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A new approach to professional learning and development for technology teachers in New Zealand: Developing networks of expertise

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Abstract

This article presents a study that focuses on the Mātanga' (Māori term for expert) perspectives of their leadership in a professional learning and development (PLD) programme in technology education. Funded by the Ministry of Education's Network of Expertise Initiative, the PLD programme was designed and delivered by Technology Education New Zealand (TENZ), to foster teachers' engagement with the technology education curriculum. It aimed to develop teachers' specialist identity by focusing on Reinsfield and Williams' notions of technological and technical thinking, by matching teachers with Mātanga. The Mātanga identified various factors affecting the nature of technology education in New Zealand, and had differing understandings and interpretations of technology, which resulted from their professional experiences. They recognised various factors affecting the nature of technology education in New Zealand. Most evident were the tensions in teachers' curriculum and assessment understanding, and the pressures being placed on practitioners to remain current in their practice.

Key words: professional learning and development, technology education

Introduction

This article presents a study that investigated a PLD model designed to support teachers in remote areas, or those who have limited access to curriculum support. In New Zealand, many technology teachers are familiar with a top-down transmissive approach to PLD which they then need to make sense of in their own classroom and school setting. The aim of this project was to reposition the agency within the professional community. The developers of the PLD programme envisaged that once a community of Mātanga and teachers were established, teachers would feel more connected to local, regional and national support through digital networks. The long-term aim of the PLD programme was to create self-sustaining PLD in technology education, based on community needs.

The Mātanga Project was purposefully designed by TENZ to foster teachers' professional identity and engagement with the technology curriculum. The term Mātanga was chosen because it reflected New Zealand's bi-cultural heritage using the Māori term for *expert*. TENZ is a professional subject association, with teacher professional development as one of its core goals. The Mātanga Project was developed with a view to support the development of communities of practice in technology education at local, regional, and national levels, and enable technology teachers in Early Childhood, Primary and Secondary settings to develop their technical and technological thinking and approaches to the curriculum. There are three curriculum documents within which technology teachers' practice is situated: *Te Whāriki* (Early Childhood); the *New Zealand Curriculum*; (English medium); and *Te Marautanga o Aotearoa* (Māori medium schools) (Ministry of Education (MoE), 2007, 2017a,b).

In 2018, initial expressions of interest were sought from teachers to be Mātanga. Having been selected, teachers were invited to take part in the PLD. The project was introduced during five face-to-face meetings across the country. The online work began early in 2019.

It was hoped that research would generate new understanding of technology educators' learning needs and inform future iterations of PLD for teachers. There was interest in how this newly conceived PLD would cater to the differing needs of technology teachers in New Zealand, and on the subsequent online learning process, as this process was a negotiation between Mātanga and participants. Initial findings are presented in this article, in relation to the first phase of the project which investigated from the Mātanga perspective. The intention of the PLD programme was that Mātanga facilitate their mentee teachers' exploration of their own pedagogical practices in a personalised and responsive manner.

Literature Review

Professional learning and development in New Zealand

In New Zealand, teachers are expected to be lifelong learners, committed to developing their understanding of contemporary pedagogical practices (MoE, 2007). Factors enabling teachers' evolving professional knowledge might include a collaborative community, a focus on continuous school improvement, internal and external partnerships, effective leadership, and time to reflect and critically analyse their own practice. Sound knowledge of pedagogical practice for application in differing learning contexts, and a safe environment to take risks are also critical (Fullan, 2002; Glaser, 1984; Hargreaves, 2000; Hargreaves & Fink, 2004; Harris, 2002; Koehler & Mishra, 2009; Le Fevre, 2014; Louis, Marks, & Kruse, 1996; Putnam & Borko, 2000; Shulman, 1986, 1987; Timperley & Philips, 2003).

When engaging in externally provided professional learning, teachers are often provided with information which they are subsequently expected to make sense of to inform their local curriculum (Gravani, 2007; Murrell, 2001). This can be an additional challenge in a climate where teacher learning is expected to be a continuous process, where practitioners inquire into, and engage in needs-based professional development to build on existing experiences and understanding. Both the Mātanga Project and the research were premised on the notion that learning is social in nature and, for teachers, often needs to connect directly to curriculum thinking with practice (Garet et al., 2001; Webster-Wright, 2006).

There was a particular interest in how an online approach to learning could privilege collaboration, and foster connections across the technology community, so that ideas, assumptions and practices be challenged, developed and changed, where needed. Connectivism is considered a theoretical framework for understanding learning of this nature, used as means to support teachers to think differently, or to foster new understanding through the use of information technologies (Siemens, 2014). Online platforms can provide discursive learning contexts to accommodate the sharing of diverse views from colleagues beyond teachers' immediate school community, thus extending the scope of their evolving understanding (Kear, 2011; Lai, Khaddage, & Knezek, 2013).

Teacher perceptions and dominant discourses within a teaching community influence the way that professionals make meaning and develop their professional identity or practice (Biggs, 2006; Brookhart & Freeman, 1992; Dakers, 2006; de Vries, 2005; Fox-Turnbull & Sullivan, 2013; Hoyle, 2008; Kadi-Hanifa & Keenan, 2016; MacGregor, 2017; Zlatković et al., 2012). This was particularly pertinent because of recent changes to the technology curriculum in New Zealand, including an increased emphasis on PLD focusing on digital technologies (MoE, 2017c). Whilst laudable, this has fostered a climate where the opportunities for needs-based PLD have been marginalised. Teachers' agency has been diminished and, as a result, and in technology education, practitioners' evolving curriculum understanding, professional identity, and consequent practices are less likely to be responsive to emerging needs – both their own and those of their students. (Reinsfield, 2018)

Teaching Technology

The Mātanga PLD programme was based on the premise that technology education should be problem-based, authentic, learner-centred and future-focused in nature, and that innovation in teaching can be represented through an increased engagement in differing pedagogical practices, which include

authentic or real-world learning opportunities for students' engagement in personalised programmes (Organisation for Economic Co-operation and Development (OECD), 2014). The New Zealand government mandate that all schools will have learner-centred pathways (MoE, 2016). Technology is perfectly situated for this (Snape & Fox-Turnbull, 2011). To facilitate the development of learner-centred programmes' process, teachers must understand how to support student agency to enable learner-centred pedagogies in technology education. Future-focused practices are inclusive of digital pedagogies, and designed to develop students' critical and creative thinking (Gilbert, 2007; Lewis Petrina & Hill, 1998; Reinsfield, 2018, Williams, 2015).

Technology teachers' specialist identity

Teachers' perceptions can be represented in diverse ways in relation to the nature and purpose of technology education. In New Zealand, the technology education indicated confused teacher identity with some teachers reverting to historically placed practices, which are technical in nature (Reinsfield, 2016). Teachers' connection to their professional community and evolving specialist identity can also be attributed to their understanding of the nature of technology education and through their emerging practices. The research project explored ways technology teachers responded when expected to teach in a manner that was different to their usual practice. This focus was premised on the view that such practice can lead to creating tensions between their professional identity and professional practice (Biggs, 2006; Dakers, 2006; de Vries, 2005; Fox-Turnbull & Sullivan, 2013; Hoyle, 2008).

Technological and technical thinking

Teachers' ways of thinking about both technology and technology education are likely to be connected to their lived experiences but will also be mediated by the 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, 2017). Both concepts have a role to play in enacting technology education from a range of different perspectives, but equally, an emphasis on either role can moderate students' learning in the subject. For example, if a teacher's 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' evolving understanding of the manipulation of materials is detrimentally impacted. Conversely, if the focus is on skill development, the quality of the product will be assured at the expense of creativity or innovation. Thus, this research explored participants' world-views of technology education, and how this translated into their thinking and pedagogical practice. The next section describes the design of this research project.

Research design

The research project was situated within a qualitative interpretivist framework (Reeves & Hedberg, 2003) and generated data through face-to-face interactions between project facilitators, Mātanga, and the participant teachers, occurring in five face-to-face meetings, interviews and online tasks. A socio-cultural lens accommodated a deliberate focus on teachers' evolving perceptions and understanding of technology and their classroom practice. Thematic analysis allowed the extraction of meaning, in relation to the research questions, and the participants' reporting of emerging knowledge (Javadi & Zarea, 2016). This approach facilitated identification, and extraction and reporting of emerging themes on contemporary PLD approaches in technology education.

This research is further informed by existing literature on contemporary approaches to professional learning and development in technology education *(*e.g., Akiba & Wilkinson, 2015; Aminudin, 2012; Reinsfield, 2018*)*, and the extensive experiences of both researchers in technology teacher education. Such an approach was deliberately chosen to determine how each teacher navigated the complexities that influenced their engagement with the PLD, when using alternative pedagogies in a deliberate and informed manner, and to reflect upon their pedagogical practice (Lampert, 2010; Soslau, 2012).

Ethical considerations

This research project sought to generate understanding about how teachers (n=31) viewed and positioned their curriculum knowledge when constructing meaning, enacting technology education, or engaging in professional learning activities. By fostering relationships with participants early, the researchers and the programme developers reassured participants that the purpose of the research was to enable exploration into their understanding of the curriculum, rather than to judge practice. Whilst each action could have been considered for its validity, veracity, appropriateness, honesty and understanding (Habermas, 1978), a socio-cultural perspective assumes that a teacher's actions are mediated by the context and their subjective stance. The data was, therefore, considered from the perspective of participants' differing identities, and apparent membership in the technology community, as defined by their engagement in face-to-ace dialogue and online contributions.

Participant selection

Experts who were prepared to share their expertise were sought to participate in the Mātanga Project, and subsequently, this research. Mātanga were shortlisted for the mentoring role based on their understanding, and/or the TENZ Council's knowledge of their professional practice in the Early Childhood, Primary, or Secondary sectors. Participation in the PLD programme and research were voluntary but those in mentoring roles needed to be able to demonstrate a contemporary understanding of the technology curriculum, as determined by the following questions in Phase 1 of the project.

1. What do you perceive to be the most pertinent issues currently facing New Zealand technology education?
2. What skills and experiences of the New Zealand technology curriculum do you have, to support other teachers?

In this way, the Mātanga were selected from the original volunteers. The Mātanga selected were then asked to volunteer in the research project. Of the 31 Mātanga, 12 volunteered as participants in this study and are profiled in Table 1.

Table 1. Mātanga Profiles

	Profile	Sector
Bella	Has taught textiles and food technology for several decades; has a passion for textiles and sustainability	Secondary
Beth	New Zealand Curriculum leader for technology education in her school; with strength in curriculum enactment	Secondary
Bruce	Teacher of Years 5 and 6 students, with expertise in Digital Technology	Primary
Colette	Centre manager who sees technology education as a means of enabling future focused approaches to learning	ECE
Corrine	Has been a TiC Textiles, HoD Multi-materials, Assistant HoF Technology; has mentored technology student teachers; is involved in technology teacher education	Secondary & tertiary
Graham	Ex-technology adviser; National Examiner; Achievement Standard writer and moderator	Secondary
Joanne	Advanced Classroom Expertise teacher assessor for the National Monitoring Study of Student Achievement interested in the revision of the technology curriculum	Intermedia te
Kevin	Moderator; researcher teacher for technology assessment in lower secondary schools; NCEA professional development facilitator; ICT	Secondary

	cluster lead; lecturer in technology education	
Kylie	Years 7 to 13 teacher with an interest in e-textiles and electronics	Intermediate & secondary
Poppy	Food and textiles technology teacher	Secondary
Susan	Has been a teacher of technology for over 20 years, across Years 1 to 13; participant in the Ministry of Education's Resource and Facilitation Project; teaches all technological areas; has expertise in the implementation of the new Digital Technology progress outcomes; has been a specialist team leader, curriculum leader, and ICT leader	Primary, intermediate & secondary
Veronica	Digital technology facilitator	Secondary

There were four phases in the Mātanga project, outlined in Table 2, from which the data was gathered.

Table 2. Phases of research for the Mātanga Project

Phase	Task	Data collection
Phase 1	Expressions of interest for the project	July - September 2018
Phase 2	Face-to-face meetings	November - December 2018
Phase 3	Online module completion	January - November 2019
Phase 4	Follow up interviews	February 2020

In Phase 2, Mātanga (and subsequently the teachers) attended an initial face-to-face meeting, to outline the nature of the project, and establish some common understanding. The online learning platform, Zoho Connect, was introduced to the project participants to enable collaborative engagement. Teachers worked through four modules with their Mātanga and others in the project with whom their Mātanga were working. Research participants agreed to allow the work they generated in the online forum to be used as data. This data consisted of the professional learning and development planning and module work. Follow up interviews were also undertaken.

The following selection reports findings from 12 Mātanga, discussing three aspects of their data: participants' self-reported perceptions about the issues facing technology education, understanding of the nature of technology education, and their consequent goals for the project.

Findings and discussion

The findings reinforced why technology education is perceived as a subject with a confused identity. The Mātanga identified various factors affecting the nature of technology education in New Zealand. Most evident were the tensions identified for teachers' curriculum and assessment understanding, and the pressures being placed on practitioners to remain current in their practice and respond to the curriculum changes in future-focused ways (Biggs, 2006; Dakers, 2006; de Vries, 2005; Fox-Turnbull & Sullivan, 2013; Gilbert, 2007; Hoyle, 2008; Lewis, et al., 1998; Reinsfield, 2018; Williams, 2015).

There were differing understandings and interpretations of the technology curriculum by Mātanga. Most pertinent for them was the need to embrace the new Digital Technologies aspect of the revised technology curriculum. They explained their view that the nature of the subject was changing, leading to a need for them to review their existing programmes in an informed, responsive and deliberate manner. Mātanga acknowledged the need for teachers to feel professionally supported during this

transition period for technology education and when setting their goals, saw opportunities to collaborate, assist, and mentor their colleagues.

Figure 1 highlights the connections between three initial key findings. Specifically, the factors impacting technology teachers' evolving practices were perceived to be *issues* in technology education (e.g., a changed curriculum), and the diverse *understandings* of the nature and purpose of technology education (e.g., technical and technological thinking). Interestingly, Mātanga acknowledged one of the *goals* of the PLD project - to afford a change in practitioners' thinking. Mātanga also anticipated their own need for ongoing professional development, particularly in the areas of mentoring, culturally responsive, evidence-based and innovative practices. This signalled that the Mātanga embodied the notion of lifelong learning, as it is conceptualised in the New Zealand curriculum (MoE, 2007).

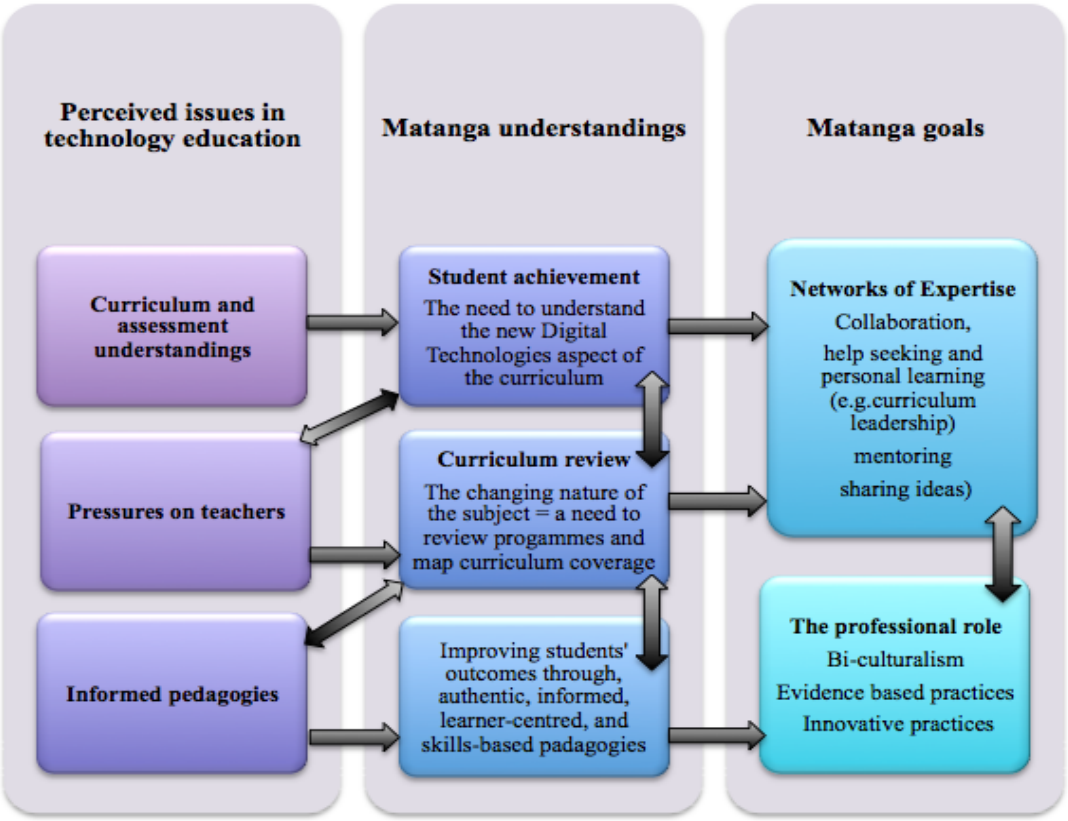

Figure 1. Summary of findings: Mātanga perceptions and goals for the project

Aspect 1: Perceived issues in technology education

The Mātanga raised the diverse and sometimes conflicting nature of teachers' understanding of the technology curriculum as an issue. Mātanga suggested this could be because of its recent revision. Bruce highlighted the need to reposition the subject as being future-focused by stating that he wanted to be involved in the project:

> … to improve my understanding of the *New Zealand Technology Curriculum* leading to enhanced learning for students. I would like to lead learning across the school to improve technology education. I believe we could be doing better developing technological understandings in our students and, given the world now, and the future world they will go into, it is important to upskill ourselves as educators to do this.

Corinne described her perception that in the senior secondary context, assessment outcomes were driving the learning in technology. She stated that there were workload pressures because of the:

> …changing nature of Technology Education. Teachers [are required to] keep up with expectations of curriculum, including the changes in Digital Technology, to sit alongside the existing curriculum…
>
> [There are] upskilling pressures, to be done in the teacher's own time, leading to assessment driven projects instead of teaching and learning programmes, [where there should be a] move to more student-driven projects - this is difficult for some teachers to manage.

Kylie suggested various issues affecting technology teachers during this period of change, and indicated a need for more support for teachers.

> … more cross-pollination and a breaking down of silos within technology departments as well as across subjects. This requires support for teachers to feel confident to step outside their comfort zones and try new ideas…
>
> Additionally, support for technology teachers to develop skills in their non-specialist [technological] areas would ease the issue of supply, reinvigorate teachers' practice, and develop a more multi-materials approach to technology education. The [senior assessment] technology matrix is [currently] designed for this though I feel that it is still not fully understood within technology departments, and at times by Senior Management, who question why so many standards are being offered.
>
> Also, helping teachers develop authentic contexts for students, such as re-developing the school grounds, revamping a classroom, [or] garments for road safety would be helpful. Often in a school a teacher can be the only specialist teacher and may not have colleagues that share their thinking, which makes for a lonely existence and a lot of work developing resources in isolation. Some way of deepening collaboration and sharing in and across schools could provide support and encouragement for those that feel alone, and security for others to try new approaches to their practice.

The recent revision to the technology curriculum has highlighted the need to continue to view technology education from an holistic rather than siloed perspective - particularly in the ECE, Primary and Junior Secondary sectors. Such contexts required teachers to consider the evolving nature of technology and its relationship with societal needs. Reinsfield's (2018) research indicated that when teachers primarily identified as a specialist teacher (of hard materials, for example) rather than a teacher of technology education, they experienced more difficulty when making connections between their specialist understanding, professional experiences, and the technological concepts in the curriculum (MoE, 2007, 2017a). Specialist knowledge (of carpentry, for example) does not necessarily equate to an ability to interpret the technological concepts in the curriculum for enactment in a teacher's practice (de Vries, 2005; Fox-Turnbull & Sullivan, 2013; Reinsfield, 2018).

Aspect 2: Mātanga understanding

As expected and appropriately, the Mātanga conceived the nature of technology education as a result of their professional experience and engagement with the technology curriculum in their school. Many wider professional learning opportunities (such as being a moderator of senior secondary assessments in technology) have enabled them to conceptualise technology education in a variety of ways, to accommodate the curriculum requirements. Curriculum understanding was espoused differently, and appeared determined by the sector within which the practitioner worked. Colette, an Early Childhood Education (ECE) centre manager, described technology education as being enacted through technology-use in her context, and stated:

> My leadership experience has enabled me to work alongside teams with varying experiences of technology and support teachers to learn and develop their understanding of ways to use technology for fostering a culture of learning and knowledge, underpinning everything they do through Te Whāriki [New Zealand ECE] curriculum document…

> In my work as a Kindergarten teacher I consistently maintain an attitude of open-mindedness to learning. This attitude endorses my work *through* technology and positive persistence when working with colleagues, coaching them through the constantly evolving nature of technology in education today. [Emphasis added]

Using digital technology as a tool to enable learning is a technical way of thinking about technology education because it only considers the use of technologies rather than a more holistic view as outlined in Te Whāriki. Technology education is defined in Te Whāriki as a way for "Students [to] learn to be innovative developers of products and systems and discerning consumers who will make a difference in the world" (MoE, 2017a, p. 57). It is interesting to note that it is not common practice for ECE students to have courses related to specific learning areas such as technology, therefore there is a risk with the recent changes to the curriculum in New Zealand, that technology in ECE will become totally focussed on using digital technologies.

Poppy described her conception of technology education which could also be aligned with a technical way of thinking, and more commonly associated with a product and/or process-driven approach. She stated:

> My understanding of technology [entails the] development of a prototype, using the technology design process... Using skills, knowledge and techniques to address needs… Developing a healthy cupcake was a challenging experience but was successful in terms of how students justified their trials and developed their recipes to make a cupcake with fruit in the batter.

This technical approach to technology education is pervasive in the subject, particularly in the senior secondary school context, where students engage with projects that can last up to three of the four terms in the school year. Currently the MOE is reviewing and revising its senior secondary qualification certificate, the National Certificate of Educational Achievement (NCEA) (New Zealand Qualifications Authority, 2019). Due to a re-thinking of current Achievement Standards, and assessment practices, these changes may embed or challenge practitioners' thinking about pedagogy (e.g., Boyatzis, McKee & Goleman, 2002; Fullan, 2002; Grundy & Robison, 2004; Handal & Herrington, 2003).

In contrast, Kylie explained the types of projects she developed, which signalled an alignment with both technical and technological approaches to thinking, as well as a negotiated approach to student learning. She stated:

> Next year's programme will still incorporate e-textiles - probably a soft toy but yet to be decided with students... [This year], the first semester has included a natural dyeing project, which used natural dyes and materials to enhance "our space." The Horticulture room at school needed a revamp so a number of students created a range of outcomes for the room which ranged from - a bag for the teacher to "carry her laptop and lipstick," a fence made out of old timber to go along the wall, 3D flowers, a door stop…
>
> This semester students are still deciding whether the final outcome will be a community project or a range of smaller projects - e.g., each individual textile is developed into a quilt perhaps or knee blankets for the local rest home…
>
> Senior projects are generally based around a minor project in Term 1 - with a focus on assessing skills although using a brief and following a technological process to scaffold for the major project, which usually assesses prototype and applied design/pattern adaptation/influential designer/design era depending on the nature of the student's project, personal interests and strengths.

The data suggested that teachers' perceived issues and understanding of the technology curriculum were diverse, motivated what they wanted to contribute to the Mātanga project, and influenced the nature of their goals, as identified at the outset of the project. This signals a continuing tension for those grouping perceived experts with teachers, particularly when participants may have differing understandings of the nature of technology education.

Aspect 3: Goals for the technology community

Mātanga were keen to develop their understanding of the curriculum but also to use the project as a means to demonstrate their ability to foster others' professional learning, and enact curriculum leadership at a national level. Bella's goals were both personal and altruistic, she commented that she would like to:

1. Practise and develop the use of Te Reo within my classroom;
2. Further engage in collaborative problem solving, collegial discussions in order to gain new ideas from fellow teachers;
3. Improve the assessment criteria for Years 9 and 10 Technology classes;
4. Use the data gathered (after assessment) to help inform my practice; and
5. Share resources with other colleagues in order to strengthen my current teaching practice - in terms of innovative teaching outcomes.

Bruce was seeking to develop his leadership skills and make sense of the recent changes to the curriculum, and outlined the following goals to:

1. Develop leadership skills, especially mentoring;
2. Understand the revisions to the technology curriculum and how they sit within the technology curriculum as a whole;
3. Assist others to understand these links; and
4. Further develop an understanding of best practice in technology education.

Mātanga in this project acknowledged that the recent revision to the curriculum presents opportunities for technology education to be re-conceptualised, with implications for teachers' workload, and a sustained need to support teachers' evolving curriculum thinking and practice. Mātanga have experience of teaching the technology education curriculum, integrating a range of technological areas, and responding to students' interests and learning needs in authentic contexts. This project has offered them an opportunity to model this thinking and practice, foster others' curriculum understanding, and provide insight for the community.

Mātanga indicated that they believed the online professional learning community was most effective (at this stage) when they had fostered a safe and collegial environment, by engaging in discussion about each other's interests, experiences and understandings of technology education. They saw the project as a way of addressing the ongoing issues in technology education, and supporting their colleagues during this transitional stage of curriculum enactment. Mātanga also acknowledged, however, that they had their own areas for development. These findings are pertinent, when considering how professional learning might be designed in the future, with a view to fostering a sustainable and reciprocal model of learning.

Conclusions

This paper has outlined initial research findings from the Mātanga Project, a professional learning and development project delivered by the Professional Association, TENZ. Designed in response to the acknowledgement that opportunities for quality teacher learning are not always equal for a variety of reasons, such as geographical location, perceived needs, and access to quality PLD providers, the PLD assisted teachers' perceptions and understandings of the nature of the subject. Increasing pressures to maintain or improve student achievement, and align their programmes of learning with new curriculum content, were identified as key factors influencing their evolving pedagogical practice. This is significant, particularly as the online approach to learning did not appear to mitigate these pressures. For technology educators in New Zealand, PLD appears heavily premised on the need to include regular face-to-face interactions. There appears a need to explore further how such communities might benefit

from a combination of face-to-face group networking and online discussion and activity, with a view to supporting participants' focused and consistent engagement in learning.

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