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Fata ho poto: Tongan science learners and engagement, enjoyment and success in secondary school and university settings

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Engagement and success are prominent in education discussions, research and policy in Aotearoa New Zealand and globally. Yet, little is known about how successful Tongan science learners define engagement, enjoyment or success, and which teaching and learning experiences have enhanced or detracted from their engagement, enjoyment and success during their studies. This article shares the stories of 26 successful Tongan science learners who participated in *talanoa* (open discussion without an agenda) about their engagement, enjoyment and success in secondary and university science education in Aotearoa, and, for some, their schooling in Tonga. The Manulua framework (Fonua, 2021) informed how their stories were gathered, analysed and woven together. The article presents the *Fata ho poto* model to demonstrate how engagement, enjoyment and success are considered by successful Tongan science learners. This model is useful for those increasing Tongan and Moana/Pacific learning achievement. It offers important insights related to the role of education policy and practice in shaping notions of engagement, enjoyment and success among Tongan and Moana/Pacific learners.

Keywords: Moana/Pacific, Tonga, science, engagement, enjoyment, success, *poto*

Introduction

I am *Pāpālangi* (*lea faka Tonga* / Tongan language for "of European ancestry"). I identify as a non-Indigenous Pacific person and was born and raised in Aotearoa New Zealand. I am married to a Tongan man, *fa'e* (mother) to my Tongan children and live with my extended Tongan family. My ontology and epistemology have been strongly shaped by my upbringing, the culture that I have been exposed to living in Aotearoa New Zealand, and, more recently, the contemporary expressions of Tongan culture demonstrated by my Tongan family, who maintain close ties to the Kingdom of Tonga. My understanding of Tongan culture and ways of being have been guided immeasurably by my Tongan family. I have always discussed my research with my husband, who then in turn discusses it with his parents, who then often engage with their family and community; to recognise and value their support and contribution, my husband and his parents are all named authors on this article.

This study explores the experiences of Tongan learners, who are often categorised as Moana/Pacific learners. The term "Moana/Pacific" is used in this article to represent learners with ancestry to the Indigenous people of the different island nations of the Pacific Ocean (mention of "Pasifika" is only where it is used in government reports and publications by other scholars). In relation to Tongan and Moana/Pacific learners, I position myself as an "external-insider" (Banks, 1998), someone who is not

from a community but has socialised within it and been adopted into it, while rejecting much of the values and beliefs of their own original community. As such, I am responsible for learning about, sharing and respecting what I do not know, and learning, sharing and respecting what I do know. As a fa'e, my life is dedicated to my children. I *lalanga* (weave) my learning and understanding in the contexts I find myself in to demonstrate how different ways of being can come together and strengthen each other (Fonua, 2020). This is how I can contribute to the transformation of educational settings (Fa'avae, 2019) so that my children, and other Moana/Pacific peoples, are able to be themselves during their educational journeys. My positioning informs who I am in relation to my research rationale, termed my "positional methodology" (Fa'aea & Fonua, 2021). As such, I chose my methodology to reflect both who the participants are and who I am.

Numerous academics have argued that the inclusion and acknowledgement of Tongan values, knowledge and identity will improve Tongan students' experiences in Aotearoa New Zealand. As a Pāpālangi science educator, I am particularly interested in Manu'atu's (2000) suggestion that incorporating Tongan concepts such as *mālie* and *māfana* in the teaching of science could transform the staid atmosphere of the general science classroom to one that energises Tongan students to learn. Mālie is something done well, a form of positive feedback, or recognition of skill, and māfana is a process of becoming impassioned, emotionally moved. Manu'atu (2000) argues that, together, these two concepts are transformative, allowing the possible to occur out of the impossible. She suggests that, by finding ways to reposition Tongan ideas and practices, Tongan students' engagement increases (Manu'atu, 2000). Manu'atu also suggests that it is worth paying attention to how learning contexts can be enriched by acknowledging and incorporating such Tongan concepts as mālie and māfana, especially to consider how to combat the seriousness of content.

I suggest that the terms engagement, enjoyment and success, which are all prominently used in education discussions, research and policy, are all aspects of māfana. Therefore, to be able to transform science education so "learning takes place and prospers" ('Otunuku, 2010, p. 27), it is necessary to understand how Tongan science learners define these concepts. This article will share findings from research on successful Tongan science learners' definitions of engagement, enjoyment and success. These learners were considered successful as they had received passing marks in at least two stage 1 tertiary (or first-year bachelor's level) study courses; most of the participants had successfully completed at least two years of university-level study focused on science subjects. Before those findings are shared, engagement, enjoyment and success are described, and the importance of understanding each of these terms with respect to Moana/Pacific students and science is explained.

Engagement

Engagement has been a topic of research for the last few decades and is an increasing focus within educational and government strategies, as it has been shown to improve academic outcomes (Leach & Zepke, 2011, p. 193). Definitions of engagement usually focus on individual factors, such as the amount of time and effort a student applies to a task (for example, Chapman, 2003). However, as understandings of engagement are informed by different perspectives, it is often not categorically defined. Adding to this complexity, research to date has demonstrated that engagement is a "meta" construct, since the way engagement occurs depends upon the interaction of multiple aspects (Fredericks et al., 2004).

A comprehensive synthesis of research on engagement by Kahu (2013) identified four (overlapping) approaches to defining engagement:

> The Behavioural perspective, which focuses on effective teaching practice; the Psychological perspective, which views engagement as an internal individual process; the Socio-cultural perspective, which considers the critical role of socio-cultural context; and finally a Holistic perspective, which strives to draw the strands together. (p. 758)

A key strength of Kahu's (2013) framework is that it recognises that the multiple perspectives informing engagement can affect each other and can be addressed to improve student engagement. Kahu's framework acknowledges the unique individual experience and emphasises the need to study specific student populations to avoid broad generalisation, hence this research's focus on Tongan science learners. It is reasonable to argue that the better the understanding of engagement and its influencers for Tongan students, the more prepared educators will be to meet Tongan student needs, improve their educational outcomes, and enhance their teaching and learning experience.

Enjoyment

Enjoyment is an aspect of psychological or emotional engagement (Fredericks et al., 2004). Emotional aspects of learning are often overlooked in favour of more obvious signs of behavioural and cognitive engagement, such as participation and grades (Kahu, 2013). However, emotional reactions to a task play a key role in learning, as they indicate the student's intrinsic response and can be a crucial motivator for engagement (Kahu, 2013). Emotional reactions are also linked to achievement and success. "Enjoyment" is often considered "interest", and it has been previously noted that some researchers use the terms interchangeably (Fredericks et al., 2004; Osborne et al., 2003).

To define and measure enjoyment and interest, the Organisation for Economic Co-operation and Development (OECD) Programme for International Student Assessment (PISA) 2006 survey of students in Aotearoa New Zealand used words such as "like", "have fun", "interest", "happy" and "enjoy" to capture learners'/students' emotional reactions to a task or activity (Coll et al., 2010). The results from this survey indicate that 71% of Aotearoa New Zealand's students surveyed enjoy acquiring scientific knowledge, and 65% agreed that they had an interest in learning about science. This result may be related to the types of teaching and learning used, with 71% reporting experiencing interactive teaching approaches in their classroom, and the use of field trips and competitions (Coll et al., 2010). Hope (2009) suggests that specific active pedagogical approaches, such as fieldwork, can enhance links between emotional responses, such as enjoyment and deep learning, ultimately developing essential skills, such as critical thinking. Both of these research findings emphasise the importance of active learning for enjoyment, particularly regarding the teaching and learning methods used in science education.

The 2010/2011 Trends in International Mathematics and Science Study *(*TIMSS*)* data indicated that the year 9 Aotearoa New Zealand students surveyed had a lower value and enjoyment of science in comparison to other countries (Caygill et al., 2013), while the 2014/2015 survey indicated only 36% of year 9 students agreed that they enjoyed learning science "a lot" (Caygill et al., 2016). Although this study focuses on year 9 students, it is reasonable to expect that these results have the potential to impact on the number of students continuing to study science in senior secondary school and tertiary. Furthermore, it is important to ask what is happening around enjoyment for students from different ethnic groups to determine if they experience it in the same way(s). Thus, this research has focused on understanding how Moana/Pacific students, in particular Tongan students, who have had continued success with science consider enjoyment with respect to science and what interests them. Based on my experience teaching science to Moana/Pacific students, I was keen to identify the positives that have influenced their enjoyment and engagement, and subsequent success and achievement. Understanding these aspects

could assist teachers of science, including myself, to adopt pedagogical approaches that will improve the learning experience and achievement of all of students, including Moana/Pacific.

Success

"Success" is another very complex concept widely used in educational literature without a clear definition, perhaps because it is relative to the context and strongly tied to other key aspects of learning, such as engagement. The scope of its interpretation is broad and it is often measured by the factors understood to contribute to it, such as "hard outcomes" (retention and completion) or "soft outcomes" (engagement, achievement of personal goals) (Zepke et al., 2011). Regardless, most definitions and research on success focus on institutional factors, including teaching and learning approach and institutional processes. For example, student success in Aotearoa New Zealand's secondary schools is strongly related to numeracy and literacy skills and the ability to apply them (Education Review Office, 2010). Success in secondary schooling influences achievement (and access) to tertiary education (Statistics New Zealand & Ministry of Pacific Island Affairs, 2010). There is often limited focus on non-institutional factors, including family, cultural and personal influences, which heavily influence success, especially for specific ethnic groups such as Pasifika (Zepke et al., 2011). For example, although success can be related to confidence and self-belief, Pasifika students are often not confident in their ability and "attribute success or failure more to luck, peers or family than their own ability and effort" (Statistics New Zealand & Ministry of Pacific Island Affairs, 2010, p. 11).

Methodology

The Manulua framework (Fonua, 2021) collects multiple theoretical frameworks together to recognise and allow for different ways of examining ontology, ways of being, epistemology, ways of knowing, and axiology, ways of valuing. It consists of four different theoretical-conceptual perspectives woven into a cohesive framework informed by Epeli Hau'ofa's seminal 1993 essay "Our Sea of Islands", and the articles of support and critique found in *A New Oceania* (Waddell et al., 1993) to locate Oceania as the context, connector and source. The four wings of the two birds denoted in the *manulua* (two birds) symbol represent Oceania as Environment (critical realism); Engaging Oceanic Ways (relationality through *vā*), (an explanation of the concept of vā follows); Valuing Oceanic Knowledge (the multiscience framework); and Charting Oceanic Currents (Tongan and Moana/Pacific methodologies).

Positional methodology (Fa'aea & Fonua, 2021) informed my methodological choice, the Manulua framework. This, in turn, informed what questions were asked and how I asked them. As a Pāpālangi science educator exploring the understanding of successful Tongan science learners, it was important to ensure I used approaches that were appropriate to answer the research questions, that value the research, and that justify the involvement of the research participants: relationality through vā and *talanoa (*open discussion without an agenda). Vā is a concept found across the Pacific, including in Tonga. Vā can be variably understood as the space where relationships or interactions occur; it is never empty, and requires the two entities involved to care for it (Ka'ili, 2005; Māhina, 2004). Four theoretical-conceptual perspectives made sense for research focused on Tongan student experiences: relationality through vā (the relational space between two entities) and Tongan methodologies drew on Moana/Pacific knowledge systems, and critical realism and the multiscience framework both critique Western science.

Participant selection and data collection

Individual semi-structured interviews were conducted with 26 (16 female, 10 male) successful Tongan students who shared their narrative accounts of specific experiences of their science education in Aotearoa New Zealand and the Kingdom of Tonga. The participants all self-identified as Tongan ethnicity, had successfully passed at least two stage 1 tertiary (or first-year bachelor's level) study courses, and were either current students or recent graduates (in the last three years). Interviews were conducted in English, but participants were encouraged to use Tongan words or phrases if they wished.

Ethical approval was given for this research by the institution. Each participant gave informed consent before the research took place and was offered the right to withdraw at any stage. All participants were able to review the transcript of their interview and indicate parts that were never to be shared.

Science subject definition

In this context, science as a subject was defined as a focus on courses in biology, chemistry, and/or physics, and their various alternatives, for example, physiology. Biology, chemistry and physics were chosen because they are the traditional secondary school science subjects, thus creating a link between the secondary and university science programs. This allowed for a comparison to be made regarding factors such as teaching and learning methods and approaches in these particular subjects.

Defining the two groups

For the data analysis and dissemination, the participants' narratives were arranged into two groups: Kingdom of Tonga educated (KOTE) and Aotearoa New Zealand educated (ANZE). All of the KOTE participants (N = 12) were educated in Tonga during their primary schooling (defined in this research as the first six years of education) and then migrated to Aotearoa New Zealand sometime during their secondary school education (form 3 to form 7) or to start university. All ANZE participants (N = 14) completed all their primary and secondary schooling in Aotearoa New Zealand before beginning university. The distinction was made to acknowledge the potential for the different educational and cultural contexts to impact on the students' educational experiences, as well as the diversity in the Tongan population within Aotearoa New Zealand.

Data collection and analysis

This research used semi-structured interviews, heavily influenced by talanoa, in a form most akin to Vaioleti's (2011) *talanoa faka'eke'eke*. *Eke* implies asking a question, allowing a participant of the talanoa to drive the questioning to uncover particular knowledge. Data was thematically analysed using a retroductive approach, which encourages a tautological process that continuously switches back and forth between the consideration of the data and theory to find meaning (Ragin & Amoroso, 2011). Retroduction considers structures and mechanisms that are not observed in the empirical domain to ask, "what qualities must exist for something to be possible?" (Danermark et al., 2002, p. 80). The absence of fixed criteria limits the ability of retroduction to test its validity in a definitive way. However, the ability for abstraction rather than logical reasoning means retroduction can offer a broader consideration (Danermark et al., 2002).

Findings and discussion

This section presents the participants' definitions of engagement, enjoyment and success in turn, while sharing their experiences and reflections on each term. The two groups are differentiated by KOTE and ANZE only if there were distinct differences in their responses.

Engagement

The KOTE participants defined engagement in science as the passion for learning the content. For example, "Being engaged in science is wanting to discover or find out or attain information that you have always wanted to know about understanding the world, understanding people" (Katinia, KOTE). It was also the desire to share knowledge: "For me, engagement in science is using scientific knowledge. When we study chemistry, to explain to my little cousin when it reacts to that, it creates this ... it's being able to explain to people how science works" (Fatai, KOTE).

The ANZE participants defined engagement as being actively involved in the learning process: "Engagement [is] going to class, actively listening, not being on Facebook during lectures. I would define it as being active in your studies, in the teaching time, approaching the lecturers, or asking tutors for help or clarification" (Lashandra, ANZE). The overwhelming majority of participants in both groups felt that the primary indicator of engagement was students asking questions: "One of the biggest things for me would be if I am asking questions. If I am asking questions it obviously shows that I want to learn, that I want to understand" (Katinia, KOTE).

Overall, the participants' definitions reflect Kahu's (2013) multifaceted engagement framework described above, namely, student behaviour and the "effect" of engagement, as well as antecedents and consequences of student engagement, were incorporated in participants' definitions. Most participants identified the relationship between the student and the teaching staff as a critical antecedent of their engagement:

> Engagement is when there's talanoa going on between two people, or a group of people and a tutor. I know that's very difficult in a lecture setting [but] I know that I get distracted easily and if the lecturer isn't talking to me, and if I am not getting what he is trying to say, and I am trying hard to understand what he is saying, but it's not getting to me, I will doze off (Grace, KOTE).

The participants described the complexity of engagement, the interplay of multiple factors and the contribution made by students and teachers. Teaching staff demonstrating their interest in their students' understanding and academic outcomes was identified as a way to enhance engagement:

> A big thing is having teachers or lecturers, tutors, who are interested in your learning, your results. A lot of my high school teachers, when I didn't do well in a test, they would give constructive feedback. Sometimes they would offer to give a tutorial after class to go through it … that was helpful … knowing that the people that are teaching are interested or care about your grades and what you are learning is a big factor in making you engage (Jake, ANZE).

Kahu's (2013) model is an appropriate vehicle for understanding these participants' responses because it recognises that aspects of engagement are under institutional control, but also that the students can enhance their engagement and success at university: "The lecturer stands up and does his lecture, and

we watch. I know that can be hard for some people but my theory, my philosophy, is that you need to do the work, you can't complain, just do it" (Vaka, ANZE).

Kahu's framework also acknowledges the unique individual experience and emphasises the need to study specific student populations to avoid broad generalisations. Although most aspects of the participants' definitions fit well within Kahu's model, some anomalies reflect the heterogeneity of the Tongan student population. Two highly achieving ANZE participants indicated that their behaviour could appear as disengaged, even though they were engaged:

> Probably test results, or with some students, the more questions they ask reflects how interested they are. But for me, throughout med school I wouldn't ask that many questions. I remember some tutors would approach me [asking] do I need help with anything. I would get it, but I wouldn't be vocal about it (Kava, ANZE).

The participants often had different experiences of engagement in science at secondary school compared with their time at university. Although finding the content interesting and enjoyable helped some, most participants indicated that it was their career goal that drove their engagement: "At secondary school, I wasn't engaged … I knew I had to do it, so I could get into what I wanted to be" (Sina, ANZE). Most participants indicated that they had experienced secondary school teaching staff who had hindered their engagement: "The teachers didn't teach us well, I didn't get most of the stuff they said, so that made it hard for me to try and get good marks" (Fifita, ANZE).

At university, interest in and enjoyment of the content helped with engagement, as well as peer pressure and the desire to complete their degrees:

> [Engagement] at uni is different from school. It's more that you want to finish your degree, you don't want to fail, you are surrounded by mates that want to pass, and that is all you talk about every day, and you don't want to let yourself down (Naua, KOTE).

Although the behaviour, disposition and attitude of some university teaching staff hindered engagement, the different learning environment, resources and style of delivery helped engage some participants who had been disengaged at school: "The different lecturers' style … and the labs, I found that a better and an easier way to engage with the information and what we were doing [than school]" (Avila, ANZE).

Enjoyment

For the participants, enjoyment often aligned with a positive emotional response to learning new content or demonstrating understanding:

> Feeling good about learning something new, or understanding something you didn't understand before, or finding out new ideas or being able to talk to about it [with] a family member or one of your mates … if you want to talk about, it's enjoyment. You wouldn't want to be sharing anything you don't like. If you like what you are doing, that would be enjoying it and passing as well, [that] makes you feel good (Naua, KOTE).

Interestingly, most participants spoke about enjoyment relative to understanding and discovery, rather than the idea that something must be fun:

> [At school] I knew my stuff, I enjoyed it, I didn't feel like I had to play catch up. When you're asked questions, you can answer them, that's enjoyment for me … true enjoyment comes from knowing my stuff and being able to participate … [at university] it's the same, if you go to a lecture and you understand what you are doing, it's enjoyable because you are learning instead of sitting there being totally lost (Grace, KOTE).

There was some discussion of the relationship between understanding and "fun", however: "When I have fun in science is when I understand what I am learning … when I understand what I am learning it makes it more enjoyable because I don't feel dumb" (Lashandra, ANZE). Importantly, several KOTE participants spoke about how enjoyment came from being able to share their understanding with their family or broader community:

> Knowing that I can help someone else out. I went to PowerUP [a community-based program to increase parents' understanding of the education system] for Pacific high school students, it felt good being able to help another Tongan or Pacific student with science, so that makes me happy, knowing I can help someone out (Setaita, KOTE).

For the ANZE participants, understanding also related to wider concepts, such as knowing how science could be a potential career pathway, and having positive feelings about what they are studying:

> Other than loving what you are learning in lecture and labs … the biggest thing is making sure you understand why you are doing this and where it's going to get you after uni, and whether you are going to enjoy that kind of thing. It's also going to sleep knowing you are loving what you are doing, waking up [thinking] now I want to go and do what I am doing, that is enjoyment for me (Jake, ANZE).

Seeing the relevance of what they were learning also increased enjoyment; the same participant continued:

> With medicine … it's enjoyable now, because I am out there doing what I wanted to do in the first place … that's a huge thing. I am applying the science that we learnt in lectures that I have studied it for so long, seeing it in real life for the first time is cool … that has been the biggest thing (Jake, ANZE).

Very few participants associated enjoyment purely with getting good grades:

> Understanding, getting to a solution that I didn't know I could, and probably getting a good grade. In the first half of this semester we had a test, I got a B+, I was pretty happy. That gave me an extra boost to know that I could do it (Fifita, ANZE).

A small number of students felt that deportment, demeanour and body language indicated enjoyment, but more often it was whether the students were doing tasks given to them by the teaching staff and asking questions. Off-topic questions also suggested students are interested in what they are learning about:

> Doing well won't tell you; they might've rote learnt it. But the students wanting to know more, asking a question that would get the lecturer thinking … In my neurology paper, students would ask questions that are not far out of the scope of what we learnt and that made the lecturer … I remember him saying, "Oh, you guys are listening!" (Takai, ANZE).

The participants also made linkages between enjoyment and other aspects, such as engagement and achievement:

> Enjoyment in science? … To me, the main thing [is] to enjoy it in order to engage and if I want to learn about it … Being interested in what you are studying … say if you calculate something, and you get the answer … that achievement, I find that enjoyable, and calculating, because I am a geek … [laugh] that part in itself is enjoyable (Setaita, KOTE).

Success

The importance of family, cultural and personal influences on success for Pasifika students are often not reflected in most definitions of success, which emphasise institutional factors (Zepke et al., 2011). The definitions provided by the participants in this research indicate the role played by these non-institutional factors, reflecting Airini and colleagues' (2009) definition, which incorporates achieving grades and personal goals as well as collective concepts of achievement. Importantly, the participants also acknowledged traditional Tongan educational values such as *poto*, or, "[skills] utilised for the greater good of the society" (Māhina, 2008, p. 83). This aligns with other research specifically focused on success and Tongan students (Fa'aea & Fonua, 2021; Kalavite, 2020; Toetu'u-Tamihere, 2014).

Most KOTE definitions of success had an academic focus: "Success would be, academic-wise, finishing what you are studying, having the grades that you want, that you strive for, that would be success" (Naua, KOTE). Often, they defined success by results and outcomes:

> For the degree it would be passing with great grades, not getting a C, and being able to continue with it after your degree … so if you find a job, or find the interest that makes you want to keep [pursuing] research or postgraduate studies, that's what I think is success (Mele, KOTE).

Grades were also an important measure for parents to understand success:

> Success in different contexts can be measured differently … in science, the first step is passing, that to most parents is success, like, you made it! Second would be if you are going from high school to tertiary, getting into a degree to do science, getting into university, doing a science [degree] (Grace, KOTE).

Interestingly, some KOTE definitions of success emphasised understanding over grades:

> Obviously, success would be getting good grades, but to me it's more, it's … achieving, discovering what [something] is and attaining the knowledge that you have always wanted to know or been curious about. Getting all the information about what you wanted to know, attaining that is being successful (Katinia, KOTE).

Success was also the ability to interact with others and share knowledge; this included going back to Tonga to share learnings:

> If you apply what you learnt into the community and you have something to show for it. I think that's what most Tongans do, we like to see people succeed. [My family] are waiting for me to graduate and go back to Tonga and do something amazing. Actions speak louder than words, so you must show that the degree is useful … that's what success is (Grace, KOTE).

For the ANZE participants, success was related to grades, but also understanding and applying content knowledge:

> Success in science for me means you are not just passing; you are doing well in your studies and you understand it. You are not rote learning it, you are able to apply it in everyday situations and you are critically thinking about your different sciences and asking questions of why stuff happens, and things like that (Sina, ANZE).

Often this application would assist the wider community, which speaks to Tongan educational values such as poto—skills employed for society's benefit:

> Using your knowledge, or your interest in science … [to] help improve something in society, taking advantage not of your gift, but your love or passion for science, using that in a way to make things better. That's what I think success is. It's not acing grades or anything like that, people could do quite average in science at uni but still make a big change in society and … that's more important than anything else (Jake, ANZE).

Success also related to how their families could benefit: "Success in science is reaching the highest level you can reach, so if you can reach postgrad then that's success, and hopefully getting a great job after that will support yourself and your family in the future" (Manu, ANZE). A few participants in the ANZE group implied an element of individual responsibility is essential to success: "If you are determined to be successful, you will be, it doesn't matter how the teacher teaches you, you should be able to find your own way" (Laulea, ANZE).

The Fata ho poto model

The participants are diverse with regards to their secondary school education background (in Tonga or Aotearoa New Zealand), socioeconomic status (as suggested by their secondary school decile rankings) and family history of study. This diversity provides a valuable insight into the heterogeneity of the Tongan science learner population in higher education in Aotearoa New Zealand, regarding their understanding of engagement, enjoyment and success as outlined above.

For engagement, the participants' insights generally aligned with Kahu's (2013) engagement framework. They all considered relationships with staff an important antecedent to engagement. How teachers demonstrated their interest in the students, or the subject, influenced how students then engaged. Most participants suggested that their engagement is indicated by asking questions, however, a few indicated that their engagement is not demonstrated by asking questions or interacting with teachers. This difference of opinion is important because it contests the belief that Moana/Pacific students are shy and do not ask questions; these comments are a means to highlight the heterogeneity of Moana/Pacific students and counter stereotypes. Interestingly, there were also differences between the two groups: KOTE participants described engagement in science as demonstrating a passion for learning and a desire to share their knowledge; ANZE participants described engagement as active involvement in learning. For both groups, the goal of attending higher education (distal consequences) drove engagement in secondary school science; at university, their interest and enjoyment of what they were learning about (proximal and distal consequences) drove their engagement.

The descriptions of enjoyment (i.e., like, have fun, interest, happy and enjoy) overlapped with their stories of engagement. As enjoyment is a form of emotional engagement (Fredericks et al., 2004), this

makes a lot of sense. Overall, the participants described enjoyment as feeling good about learning or discovering something new, or demonstrating understanding, rather than as something fun. Enjoyment was not generally associated with academic results. Interestingly, for the ANZE participants, enjoyment also came from understanding how their science studies contributed to a career pathway. This meant science had increased relevance to them; associating it with a career helped them to understand the purpose of the subject and why they should be interested.

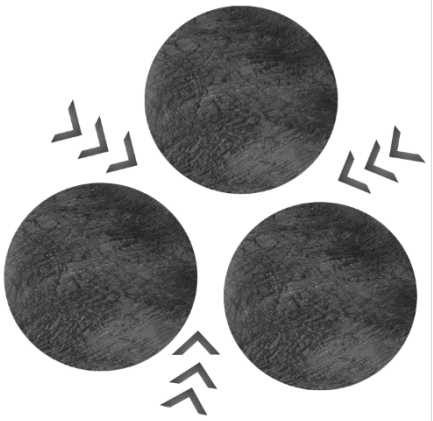
For all participants, using a diverse range of techniques helped their enjoyment, especially opportunities to work collectively, particularly in a structured way with the teaching staff. They also enjoyed practical applications, and when the content was made relevant to them through the use of analogies, stories and association with familiar objects or cultural references, teachers heavily influenced their enjoyment in the manner in which they taught. At secondary school, enjoyment was associated with grades, but this was replaced at university by understanding. University science learning was more enjoyable because of the understanding they had of content but also because they had more Moana/Pacific students to learn with.

Previous researchers such as Zepke et al. (2011) have critiqued mainstream definitions of success that have a focus on institutional rather than non-institutional factors, arguing this to be problematic for ethnic groups such as Pasifika. The successful Tongan science learners in this research considered grades and employability as evidence of success, but so was their understanding and sharing of knowledge with others. Like their discussions around engagement and enjoyment, understanding was linked to success. Teachers and family support also played an important role in their success, as did the increased number of Moana/Pacific learners in their science classes at university compared to their secondary school experience.

From my research findings I developed the *Fata ho poto* model. This model visualises engagement, enjoyment and success from the perspectives of successful Tongan science learners and demonstrates how these terms interconnect and overlap for them. We have theorised this model in relation to the *fo'i hea* motif, a well-known design on Tongan *ngatu* (painted barkcloth) (Figure 1), depicted using three black dots (Figure 2).

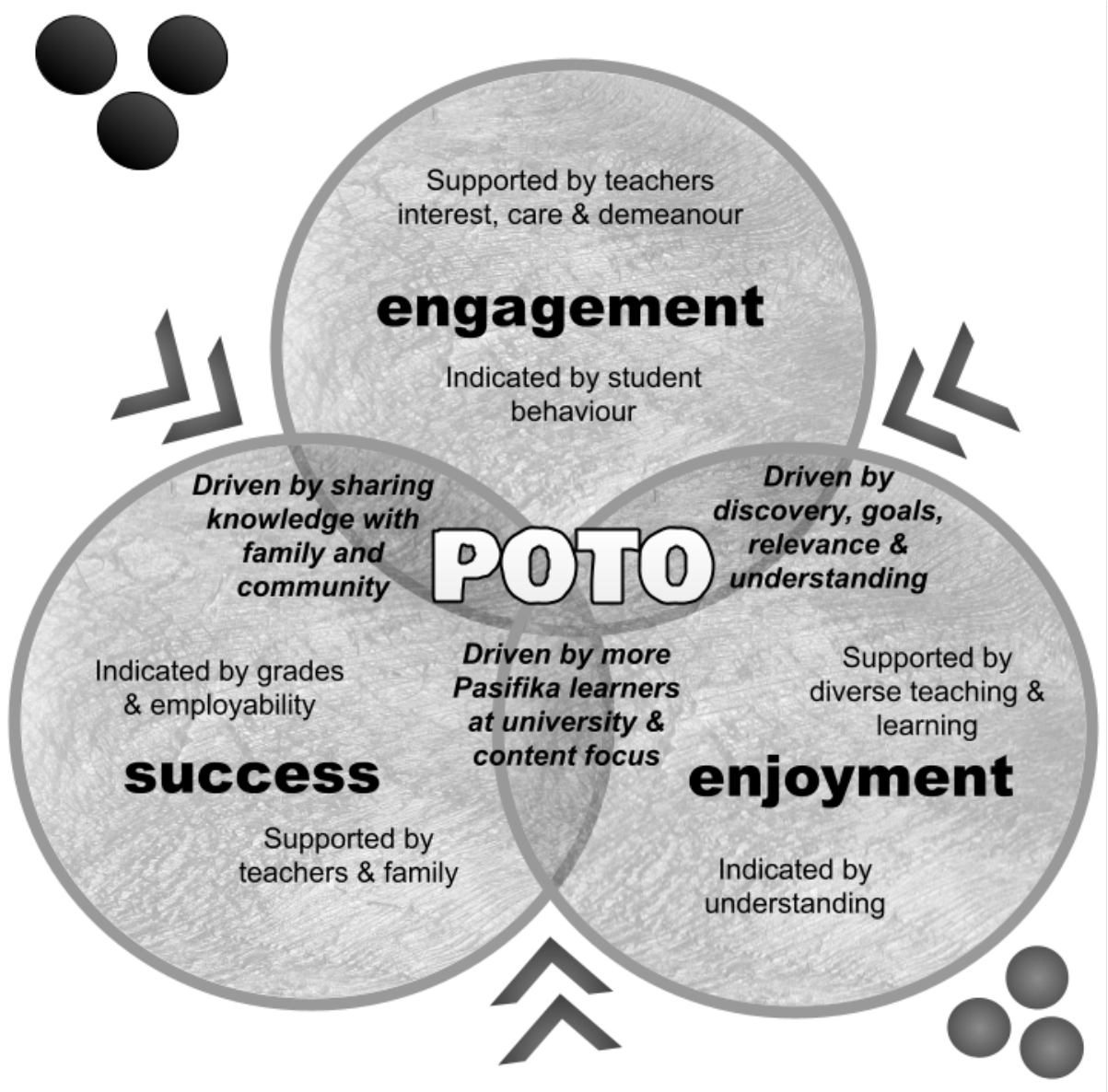
Figure 1. Ngatu Tahina, Hangatonu depicting various kupesi (designs) including the fo'i hea. Ngatu was made by Haveluloto Village (2019) and is from the collection of Dowager Lady Fielakepa, Tonga

Figure 2. The fo'i hea design



The *hea* is a plant, the fragrance of which was very important. The dots also represent other trinities such as the three royal lineages (Tu'i Tonga, Tu'i Ha'atakalaua, Tu'i Kanokupolu), the three main islands of Tonga (Tongatapu, Ha'apai and Vava'u), and the eyes and mouth of the coconut from the story of Hina and the eel. We consider these three dots may also represent the three areas of interest in this research, engagement, enjoyment and success, and the importance of considering them together, rather than separately. While the three hea are arranged separately on ngatu, we are more closely aligning them to show the overlap between the three entities. For those with an understanding of vā (relational space), they would know there is a direct connection between the three hea, even though there is space; unlike Western conceptualisations of space, this space is not empty, but full of connection. By visualising the three hea together, with the overlap, it also helps educators without this understanding to "see" the relationship between the three entities.

Figure 3. Fata ho poto: Visualising Tongan science learners' considerations and experiences of engagement, enjoyment and success



With respect to the model's name, *fata* means "to carry", *ho* means "your" and poto is a core concept in Tongan education (Thaman, 1988), defined as "to be clever, skilful; to understand what to do and be able to do it" (Churchward, 1959, p. 125). Māhina (2008) describes the practice of Tongan education (*ako*) as

the process of shifting the mind from *vale* (ignorance), to *`ilo* (knowledge), and then poto (skill), to both remove confusion and gain knowledge and skills for the greater good of society. Fata ho poto acknowledges that, for these Tongan science learners to achieve, poto is a sacrifice. Most are carrying the burden of sacrifices made by family, such as migrating to Aotearoa New Zealand. Many participants were also balancing family expectations to study and their contributions to their *famili* (immediate family). Essentially, Fata ho poto intends to emphasise that the collective (i.e., family, friends, teachers, peers, etcetera), rather than the individual, influences engagement, enjoyment and success for successful Tongan science learners. This model centralises poto because it underpinned the participants' explanations of all three terms. Importantly, the participants associated poto with achieving a depth of understanding in their studies that can help their families or communities, either through employment or through the dissemination of valuable knowledge gained from their science studies.

Conclusion

The participants had very clear ideas of what engagement, enjoyment and success were for them, and how they had experienced them in the formal learning spaces of their science education. Much of what they describe aligns with understandings of engagement, enjoyment and success as expressed in the literature. However, there are unique elements: the importance of understanding so that they can share knowledge with family and community; the influence their teachers have over their engagement, enjoyment and success; the view that enjoyment is driven by understanding, rather than fun or entertainment; the opportunities for working collectively; and the valuing of content relevant to their lived experiences.

Since the published definitions of these three terms can be highly variable, having a Tongan perspective is useful for educators, policy makers and researchers working with Tongan and other Moana/Pacific learners to consider how education policy and practice can shift to increase the achievement of Tongan (and other Moana/Pacific) science learners. The Fata ho poto model provides a way to understand what engagement, enjoyment and success are for successful Tongan science learners, and how these three concepts intersect and interact in the shift towards poto. This model will be useful as a tool to guide educators, policy makers and researchers to understand their Tongan science learners.

References

Airini, Brown, D., Curtis, E., Johnson, O., Luatua, F., O'Shea, M., Rakena, T. O., Reynolds, G., Sauni, P., Smith, A., Huirua, T. S., Tarawa, M., & Ulugia-Pua, M. (2009). *Success for all: Improving Māori and Pasifika student success in degree-level studies. Milestone Report 8*. University of Auckland, UniServices Ltd.

Banks, J. A. (1998). The lives and values of researchers: Implications for educating citizens in a multicultural society. *Educational Researcher*, *27*(7), 4–17.

Caygill, R., Hanlar, V., & Singh, S. (2016). *TIMSS 2015: New Zealand year 9 maths results*. Comparative Education Research Unit, Ministry of Education.

Caygill, R., Kirkham, S., & Marshall, N. (2013*). Science: Year 9 students' science achievement in 2010/11 New Zealand results from the Trends in International Mathematics and Science Study (TIMSS)*. Ministry of Education. Retrieved from https://www.educationcounts.govt.nz/__data/assets/pdf_file/0003/121962/TIMSS-2010-11-Year-9-Students-Science-Achievement-Full-Report.pdf

Chapman, E. (2003). Alternative approaches to assessing student engagement rates. *Practical Assessment, Research & Evaluation*, *8*(13), 1–10.

Churchward, C. M. (1959). *Tongan dictionary*. OUP.
Coll, R. K., Dahsah, C., & Faikhamta, C. (2010). The influence of educational context on science learning: A cross-national analysis of PISA. *Research in Science & Technological Education*, *28*(1), 3–24. https://doi.org/10.1080/02635140903513532
Danermark, B., Ekstrom, M., Jakobsen, L., & Karlsson, J. (2005). *Explaining society: An introduction to critical realism in the social sciences*. Routledge. https://doi.org/10.4324/9780203996249
Education Review Office. (2010*). Promoting Pacific student achievement (June 2010)*. Retrieved from http://www.ero.govt.nz/National-Reports/Promoting-Pacific-Student-Achievement-June-2010-web-only
Fa'aea, A. M., & Fonua, S. M. (2021). Se'i lua'i lou le ulu taumamao: Privileging Pacific notions of success in higher education. *Higher Education Research & Development*, 41(*5*), 1499-1513. 10.1080/07294360.2021.1937954
Fa'avae, D. (2019). Tatala 'a e kokoa 'o e to'utangata Tonga i Aotearoa mo Tonga: A way to disrupt and decolonise doctoral research. *MAI Journal*, *8*(1), 3–15. https://doi.org/10.20507/MAIJournal.2019.8.1.1
Fonua, S. M. (2020). Lalanga ha kaha'u monu'ia: Helping science educators to embed indigenous knowledge, values, and culture in their courses for Māori and Pasifika science student success. *MAI Journal, 9*(1), 49-58. 10.20507/MAIJournal.2020.9.1.6
Fonua, S. M. (2021). The Manulua framework: How combining multiple research methodologies and theoretical or conceptual frameworks strengthens research with Tongan participants. *AlterNative: An International Journal of Indigenous Peoples*, 17(*2*), 254–264. https://doi.org/10.1177/11771801211017557
Fredericks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, *74*(1), 59–109. http://www.jstor.org/stable/3516061
Hope, M. (2009). The importance of direct experience: A philosophical defence of fieldwork in human geography. *Journal of Geography in Higher Education*, *33*(2), 169–182.
Kahu, E. R. (2013). Framing student engagement in higher education. *Studies in Higher Education*, *38*(5), 758–773. https://doi.org/10.1080/03075079.2011.598505
Ka'ili, T. O. (2005). Tauhi vā: Nurturing Tongan sociospatial ties in Maui and beyond. *The Contemporary Pacific*, *17*(1), 83–114.
Kalavite, T. (2020). Toungāue cooperative pedagogy for Tongan tertiary students' success. *Waikato Journal of Education*, 25(1), 17–29. https://doi.org/10.15663/wje.v25vi1.783
Leach, L., & Zepke, N. (2011). Engaging students in learning: A review of a conceptual organiser. *Higher Education Research & Development*, *30(*2), 193–204.
Māhina, 'O. (2004). Art as tā-vā, "time-space" transformation. In T. Baba, 'O. Māhina & U. Nabobo-Baba (Eds.), *Researching the Pacific and indigenous peoples: Issues and perspectives* (pp. 86–93). Centre for Pacific Studies, University of Auckland.
Māhina, 'O. (2008). From vale (ignorance) to `ilo (knowledge) to poto (skill). The Tongan theory of ako (education): Theorising old problems anew. *AlterNative: An International Journal of Indigenous Peoples*, *4(*1), 67–96.
Manu'atu, L. (2000). *Tuli ke ma'u hono ngaahi mälie: Pedagogical possibilities for Tongan students in New Zealand secondary schooling* [Unpublished doctoral thesis]. University of Auckland.
Osborne, J., Simon, S., & Collins, S. (2003). Attitudes toward science: A review of the literature and its implications. *International Journal of Science Education*, *25(*9), 1049–1079.

'Otunuku, M. (2010). *Tongan conceptions of schooling in New Zealand: Insights and possible solutions to underachievement* [PhD thesis (EdD)]. University of Auckland. Retrieved from https://researchspace.auckland.ac.nz/handle/2292/6980

Ragin, C., & Amoroso, L. (2011). *Constructing social research: The unity and diversity of method* (2nd ed.). Pine Forge Press/Sage Publications.

Statistics New Zealand & Ministry of Pacific Island Affairs. (2010). *Education and Pacific peoples in New Zealand*.

Thaman, K. H. (1988). *Ako and faiako: Educational concepts, cultural values and teachers' role perception in Tonga* [Unpublished PhD dissertation]. The University of the South Pacific.

Toetu'u-Tamihere, A. (2014). *Ki he lelei taha: Tālanoa mei he kaliloa of successful Tongan graduates* [Unpublished PhD dissertation]. University of Auckland.

Vaioleti, T. M. (2011). *Talanoa, manulua and founga ako: Frameworks for using enduring Tongan educational ideas for education in Aotearoa/New Zealand* [Unpublished PhD thesis]. University of Waikato. Retrieved from https://hdl.handle.net/10289/5179

Waddell, E., Naidu, V., & Hau'ofa, E. (Eds.). (1993). *A new Oceania: Rediscovering our sea of islands*. School of Social and Economic Development, The University of the South Pacific.

Zepke, N., Leach, L., & Butler, P. (2011). Non-institutional influences and student perceptions of success. *Studies in Higher Education*, *36*(2), 227–242.

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