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Innovative professional development for teachers of technology in New Zealand: The Mātanga Project

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Abstract

The Mātanga (Māori term for expert) project aimed to engage teachers with needs-based professional development with a particular focus on the teacher participants' perspectives of their developing understandings. This article also explores the subsequent impact on teachers' students as a result of their engagement with professional learning and development (PLD) in New Zealand. The PLD programme, funded by the Ministry of Education's Network of Expertise Initiative and delivered by Technology Education New Zealand (TENZ), was designed to foster teachers' engagement with the technology education curriculum. It also aimed to develop teachers' specialist identity by focusing on notions of technological and technical thinking, by matching teachers with Mātanga experts.

Research findings indicate that teacher professional development was significant. Participants developed a deeper understanding of the benefits of authentic technological practice, as well as the technology curriculum. Some participants also obtained a deeper understanding of the nature of responsive pedagogies, and the role of reflection in professional practice. The programme motivated technology teachers, which translated into a more positive learning environment for their students.

Feedback was also sought on the Mātanga Project's professional development model. Participants identified a number of key benefits gained through their participation. Specialist participants gained an appreciation for the theoretical and historical perspectives of technology, while generalist participants valued their increased curriculum knowledge. Participants found the year-long approach beneficial, particularly because they had access to experts in their area of

technology. Participants also identified some limitations for the first iteration of the PLD and suggested improvements for the future.

Keywords

Technology education; teacher professional development; needs-based professional development; meaning making

Introduction

This article presents the participant teachers' views and the subsequent impacts the programme had on student learning while participating in a professional learning and development (PLD) programme designed to support teachers in remote areas, or for those who had limited access to curriculum support. In New Zealand, many technology teachers are familiar with a top-down transmissive approach to PLD. Some struggle to make sense of the content or do not see the relevance of professional learning for their own classroom and school setting. The aim of this project was to acknowledge our existing teachers' knowledge and reposition teachers' agency within the professional community, using Technology Education New Zealand (TENZ) to facilitate the process. TENZ is a professional subject association, with teacher professional development as one of its core goals. The article extends the research reported in Reinsfield and Fox-Turnbull (2020).

The term mātanga was chosen because it reflected New Zealand's bi-cultural heritage and is the Māori term for expert. The developers of the PLD programme envisaged that when paired with a mātanga who had expertise relevant to the participant teachers' needs, there would be increased likelihood of engagement and/or a change in practice. The long-term aim of the programme was to create a self-sustaining model for PLD, where teachers' professional identity could be fostered within the technology education community. The Mātanga Project was developed to support individual teachers' professional learning through the development of communities of practice in technology education at local, regional, and national levels. It was anticipated that technology teachers in early childhood, primary, and secondary settings would develop their technical and technological thinking to explore new ways of conceptualising and enacting the curriculum in authentic ways.

Three curriculum documents frame early childhood education (ECE) and primary/secondary pedagogies in New Zealand. These are Te Whāriki (Ministry of Education, 2017b) (early childhood), The New Zealand Curriculum (NZC) (Ministry of Education, 2007) Technology in the New Zealand Curriculum (Ministry of Education, 2017c) (English medium-primary and secondary), and Te Marautanga o Aotearoa (Ministry of Education, 2017a) (Te Reo Māori medium for primary and secondary). We hoped that the research would generate new understandings of technology educators' curriculum learning needs to inform future iterations of PLD for teachers.

There was significant interest in how this newly conceived PLD would cater to the differing needs of technology teachers in New Zealand, by using an online learning process, and, as a result, of giving participants the agency to negotiate a personalised approach to learning. The Mātanga Project began in 2010, and this article focuses on the second phase of the data gathering process, which explores the teachers' perspectives.

Literature review

Technology education assists learners' preparation for life, both in their current and future technological worlds. Barlex (2006) suggests that a major educational goal of technology is to teach students the capability to operate effectively and creatively in the made-world and prepare students to participate in rapidly changing technologies. Teachers' pedagogies need to evolve to reflect this change and include

students in the decision-making about the nature of their learning. Barlex (2006) stated that "it is the pupil who has the knowledge and expertise in this situation, only he/she knows about his/her design" (p. 193). Barlex (2017) also suggested a significant and continuing need for professional development and learning, to focus on teachers' specialist knowledge and pedagogy, with a view to modernise the curriculum area's profile and encourage more effective teaching. By engaging students in authentic learning, they are given opportunities for sustained problem solving and decision-making, exposure to a range of theoretical concepts, and collaborative working methods (Lombardi, 2007; Reinsfield, 2018). Whether students are provided with this opportunity, however, is likely to be determined by teachers' perceptions about the nature of technology education, as well as what is valued in their classroom.

Authenticity in technology occurs through specific links to students' context and real technological practice. It is predominantly based on connecting students' understanding to meaningful and real-world situations, and involves them in technological practice that is similar to practising technologists, while using authentic tools and processes where possible. Snape and Fox-Turnbull (2013) suggested three dimensions of authenticity to enhance learning in technology: pedagogy and instruction, teachers and learners, and activities. Learning should closely resemble everyday situations and provide students with opportunities to make decisions about the nature, content, and pace of their learning (Petraglia, 1998).

Professional learning

According to Timperley and Alton-Lee (2008), professional learning positions teachers as learners, and newly acquired knowledge can lead to motivation to enable personal change. The drivers for professional learning and development can be systemic or personal, and effectiveness can be determined by teachers' motivation to engage, sustain, or change their educational practice (Grundy & Robison, 2004). The Mātanga Project was conceptualised from the perspective that activity is significant, social, systematic, and that participants need to make meaning of their learning through engagement in a series of curriculum-focused tasks.

A technology teacher's practice is socially embedded and likely to be reflective of explicitly stated rules, or, alternatively, the practice within a school community, and the way that a teacher's practice manifests is reflective of their sociocultural context (Hill, 2003; Reinsfield, 2018). In the case of school-based professional learning opportunities (e.g., during staff meetings), the driver for an advocated practice can be governmental policy or a school's priorities rather than teachers' personal learning needs (Akiba & Wilkinson, 2015). There is a risk that when there are generic rather than personalised goals, assumptions can be made about a teacher's professional skills and knowledge, or indeed the conceptual processes that aid the transfer of new knowledge, for application in their practice. In other words, the concepts with which teachers engage are likely to be determined by what they perceive to be important to their professional identity.

Technical and technological thinking

Teachers' ways of thinking about both technology and technology education are likely to connect to their lived experiences and socio-cultural (centre or school) context. Technical ways of thinking align more closely to a traditional view of the subject, whilst a technological way of thinking more explicitly acknowledges the role of problem-solving, creativity, and critical approaches to learning (Reinsfield & Williams, 2018). Both ways of thinking have a role to play when enacting technology education, but an emphasis on either can moderate students' learning. For example, if a teachers' sole emphasis is on creativity during the design and development phases of students' technological outcomes, it might be that the quality of the outcome or students' understanding of material manipulation is detrimentally impacted. Conversely, if the focus is on skill development, the quality of the product will be assured at the potential expense of creativity, or innovation.

This research explored participants' perceptions of technology education and how they made meaning of the curriculum for enactment of their pedagogical practice. The way that a teacher makes meaning of a curriculum will be dependent upon their understanding of its driving philosophy, their perceptions, and the social factors influencing their practice. Meaning-making process can be aligned with the concept of orienting activity (Galperin, 1969, 1989) which "explains mental activity as the ability that allows human beings to explore, examine and predict potential results of actions they were preparing to imitate" (Yamagata-Lynch, 2010, p. 20). The way that teachers interpret and make meaning of the curriculum offers insight into why technology teachers might become acculturated to particular ways of working in their educational setting. The research methodology is outlined in the next section.

Methodology

The research reported in this paper was derived from the TENZ PLD Mātanga Project, funded by the New Zealand Ministry of Education. The PLD programme paired technology education experts (mātanga) with teachers who wanted professional development in technology education. Mātanga were selected for the mentoring role based on their contemporary understanding of technology education, and/or their reputation for professional practice in the early childhood, primary, or secondary sectors. After the identification and selection of mātanga, schools throughout New Zealand were notified of the PLD programme with a request for expressions of interest. Participation in the Mātanga programme and research were voluntary.

The research was situated within a qualitative interpretivist framework (Reeves & Hedberg, 2003) and generated data through face-to-face meetings between project facilitators and the participant teachers. Participants attended the meeting in their geographical location in New Zealand, where they were introduced to the programme. Participants were also interviewed and the work from their online tasks contributed to the data set.

A socio-cultural lens accommodated a deliberate focus on teachers' evolving perceptions and understandings of technology and their classroom practice. Saldana (2013) offers a number of strategies for coding qualitative data based on his codes-to-theory model for qualitative inquiry, which served as a means to identify themes. This process allowed the identification, extraction, and reporting of emerging themes on teacher experiences during the PLD programme to address the following research questions:

1. What were teachers' experiences and perceived benefits of participating in a specifically designed PLD programme?
2. What aspects of the project were perceived as successful and what aspects required modification for future success?

The research was further informed by existing literature on contemporary approaches to professional learning and development in technology education (Akiba & Wilkinson, 2015; Aminudin, 2012; Reinsfield, 2018) and the experience of both researchers in technology teacher education.

Six teacher participants agreed to be a part of the research project, which ran in parallel to the PLD programme. Table 1 summaries the demographic data of these research participants.

Table 1. ***Summary of the Research Participants***

Pseudonym	*Gender*	*Sector*	*Technological area*	*Age of students*
Brian	Male	Primary	N/A	Years 0–6
Kylie	Female	Secondary	Textiles	Years 9–13
Kent	Male	Secondary	Design	Year 9–13

Nicola	Female	Primary	N/A	Year 0–6
Suna	Female	Secondary	Food	Years 9–13
Sally	Female	Primary	Design	Years 0–8

Before commencement, the researchers obtained ethical approval from their institution's ethics committee. All participants in the professional development programme (n=96) were invited to be a part of the research project. The low number of participants agreeing to become a part of this project was not surprising given the hectic nature of schools, and the current focus on numeracy and literacy leaves many teachers with little time to do technology. Pseudonyms were assigned to the participants and used in this paper. The research project sought to generate understanding about how teachers' viewed and positioned their curriculum knowledge when constructing meaning, enacting technology education, or engaging in professional learning activities. By fostering relationships early with participants, the researchers, who were also the programme developers, reassured participants that the purpose of the research was to enable exploration into their understanding of the curriculum, rather than to make judgements about their practice. The data was therefore considered from the perspective of participants' membership in the technology community, as defined by their engagement in face-to-face dialogue and online contributions.

Findings and discussion

All participants in the research mentioned they had experienced significant changes in their thinking while participating in the Mātanga Project. Teachers of technology are educated professionals who know and understand content and technical practices within the vast discipline that is technology. As well as this, teachers also need to understand the nature of technology, and the impacts technology has on individuals, society, and the environment. In addition, teachers need to understand pedagogy and how to translate pedagogical content knowledge (PCK) to learners (Ritz, 2018). The Mātanga Project assisted teachers to develop their technological content knowledge and their PCK. This section outlines teacher insights pertaining to their understanding of technology education and its practice. The impact of the PLD is presented, followed by participants' views on the nature of the professional development model used in the Mātanga Project. Identification and discussion related to a number of issues with the technology education sector, identified by the participants in the study, conclude this section.

Ways of thinking about technology education

One of the emerging issues for participant teachers was related to their professional identity and the impact of others' misconceptions about technology education. Kylie identified that people, mostly from outside the community, but some from within, often have inaccurate ideas about technology, which are based on outdated ideas or people's experiences of "making" at school. She referred to assumptions that "you're making wooden spoon characters. It's going to take a lot to shift them and hopefully they're close to retiring". When designing the PLD programme, there was acknowledgement that the dominant discourse within a teaching community influences the way professionals can develop their professional identity or practice (Dakers, 2006; de Vries, 2005; Fox-Turnbull & O'Sullivan, 2013; MacGregor, 2017; Zlatković et al., 2012) PLD to connect professionals beyond their own community. This mitigated the risk that those in positions of power (who may have alternative views about teaching technology) might subjugate others (who may or may not be oppressed) to maintain a dominant discourse and protect their place in a community (or society) (Giroux, 1983).

While undertaking the programme, participant teachers were introduced to ideas that conceptualised the intent of technology education, as well as how they might approach their future practice (Slatter &

France, 2018). Significantly, participants were reminded of the importance of having students participate in authentic learning (Fox-Turnbull, 2003; Slatter & France, 2018; Snape & Fox-Turnbull, 2013). For students to gain the most from their learning in technology education, outcomes should be authentic in nature, about real-world issues, and negotiated with or determined by them. This was best illustrated by Sally who stated:

> I think I've been much more aware of trying to have authentic learning projects here at school … especially with the learning partnerships and learning environment links … Obviously [with] the revisions to the tech. curriculum … digital technologies, so I'm trying to create as many projects as I could that are meaningful, but also current.

Another insight related to belonging, and a deeper appreciation of the value of culturally responsive pedagogy as a means to ensuring all students can find connections with the intended learning. Kylie indicated that she developed her awareness of cultural responsiveness, reflecting that she was

> more aware of things that I need to be focusing on … the cultural context here, [and] the extent of our students identifying as Māori, and the project the girls called haerenga (journey). It is a journey, it's about the journey that they're on. But it's just being so culturally responsive all the way through …

This is a pertinent finding because teachers' evolving knowledge for practice, in relation to their curriculum understandings, can also be shaped in culturally meaningful ways (Bell & Reinsfield, 2012; Hill, 2003; Reinsfield, 2018, 2020). Reproduction theory presents a view that social groupings and culturally defined behaviours can communicate the meaning behind a manifesting practice (Kanjanabootra & Corbitt, 2016). There are implications for both curriculum and professional learning and development designers here, who need to ensure that culturally responsive ways of designing learning are accessed, explored, and modelled. The emergence and use of supporting resources pertaining to the development of local curriculum design in New Zealand (Ministry of Education, 2021) also presents an appropriate way for technology teachers to be responsive to the needs, identities, languages, cultures, interests, strengths, and aspirations of their learners and families.

Teacher participants gained insight into the nature and philosophy of the technology curriculum in New Zealand. Understanding the nature of and rationale for teaching technology are core components of teacher education curriculum in technology (Forret et al., 2011; Fox-Turnbull et al., 2021; Ritz, 2018). For example, Nicola referred to the scope of the curriculum:

> But when you break it down, technology [education] is a number of different things; that can be building things but it can also be food technology. Then you can have your digital technologies …

Sally developed her understanding of the role the principles, values, and key competencies of the New Zealand Curriculum (Ministry of Education, 2007) have when planning for teaching technology, and vice versa. Sometimes referred to as "the front end" of the curriculum document, the values, principles, and key competencies should be integrated into the teaching, even when the focus is on a particular learning area (e.g., technology).

The addition of "key competencies" to the national curriculum (Ministry of Education, 2007) resulted from the OECD's (2005) Definition and Selection of Competencies (DeSeCo) project. The DeSeCo report emphasised the need for students to have an active role in their education and proposed that by embedding future-focused competencies into their learning, students would be more likely to use them in order to shape society. Sally identified that as a technology teacher, she asked herself:

> How can we [integrate] the key competencies and values into technology? Technology is an amazing forum to get all the key competencies in there. You can't

> do technology without those. And I think that was great, to get that thinking coming across.

The key competency of thinking is described as "using creative, critical and metacognitive processes to make sense of information, experiences and ideas" (Ministry of Education, 2007, p. 12) and can provide a way for technology teachers to focus students' learning on the relationship between technology and society. This is particularly relevant in the New Zealand context because all students have a right to feel that they can learn in ways that encourage their sense of belonging.

It is an enduring expectation in New Zealand that teachers should be responsive to students' academic and social needs and encourage a sense of safety and belonging (Covington & Omelich, 1984; Parsons & Taylor, 2011). However, some teachers continue to design classroom-based learning according to what is manageable for them. Whilst they might consider student interest, their teaching does not always include negotiating the learning context with students prior to or during its enactment (Reinsfield, 2016). This is likely due to the perception that it is the teacher's responsibility to ensure that the curriculum is translated into practice.

Kylie developed understanding of teachers' technology practice by reflecting on the decision-making about teaching specific skills, versus empowering students to undertake technological practice independently, with the risk that they might fail. She commented,

> I think it is a way of thinking and we can't throw away the skills. You know, of course [at a] level everybody has a beautiful one-centimetre seam or beautifully routed joints. But actually learning the process and the opportunities, that skill might be useful here and it could be used somewhere else. Maybe we don't want to lose the skills but is it so essential that they're done perfectly?

The professional development model

Slatter and France (2018) identify a number of principles to guide the development and partnerships between technology education teachers and groups outside the educational arena. The authors suggest a modified version of principles also inform and frame teachers' PCK when engaging with communities within their practice. These principles consider that participants' world views and ontological positioning be shared and discussed, the purpose of all interaction clearly identified and linked to learning outcomes, all participants are aware of the purpose and role of the intended outcomes, initiatives should be coherent and translate purpose to outcomes, and, finally, if initiatives step over boundaries this should be acknowledged and managed where necessary. The model of professional learning used in the Mātanga Project was considerably different to other forms of PLD that were available to teachers of technology at the time and was loosely guided by the above principles. For this reason, the research team gathered feedback from the participants, with the aim of informing its next iteration. This section presents the perceived benefits of the study.

Teacher benefits

Teacher participants felt they gained a number of benefits from participation in the programme. Sally, a specialist technology teacher, felt she had developed a deeper theoretical knowledge of the curriculum.

> The project [has] given me more of a background research/theoretical side of the technology curriculum. I have a good working understanding of it … I think it's actually also helped with my teaching and planning. And I think having some of the quotes readings that [the facilitator] has provided have been quite beneficial to give that background of where things have come from [and] where they're going to.

In contrast, Brian and Nicola felt they developed their curriculum content knowledge. Nicola stated, "It's the content knowledge [that] has developed. And I guess I probably still have got quite a bit to

learn—I'm not a technology teacher." Brian reinforced his views about the need to engage his students in authentic contexts, stating, "It was really strengthening the technological process [that] the students would go through. So they have got a product or something they want to make in mind, [and] it's making sure it's got an authentic context."

It is interesting to note that Brian and Nicola, the two participants who felt they gained curriculum content knowledge, were generalist primary teachers, whereas it was the specialist teacher, Sally, who gained the most from the deeper theoretical and background aspects of the course. This suggests that the programme allowed teachers to meet their own professional development needs while participating in the programme. Participants also felt that the mentoring model and length of the PLD programme contributed to its success. Brian stated,

> I definitely think the mentoring model is the way to go and you have got to sustain it over a period of time, like a year or even longer. I definitely think that [a shorter time frame] is just not enough. So often in schools, you have a bit of PD. You are expected to change practice, 'bang'. [Then] you're on to something else.
>
> So I think this model, [having] mātanga here to support you for a whole year … For a year of learning or even longer … That actually is a really successful way of doing it.

Kent and Sally both referred to the value of making connections with other people. Technological practice is collaborative. It stands to reason, therefore, that working together would be advantageous when teachers are designing and developing their programmes. They stated,

> So it's lovely to find some [different] ways, which is what you're trying to achieve in this Mātanga Project—to take that message out … to make some kind of connection between people. (Kent)
>
> It's good to listen to other people and see how other people do things. I think that's been quite beneficial for me. [For example] what somebody might think an authentic project is, other people wouldn't. (Sally)

Keith, on the other hand, deepened his understanding of digital technologies and their relationship within technology education and acknowledged a shift in his thinking.

> There's a disconnect there between digital teachers and all of the [other technological areas] and time and trying to disseminate that. I think it was one of the aims of this project to the wider world. I have not accepted that connection in my head but I've acknowledged at least now I know that is there. So that's quite a shift.

The Mātanga PLD model aligned with Timperley and Alton-Lee's (2008) study by identifying that well-structured and planned PLD motivated and enabled personal change. The findings also align with the findings of Reinsfield (2016, 2018) and Grundy and Robison (2004), that needs-based and culturally situated professional development is motivational and effective. Drivers for participants' professional learning and development were systemic and needs-based.

Student benefits

Although not aimed to improve student learning directly, the programme had a number of benefits for the students of the participants. Those reported have improved engagement of students and enhanced technology learning.

Engagement

Kylie found that her new skills and knowledge had an impact on her students' attitudes towards taking technology in the future.

> It's actually the boys. Like the other day, I had one student who said, I'm going to take fabrics next year. And I was like, Oh, it's good. So I hope Yeah, you know, what we are going to be doing here and I'm looking forward to learning how to use the sewing machine next year. So yes, it is. Yeah. Which is great. And it's been lovely for them to be in another room and the tech department as well and meeting more tech staff that have come in and helped … And it's been lovely to see the engagement. And I have had lots of people come into my class, and just been really impressed with all walks of life being engaged with this. And for me, it's been wonderful to actually see them having a better understanding of, you know, we've got this wonderful natural product in New Zealand and how we can actually put it together. I've been trying to link, you know, the real tech process as well in this which sometimes gets missed depending on what option they get. So it is hopefully being some underlying … tech process that's been really implemented in [for] this Year 9.

Brian also recognised improved engagement from his students.

> What's been really cool this year is a lot more of the girls have been involved. In the hands-on making and tinkering. In the past, it's mainly been boys that have taken on the more technological projects, but it's been a lot of girls this year, which has been awesome.

Enhanced technology learning

Three of the participants specifically mentioned that although it was not the aim of the programme, their students' learning in technology was enhanced. Kylie stated,

> And that's something that, again, sort of trying to broaden what we're doing in here with a view that it's helpful for students that they've, they've got a really nice resource that has got content and depth to it, but it's actually visually can be useful for end of the year, isn't it? And university portfolio presentations say they've actually got the physical evidence of things they made rather than purely just the art form.

Brian recognised that the students benefited from a more rigorous following of technology practice: "I think, they are understanding the process a lot more, but just because of the rigor that we have built into the programme." And Nicola found value in the confidence that she was setting her students up well for their entry to high school. She stated,

> That is how we, in primary school, make sure that we are setting them up so that when they hit high school, they've got those understandings, or dispositions, or those skills in place. They know the design process. So I think we are probably here. Hopefully the intermediates continue to grow there.

The above findings support the research of Alansari and Rubie-Davies (2021), who found that a purposefully designed and planned year-long PLD assisted students' learning and as well as developing improved pedagogical practice in their teacher participants.

Limitations

Like all PLD there were limitations in the programme reported on in this article. Some of these frustrations were with the technological tool used for communicating and facilitating meetings, as stated by Suna: “I found Zoho was quite frustrating. It was there but quite tricky to use sometimes. Or it wasn't.working. Like you would get this email saying that someone's made a notification but sometimes we weren't going back”. Kylie was also frustrated by the tool and said,

> Sort of getting started on the Zoho. [It] wasn't for me, I think it would have been, I think we've mentioned this before. is that I would have liked to meet face-to-face with the other people in the group, even if it's only once initially.

All participants struggled to find the time they wanted to put into the programme. This was exemplified by Sally who stated that she would have liked more time to better engage with the project and its materials and was frustrated with getting her colleagues together for professional conversations. She said, “Time- especially with a busy teacher life that we've got. It's been quite hard to get people responding regularly, on Zoho”

Sector issues

A number of issues within the technology education sector were also identified by the participants. Reinsfield (2020) and Forret et al. (2011) identified that in New Zealand the implementation and delivery of technology education was impacted, possibly hindered by either out-dated or ill-situated ideas and understanding of the underlying purpose and philosophy of technology education. This study found that these ideas were still present as eloquently articulated by Kylie and Brian respectively:

> However, traditionally, you're making a wooden spoon characters, it's going to take a lot to shift them. Hopefully they're close to retiring. So yeah, I would like to think that people who have enrolled in the project, if they're more traditional then they started to see a shift in the deeper understanding of what [the] subject [is] about because … people still think it’s just coming in to do some skills and that's that without any of that higher order critical thinking. (Kylie)

> Yeah. We go to one of our local intermediates and we see what they are up to … They are just building wooden pencil cases just for the sake of it, just to learn some skills. But certainly we have tried to make sure they're getting authentic stuff here. (Brian)

Brendon alluded here to the skill-development purpose of workshop and cooking classes of a bygone era, rather than situating students’ learning in authentic needs-based technological practice. Another issue identified by Kylie and indirectly related to the issue above, was the lack of understanding from senior management leading to poor decisions about timetable and facility management. She stated, “The subject identity is probably more of an issue from people outside the subject and people in senior leadership in some cases, rather than within the subject.”

The final issue identified by participants was the continued gender disparity in specialised spaces as identified by Brian in the extract below:

> And they're also saying at the TENZ conference that a whole lot of girls drop out of technology, and they don't get back into it until much, much later. Which I think is a shame because they are just as capable as the boys.

There is a recognised lack of female participation in most engineering disciplines and STEM-related (science, technology, engineering and mathematics) careers in New Zealand and across the developed world (Dresden et al., 2017; Engineering, UK., 2020; Gutierrez et al., 2017). Today's world is complex. Technological practice must change due to increasing these complexities. Diversity is one of the changes that may assist this process (Ahmed et al., 2019; Weber, 2012).

Conclusion

The Mātanga Project set out to develop content knowledge and PCK in teachers of technology education using a PLD model that was significantly different to that what had been tried before in New Zealand. As with most new initiatives, it hit a number of snags along the way; however, the data shows that the participants did benefit from participating in the project, albeit in a range of ways. Those in the secondary space came into the project with a degree and existing practical knowledge of teaching technology. For them the value of the project was philosophical through developing a deeper understanding of the theoretical underpinning that informs technology in the New Zealand curriculum. For those from the primary space, their benefits were more practical in nature as they were encouraged to give technology a go in the classroom and were given the opportunity to reflect on and improve their practice. This difference illustrates that the Mātanga Project catered for a range of needs and levels within its participant population. The online-medium for the project proved beneficial but was not without challenges. However, given that this project occurred pre-COVID-19 and considering the movements we have all made in the online and flexible modes of delivery space, we suspect that the next iteration, if delivered with familiar tools and modified to incorporate the recommendations from this project, would prove to be an even more valuable PLD model for technology education.

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