiritual well-being).

Noho Puku – Key points and questions for consideration

Mātauranga Māori

- Whare tūpuna are built in a sequential manner, with the tāhuhu (including the roro) as the primary element, determining the size of the whare tūpuna.
- Whare tūpuna have evolved to become larger to meet contemporary requirements and design.
- Whare tūpuna are a source of reconnection and resurgence for Māori and mātauranga Māori.
- A whare tūpuna, as a metaphor, represents an ancestor and is a storehouse of pūrākau and whakapapa kōrero.
- The structure of the whare tūpuna represents the human body, including the roro and spinal column (tāhuhu stretching along the whare and out into the mahau).
- The front of the whare tūpuna is exposed to and associated with atua related to disturbance (Tūmatauenga—deity of war and the courtyard of marae—and Tāwhirimātea); whereas, the inside of the whare tūpuna is associated with atua related to peace and healing (Rongo and Hine-nui-te-pō).
- The symbolic representations of Rongo and Hine-nui-te-pō within the cultural context of the whare tūpuna show insights into the role of light and darkness, learning and growth, pain and healing, and the sacred connections that link atua to ancestral teaching. The complexity and depth of acquiring and forming knowledge is apparent, where some aspects are readily available, while others remain hidden or take time to surface and become fully understood.

Tamariki development

- The use of the whare tūpuna in the health model, Te Whare Tapa Whā, reinforces the importance of stability and balance for well-being, through comprehensive mental, spiritual, familial, and physical health.

Questions for reflection

- | | |
|--|---|
| <ul style="list-style-type: none"> • Which whare tūpuna are you connected to? • What do you sense, feel, and experience when entering a wharenuī? • What practices do you know that are associated with the whare tūpuna and marae? | <ul style="list-style-type: none"> • How does your practice address the physical, social, spiritual, and mental aspects of well-being of tamariki, to provide balance and stability? • How can practices on the marae influence your practice? • How does the role of the external and internal space of the whare tūpuna influence your practice with tamariki? |
|--|---|

The structure and sequential development of the brain

The brain comprises a complex network of around 86 billion neurons. The way an adult engages with the world is fundamentally influenced by the development of their brain, which begins at conception. This development is greatly influenced by the interactions between a child and their environment, ultimately shaping how a child's genetic potential is expressed. In essence, genes provide the blueprint for a child's potential, but it is the early experiences and environmental factors that determine whether a tamaiti (child) will fully realise this potential.

A **neuron** consists of a cell body that contains the cell's information, an axon (the nerve fibres of a neuron, along which messages are carried to other neurons as electrical impulses), and many dendrites (smaller fibres that receive messages from other neurons). By the time a pēpi is born, the brain has developed most of the neurons it will ever need (Webb et al., 2001). At birth, a pēpi's brain is approximately 15% of its complete adult size and by the time that tamaiti is four years old, the brain is close to 90% of the weight of an adult brain (Perry, 2004). This emphasises how rapidly a brain grows and develops, and how crucial the first four years of a tamaiti's life are in terms of brain development.

Neuroplasticity refers to the brain's ability to adapt, to learn, and to change over time. Pruning is a process by which the brain adapts, based on use and activity, where active pathways are strengthened, and those pathways used less often are weakened and removed (Eagleson & Levitt, 2016). The more a pathway is used,

the stronger the connection becomes. This increased strength leads to greater efficiency and faster responses. Ultimately, this process transforms the action into an automatic, instinctive one. The metaphor of a trail through the ngahere (forest, bush) is a good example of the need to develop and strengthen neural pathways.

Walking through a forest without a trail is difficult, because you have to compact and push the vegetation and branches out of the way to carve your way through. But the more you use the same trail, the easier and more practicable it becomes. Conversely, when you stop using the trail, the vegetation grows back, and the trail slowly disappears. (Massonnie et al., 2020, p. 7)

At a cellular level, the brain is an incredibly complex and dynamic system of neurons arranged in networks that transmit information and work in tune with the body to function. The roles of neurons, glial cells (cells that support and strengthen

A **neuron** is a nerve cell that processes and transmits information in the nervous system

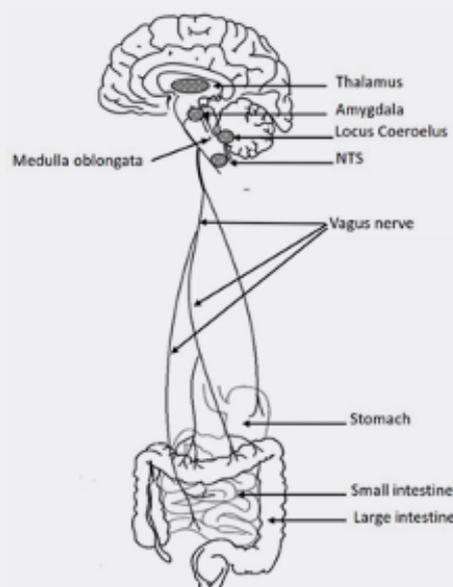


Figure 4: Vagus nerve and the brain-gut connection (Breit et al., 2018, p.2)

The **vagus nerve** is the longest cranial nerve in the body, responsible for controlling various bodily functions, including heart rate, digestion, and respiratory rate.

The **autonomic nervous system** is a division of the peripheral nervous system that regulates involuntary bodily functions without conscious control (e.g., heart rate and digestion).

The **sympathetic nervous system** is responsible for the fight-or-flight response, increasing heart rate, dilating pupils, and preparing the body for high-stress situations.

The **parasympathetic nervous system** is responsible for the rest-and-digest response, promoting relaxation, slowing heart rate, and aiding in digestion and recovery.

The **Polyvagal Theory** is a neurobiological theory that explains how the vagus nerve influences social behaviour and emotional regulation by modulating the body's responses to stress and connecting the brain to the body.

neurons), and the vast neuronal networks bring together the separate parts of the brain to be an integrated functioning body. The brain has relatively short axonal projections between brain structures within a specific area of the brain. The brain also has long-range projections such as those between the thalamus and cortex (Leong et al., 2016).

The brain connects with the rest of the body through the nervous system and spinal cord, carrying messages to and from the extremities of the body. It is stimulated and functions in relationship to the outside world, and particularly to other people (Sporns, 2010). One particular nerve bundle, called the vagus nerve, has been identified as an important component of the relationship between the brain, the organ, and the senses. One of the main functions of the **vagus nerve** is to bring sensory information from the gut to the brain. It has been called the brain–gut axis, involved in two-way communication between bodily states (senses, hunger, and stress) and emotional and cognitive functions (Breit et al., 2018).

The vagus nerve is part of the **autonomic nervous system** that regulates reflexive, involuntary processes of the body such as heart rate, blood pressure, and breathing. The autonomic system includes a **sympathetic** and **parasympathetic system**. These are complementary, with one signalling your body to be on alert (sympathetic) and the other to relax (parasympathetic). The vagus nerve is part of the parasympathetic system which helps maintain normal body functions and conserves physical resources. Other components of this brain–gut axis is the brain and the hypothalamic–pituitary–adrenal (HPA) axis. This means one of the

functions of the vagus nerve in this axis is regulating the body's response to stress. The **Polyvagal Theory** by Porges (2022) proposes that the vagal pathway is an important component in downregulating the body's response to threat, shutting down defensive strategies used to maintain safety and allowing an individual to engage in interpersonal relationships (i.e., forming bonds and seeking and receiving support from others).

The vagus nerve is one of the longest in the body. Due to its length, it has been called the 'wanderer nerve'. The nerve runs from above the brainstem, coming out of the medulla oblongata, and travels along the spine to the stomach. The vagus nerve has tracks (nerve bundles) that move from the gut to the brain (afferent) and tracks that move from the brain to the gut (efferent) (see Figure 4). The afferent tracks account for 10–20% of nerve signals, while 80–90% of the signals are sent efferently.

From the time of conception, the brain develops in a sequential manner, starting with less complex areas that are most critical for survival, and ending with the most complex areas. The brain is commonly divided into four distinct regions: the brainstem, the diencephalon and cerebellum, the limbic system, and the cortex (see Figure 5). The structure and development of the brain is hierarchical, beginning from the bottom and towards the rear with the brainstem (above the spinal column), and finishing at the top of the head at the front behind the eyes with the frontal lobe of the cerebral cortex (Perry 2006, 2009). It is important to note that these regions of the brain are present at birth; however, they are not wired-up and fully functioning; this happens over time.

The four main regions of the brain

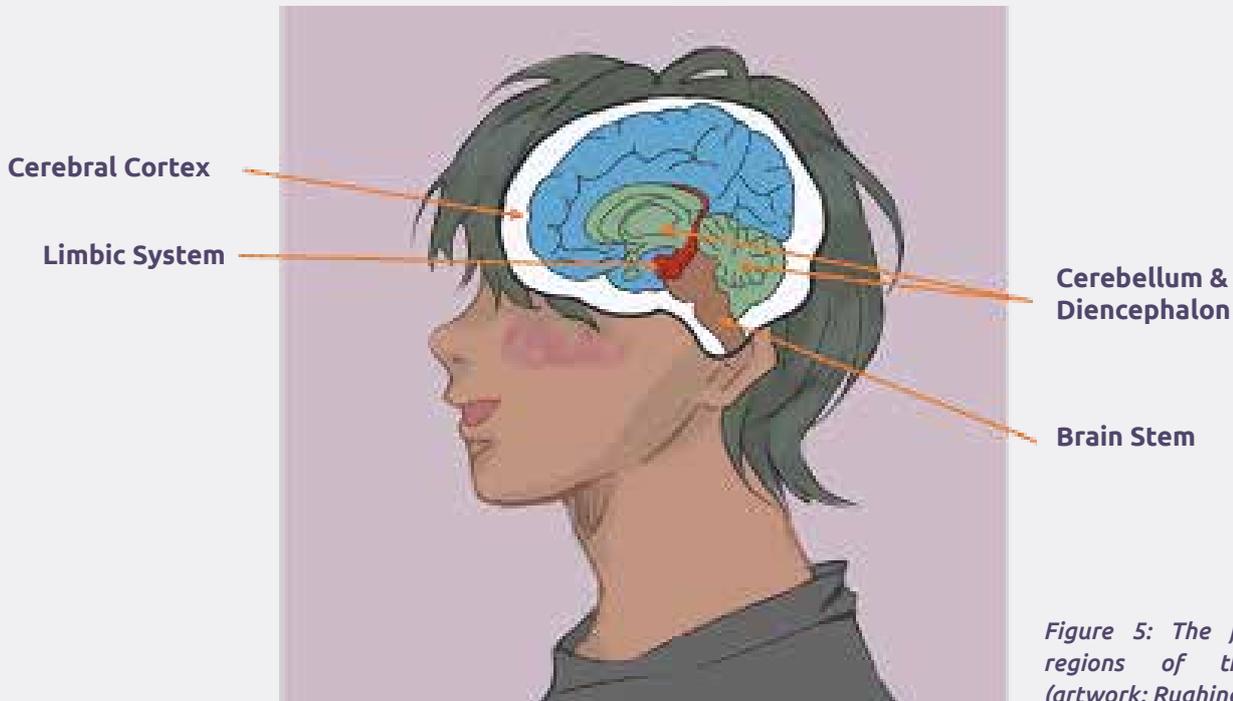


Figure 5: The four main regions of the brain (artwork: Ruahine Harmer)

The brainstem

The primary function of the **brainstem** is to carry out our basic survival and regulatory functions. It is, therefore, the first area to develop while a pēpi is in the kōpū (womb, pregnancy) and continues developing rapidly in the first year of life (Perry 2006, 2009). Changes after that only occur after intense, recurrent experiences (Perry, 2006). The brainstem also has conduit functions (passing information up and down the brain and body). The brainstem is also the location of the **cranial nerves** which are responsible for sensory or motor functions.

The basic survival functions of the brainstem include swallowing, breathing, blood pressure, heart rate, regulating the sleep-wake cycle, and some complex motor patterns. Much of this is processed by the reticular formation, which forms the central core of the brainstem. The brainstem also incorporates several neural networks,

including monoamine, cholinergic, and serotonergic (Jacob & Neinborg, 2018). The brainstem has an important role in automatic responses to fear, a key role in the trauma response.

According to Perry and Pollard (1998), when sensory information is processed through the brainstem and midbrain, that information is compared to previously stored information to coordinate a response. If the information is unfamiliar or linked to a previous threat, then an alarm response is activated which progresses through the diencephalon (e.g., preparing the body for fight-or-flight and dissociative responses), limbic (e.g., an emotional response and expression), and cortical systems (e.g., interpreting the threat and developing a plan) (Perry & Pollard, 1998).

The **brainstem** is at the base of the brain and connects it to the spinal cord, controlling vital functions like breathing, heart rate, and consciousness.

The **cranial nerves** are twelve pairs of nerves that control sensory and motor functions in the head and neck, including activities like vision, hearing, and facial movements. The vagus nerve is the 10th cranial nerve.

Together, the **cerebellum** and **diencephalon** are responsible for coordinating voluntary muscle movements and maintaining balance, sensory processing, hormonal regulation, and basic survival behaviours.

The **limbic system** is a network of brain structures that play a key role in emotions, memory, and motivation.

The **thalamus** acts as a relay station, transmitting sensory information from the body to the cerebral cortex, where it is processed and perceived.

The **hypothalamic-pituitary-adrenal (HPA) axis** is a complex hormonal system in the body that regulates the body's response to stress and controls various physiological processes.

The cerebellum and diencephalon

The **diencephalon** and **cerebellum** are primarily responsible for movement, coordination (physical messages around the body and brain), and survival responses (in response to the brainstem). They develop rapidly in early childhood, between 6–24 months (Perry 2006, 2009). Despite accounting for only 2% of the weight of the brain, the diencephalon is extremely important (Vanderah & Gould, 2019). It is made up of several structures, including the **thalamus**, hypothalamus, epithalamus, and subthalamus. It is involved in visceral (automatic) responses, body temperature, and has some involvement in the **limbic system** (Vanderah & Gould, 2019). The thalamus is a vital relay centre in the brain, and nearly all sensory information destined for the cerebral cortex passes through it, with the exception of olfactory (smell) information. This includes limbic projections, which are related to emotions and emotional processing. The thalamus helps filter and route sensory information to the appropriate areas of the cerebral cortex for further processing and integration. The thalamus is also involved in motor systems between the cerebellum and cerebral cortex (Vanderah & Gould, 2019).

The structures of the diencephalon are important in organising the response to threats. One mechanism by which this occurs is via the brainstem detecting threat and increasing arousal. The increased activity in this region then activates the **hypothalamic-pituitary-adrenal (HPA) axis** which releases corticosteroids, resulting in changes within the body to prepare for defence against a threat (e.g., increased heart rate, blood pressure, and muscle tone) (Perry & Pollard, 1998).

Historically, the cerebellum's key role was considered to be motor function, however, more recently, the cerebellum has been identified in cognition and affect (initial emotional response) processing (Rabellino et al., 2018). The cerebellum is also involved in arousal via the reticular activation system and connections with the brainstem, vestibular function (via the brainstem), autonomic functions (via the hypothalamus), emotion regulation (via the limbic system), and sensorimotor integration (via the sensorimotor cortex).

The limbic system

Located above the cerebellum is the limbic system, which functions as the emotional core of the brain. This system develops rapidly between 12 months and four years of age through interactions with the environment (i.e., with caregivers) (Perry 2006, 2009).

The limbic system is made up of numerous brain structures, including the amygdala, caudate nucleus, hippocampus, basal ganglia, nucleus accumbens, putamen, and the corpus callosum. The areas within the limbic system are responsible for a range of functions, including attachment and emotion regulation (Perry et al., 1995). This system has an important role in motivations (e.g., to avoid pain or approach rewards), learning, emotional responses, physiological drives (e.g., hunger, thirst), and memory (Vanderah & Gould, 2019).

In contrast to the other brain regions discussed, there have been many more studies examining the impact of trauma on the limbic system, particularly in relation to the amygdala and the hippocampus (for reviews see Calem et al., 2017; Cassiers et al., 2018). The amygdala is involved in memory and emotional responses, not just during times of anger. This is important for pairing pleasant or unpleasant experiences

with people, places and things, which is an important survival mechanism and also has a role in social cognition and relationships (Vanderah & Gould, 2019).

The cerebral cortex

The **cerebral cortex** is a sheet of grey matter (neurons) just a few millimetres thick, covering the brain structures. However, it is estimated to have approximately 25 billion neurons, 100,000 kilometres of axons (white matter or neural pathways) and accounts for nearly half the weight of the brain (Vanderah & Gould, 2019). Broadly speaking, the functions of the cortex are what make us human, for example, speaking, thinking, and processing information. The cerebral cortex develops rapidly during the preschool years and continues through to the mid-20s (Perry 2006, 2009).

The cerebral cortex looks like a helmet that sits over the top of the other brain structures and is separated into two hemispheres. There are arguments for the left-hand side being associated with language and the right-hand side associated with visuo-spatial abilities, however, it is much more complicated than this. The cerebral hemispheres incorporate primary sensory areas, primary motor areas, association areas, and limbic areas (Vanderah & Gould, 2019). The two hemispheres are connected by the corpus callosum, a large fibre bundle (neural tracts) in the brain, with approximately 250 million axons (Vanderah & Gould, 2019).

The cerebral cortex is made up of many different structures and is implicated in various functions, most simply stated as abstract cognition and complex language (Perry et al., 1995). Another term commonly used is **executive functions**, which include planning, working memory, insight, foresight, self-control, decision-making, inhibiting actions and many of the most basic aspects of personality (Vanderah

& Gould, 2019). There have been several reviews which document the evidence for a link between early experiences of trauma and structural changes in the cortex (Cassiers et al., 2018; Jeong et al., 2021; Lim et al., 2014).

Contemporary Māori conceptualisations of the brain, brain injury, and illness

Riwai-Couch (2021) undertook a literature review for the Ministry of Education on te ao Māori perspectives of Māori neurodiversity, and the educational experiences, needs, and aspirations of ākongā Māori (Māori students). Riwai-Couch identified that there was a lack of appropriate terminology for neurodiversity in the Māori language. The term *mate hinengaro* (mental illness) had been used for intellectual disability in the past but was changed to *māuiui hinengaro* (mentally ill) by Opai (2018) in *Te Reo Hāpai: The language of enrichment - A Māori language glossary for use in the mental health, addiction, and disability sectors*. The term moved from an unchanging sickness, illness, or at times death to *māuiui*, which represented more of a changeable illness. Riwai-Couch (2021) introduced the term *kanorau ā-roro* (child experiencing neurodivergence). *Kanorau* (diverse) is an adjective meaning diverse or varied and paired with the *roro*, becomes neurodiverse. However, she also referred to *kanorau ā-io* (emotional diversity). The word *io* is the noun commonly used to describe nerves, the nervous system, and things that are neurological. *Io* (supreme deity in Māori history) is also the name commonly used for God or, specifically, God as the supreme being who created and oversees Māori and our ancestors. *Kanorau ā-io* can be used to describe both *neurological diversity* and *emotional diversity* (Riwai-Couch, 2021).

The **cerebral cortex** is the outermost layer of the brain responsible for higher cognitive functions such as thinking, perception, and voluntary muscle control.

Executive functions are a set of mental skills that help manage tasks, make decisions, control actions and solve problems.

Hanara (2020) developed a neurosequential-type model of the brain, Te Āheinga Pū Reretahi, to provide an understanding of the brain and Māori philosophy related to the brain. This model was heavily influenced by pūrākau, related to Tangaroa (deity of the oceans) and his attributes and achievements. Hanara cites Te Rangi Hīroa’s use of the word *waioro* (another Māori term for the brain) demonstrating the connection of the brain to water and Tangaroa, and signifying the importance of Tangaroa to brain health. The model proposes three primary functions of the brain which he defined as āheinga (functions or competencies), pū (related to vital functions, precision, and connection to the body), and reretahi (coordination, harmony). This model specifies the brainstem (pū), the cerebellum (reretahi), the limbic system, and the cortex, brought together within the āheinga (see Figure 6 below).

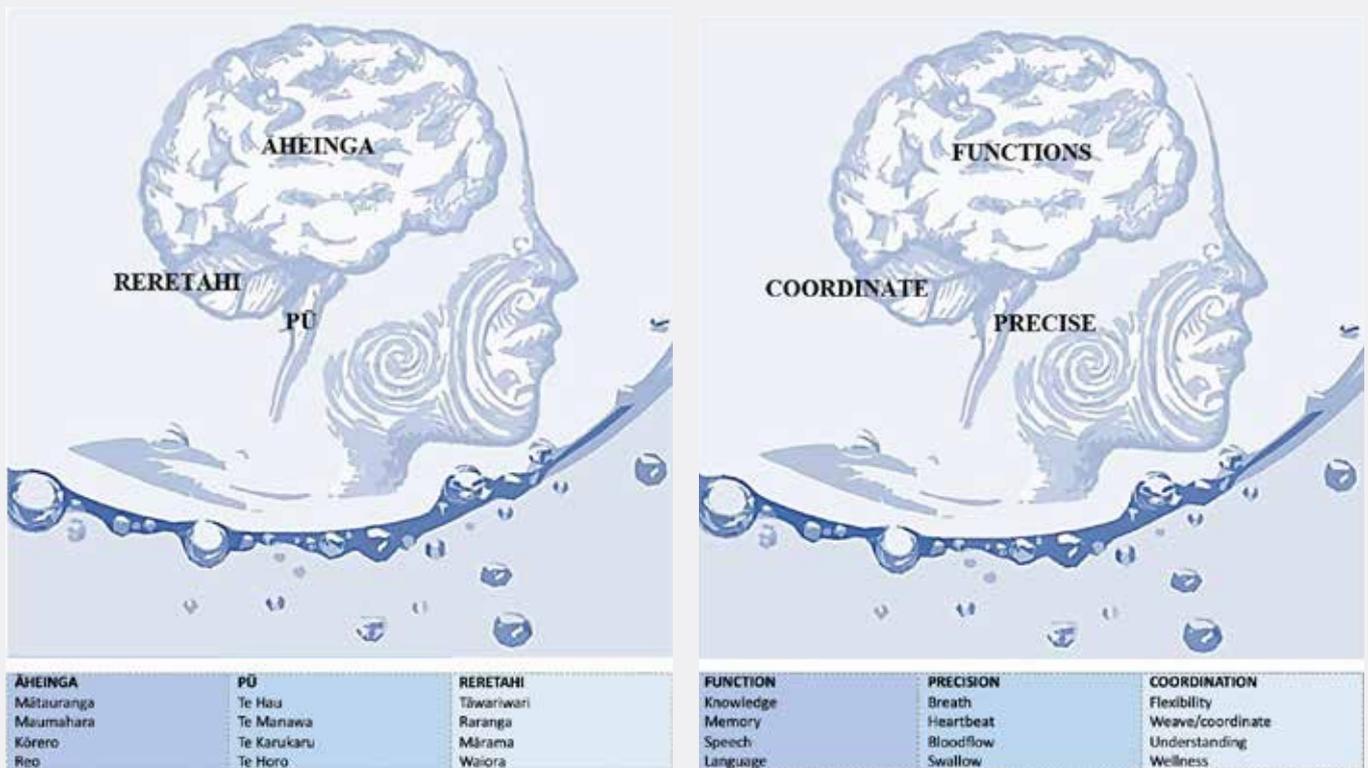


Figure 6: Te Āheinga Pū Reretahi (a Māori Health model of Indigenous understanding the brain) Māori brain health model (Māori and English versions) (Hanara, 2020, pp. 139–140). Images used with permission.

The important role of mātauranga Māori, particularly values and practices related to wairua and whakapapa, is demonstrated in research on both mate wareware (dementia) and traumatic brain injuries (TBI). Implicit in Elder's (2013) Wairua Theory of Mokopuna TBI is the belief that an injury to the head of a mokopuna (grandchild) reawakens the awareness of whānau to the tapu nature of the upoko (head).

The wairua theory of mokopuna TBI proposes that wairua is also injured in mokopuna TBI. According to this theory, wairua is understood as a profound sense of connectivity between Māori and all aspects of the universe. This injury to wairua activates a cascade of culturally determined responses. (Elder, 2013, p. 410)

The wairua theory of mokopuna TBI emphasises the need for whānau to be involved in the rehabilitation of their mokopuna because they are most closely linked, through wairua, to their mokopuna. In this situation, Western methods of treatment and rehabilitation are limited in being able to respond in a culturally-appropriate way.

The injury's occurrence is transmitted via wairua through the whānau into the whakapapa, both into the past and forward into the future. This communication is made clear because the whakapapa responds in two ways. The whakapapa stretches across time and holds within its memory both other traumatic events and mātauranga of specific practices for healing mokopuna traumatic brain injury. First, the memories of past traumatic events are rekindled when discussing a mokopuna traumatic brain injury. Concern about the impact of this brain injury on future generations comes to the fore alongside the meaning of the TBI in relation to past events. Second, the mātauranga resources required to attend to the wairua injury component of the traumatic brain injury are recalled. (Elder, 2013, p. 410)

Māori concepts of interrelated well-being is also seen in the mate wareware research. Dudley et al. (2019) describe mate wareware as 'becoming forgetful and unwell', often translated to refer to dementia. Their research found that mate wareware affects the individual, their whānau, hapū, and wider communities. Within many whānau, mate wareware was perceived to be a spiritual journey in preparation for joining the world of one's tūpuna. The importance placed on connection to wairua shows a distinct difference to western models of well-being and TBI.

Therapeutic approaches to addressing the impact of trauma on the brain

There are critical periods in a child's life when the brain is most sensitive to experiences that influence the structure, function, and development of the brain. Sensitive periods called 'windows of opportunity' are specific stages in the development of a pēpi when their experiences play a crucial role in shaping their brain's healthy development. During these times, the brain is highly receptive and neural pathways can be easily adapted and moulded in response to their experiences (Nelson & Gabard-Durnam, 2020). In essence, if certain experiences occur within these windows of time, then a pēpi's development will continue as expected. Critical periods include the development of motor skills, social connections, and language development (Bruer, 1999). Hence, the early experiences of a child are crucial; the sequential nature of the brain's development means that a healthy, functioning cortex is dependent on healthy development of the earlier brain regions.

The Neurosequential Model of Therapeutics (NMT)¹ builds upon the sequential nature of a brain's development and the notion of sensitive and critical periods of a child's development. The model asserts that adversity during infancy and early childhood, when the lower/earlier areas of the brain are developing

1. The **neurosequential model of therapeutics (NMT)** is a therapeutic approach that takes into account neurodevelopmental trauma and uses a neurobiological framework to guide interventions for individuals, particularly children, to address their emotional and cognitive needs.

(those that are most crucial for survival), is likely to impact communication and function within various brain systems, rather than one specific brain area (Perry et al., 1995). The NMT model is a comprehensive assessment and intervention approach (Perry & Hambrick, 2008) that has shown evidence for addressing child and adolescent neurodevelopment trauma (Barfield et al., 2012; Cox et al., 2021; Hambrick et al., 2018).

We often approach children experiencing difficulties of distress from a 'top-down' way, seeking to enhance 'self-control' in the tamaiti (child) through appealing to their executive function. However, 'dysregulation' such as disorganisation, underdevelopment, and impairment is often related to lower networks in the brain, requiring a 'bottom-up' approach to allow other relational and cognitive experiences to succeed. An NMT intervention, informed by a neurosequential assessment, often starts with simple rhythmic and repetitive activities that help the brainstem neural systems become well organised and regulated. As therapy progresses and evidence of brainstem regulation emerges, the activities can begin to target higher, more complex parts of the brain (Perry, 2006; Perry & Dobson, 2013).

Perry (2015) proposes six core elements of an NMT approach:

1. relational (safe),
2. relevant (developmentally matched),
3. rhythmic (resonant with neural patterns and positive entrainment),
4. repetitive (patterned),
5. rewarding (pleasurable), and
6. respectful (of the child, family, and culture).

Building on the NMT model, McCaleb and Mikaere-Wallis (2005) identified the needs of each brain region at each stage of development and translated these needs into Māori concepts. While the brainstem is developing, the primary needs are for safety, which McCaleb and Mikaere-Wallis translate as wairua rangimarie (peace/peaceful), requiring karanga (call), and karakia. At the stage of the midbrain, the primary need is for movement, translated to tino rangatiratanga (sovereignty). In the limbic system, it is emotional engagement (whanaungatanga - relationships), and finally, when the cortex is developing, the primary need is opportunities for learning (ako, wānanga).

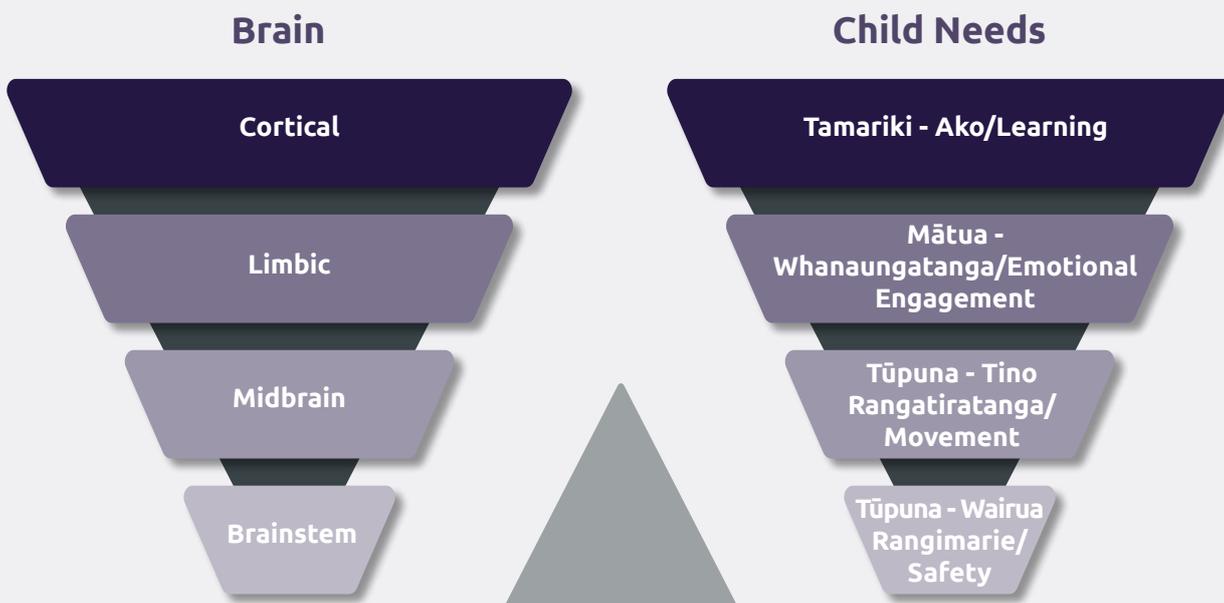


Figure 7: Perry's (2004) Neurosequential Model, adapted from McCaleb & Mikaere-Wallis (2005).

McCaleb and Mikaere-Wallis (2005) documented a discussion with Dr Rangimarie Rose Pere in which she aligned three of the four areas of the brain with roles in the whānau. She aligned the role of the tūpuna with the brainstem. Mikaere-Wallis (Mikaere-Wallis, n.d.) later incorporated the midbrain (Cerebellum and Diencephalon) under the tūpuna role. Although, often in the background, the tūpuna are ultimately the decision makers in the whānau as to whether a certain course of action proceeds. As the oldest and original members of the whānau, they are setting the tone or the backdrop within which the rest of the whānau function. The brainstem, as the oldest part of our brain, performs much the same function.

The role of mātua was aligned to the limbic system, responsible for the here and now and working to ensure successful growth and development. The mātua, like the limbic system, were seen to be more responsible for reacting to the everyday aspects of the world rather than the 'bigger picture' concerns of the brainstem. Secondly, both the limbic system and the mātua play a vital role in the successful growth and nurturance of the tamariki.

The tamariki were the cortex, as both the cortex and child need to be nurtured into being. In the same way that successful, healthy children result from the parent's ability to love and nurture them (with support from tūpuna), a healthy and successful cortex results from a limbic system and brainstem that are appropriately nurtured in order to successfully support the growth of the cortex.

One of the benefits of this model is the focus on relationships. However, the authors also noted that Perry's (1995) Neurosequential Model aligned with the concept of a house.

This principle lends itself easily to the metaphor of building a house. That is; the concrete for the foundations needs to have [been] set and the walls need to be securely in place before the roof can be added. Similarly, considerations of the brainstem, mid-brain and limbic system need to be in place if we are to hope for secure and robust cortical development (McCaleb & Mikaere-Wallis, 2005, p. 3)

The Polyvagal Theory² (Porges, 2009, 2022) also argues for a hierarchy of development, with a primary focus on feelings of safety in order to engage in cooperative social relationships and to engage higher cognitive structures enabling 'learning, creativity, appreciation of aesthetics, and even spirituality' (Porges, 2022, p. 3). The Polyvagal Theory proposes three autonomic subsystems that are linked to neuroanatomy as well as important adaptive behaviours including: social communication e.g., facial expression, vocalisation and listening (ventral vagal complex); mobilisation e.g., fight-flight behaviours (sympathetic-adrenal system); and immobilisation e.g., behavioural shutdown (dorsal vagal complex). These three states of the polyvagal system are sometimes referred to as three levels of a house or three rungs on a ladder (Dana, 2018) (see Figure 8).

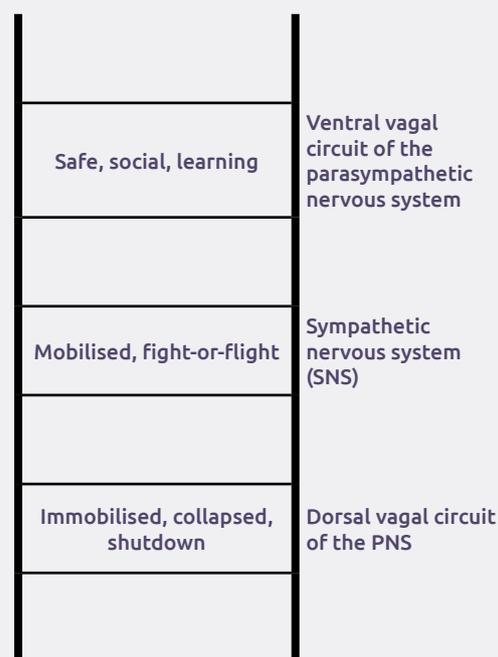


Figure 8: Polyvagal Ladder, adapted from Dana (2018, p. 20)

2. The **Polyvagal Theory** explains how the vagus nerve influences social behavior, emotional regulation, and physiological responses to stress by regulating the autonomic nervous system.

Three important concepts in Polyvagal Theory are neuroception, dissolution, and social connectedness. The term *neuroception* reflects awareness outside of conscious awareness, a reflexive state that picks up and responds to cues of threat in the environment (sights, sounds, and movements) in order to mobilise adaptive behaviour such as social engagement, flight, fight, or shutdown. The term *dissolution* emphasises that when a higher-order cognitive function is affected, such as by disease or injury, lower-order functions associated with limbic or brainstem functions are relied upon. From a Polyvagal Theory perspective, when higher-order (later-developed) strategies are not effective, such as seeking support, lower-order fight-or-flight responses come to the fore. The concept of social connectedness recognises the importance of feeling safe and connected to others as a way to regulate one’s internal state and optimise learning, health, and development. For someone to move from a defensive position to one

of social engagement, the nervous system is required to engage two important and adaptive tasks: ‘(1) assess risk, and (2) if the environment is perceived as safe, inhibit the more primitive limbic structures that control fight, flight, or freeze behaviours’ (Porges, 2009, p. 5).

Therapeutic approaches utilising Polyvagal Theory focus on a range of activities such as understanding patterns of response, which are the triggers for how they respond to perceived threats (mobilised or immobilised) and what they call *glimmers*, the things that signal safety and engagement in social behaviour (Dana, 2018). Other activities develop passive and active approaches to increase a sense of safety and downregulate perceived threat responses. These include learning to ‘attend’ to safety signals and calm the physiological state through controlled breathing and activities that stimulate safety cues, including engagement in music, singing, movement, and play (Dana, 2018).

Noho puku: Reflection

Noho Puku – Key points and questions for consideration	
Mātauranga Māori	Tamariki development
<ul style="list-style-type: none"> Mātauranga Māori tells us that the brain and body are connected. Knowledge not embedded in the body (whakatinana – to embody) is not retained. The body must be tau, to engage in higher levels of knowledge. The sequential development of the brain has been likened to whakapapa and to a house. Atua Māori associated with the roro, Rō Ake and Rō Iho, reinforce the brain–body connection and duality. Newer Māori terms such as kanorau ā-ro-ro are more mana-enhancing than other forms of illness-based descriptions of neurodiversity. 	<ul style="list-style-type: none"> The brain develops in a sequential manner, from basic survival, movement, and coordination to emotions and higher cognitive functions. The brain and body are connected. Signals from the body have powerful influences on behaviour outside of higher cognitive functions such as planning. Each level of development has needs.
Questions for reflection	
<ul style="list-style-type: none"> What do you notice when you know how to do something? Do you still need to be alert and observant, or do you let your body take over? What do you need to do to learn? What environment do you need? 	<ul style="list-style-type: none"> What activities do you do to stimulate safety, connection and, in turn, learning? How do you co-regulate with your tamariki?

Glimmers are brief moments of safety and connection that can help regulate the autonomic nervous system and promote emotional well-being.

Te Whare o Oro and neurodevelopment

The construction of a whare tells a story, as whare tūpuna were often placed facing the rising sun and on a hill, providing a way to monitor threats, and so the whenua (land) selection was important. Whenua is also another name for the placenta. Understanding the whare tūpuna and the brain also requires understanding the role of the placenta as a place of protection and sustenance for pēpi.

The roro of the whare tūpuna is an extension of the tāhuhu (spinal cord) that runs along the inside of the whare tūpuna and projects out into the mahau (verandah). Collectively, this forms the central nervous system (CNS) of the whare tūpuna. The following section introduces the four pou (carved posts) that hold up this CNS in relation to four areas of the human brain, and the foundational construction of the whare tūpuna. These pou are not traditionally associated with the brain; however, each pou holds traditional meaning that can assist in understanding the areas of the brain, and also guide the relationship when addressing trauma in these areas of the brain.

The four pou hold up the CNS of the whare tūpuna, the tāhuhu and roro; however, the walls, represented by Te Whare Tapa Whā provide additional protection. The walls are tensioned to the tāhuhu by the heke which in the Te Whare o Oro model, represent the individual and structural supports required for positive well-being (Te Whare Tapa Whā) and healthy neurodevelopment (Ngā Pou o Te Whare o Oro).

Ngā pou o Te Whare o Oro and the Neurosequential Model

The intricacies in pou whakairo (carved post) across the country not only act as beautiful adornment for the whare tūpuna, but also as a repository of local tribal knowledge and history. Pou are carved with representations of tribal narratives, ancestors and their accomplishments, stories of migration and settlement, and ancestors from other regions (signifying connections to other regions) (Prendergast, 2012). Pou are part of the archives of history for hapū and iwi and, like the brain, hold knowledge that reveals information to those who know and can interpret their meaning.

Within pou whakairo, the interpreter can often identify with the concept of *matangaro*, which refers to something that is not visible but can be sensed. Utilising *matangaro* is the means through which the pou and the tohunga whakairo work together to convey mauri (Heaton, 2022). Pou are considered the literal pillars of a house used to keep the house standing. Māori who possess strong leadership qualities or who are the matriarchs and patriarchs of a family are referred to as pou or pou pou.

As we look further into the meaning of the word pou, we see some common themes in the use of this word to describe support. *Pouako* (teacher, source of knowledge) is the word used for a teacher, whose role it is to support the learning outcomes of an ākongā (student). *Pou whakarae* (foremost post), which is traditionally the carved sentry pou that stands at the entrance of a palisaded fortress, is also used to describe a leader, a prominent figure in a community, or a leader of a movement. *Pou whirinaki* (a pillar of support) is traditionally a leaning post for warriors on watch over the palisaded fortress but is now used to describe someone who is reliable or a pillar of support (Te Taura Whiri i Te Reo Māori, 2004).

When we consider the structure of a whare tūpuna, it has a tuāpapa or foundation and a tuanui (roof, ceiling). It is no coincidence that the tuāpapa is likened to Papatūānuku, and the tuanui is likened to Ranginui, with the root words of each part of the house being *papa* (ground) and *nui* (big, large), taken from the parents of atua. According to Māori creation history, the beginning of the world of enlightenment starts with Tāne separating his parents, Ranginui and Papatūānuku, to bring māramatanga to the world. He uses poutiriao to keep the sky up and separate from the earth (R. Smith, personal communication, December, 2016). The interpretation of this narrative is evident in the design of whare tūpuna. It consists of a foundation, roof, and pillars supporting the roof, creating a distinct space from the foundation. This

design allows individuals to seek enlightenment within the walls of the whare tūpuna.

Within Te Whare o Oro model, the pou do not line up from one to four like the Neurosequential Model (see Figure 7). The pou begin with the two structural and foundational pou of the whare tūpuna, the pou tuarongo at the back and the pou tāhū (front wall post in an ancestral house). The model then moves to the pou tokomanawa and the pou kaiāwhā. This maintains consistency with the structure and integrity of the whare tūpuna and also aligns with the Neurosequential Model where the structures they reflect are the foundational structures of the brain. Below, and in the following sections, each pou will be presented, and links will be made to areas of the roro.

Pou tuarongo and the brainstem



Pou tuarongo

The pou tuarongo is the weight-bearing pou at the rear of the whare tūpuna, created with halved tree trunks. If we were to dissect the word into its components, *tua* is related to beyond or father, and *rongo* is related to all things sensory (Te Taura Whiri i Te Reo Māori, 2004)

The back of the whare tūpuna is associated with Hine-nui-te-pō (Paama-Pengelly, 2010) and the ancestors and whakapapa of the hapū and iwi. This is often represented by the photographs and paintings hanging on the back wall. Some iwi also hang these pictures around the walls of the whare tūpuna (Merito, 2006).

Some tribes call the pou tuarongo of the meeting house *te pou whakapirau* (the post reserved for the deceased), which literally translates to the decomposition pole. This is in reference to the custom of taking the deceased to the back of the meeting house to rest for the duration of the tangihanga rites.

In some tribes, when visiting a meeting house, it is customary to first walk all the way to the rear of the meeting house to the pou tuarongo, before coming back to greet the residents, then taking a seat at the orator's bench near the front of the meeting house. This is said to be done to acknowledge the ancestors and the recently departed of the tribe that you are visiting. The practice of firstly acknowledging the deceased is important for Māori custom and shows the sanctity of the pou tuarongo. It is apt that the deceased lay at the pou known for being deprived of all things sensory because this is in effect what happens to the deceased.

However, during tangihanga, the concentration of all sensory things occurs as the congregation reaches the tūpāpaku (body of the deceased) to mourn. The pou tuarongo ends up being the focus of tears, wailing, uncontrollable sobbing, and sometimes haehae kiri, which is the customary practice of tearing at the physical body to communicate emotional and spiritual pain and, thus, the pou tuarongo and its inhabitants can often be overwhelmed physically, emotionally, and spiritually. This pou in the whare is clearly the one associated with spirituality given its place in the tangihanga rites and the practice of tohunga.

The pou tuarongo of a house is the last pou to feel or see any happenings on the marae or in the whare tūpuna because it is in the back of the house. It is, however, integral in maintaining the structural integrity of the building. There is some research to say that the pou tuarongo of the house is also where tohunga would convene to commune with the other realm, *kia rongo i ngā reo o tua*, which translates to, *to listen to the voices from beyond*. Tohunga would reside at the pou tuarongo of the house to recite karakia, takutaku (incantation), and tap into the spiritual realm, as well as interpret the current environment. This was an incredibly spiritual process and often required the quiet space for contemplation and reflection, which made the back of the house the perfect spot, as it wasn't frequented by the wider community (Whatahoro, 2013).

It is also important to recognise the word *rongo* as related to all things peaceful. The process of hohou te rongo, or making peace, can also take place at the back wall of the whare tūpuna as a show of good faith and the intent to seek resolution.

Traditionally, marriage and birth rituals were also conducted at the back of the whare tūpuna. A takapau wharanui (woven mat, traditionally for marital or funeral rites) was prepared for the couple to encourage the conception of a child.

He tamaiti [child] i aitia ki runga ki te takapau wharanui

A child conceived on the marriage bed

(Mead and Grove, 2001, p. 119)

The takapau wharanui are now more frequently used during marriage ceremonies and to lie under the coffin of the tūpāpaku during tangihanga (McRae-Tarei, 2013).

Brainstem

As identified on previous page, the pou tuarongo relates to critical areas and practices related to death and life. Direct relationships can be found with the Brainstem. These include:

Critical functions being organised:

- regulation of arousal, sleep, and fear;
- survival e.g., swallowing, breathing, blood pressure, heart rate, and sleep-wake cycle regulation;
- conduit functions (passing information up and down the brain and body);
- cranial nerves which are responsible for sensory or motor functions; and,
- detection of threats and activation of an alarm response (fight-or-flight).

Primary developmental goals:

- state regulation;
- primary attachment; and,
- flexible stress response resilience.

Primary needs:

- whanaungatanga/emotional engagement
- safe and healthy environment; and,
- rhythmic and patterned sensory input (auditory, tactile, motor) and aroha (attuned) responsive caregiving.

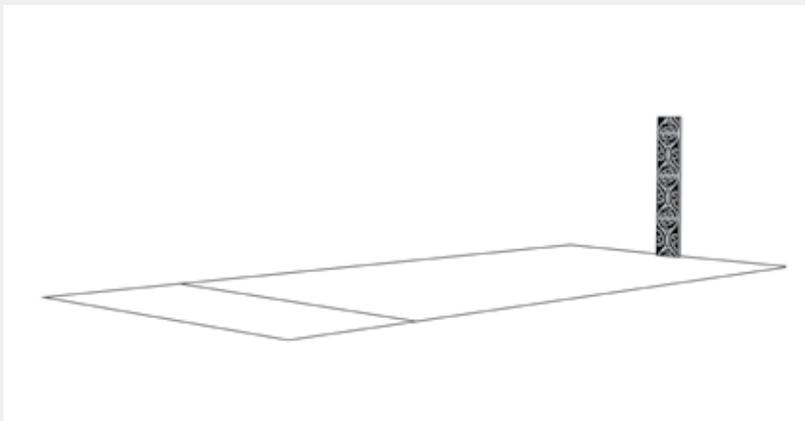
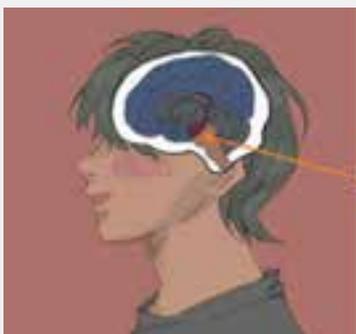


Figure 9: Pou tuarongo



Brain Stem

Figure 10: Brainstem (art work by Ruahine Harmer)



Figure 11: Poutuarongo (close-up) (artwork: Adrian Campbell)

Pou tāhū and the diencephalon and cerebellum



Pou tāhū

The pou tāhū, sometimes known as the pou te wharau (front wall post in an ancestral house), is made from a halved tree trunk, resides at the front of the house, and bears the foremost weight of the tāhuhu, the ridgepole of the meeting house. This pou is responsible for providing structural integrity to the front part of the house, as well as propping up the front inner wall of the ancestral house (Heaton, 2022). The front of the whare is often associated with the future and is often where pōwhiri (welcoming rituals) are completed.

The pou tāhū is often referred to as Tāne's post (Neich, 2011), or te pou tāhū ā Tāne (the ridgepole belonging to Tāne), representing Tāne Mahuta and his role in the separation of Ranginui and Papatūānuku (Paama-Pengelly, 2010).

Na Tane i toko, ka mawehe Rangi raua ko Papa; nana i tauwehea ai, ka heuea te Po, ka heuea te Ao.

Tane propped them apart, Rangi and Papa were separated; it was he who made the separation, so that Night and Day were set apart.

(Grey, 1953 as cited in Salmond, 1978, p. 24)

Within Māori cosmology, this separation is referred to as creating light and space in the world. Tāne is credited as making himself a toko (hoist up) by placing his head and shoulders on Papatūānuku and thrusting Ranginui upwards. Hence, the pou tāhū is seen as a physical pou, representing strength and bringing knowledge into the world (Best, 1924).

Tāne, referred to as the god of the forests, was also known by many other names, often following a new adventure or accomplishment, such as the name Tāne te waiora (deity of wellspring; Tāne as light and life giver) and Tāne te wānanga (deity of cognitive thought; Tāne as source of knowledge) (Best, 1923). As discussed earlier, he was the progenitor of the female element, Hine-ahu-one, who later became known as Hine-nui-te-pō. He is also recognised as climbing to the heavens to receive the three baskets of knowledge for humankind (Tāne-nui-a-Rangi).

It is worth mentioning that the term tāhū (basis, subject, direct line of ancestry) can also refer to the senior-most line of whakapapa in a family, therefore, it is apt that this pou is at the front of the inside of the front wall of the whare tupuna. The pou tāhū is often carved in the image of a notable ancestor, someone who may have been of great reputation or well accomplished in their life. By doing this, the community, to whom the whare belongs, are able to retain the historical narratives of this ancestor that are depicted in the carvings. In traditional architecture, the pou tāhū would sometimes be built slightly taller than the pou tuarongo. There would often be a fire lit at the middle of the whare, therefore, having the front of the whare taller than the rear of the whare meant that smoke of the fire could rise towards the front and escape the whare at the front end (Whatahoro, 2013).

Diencephalon and cerebellum

As identified on the previous page, the pou tāhū has been connected through pūrākau with attributes associated with Tāne, including strength, coordination and whakapapa. Direct relationships can be found with the Diencephalon and Cerebellum. These include:

Critical functions being organised:

- integration of multiple sensory inputs and fine motor control;

- movement, coordination (physical messages around the body and brain), and survival responses (in response to the brainstem);
- visceral (automatic) responses and regulation of body temperature;
- relaying information (via the thalamus and hypothalamus, sub-structures of the diencephalon);
- organisation of the threat response via the HPA axis to increase heart rate, blood pressure, and muscle tone;
- motor function, cognition, and initial emotional responses; and,
- cerebellum roles in arousal, vestibular function, autonomic functions, and sensorimotor integration.

Primary developmental goals:

- sensory integration;
- motor control;
- relational flexibility; and,
- attunement.

Primary needs:

- Tino Rangatiratanga/movement
- more complex rhythmic movement; and,
- simple narrative emotional and physical warmth .

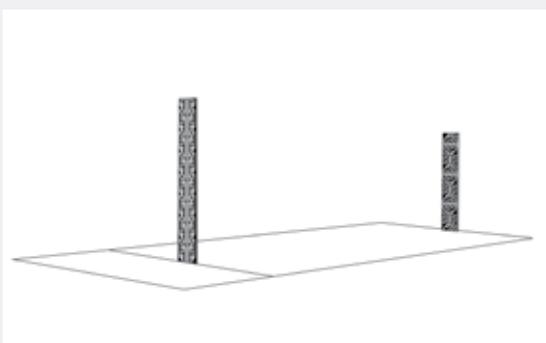


Figure 12: Pou tāhū (artwork: Adrian Campbell)

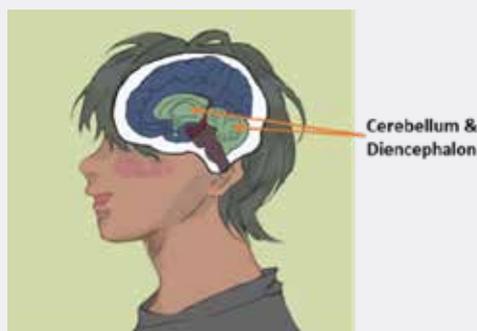


Figure13: Cerebellum and diencephalon (artwork: Ruahine Harmer)



Figure 14: Pou tāhū (close-up) (artwork: Adrian Campbell)

Pou tokomanawa and the limbic system



Pou tokomanawa

This is not a traditional weight-bearing pou involved in the raising of the tāhuhu (as discussed earlier). It is a mid-point supporting pou (Treadwell, 2017). The pou tokomanawa is often referred to as the heart of the whare, in a sense representing the seat of emotions. It has also been referred to as the umbilical cord and the heartbeat of the whare tūpuna (Prendergast, 2012). 'The pou tokomanawa represents the heart of the tūpuna. Manawa translates to heart; therefore, it is the centre beam of the whare' (Hanara, 2020, p. 75).

This pou is also associated with the atua Rongo, through the fireplace at the base of the central post of traditional houses. This is also where kūmara were cooked as part of peace-making rituals (Smith, 2019). However, as discussed earlier, emotions were also traditionally referenced to the puku or lower organs around the ate. This centre is noted to be important for memory, emotions, and processing māramatanga integrating into mōhiotanga.

If we look at the meaning of the word *pou*, we see that it means the post that supports the heart of the whare. *Pou* meaning *post*; *toko* meaning *to prop up*; and, *manawa* meaning *heart, centre, or internal support post* (Te Taura Whiri i Te Reo Māori, 2004). In a literal sense, we know that without this pou the whare would likely collapse in on itself due to the lack of internal support to maintain the weight of the building.

This perspective provides context for the metaphorical application of the term *pou tokomanawa*. This term is often afforded to a person integral to a family or social grouping, without whom the social unit would function or exist. In a whare, there is typically a carved figure located at the pou tokomanawa. This figure usually represents an ancestral figure who is considered the common ancestor of the entire community connected to the whare. Whare are not viewed as personal possessions; instead, they are seen as members of a community, dedicated to the collective well-being, including the proper functioning and operations of the whare.

The limbic system

As identified on the previous page, the poutokomanawa is referenced within te ao Māori as representative of not only emotions, but also relationships. Direct connections can be made with the Limbic System.

Critical functions being organised:

- emotional states, social language, interpretation of nonverbal information;
- attachment and emotion regulation, motivations (e.g., to avoid pain, approach rewards), learning, emotional responses, physiological drives (hunger, thirst), and memory;
- memory and emotional responses involve the amygdala.

Primary developmental goal:

- emotional regulation, empathy, affiliation, tolerance.

Primary needs:

- whanaungatanga/emotional engagement
- social connections and experiences;
- narrative;
- validation; and,
- complex movement .

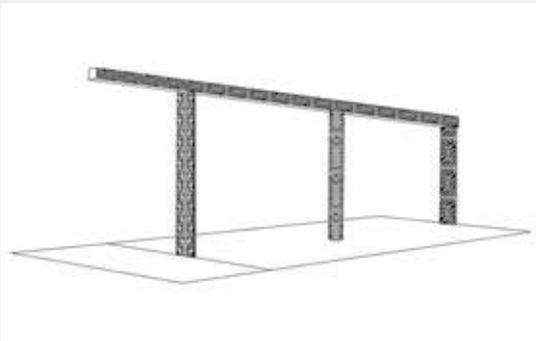


Figure 15: Pou tokomanawa (artwork: Adrian Campbell)

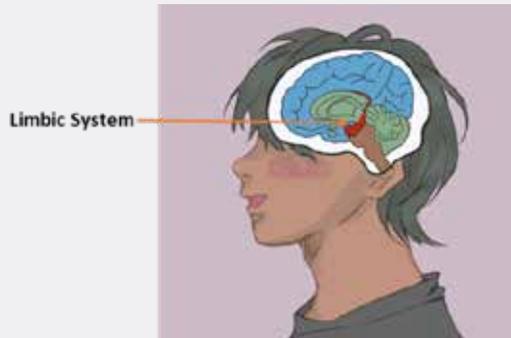


Figure 16: Limbic system (artwork: Ruahine Harmer)



Figure 17: Pou tokomanawa (close-up) (artwork: Adrian Campbell)

Pou kaiāwhā and the cerebral cortex



Pou kaiāwhā

The pou kaiāwhā, also known as the pou waho, stands at the very front of the meeting house, external of its walls, and hold up the front end of the tāhuhu and, in turn, the veranda of the house. Not to be confused with the pou mataaho found on the exterior of the front wall of the whare.

Pou kaiāwhā, literally ‘the post that consumes the storms’ (Te Taura Whiri i Te Reo Māori, 2004), a good description of the role of this pou. This pou, situated outside the ancestral house, is vulnerable to threats from Tāwhirimātea and the external world. There are distinct differences between the interior of a whare and the exterior. Cultural tradition dictates that the interior of a whare is for peaceful discussion and deliberation, while the exterior of a whare, the veranda, and the forecourt are for matters that are still being discussed.

The connection of the function of pou are noticeable, as the pou kaiāwhā and sometimes the tekoteko (sentry post on top of an ancestral house) and koruru are skilfully crafted to represent ancestors who were known for their strength, significant contributions to tribal lineage, and their role as champions of the marae’s mana motuhake (absolute sovereignty/self-determination). The koruru on top, front of the whare is referred to as the face, but at the same time is the protector of the whole house (Hata, 2019).

The pou kaiāwhā is therefore often also referred to when speaking of a leader, manager, or good decision maker.

E ai ki te Poukaiāwhā o te whare

They are the leader of the whare

Various viewpoints regarding the role and importance of the pou kaiāwhā are evident in the diverse perspectives held within the marae community. When the home speaker addresses guests, they may look towards the whare for inspiration for their speech. Depicted in the carvings are important historical narratives that connect the home people and the visitors. It is important recognise and pay respect to stories that connect home people and visitors. It is also important to acknowledge the eponymous ancestor and founding progenitors as this helps the home people to assert their rightful presence on the land where they live. The pou kaiāwhā, pou mataaho (foremost post), tekoteko, koruru, and other carvings are positioned at the front exterior of the whare to speak to those on the marae forecourt. These pou in particular are the first of the ancestors to greet any visitors and they are on alert and active at all times, day and night. They have a great responsibility and this is noted when deciding which ancestors are chosen to be depicted in these carvings. They would be ancestors worthy of the task.

Cerebral cortex

As identified on the previous page, the pou kaiāwhā is referenced within te ao Māori to decision making, leadership and facing the challenges posed by the outside world. Direct relationships can be found with the frontal cortex. These include:

Critical functions being organised:

- abstract cognitive functions, socioemotional integration;
- speaking, thinking processing information, abstract cognition and complex language; and,
- executive functions (planning, working memory, insight, foresight, and personality).

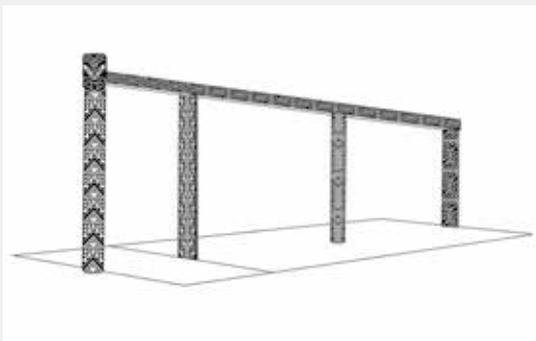


Figure 18: Pou kaiāwhā (artwork: Adrian Campbell)

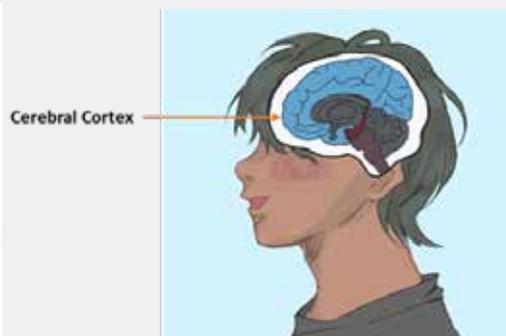


Figure 19: Cerebral cortex (artwork: Ruahine Harmer)



Figure 20: Pou kaiāwhā (close-up) (artwork: Adrian Campbell)

Primary developmental goal:

- abstract reasoning, creativity, respect, moral, and spiritual foundations.

Primary needs:

- ako/learning
- complex conversation; and,
- social interactions and exploratory play.

Whare tūpuna and the roro

Despite discussion of the brain in its parts and the whare tūpuna according to its pou, both must be considered as a whole, as they were designed. As described above, the brain is an integrated system in itself and, with the spinal cord, it also functions to transfer messages to and from the outside world (Sporns, 2010). This is also true of the whare tūpuna. The pou, tāhuhu, tūpuna whakairo, and tukutuku panels are all part of the tinana of the tūpuna, which is part of the marae in relation to other buildings, such as the wharekai.

Tāhuhu and the central nervous system

Tāhuhu

The tāhuhu is the central support beam of the whare tūpuna, representing the spine of the ancestor (Ellis, 2016). This is also replete with representations of ancestors and decorated with patterns that reflect whakapapa.

The heke come off the tāhuhu and join the walls of the whare tūpuna. These heke are rafters decorated with kōwhaiwhai and span from the tāhuhu to sit on the tops of pou on the walls that represent more recent ancestors (Ellis, 2016). The point where the heke rest on grooves in the wall slabs is termed *ruawhetū*, and continues the whakapapa line from Ranginui along the tāhuhu down the heke and into each ancestor, which is firmly embedded into Papatūānuku. This exemplifies the mind–body connection of the whare tūpuna, and the deep connection between Ranginui (the roof of the whare tūpuna) and Papatūānuku (the floor of the whare tūpuna).

The tāhuhu of a house is the central ridge pole that spans the length of the whare tūpuna. Because the ancestral house is considered a representation of the body of an ancestor, the tāhuhu is often considered the spinal column of the ancestor, with the *heke* coming down either side considered the ribcage (Ellis, 2016). The tāhuhu also represents the main whakapapa line of the ancestor, from the head of the founding

ancestor at the front of the whare tūpuna, with lines of descent represented along the length of the spine with patterns that reflect hapū values and whakapapa.

In the traditional sense, the tāhuhu is considered the place where all of the wānanga and kōrero that has taken place inside a whare is stored and, traditionally in wānanga settings, participants sit with their backs against the wall, *hei whakakōrero i ngā pou o te whare* (to be a voice for the carved pou depicting ancestors that stand around the house). (Prendergast, 2012). It is said that the knowledge is sent from the tāhuhu, down the heke, through the pou, and into the participants of the wānanga. This is only one method of Māori transmission of knowledge, but it places a huge importance on the role of the tāhuhu of a whare tūpuna as the main repository for narratives.

This role of the tāhuhu is found within a statement often shared at the end of a wānanga in a whare tūpuna in the evening, and now beginning to be used at the end of hui and wānanga in different locations.

E Rongo whakairihia nga korero ki te tāhuhu o tō tatau whare, whiti whano haere mai te toki haumie hui e taiki e

Calling to rongo (the atua responsible for the inside of the whare tūpuna) to suspend our korero to the rafters of the house.

It is also important to note that the word tāhuhu has subsequently been used to describe the main points of a thought, concept, or philosophy, as well as a direct line of ancestry, which makes sense given the physical attributes of the pou tāhuhu of the whare tūpuna.

The concept of the binding components of the tāhuhu is also reflected in weaving communities, where there is a method of weaving called *aho tāhuhu*, which is the very first weft woven in a piece and lays the foundation for the subsequent weaves, essentially holding the piece of weaving together.

Within Te Whare o Oro, the vagus nerve runs parallel

to the tāhuhu, which is akin to the spine. It extends from the dorsal vagal circuit; is responsible for freeze, shutdown, and retreat; and, is located at the pou tuarongo, all the way to the pou kaiāwhā positioned in the mahau of the whare tūpuna. This journey reflects the ventral vagal complex, symbolising safety and connection through relationships.

The heke are the pathways through which messages from the tāhuhu are carried to the ruawhetū, which are the decorative carvings on the pou pou lining the walls of the whare tūpuna. This two-way communication mirrors the body's role and internal systems as rongo or senses. They send signals or tohu to the pou kaiāwhā and pou tāhu for action. Additionally, they embody memories, including both moments of success and trauma, observed by the pou kaiāwahā and experienced by the pou tokomanawa.

The central nervous system

As identified above, the tāhuhu holds a special place within te ao Māori as a repository of knowledge, and also a core aspect of relaying information from the outside world to the inside of the whare. Direct relationships can be found with Central Nervous System and the vagus nerve. These include:

Critical functions being organised:

- structures the vagus nerve running alongside the spine from the brain to the stomach; and,
- interoception and neuroception, awareness of, awareness of internal and external signs of threat and safety.

Primary developmental goal:

- the integration of mind, body, and senses.

Primary need:

- reflection of physical and spiritual experiences (connecting body and mind).

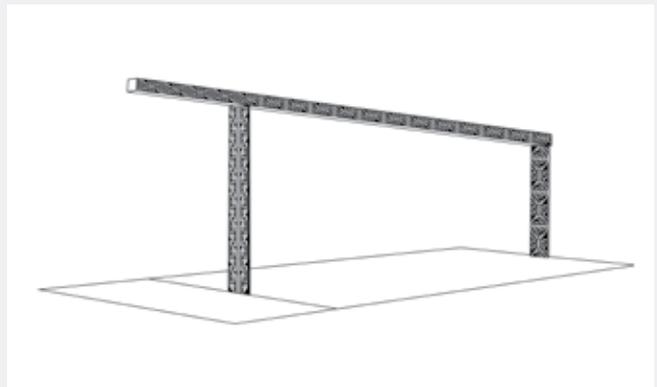


Figure 22: Tāhuhu (artwork: Adrian Campbell)

Ngā Pou Kokonga

Te Whare Tapa Whā, represented by its four corner pou within Te Whare o Oro, guides whānau, educators, and policymakers to take into account the culturally-aligned developmental needs of each child. These needs encompass each aspect of Te Whare Tapa Whā: taha hinengaro (mental and emotional well-being), taha tinana (physical well-being), taha whānau (family and social well-being), and taha wairua (spiritual well-being). This focus guides the assessment of strengths and challenges in each area, and the planning needed to ensure access to opportunities that all children need.

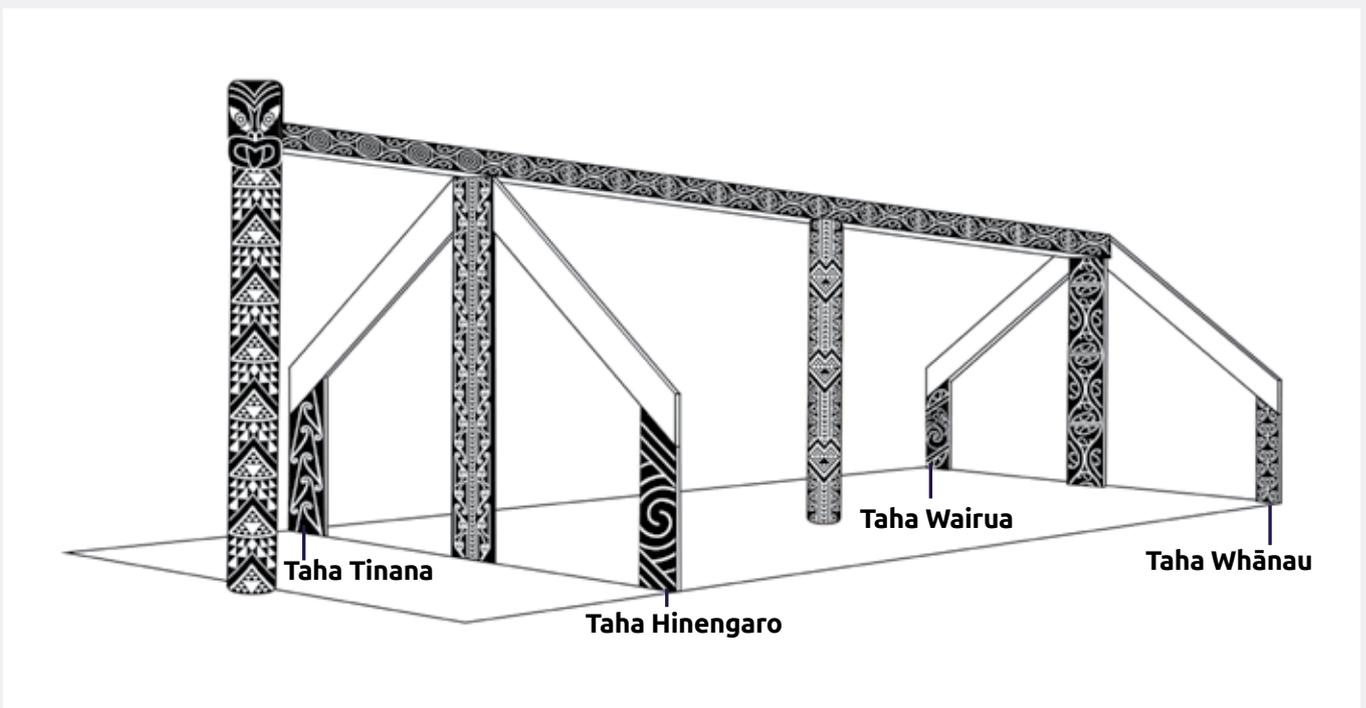
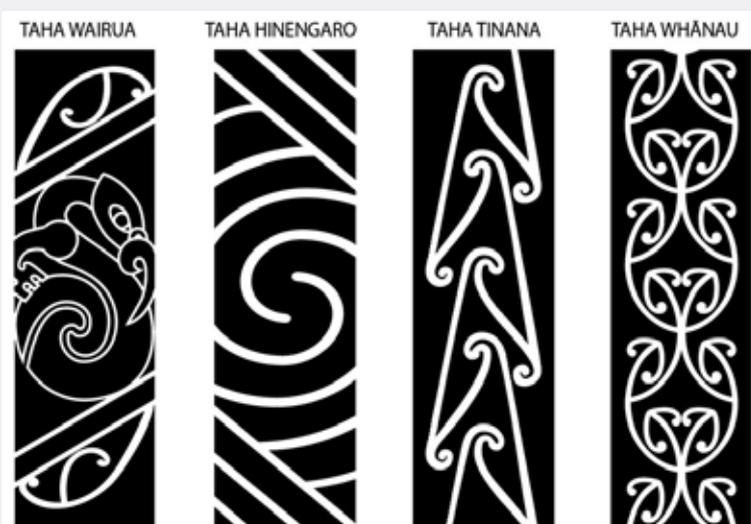


Figure 21a: The pathway and connections (artwork: Adrian Campbell)



21b: Te Whare Tapa Whā pou (artwork: Adrian Campbell)

The heke of the whare tūpuna, which tension against the pakitara and tāhuhu, provide the pathway which connects the roro to the body of the whare tūpuna

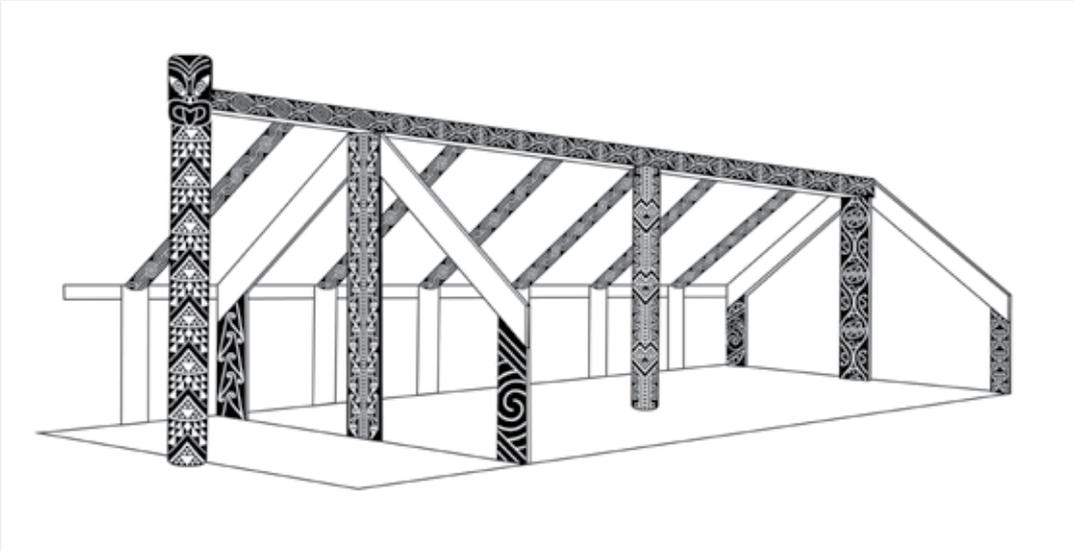


Figure 24: Whakapapa and mauri of the whare tūpuna (artwork: Adrian Campbell)

Neuroplasticity and pruning refer to the brain’s ability to change and adapt according to experience, and the need for repetition to strengthen these pathways has been likened to the metaphor of creating a trail through a ngahere (forest, bush). These neurons and neural pathways are represented by the rhythmic and repetitive patterns of tukutuku panels on the walls, whose role is to tell stories and portray the attributes of the ancestors in the poupou beside them. These patterns can also be seen running along the tāhuhu, running down the heke, and joining the poupou on the walls. This represents the interconnected nature of whakapapa and the mauri of the whare tūpuna.

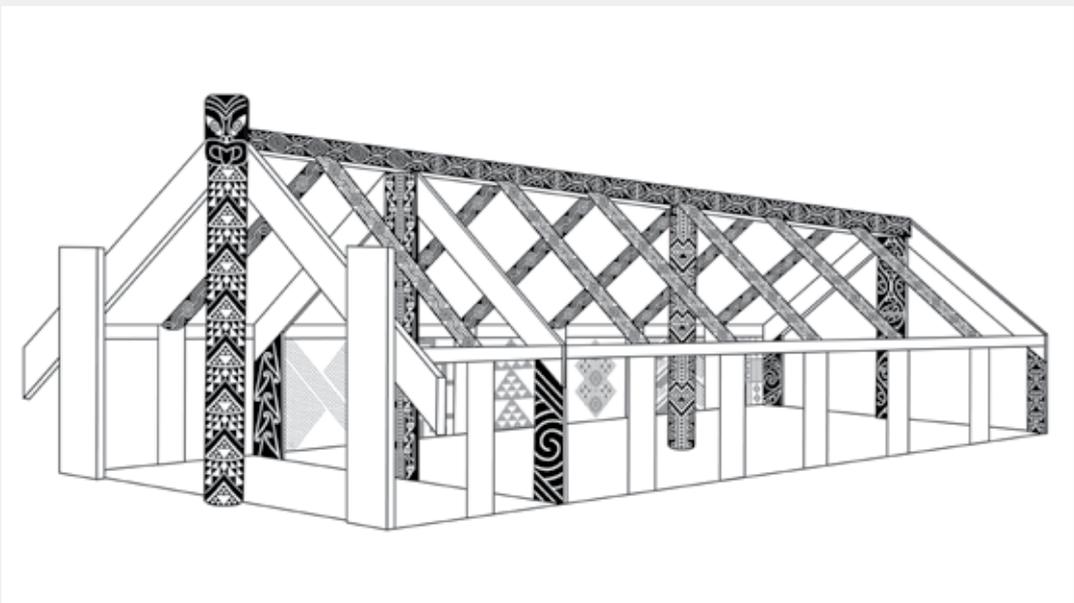


Figure 25: Visual depiction of Te Whare o Oro (artwork: Adrian Campbell)

Lessons of the whare tūpuna: Te Whare o Oro and neurodevelopment

Te Whare o Oro has laid a foundation for mātauranga Māori as a lens to view neurodevelopment and trauma in children through the metaphor of the whare tūpuna. The reader brings their own level of mātauranga Māori to add to the understanding needed to provide meaningful supports to work alongside whānau. These lessons offered reflect a te ao Māori perspective to understand whānau needs, identify strengths, and create mana-enhancing pathways to healing.

These lessons take you on a journey, starting with the whenua, where we explore its design and significance. The whenua serves as both the taiao for the development of the kukune inside the womb (whare tangata, also referred to as the kōpū) and the nurturing environment for the growth of the tamaiti on the land. Moving forward, we delve into the concept of a pā tūwatawata (fortified settlement) illustrating the various roles within a marae and emphasising the importance of providing additional support and safety for tamariki kanorau ā-roro. The final series of lessons focus on the whare tūpuna: entering and engaging within this ancestral house, known as the realm of Rongo. These lessons shed light on the diverse needs of tamariki kanorau ā-roro and how we can acknowledge, comprehend, and respond to their needs in a mana-enhancing manner.

1. Tiaki te whenua³ : Creating a nourishing environment

Ka wera hoki i te ahi, e mana ana anō.

While the fire burns [ahi kā], the mana is effective.

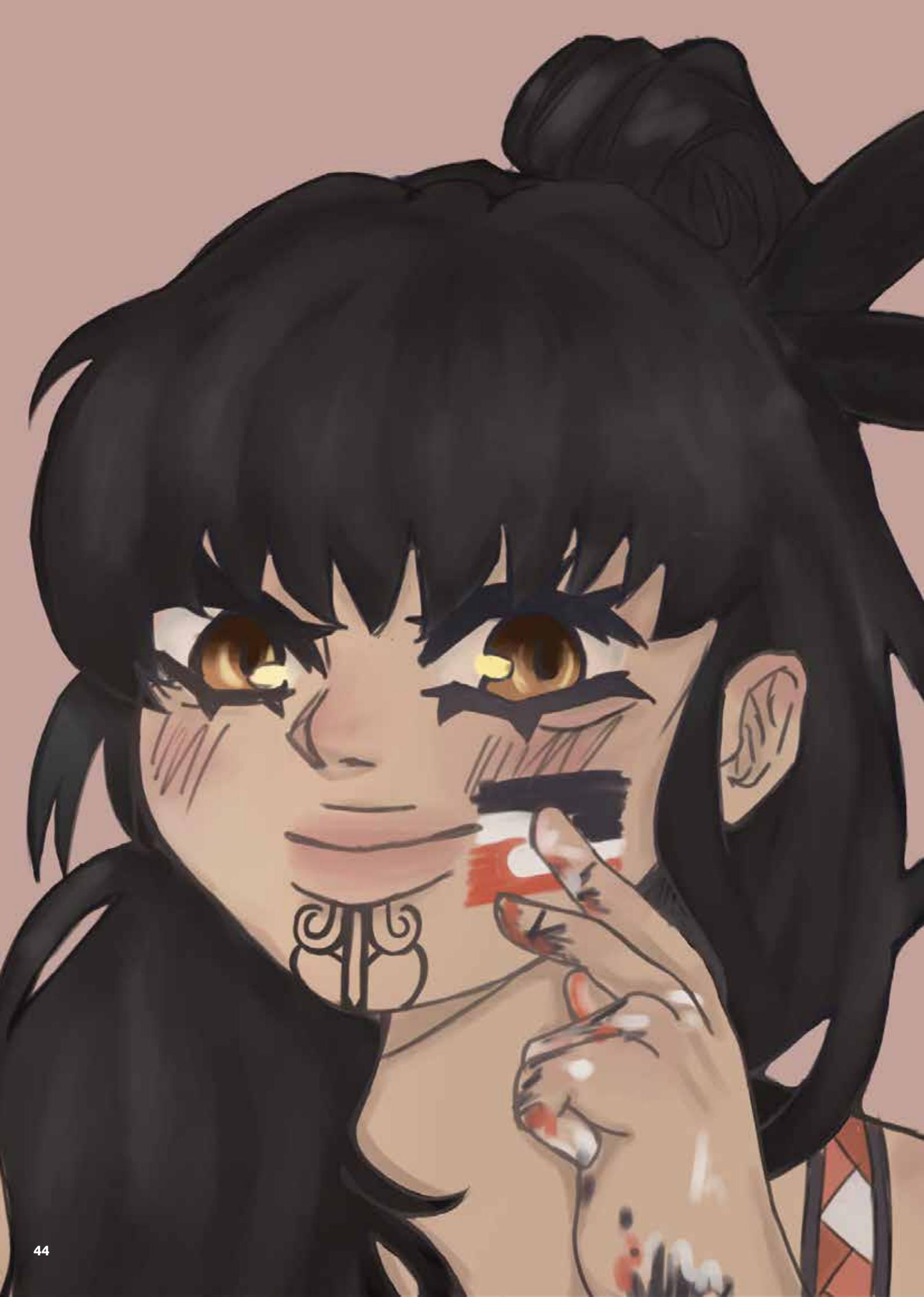
(Williams, 1908, cited in Mead & Grove, 2001, p. 197)

When building a whare tūpuna or creating a marae, the whenua is selected for its connection with whakapapa kōrero and pūrākau, which is why we often call it tūpuna whenua. It provides access to sources of kai and other resources, shelter from weather, and ability to identify and stay safe from threats.

Our tūpuna whenua acts as an anchor of our whakapapa to our tūpuna and connections to each other. The whenua itself is one of our teachers about life, values, and behaviour. It has been noted to be an 'encyclopaedia of mnemonic devices' for mātauranga Māori (Smith, 2000, p. 55). The whenua, or placenta, is also the primary taiao for the kukune. It is important that this environment is safe from harm and provided with optimal aroha (love, affection) and nourishment.

This kōrero provides us with the lessons to address the impact of stress, assault, alcohol, and other drug use upon the mother and womb. The kōrero also acknowledges the importance of paying attention to the need to connect our tamariki kanorau ā-roro with sources of mauri, and to those who operate within a mātauranga Māori, whenua, and taiao worldview.

3. Stewardship over the land



2. Pā tūwatawata: Establishing a safe and responsive environment

He whare maihi tū ki roto ki te pā tūwatawata, he tohu nō te rangatira; he whare maihi tū ki te wā ki te paenga, he kai nā te ahi. (Tūrei, 1913, as cited in Mead & Grove, 2001, p. 137)

A solitary house will succumb to fire. A house in the stockaded pā is the sign of a chief.

A pā tūwatawata or a marae has a collective function and focus to ensure safety, well-being, and flourishing growth. A whare tūpuna is one whare within the pā. For it to fulfil its role and to meet its full potential, the other whare must also be valued, operate well, and communication between them must be clear and consistent.

Due to the challenges our tamariki kanorau-ā-roto face, including stress and stigma, they will benefit from being enclosed in a tūwatawata, especially with putānga (sentry post of a fortified settlement). The lesson is that we need to ensure that, across our whānau and whānau hāpori (community), we have a tūwatawata, in the form of clear and consistent boundaries and putānga in the form of allies and people who can support monitoring the safety of our tamariki. Our tamariki also need guidance to fulfil their roles within whānau and whānau hāpori. This can include our key people or putānga having appropriate and responsive expectations of our tamariki kanorau-ā-roto. These people, knowing the strengths and vulnerabilities of our tamariki, know how and when to step in and support or guide interactions. Every tamariki kanorau-ā-roto has a place in our whānau hāpori.

Ko Tū a waho, ko Rongo a roto

Tū outside, Rongo inside

(Metge, 1976, as cited in Mead & Grove, 2001, p. 266)

The marae ātea is often referred to as the domain of Tūmatauenga (god of human activities, war, and cultivation), whereas the inside of the whare tūpuna is referred to as the realm of Rongo. When a child is at the pou kaiāwhā at the front of the whare, they face the domain of Tūmatauenga. Tāwhirimātea, the god of the weather, is also often close by to stir up and provoke the space. Even though the child is situated in an optimal space for receiving new information, the knowledge acquired in this setting is exposed to the elements and is at risk of not being retained. To ensure its preservation, this process should occur within the whare, specifically in the ngākau, where it can be firmly grounded.

An important lesson is to understand the role of adults in reducing external pressures and stressors so tamariki can understand to their best ability, thus allowing them to shine. This could include taking note of times when a tamaiti is doing well or struggling and potential contributors of each (e.g., time of day, hunger, tiredness, type of activity, or context). From these observations and learnings, we can adapt expectations, tasks, and routines so we support our tamariki to flourish.

As described earlier, the brain is separated into two lobes. The left side is associated with language and the right is associated with visual perception and other tasks such as creativity. In relation to the whare tūpuna, tamaiti struggle enough to comprehend their world, their own whare, let alone ours. In the context of the whare model, they are at times manuhiri (visitors) who traditionally enter a whare on the right side, who struggle to understand the directions and subtle signs of the mana whenua (sovereignty over land), home people, who traditionally stand on the left-hand side.

The learning from this example is that we, as adults, have an opportunity to be an elder and to guide interactions, rather than assume that tamaiti know or remember from last time. Our role is to guide them so the interactions are safe and meaningful, as this will lay a foundation for learning.

Ka tō he rā ka rere he rā

When a sun sets another rises

(Mead & Grove, 2003, p.190)

The positioning of the whare tūpuna itself within the pā tūwatawata or marae, facing the east towards Hawaiki (the original home of the Māori) and the rising sun, is a lesson for the well-being of the whānau, caregivers, practitioners, and teachers. Every day is a new day, a chance to start again. After major events, as parents, whānau, carers, and educators, we must refresh and look to a new day. We must help our tamaiti feel the sun through encouragement, not be hiding at the back of the whare tūpuna in survival mode, due to constant punishment.

Mataihi tuku ki raro, he whare auahi; mataihi tū noa, rakorako noa a raro.

A house with its front end set low is a smoky house; a house that stands boldly forth is exposed.

(Williams, 1908, as cited in Mead & Grove, 2001, p. 284)

Adults, whether they are parents, caregivers, teachers, or practitioners, have their tried-and-true ways of parenting and teaching. This may have worked for all of the other tamaiti they have brought up or taught in the past. Many of the other adults in their life will also encourage these practices. However, caring for tamariki kanorau ā-roro requires adjusting expectations and practices. In other words, your role is to find the compromise that suits your family best. It is for us to adapt how we approach, understand, and support our tamaiti—a shift in the way we teach and parent.

3. Entering the whare tūpuna, the realm of Rongo – identifying and responding to strengths and challenges

Ka whakairohia ki te whare o te mahara

It is carved into the house of the mind

(Royal, 1992, p. 105)

The whakapapa, achievements, values, and grief of the hapū are often carved into the poupou that line the walls of the whare tūpuna. These events are further elaborated upon and supported by the tukutuku panels that stand on either side of them. Memories are stored within the ngākau of the whare tūpuna, and we can think of them being carved into the mind as the poupou within Te Whare o Oro. Experiences and memories shape the attributes, aspirations, achievements, and trauma responses of the child. This whakaaro is well established within te ao Māori as noted above—Ka whakairohia ki te whare o te mahara (Royal, 1992, p. 105).

When we view trauma as toxic, whether it's related to prenatal alcohol exposure or stress, deprivation, or violence experienced by a pregnant mother or child during their developmental stages, it's crucial to recognise that, like the whare tūpuna, the entire body and brain form a holistic and interdependent structure. Trauma can affect children in ways which may not be obvious, however, through assessment, observation, and care we can begin to address physical, emotional, spiritual, and familial signs of trauma.

A child might experience day-to-day difficulties in areas like coordination, balance, or basic life skills. These challenges may indicate issues or damage in fundamental brain regions such as the brainstem, diencephalon, and cerebellum. While we may initially focus on building their confidence and well-being, it is essential to recognise that they may require more comprehensive support.

Within the whare tūpuna, they may be situated at one end that is structurally less stable and may need additional support and attention. We can also assess how they are managing these challenges by discussing them at the pou tokomanawa.

A key takeaway from this is the necessity to gain a complete understanding of the strengths and challenges of our tamariki kanorau ā-roto. This entails conducting a comprehensive assessment involving a multidisciplinary team of professionals, including speech-language therapists, occupational therapists, psychologists, and pediatricians.

Ko Rongo, ko Haumia he mea huna

Both Rongo and Haumia are hidden

(Best, 1977, as cited in Mead & Grove, 2001, p. 244)

This saying refers to the children of Papatūānuku who turned inwards to the protection of their mother. The inside of the whare tūpuna is recognised as the realm of Rongo. It is important that when engaging in the realm of Rongo, that we understand where our tamariki kanorau ā-roto are in their whare. When we are physically inside a whare tūpuna it is impossible to be in two places at once. We cannot be seated at the back, leaning against the pou tuarongo, while at the same time be on the mahau, standing at the base of the pou kaiāwhā. Likewise, if a child who has experienced trauma is in fight-or-flight mode and their brainstem (survival brain) is dominating, we cannot expect them to engage in logical conversation, let alone retain information. When seeking to understand a child's behaviour we must ask ourselves, 'Where in the whare tūpuna are they now?' This question is about considering whether the tamaiti is overwhelmed and uncertain or open and engaged. As adults, we must also ask this of ourselves. Are we meeting the tamaiti where they are, or are we operating from a logical space in the mahau, not accepting or validating their fear, confusion, or uncertainty?

It is also important to consider that the child may have limited energy to engage in higher-level learning. A tamaiti may only have a brief period of their day where everything is working well together, they are sitting in the mahau (covered veranda) by the pou kaiāwhā, and they are in a space to learn new information. The role of educators is to consider such factors.

Tamariki are often given information while the parent or educator is standing at the pou kaiāwhā. However, when overwhelmed or frightened, a child will often run to the back of the whare tūpuna, to the pou tuarongo, for quiet, darkness, and safety. We must allow this as a form of recuperation and join them after a period of time, rather than yelling demands, directions, and threats of consequences from the other end of the whare tūpuna. If the adult comes into the whare, they are entering the realm of Rongo and behaviour must consciously reflect the values of Rongo such as nurturing tapu and mana. Self-reflective questions could start with: Have we prepared ourselves? What are we bringing with us?

Nā Tāne i toko, ka mawhe a Rangi raua ko Papa, nāna I tauwehea ai, ka heuea te Pō, ka heuea te Ao.

By the pushing of Tāne, Rangi and Papa were thrust apart, by him they were separated, and the darkness and light were disengaged.

(Grey, 1971, as cited in Mead & Grove, 2001, p. 315)

Pūrākau of the separation of Rangi and Papa often refer to their children seeing a hīnātore (enlightenment) or a glimmer of light in the distance that spurred them to seek space to flourish. This led to the awareness that there was something outside of the confining embrace of Rangi and Papa. For tamariki to whakatau, to settle, in response to being distressed, they also require a tohu hīnātore (sign of light or safety), which Polyvagal Theory refers to as glimmers, those processes and practices that signal safety and whanaungatanga for our tamariki kanorau ā-roro.

As said earlier, a tamaiti cannot operate from two separate locations. If a child is operating from their brainstem, seeking safety in the dark embrace of the pou tuarongo, our role is to facilitate a process that allows them to settle their kare ā-roto (internal feelings, emotions). Once they feel secure, they are more likely to move towards the pou kaiāwhā, to bask in the warmth of Tamanuiterā (sun deity), and be open to new information.

Furthermore, the journey to the pou kaiāwhā from the pou tuarongo will likely involve engagement at the second foundational and structural pou, the pou tāhū. This requires engaging in activities that stimulate movement and soothing such as waiata, oriori, games, or simply a walk. Engaging at the pou tokomanawa require activities that validate and express emotion, such as waiata, awhiawhi (hugging, to embrace), or oriori.

Te amorangi ki mua, te hāpai ō ki muri. (Grey, 1857, as cited in Mead & Grove, 2001, p. 366)

The importance of all the background functions and supports being in place for the front to operate.

The late Wiremu Tāwhai, a kaumātua and lecturer at Te Whare Wānanga o Awanuiārangi, addressed this specific whakataukī. He noted that this whakataukī often referred to travelling groups. The first part of the whakataukī refers to an amorangi. *Amo* means to carry, often on the shoulders, and *rangi* (sky, heavens, day) represents the sky or heavens. The amorangi represents the roles that were deemed precious or important, such as a tohunga or rangatira at the front. Whereas the second part of the whakataukī, *te hāpai ō ki muri*, refers to being carried or supported, referring to the important roles and processes in place to ensure a journey is provisioned and sustained. Wiremu Tāwhai noted “those who follow behind are as important as those who go ahead in the lead” (Jenkins & Murphy, 2012, p. 6).

There are other variations of this whakataukī, including 'Waiho tonu anō te amorangi ki mua, ko te amokoko ki muri!' (Te Karere, 1944, as cited in Mead & Grove, 2001, p. 420) and 'Ko te amorangi ki mua, ko te hāpai ō ki muri'. The focus is often more on the role of the amorangi as a spiritual element. 'In general terms it counsels not to neglect the spiritual side of life' (Mead & Grove, 2003, p. 250).

The lessons of this whakataukī for Te Whare o Oro are threefold. First, the foundational elements of the brain reflected in the pou that uphold the tāhuhu, pou tuarongo (brainstem), pou tāhū (cerebellum and diencephalon), and pou tokomanawa (limbic system) are as important for functioning as the more known pou kaiāwhā (cerebral cortex). Second, as a whare tūpuna is part of a marae, other areas of the marae are equally important for well-being. For example, the kitchen on the marae needs to operate as effectively as the paepae. This highlights the importance of other people in the lives of our tamariki who support the well-being and aspirations of the tamaiti. Finally, when reflecting upon and discussing neurodevelopment, te taha wairua, the spiritual realm, must be included as a key element of well-being.

Adapting Te Whare o Oro for specific neurodivergence and trauma

Along with neural pathways represented in the tukutuku panels, the heke of the whare are important components for imparting messages from the tāhuhu to the other structural components of the whare (body). The four corners representing Te Whare Tapa Whā are also connected to the tāhuhu by the heke, so this shows how the heke can be seen connecting the central nervous system with broader concepts of well-being and support.

The concept of the heke were used in a project to represent a Māori neuro/trauma-informed approach to care for tamaiti and their whānau affected by Fetal Alcohol Spectrum Disorder (FASD) (Chu et al., 2023). Two acronyms were developed, each with six heke (see Table 1). The first acronym 'pūtahi' (to join or meet) presented six system-oriented factors for teachers/practitioners supporting tamaiti and whānau affected by FASD. The second, 'pāheke' (to mature, grow up, become adult) presented six factors designed to guide whānau raising a tamaiti who experiences FASD.

The heke were developed from the lessons of the whare tūpuna presented above and turned into anagrams to enhance knowledge retention among whānau and practitioners. These are briefly presented below as examples of ways to utilise Te Whare o Oro to its full extent in addressing various neurodevelopmental concerns.

Ngā heke pūtahi (to join or meet):		Ngā heke pāhake (to mature, grow up, become adult).	
Six factors for supporting tamaiti and whānau affected by FASD.		Six factors for raising a tamaiti with FASD.	
P	<p>Pūtake (purpose): Understanding the source of the issue</p> <ul style="list-style-type: none"> Action is informed by identifying the individual strengths and challenges of the tamaiti, and the strengths and challenges of the whānau, their supports, and available services. FASD diagnoses require a multidisciplinary team and physical and neurodevelopmental assessment. 	P	<p>Poutama (ladder pattern in traditional Māori art): Creating a pathway to knowledge</p> <ul style="list-style-type: none"> Break tasks down step-by-step to set up for success. Reduce environmental demands (stimulation, change). Create routines for predictability and safety. Ensure safety through increased monitoring.
Ū	<p>Ūkaipō (home, homeland): The source of sustenance</p> <ul style="list-style-type: none"> Understand that the source of love and support for the tamaiti sits within the whānau and their support systems. Focus on strengthening the whānau to better understand and respond to the needs of the tamaiti. 	Ā	<p>Āta whakarongo (listen carefully and with intent): Learning and observing with all of our senses</p> <ul style="list-style-type: none"> Develop an understanding of FASD, and how our tamariki are affected by FASD. Understand a tamaiti may be at other stages of development than others their age (physically, socially, emotionally, sexually). Ensure expectations, monitoring, and support are appropriate for the current development. Bring people you trust into a whānau of support. Assist them to learn about FASD and your tamaiti.
T	<p>Tipu tonu ake: Continued growth and development</p> <ul style="list-style-type: none"> Take a lifelong focus on development. Intervene early to reduce secondary impacts. Build systems and environments of care, focusing on key transition points (school, secondary school, employment, and adulthood). 	H	<p>Huritao (reflection): Creating the ability to reflect on and learn social and emotion regulation skills</p> <ul style="list-style-type: none"> Help tamariki see, feel, and experience different social and emotional skills. Reflect what you see, help them learn and normalise emotions: 'You must feel...', 'Because...', 'That makes sense due to...' Give direction and praise success. Options and choices are, at times, overwhelming. Reflect on why something may be happening based on the tamaiti abilities, situation, and impact on their decision making and emotions. Let the small stuff go. Help the tamaiti know, plan for, and where necessary avoid or better manage known challenges or triggers for distress. Create a plan.

Ngā heke pūtahi (to join or meet):		Ngā heke pāhake (to mature, grow up, become adult).	
Six factors for supporting tamaiti and whānau affected by FASD.		Six factors for raising a tamaiti with FASD.	
A	<p>Aronga (focus): A focused approach to learning and understanding</p> <ul style="list-style-type: none"> • Develop a considered understanding of FASD and how it impacts tamaiti. • Understand family's needs and experiences in relation to FASD. • Can't not won't. • Understand the different implications and experiences of birth parents, whānau caregivers, and foster caregivers. • Punishment and reward systems are not as effective; tamariki learn differently. 	A	<p>Aroha: Caring for ourselves and our whānau</p> <ul style="list-style-type: none"> • Consider the needs, safety, and care for self (parent); couples; and other tamariki (acknowledge the role of siblings including combatants, protectors, and helpers). • Access respite care. Make it something to look forward to for everyone. • Strengthen whānau routines for well-being, fun, and tasks. • Try 'shifting gears' and doing things differently.
H	<p>Hononga (connection): Developing strong and clear relationships across systems of care</p> <ul style="list-style-type: none"> • Collaborative and integrated practice across professional (practitioners and educators) and whānau system. • Clear and effective communication. • All on the same page. • Reduce system barriers (criteria). 	K	<p>Kaiwhakatere (navigator): Being a navigator</p> <ul style="list-style-type: none"> • Learn about what services are available and what their criteria are. • Talk with FASD-informed whānau and practitioners about navigating these systems. • Seek support in advocating for your tamaiti and whānau needs.
I	<p>Ihi (essential force): Accessing the transformative nature of ihi held within Te Ao Māori</p> <ul style="list-style-type: none"> • A focus on supporting tamariki development through Te Ao Māori. • Access activities and knowledge that strengthens identity and connection. • Enhance physical development through mahi-a-toi (art, artistry). 	E	<p>Ea (fulfil, satisfaction): Creating a sense of achievement and satisfaction</p> <ul style="list-style-type: none"> • Allow tamariki to feel achievement, success and accomplishment. • Support them to do what they do well and enjoy. This is mutually rewarding. • Join in.

Table 1. 12: Heke guiding systemic and tamaiti-centred FASD practice

He kupu whakakapi: Summary

In this manual, mātauranga Māori has laid the foundation for understanding the roro. This started with acknowledgement of the role of oral traditions in passing on knowledge through waiata, pūrākau, whakataukī, raranga, and whakairo. These oral traditions highlighted the importance of whakapapa. The whakapapa of the brain was related to several atua through the creation story of Tāne and Hineahu-one. Likewise, the whare tūpuna was taken back to the beginning of whare whakairo with Tangaroa and Rua-te-pupuke. These atua, along with others such as Tāwhirimātea, can be seen within and around the whare tūpuna. The role of the whare tūpuna in cultural revitalisation of mātauranga Māori is evident in its history.

The authors acknowledge that the roro and tāhuhu are traditionally represented in the whare tūpuna as the brain and spinal column; however, the four pou of the whare tūpuna are not traditionally associated with the brain. The authors utilised oral traditions to apply the existing knowledge about whare tūpuna to the Neurosequential Model to guide our thinking and connection to Māori ways of viewing the world.

Understanding the role of mātauranga Māori and the associated oral traditions in imparting values, beliefs, and expectations, allows us to look to the knowledge associated with stories about the whare tūpuna and its metaphorical representation of a human body in how we view the brain. The application of these values, beliefs, and expectations is guided by other concepts such as tapu, noa, and mana. This prompts us to reflect on our behaviour and intentions in responding to a tamaiti who may have experienced trauma and require healing and adaptation of teaching and carer approaches. McCaleb and Mikaere-Wallis (2005), and to some extent Hanara (2020), have extended upon the work of Perry et al (1995) and identified important roles associated with a neurosequential approach to neurodevelopment and functioning.

Alongside the four pou of Te Whare o Oro that represent the Neurosequential Model of the brain, there are three additional components to the model. These are: the tāhuhu and the central nervous system, the four corner posts representing Te Whare Tapa Whā; the tukutuku panels representing neural communication; and the 12 heke (rafters, ribs) (see Table 1) representing individual interventions and systemic interventions to adapt education, caring, and practice to strengthen the whare to uphold the roro and tāhuhu, the CNS of the whare tūpuna.

Within an assessment and planning approach, the Te Whare Tapa Whā component of Te Whare o Oro ensures reflection on the standard expectations of healthy development for the child at the time of assessment, considering their taha whānau, taha wairua, taha tinana and taha hinengaro. Heke can be designed that bring the concepts of Te Whare o Oro and Te Whare Tapa Whā together into a comprehensive tamaiti centred, whānau responsive model of well-being and development, tailored for the needs, and strengths of the tamaiti, their whānau and community.

Further development and research

Further work is required to bring Te Whare o Oro Model in line with deeper understandings of mātauranga Māori, the Neurosequential Model of Therapeutics (Perry & Hambrick, 2008), and Polyvagal Theory approaches (Porges, 2009, 2022). As previously mentioned, both the NMT and Polyvagal approaches are not one-size-fits-all methods; they are adapted based on a tamaiti's developmental stage and potential trauma history. This adaptation guides the selection of strategies that target the necessary developmental milestones for healthy neurodevelopment. These strategies are further influenced by the identification and development of traditional Māori approaches to address various themes and functional roles within the Neurosequential Model. These include wairua rangimarie (safety), tino rangatiratanga (movement), whanaungatanga (emotional engagement), and ako (learning), as described earlier (McCaleb & Mikaere-Wallis, 2005).

Furthermore, we also need to identify and resource *tohu hīnātore*, also referred to in Polyvagal Theory as glimmers. From a *te ao Māori* perspective, this can facilitate passive and active approaches to *whakatau* (settle) the emotions of the tamaiti so that their body is not in a stress-induced reactive state. As educators, we are encouraged to reflect upon and apply activities from a *te ao Māori* that *whakatau* (while also acknowledging) the emotions that tamariki are experiencing. By connecting tamariki and ourselves to *te ao Māori* concepts and knowledge, we not only foster an understanding of *ngā kare ā-roto* but also establish a connection with the *mauri* of those in our midst. Simultaneously, this approach strengthens a child's Māori identity and their relationships with *whānau*.

With a foundation of *mōhiotanga* and actions guided by *aroha*, *manaaki* (the principal of caring), *mana*, and *tiaki* (to take care of), and enriched by the available *māramatanga* within Te Whare o Oro, we can assume the role of *putānga* within the *pā tūwatawata* (the marae of mothers, families, and communities). In this role, we concentrate on fortifying the four *taha* (dimensions) of the lives of tamariki *kanorau ā-roto* to foster *hauora Māori* (Māori well-being). Our aim is to empower tamariki to craft their own narratives, accomplishments, and connections throughout their lives, contributing to the construction of a *whare tūpuna* that will shape the lives of future generations.

He kuputaka: Glossary

Use of tohutō (macrons): the introduction of macrons over some Māori vowels, has (1) clarified definitions and (2) made it easier to pronounce Māori words (i.e., knowing where to place the emphasis as you are saying the words). When we quote sources from earlier periods where macrons have not been used, we have not included the macron to remain true to the original text. In the glossary, we have included both versions of the word (with and without macrons).

āheinga	functions or competencies
aho tāhuhu	the first weft in a pattern of weaving
ahua	shape, appearance, condition
ake	the direction above or forward
ako	learn/teach
ākonga	student
amo	bargeboard support on an ancestral house
aroha	love, affection/attuned
aronga	focus
āta whakarongo	listen carefully and with intent
ate	organs/region of our kidneys and liver
atua	deity, supreme beings
awhiawhi	hugging, to embrace
ea	fulfil, satisfaction
haehae kiri	the custom of tearing at ones skin in grief
hapū	subtribe
harakeke	a type of flax native to Aotearoa New Zealand
hauora	wellness, health
Hawaiki	the original home of the Māori
hei whakakōrero i ngā pou o te whare	to be a voice for the carved pou depicting ancestors that stand around the house
heke	rafters
hīnātore	enlightenment
Hine-ahu-one	the first human woman in Māori history, made from clay
Hine-nui-te-pō	guardian of the deceased
hononga	connection
Hui-te-ana-nui	an underwater fortified village
huritao	reflection
ihi	essential force
iho	from above/ downwards
Io	supreme deity in Māori history

io	nerves/the nervous system
ira atua	all deities
ira tangata	humankind
iwi	tribe/s
kaiako	teacher
kaitiakitanga	protection and nurturing
kaiwhakatere	navigator
kanorau	diverse
kanorau ā-io	emotional diversity
kanorau ā-roro	child experiencing neurodivergence
karakia	incantation
karanga	call
kare ā-roto	internal feelings, emotions
kaupapa	needs, topic, context
kauwae raro	the lower jaw – all things terrestrial
kauwae runga	the upper jaw – all things celestial
kīwaha	saying, idiom said to express affection towards a person
koha	offering, contribution
kōhanga reo	language nest
kōpū	womb, pregnancy
kōrero	speak, narrative
koruru	carved face on the gable of an ancestral house
kōwhaiwhai	painted patterns to ornament an ancestral house
kukune	foetus, embryo
kūmara	yam, sweet potato
kupu whakarite	metaphors and similes
Kurawaka	the original home of humankind
mā	a memory or recollection
mahau	covered veranda
mahi-a-toi	art, artistry
maihi	front bargeboards of an ancestral house
mana	prestige
mana motuhake	absolute sovereignty, self-determination
mana whenua	sovereignty over land
manaaki	the principal of caring
manawa	heart, centre
manuhiri	visitors

Māori	Indigenous people of Aotearoa New Zealand
marae	complex of buildings and courtyard belonging to hapū
marae ātea	courtyard
māramatanga	enlightenment, clarity
matangaro	that which is unseen, but is felt
mātau	knowledge, knowing, intelligence, embodied knowledge
mātauranga	knowledge
Mātauranga Māori	Māori knowledge systems, Māori knowledge
mate hinengaro	mental illness
mate wareware	dementia
mātua	parents
māuiui hinengaro	mentally ill
mauri	life force
me	a hollow in the skull of the foetus, the intersection of the transmission of sacred knowledge
moemoeā	dream, dreamscape, aspirations
mōhiotanga	knowing, knowledge and methods of knowing
mokopuna	grandchild/ren
mōteatea	traditional Māori rhythmic chant
ngā atua	deity, supreme beings
ngahere	forest, bush
ngākau	heart, emotions belonging to the heart
Ngāti Porou	tribe on the East Coast of Aotearoa New Zealand
noa	unconsecrated
noho puku	reflective, sit still, reflect
nui	big, large
Ōrākaiapu pā	Ōrākaiapu pā was a fortified village on the East Coast of Aotearoa New Zealand
oriori	a chant composed for and sung to infants
oro	sounds, vibrations
pā tūwatawata	fortified settlement
pāhake	to mature, to grow up, or to become adult
pakitara	slide wall/s of a house
pakiwaitara	stories and narratives
papa	ground
Papatūānuku	Mother Earth
pare	the doorframe of an ancestral house

pēpi	baby, child
poho	chest
pou	post, pole, pillar
pou kaiāwhā	post at the front of an ancestral house
pou kokonga	corner post of an ancestral house
pou pakoko	effigy
pou tāhū	front wall post in an ancestral house
pou te wharau	front wall post in an ancestral house
pou tokomanawa	centre post in an ancestral house
pou tuarongo	back wall post in an ancestral house
pou whakairo	carved post
pou whakarae	foremost post
pou whirinaki	a pillar of support
pouako	teacher, source of knowledge
poumataaho	foremost post
poupou	post, carved slab
poutama	ladder pattern in traditional Māori art
poutiriao	spiritual guardians that take the form of posts
pōwhiri	welcoming ritual
pū	related to vital functions, precision, and connection to the body
puku	gut, stomach, entrails, centre
pūmotomoto	fontanelle
pūrākau	story, narrative
pūtahi	confluence, intersection, meet, join
pūtake	purpose
putānga	sentry post of a fortified settlement
rākau	tree, wood
rangatira	chief, chiefly
rangi	sky, heavens, day
rangimarie	peace/peaceful
Ranginui (short form: Rangi)	Sky Father
raparapa	carved ends of a barge post
raranga	weave, weaving
reretahi	coordination, harmony

Ringatū	a faith movement started by Te Kooti Arikirangi
rō	inside, internal
Rō Ake	one of the twin deities of the brain
Rō Iho	one of the twin deities of the brain
Rongo	god of peace
Rongo-mā-Tāne	god of peace and cultivated food
Rongomai-taha-rangi	deity responsible for hearing and listening
Rongomai-tahanui	deity responsible for hearing and listening
roro	brain
rua kai	food pit, food holes, apertures
Rua-i-te-kōrero	personified thought, the postulation of spoken word
Rua-i-te-mahara	power of thinking and memory, the postulation of thought
Rua-i-te-whaihanga	of building or constructing, the postulation of creation
Rua-te-pupuke	the origin of carving wood
ruawhetū	<i>(refer to me page 56)</i>
taha	side, element
taha hinengaro	mental and emotional well-being
taha tinana	physical well-being
taha wairua	spiritual well-being
taha whānau	family and social well-being
tāhū	basis, subject, direct line of ancestry
tāhuhu	ridgepole of an ancestral house, spinal column
taiao	environment
Tainui waka	canoe
takapau wharanui	woven mat, traditionally for marital or funeral rites
take pū	values
takutaku	incantation
tamaiti	child
Tamanuiterā	sun deity
tamariki	children
Tāne	deity of humankind
Tāne Mahuta	deity of the forest
Tāne te waiora	deity of wellspring
Tāne te wānanga	deity of cognitive thought
Tāne-nui-a-Rangi	deity of ascension
Tangaroa	deity of the oceans
tāngata	people, humans

tangata whenua	Indigenous people of Aotearoa New Zealand, literally: people of the land
tangihanga	funeral rites
tapu	consecrated
tātai whakapapa	genealogical lines, genealogical table
tau	settled
tauparapara	incantations
tauwhenua	cables
Tāwhaki	deity of knowledge seeking
Tāwhirimātea	deity of the winds
Te Āheinga Pū Reretahi	a Māori health model of Indigenous understanding the brain
te ao Māori	the Māori world
Te Hau ki Tūranga	carved ancestral house from the Ōrākaiaipu pā
te pou tāhū ā Tāne	the ridgepole belonging to Tāne
te pou whakapirau	the post reserved for the deceased
Te Whānau-a-Rua	the family of cognitive beings
Te Whare o Oro	a Māori model of neurodevelopment based on whare tūpuna
Te Whare Tapa Whā	a Māori model of health and well-being
teina	younger relation in the same generation
tekoteko	sentry post on top of an ancestral house
tiaki	to take care of
tiaki te whenua	stewardship over the land
tikanga	protocol and process
tinana	body
tino rangatiratanga	sovereignty
tohu hīnātore	sign of light or safety
tohunga	an expert
tohunga whakairo	master carver
toko	hoist up
tua	beyond
tuakana	older relation in the same generation
tuānuī	roof, ceiling
tuāpapa	foundation
tūhonohono	connection, connecting
tukutuku	traditional Māori latticework
Tūmataunga	deity of war and the courtyard of marae
tūpāpaku	body of the deceased
tūpuna	ancestors

tūpuna whakairo	ancestral carving
tūpuna whenua	ancestral land
tūwatawata	fortified settlement
ūkaipō	home, homeland
upoko	head
utu	reciprocity, balance
waiata	song, sing
wairoro	another Māori term for the brain
wairua	soul, spirit, spiritual, spirituality
wairua rangimarie	safety
waka	vessel for transport
wānanga	method of learning and exchanging knowledge
whaikōrero	speech making
whakaaro	think, thoughts
whakairo	carve, carving
whakanoa	to make safe
whakapapa	genealogy, relationships to all things
whakapapa kōrero	genealogical narratives
whakatau	settle
whakataukī	proverbial sayings
whakatinana	to embody
whānau	family, to be born
whānau hāpori	community
whanaungatanga	relationships
whare	body
whare rangatira	chiefly house
whare tangata	womb
whare tūpuna	ancestral meeting house
whare whakairo	carved house
wharekai	dining hall and kitchen
wharenuī	large house
wharepuni	sleeping house
whenua	land, placenta
whetū	stars

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