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# Technology education in the New Zealand context: Disparate approaches to meaning making of the curriculum and the implications for teachers' evolving knowledge for practice.

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## Abstract

*Technology education in the New Zealand context provides an opportunity for schools and teachers to offer future-focused, and innovative learning opportunities for all their learners, regardless of social or academic need. Teacher perceptions of the purpose of technology education influences the way that they interpret and make meaning of the curriculum in their school context. This article draws upon the emerging findings from a research project which explores how teachers' knowledge of practice was mediated during professional development in two secondary schools. The findings suggest that teachers' understandings can be deduced from their use of language, which is shaped in culturally meaningful ways. The article draws upon activity theory to illustrate two disparate approaches to discussing the delivery of technology education in the New Zealand context.*

**Key words:** Activity theory, curriculum, knowledge for practice, meaning making, professional development, technology teachers' perceptions.

## Introduction

Technology education in New Zealand is a mandatory subject within the compulsory schooling system, from Years 1 to 10 (aged 5 to 14 years). The subject provides an opportunity for schools and teachers to offer future-focused, and innovative learning opportunities for all learners, regardless of their social or academic needs. The reality for some teachers, however, is that their subject's position in schools remains tentative, and is influenced by government agendas, community expectations, and their own perception of the purpose of the subject. These factors influence the way that a teacher interprets and enacts the curriculum in their school context.

This article reports on the initial findings from a research project which explores the disparity between theory and practice in technology education within the New Zealand context. The research investigated how six technology teachers' perceptions of the nature of technology education were mediated within two school contexts. This article focuses on professional development that occurred at the department level in the two secondary schools.

## Nature of the New Zealand Curriculum

Technology education can be taught through a variety of different contexts: structures, control, food, information and communications technology or biotechnology. The subject is defined in the New Zealand curriculum statement as:

> …Intervention by design, the use of practical and intellectual resources to develop products and systems…that expand human possibilities by addressing needs and opportunities. Adaptation and innovation are at the heart of technological practice. Quality outcomes result from thinking and practices that are informed, critical, and creative. (Ministry of Education [MoE], 2007, p. 32)

Within the New Zealand curriculum, Technology Education (MoE, 2007) is one of eight learning areas, and consists of three strands: technological practice, technological knowledge and the nature of technology.

Technological practice is the concepts that inform the development and making of products. Technological knowledge focuses on the processes and properties of materials that can be used in the development of a product; the nature of technology strand advocates for learning where students can explore the relationships between technology and society (MoE, 2007).

Technology education has seen significant change in its philosophy and content (Williams, 2009) which has, at times, led to a disjunction between Technology in the New Zealand Curriculum (MoE, 2007) as espoused by the Ministry of Education, and the practice being enacted in some schools. In his writing about the philosophy of technology, de Vries (2012) indicated that this could be attributed to some technology teachers who found a change in thinking and content challenging because they were "practical people who like to do practical things in class" (p. 15). de Vries was referring to a wider community perception, which assumes that technology teachers are defined by their practical skills. This is a pervasive attitude, which has meant that since its inception, technology education has been expected to rationalise its place in the curriculum and has been undervalued as the result of this practical focus (Williams, 2012).

The practical component of technology education is a strength, as long as this is not the only part of the curriculum that is being emphasised. Practical activities are a means by which to engage students in learning unique to the subject. In technology education students can problem solve, and engage in modelling and testing to identify production issues that cannot be anticipated without physical application. The challenge for teachers is to interpret the curriculum, and to address policy requirements whilst also being responsive to their students' social and academic learning needs.

## Curriculum interpretation and enactment

The National Education Guidelines (MoE, 2004) in New Zealand advocate for teachers to interpret the official curriculum and make decisions about the appropriateness of learning in their school context. The way in which a teacher interacts with a curriculum, however, will be dependent upon their understanding of its driving philosophy, their perceptions, and the social factors influencing their practice. For example, if a teacher believes they are a conduit for, rather than a consumer of, the curriculum, they will endeavour to reproduce, rather than interpret, its concepts (Remillard, 1999).

The transition from curriculum concept to practice is complex in nature. According to Singh, Thomas and Harris (2013), a policy of any kind is not just a text or document but also a process that combines values, activity and context to construct discourses, which in turn reflect their own ideas and truths. Discourse in this context refers to both written and spoken communication as well as forms of power that define a social context (Diamond & Quinby, 1988). Curriculum interpretation can be seen as a way of making meaning of policy, reviewing or decoding text, and considering options for delivery. However, specific contexts and communities determine what is privileged or irrelevant knowledge and therefore regulate that interpretation (Apple, 2014).

## Teacher perceptions

The roles and responsibilities of teachers have changed significantly in New Zealand and according to the New Zealand Post Primary Teachers Association, technology teachers have been represented in a variety of ways from being progressive to being regressive and indifferent to their subject's delivery (Institute of Professional Engineers New Zealand [IPENZ], 2001; Jones, Harlow & Cowie, 2003; Mansell, Harold, Hawkesworth & Thrupp, 2001; O'Brien, Alison, & Cross, 2006). A teacher's view of the official curriculum and pedagogical philosophies encompass their own perceptions of the subject they teach.

To interpret teachers' perceptions of the purpose of technology education serves as a means to understand how they negotiate the continuing tensions that influence the nature of the subject. For example, in the case of vocational and general secondary technology education, there is sometimes the provision for only a singular pathway in many schools, because of economic and timetabling factors, despite the differing philosophical beliefs underpinning their delivery (Jones, Buntting & de Vries, 2013). The need for teachers to deliver both a vocational and general programme, or make choices about which pathway is more financially viable, has led to some disparity in the way in which the curriculum is likely to be interpreted and taught (Jones, 2009; Williams, 2012; Williams & Lockley, 2012).

According to the New Zealand Curriculum, it is the teacher's professional responsibility to reflect upon how their teaching facilitates "thinking and practices that are informed, critical and creative" (MoE, 2007, p.32). Some teachers have found this process difficult, however, because of the need for them to align their attitudes with differing perspectives of the purpose of technology education (Reinsfield, 2014). The need for a change in practice is received in differing ways, but for some teachers, their response is to sustain or retreat to historical practices (Paechter, 1995). Professional development is a way of mediating teachers' perceptions and knowledge for practice, in order to develop shared understandings of the purpose of technology education both in the wider community and also from a school-based perspective.

## Conceptual framework and research design

In this research, the emphasis was on language as a mediating tool and on the ways that teachers navigated practice within their school context. An interpretivist framework was utilised, because it allowed a view of reality as determined by participants' subjective experience of their external world. From this perspective, language use and mediated activities could be explored, through the observation and interpretation of participant interactions with others, to aid understanding, and enable the identification of inferences, contradictions or patterns of meaning (Myers, 2009).

Socio-cultural theory was the lens used to view "teaching and learning as a socially, culturally and historically shaped process" (Sewell, 2011, p. 63) in two secondary schools and from six participants' perspectives. Case study methods provided a way to communicate how a teacher's context impacted on the way they were engaging in and making meaning of curriculum concepts within school-based professional development activities (Gee & Green, 1998).

*Case study approach*

The case study approach can provide a deep description of a particular phenomenon. It promotes the credibility of a research project (Shenton, 2004) and provides the reader with insights into the issue being considered, even if they are not familiar with the discipline. A consideration in using the case study method here was to keep the research reasonable in terms of its scope (Baxter & Jack, 2008), to present the two schools as separate systems (Stake & Kerr, 1995), and as bounded units of analysis (Yin, 2003).

*Activity theory*

Activity theory allows a direct focus on the concepts of mediation and tools (Ellis, Edwards, & Smagorinsky, 2010) to consider how, within a context of change, an activity can enable learning opportunities for teachers. Activity theory is a conceptual approach that provides a framework to describe organisational structures and teacher development.

Outcome

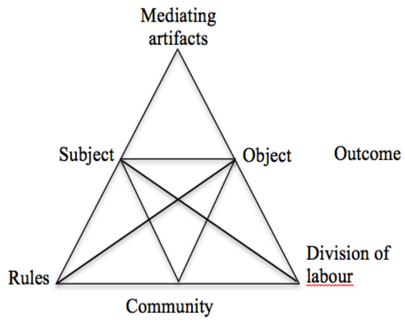


Figure 1: Engestöm's expanded activity system model (1987).

By using Engeström's expanded activity system model (1987), both case study sites could be interpreted to generate understanding of the ways that individual and collective transformations in thinking and practice were represented within and across activity systems. According to Engeström's model (see Figure 1), the elements within an activity system are goal directed and comprise instruments, subjects, objects, rules, community, division of labour and outcome. The terminology is adapted to suit this research focus (see Table 1).

Table 1: Activity theory terminology, as applied to the PhD research

| Terminology | |
|---|---|
| Engeström's expanded activity system model (1987) | Used in this research |
| Subject | Teacher |
| Instruments | Language as a mediating tool |
| Object | Objective |
| Rules | Discourse |
| Community | Community |
| Division of labour | Roles |
| Outcome | Outcome |

The terminology used within this research is associated with the following meanings: *Teacher* refers to the participants within the research; *tools* focuses on the way that language was used, to mediate an outcome; the *objective* helps to contextualise the purpose of the activity; *discourse* is used as an alternative to rules because of the researcher's conclusion, based on experience, that a school or department's culture heavily influences a teacher's evolving practices. Discourse is interpreted through the shaping and manifestation of written or spoken outcomes which represent the ways that knowledge is constructed, as influenced by a participant's subjectivity or power relations within their school context. The concept of *community* recognises that teachers were encouraged to work both collaboratively and independently to make meaning of the curriculum, and to apply new or evolving knowledge to their practice. The division of labour is replaced by *roles* to acknowledge a teacher's contribution to an activity. The *outcome* refers to a desired result, and the means by which objectives were transformed during an activity, or as the result of mediation.

## Case study sites

Two schools were selected for the research because of their convenient location. Six teachers participated. Three were purposefully selected because they were known to the researcher as being effective teachers of technology education. The other three were volunteers who were keen to engage in professional development and develop their understanding of the technology curriculum.

*Case study one – School A*

School A was of interest because the newly appointed Head of Technology had a nationally established reputation for his contributions to the subject for over two decades. He had indicated that one of his key priorities was to consolidate shared understandings of the purpose and delivery of technology education at both school and department level. He aimed to foster these shared understandings through collaborative professional development practices. Four teachers in School A, including the head of faculty, agreed to be participants in the research and one teacher moved from School A to School B during the data collection phase.

School A was established in the early 1960s as a state integrated Catholic secondary school with a roll of approximately 800 students and a reputation for academic excellence. The school's last Education Review Office (ERO) report indicated that the character of the school remained central to the ethos of the teaching, and was reflected in the strength of relationships between whānau (family), staff and students, and in the curriculum offered to meet learners' needs. Students were reported to receive appropriate advice about career pathways, and academic results were at or above those of students in similar schools, for the National Certificate of Educational Achievement[1] (NCEA) at Levels One and Two. Teachers were described as maintaining positive and supportive classroom environments, and were using effective strategies for promoting educational success. The school communicated the intent to facilitate learning which enabled students to become contributing citizens in society, and to foster personal growth and occupational preparedness.

In 2002, the school opened a purpose designed technology education centre, with specialist facilities for art, food and materials technology, as well as graphic design. Anecdotal knowledge of the technology department suggested that, in general, the teaching predominately focused on occupational preparedness rather than the development of critical thinking. The newly appointed

[1] The National Certificate of Educational Achievement (NCEA) is the main national qualification for secondary school students in New Zealand.

head of faculty was the exception, having embraced the technology curriculum (MoE, 2007) within the specialist area of hard materials.

In 2016, the school's website acknowledged the technology department's contribution to the delivery of the New Zealand Curriculum (MoE, 2007). Emphasis was placed on the progressive and innovative nature of the subject and the learning was reported as being focused on the development of independent and creative thinking skills, through student exposure to problem solving activities and an engagement in the making of products or systems, and with a view to making a difference to society. Initially, four teachers agreed to become research participants in this school; however, Fred moved to School B during the data collection phase. Their professional experience and interest in the study is outlined below.

*Participant one: Bob* is an experienced New Zealand teacher, having been in the profession since 1990. He has been a teacher of workshop technology, design technology and more recently, technology education. Bob has a national reputation for his involvement in the development of the current technology curriculum, at both policy and practice level, and had recently been appointed as the head of faculty at the school. He was keen to foster some shared understandings of the nature of technology education, and to generate a common vision with his colleagues in the department. Bob did not define his professional development experience, but indicated that he would engage in anything that was available, if he perceived it to be beneficial to his practice. His interest in the research was to encourage departmental dialogue about the nature of technology education, rather than to generate deeper personal understanding of the concepts within the curriculum for application in his own practice.

*Participant two: Helen* is originally from South Africa, with a background in home economics. She previously held a variety of roles in South Africa, as a technician in a University of Technology and later as a lecturer of home economics. She also had experience of teaching in schools from Year 1 to Year 13 Level, and had secured a position at this secondary school five years ago to teach science, junior food technology and hospitality at NCEA Level One. Helen's recent professional development had centred on curriculum and assessment in technology, with some specialist workshops in her technological area of food. She had also recently enrolled in a course which focused on raising student achievement in technology. Helen felt that she had sound specialist content knowledge but was experiencing difficulty in applying those understandings to the New Zealand Curriculum.

*Participant three: Margaret* began teaching after a career in the military as an electronics specialist. She was an unqualified teacher for some time in the United Kingdom before moving to New Zealand and gaining a Scholarship at the University of Waikato, where she became a technology education teacher. Margaret was in her second teaching post in New Zealand and the teacher in charge of digital technology. During her initial interview, she explained that she wanted to be involved in the research project because she sought affirmation that the work that she was doing in the school was in line with the requirements of the curriculum.

*Case study two - School B*

School B was selected because it was entering an establishment phase; the curriculum would be interpreted in a context where teachers were not familiar with other colleagues' thinking or practice. This provided a unique opportunity to view pedagogical decision making from a contrasting perspective to School A, and to determine how discourse could be influenced in a context where teachers were more likely to feel empowered to think creatively and without historically placed constraints. Two teachers who agreed to participate were known to the researcher and purposefully selected because of their reputations for the effective delivery of technology education.

School B is a newly established junior high school, which acknowledges the [2]whakapapa of the land upon which it has been built. The school roll began in 2016 with nearly 600 students, in Years 7 to 10. The school's website promoted its new facilities, which were situated within a modern learning environment[3]. The school's design was aligned directly with an emphasis on positive student welfare (MoE, 2011). On its opening, there had been some media coverage about the effect on nearby schools, whose numbers had been negatively impacted.

Learning in this school was described as being goal focused, to support students' monitoring of and reflection on their own development. In terms of the curriculum, learning was co-constructed between two specialist teachers from two differing learning areas, and in response to students' needs and interests. Throughout each semester, students in Years 7 to 10 were given a choice of options, as long as some of the learning throughout the year included a focus on mathematics and English.

Whilst there were specialist technology teachers and a purpose designed physical space, the philosophy of the department was still in an establishment phase. The three participants from this school are described below.

*Participant four: Fred* is an Australian trained history teacher who had taught in Australia for over 20 years. He had an interest in working with wood and gained a Certificate in Cabinet Making, so that he could teach design and technology in Australia. It was Fred's first year of teaching technology education in New Zealand and he expressed an interest in developing his understanding of the curriculum, with a view to contextualising his teaching practice.

*Participant five: Paul* had been a teacher in New Zealand for 22 years. Most of his experience was based in one school, teaching graphics and hard materials, but he had recently secured the position of specialist leader of product design in this junior high school. He is known at a national and local level for his understanding of design concepts, as applied in technology education. Paul identified that he had engaged in much professional development over the years, through advisory groups, professional associations, national conferences and the Virtual Learning Network[4]. He stated that he was keen to work collaboratively throughout the research process, to establish a shared vision for teachers of technology and foster deeper understandings of the nature of technology education, within the new school context.

*Participant six: Gayle* had been a chef before entering the teaching profession. She gained a Career Changer Scholarship at the University of Waikato in New Zealand. After completing her Diploma, she secured a position as a food technology and hospitality teacher in a high school. Gayle was currently in her third school and had been teaching for five years. She had recently obtained her current role as a specialist teacher of food technology in this junior high school. Her

[2] Whakapapa is a Māori belief which acknowledges the relationships between history, knowledge and legend to organise, preserve or transmit knowledge (in this case, of the land on which the school is situated) to the next generation (Te Ara Encyclopedia of New Zealand, 2011).

[3] A modern learning environment (MLE) is also known as an innovative learning environment (ILE). It is designed to consider and respond to the physical, social and pedagogical context in which learning can occur. Educational practices within these environments should be able to more easily respond to students' evolving and diverse learning needs (Ministry of Education, 2011).

[4] The Virtual Learning Network (VLN), is an interactive resource provided by the Ministry of Education for all New Zealand educators.

recent professional development experience had been orientated around the delivery of food technology at NCEA Level, and on assessment approaches in a junior high school context.

## Data collection and analysis

The data collection stage of this research relied on several primary sources: the New Zealand curriculum document (MoE, 2007); its supporting materials (MoE, 2010); an individual semi-structured interview with each participant during phase one of the research; lesson observations; recording and observation of two department meetings per school; individual teacher reflections; and teacher-generated resources.

Each semi-structured interview lasted approximately forty minutes, and was recorded and transcribed to allow for the verification and validation of the record (Cresswell, 2012). During the department meetings, the themes of discussion, the activities and the interactions between teachers were all of interest (Lodico, Spaulding & Voegtle, 2006). By video recording the department meetings, the conversation could be captured. An overview of the data collection process, as connected to the research questions, is summarised below.

Table 2: Summary of the research process

| Phase | Research question | Data collection method |
|---|---|---|
| *Phase one: Teacher perceptions* | How do technology teachers' perceptions influence their enactment of the New Zealand curriculum? | An initial semi-structured interview of approximately 40 minutes<br>Department meetings |
| *Phase two: Interpretation of the curriculum* | How do teachers interpret the concepts presented within the official technology curriculum? | Department meetings<br>Teacher-generated resources |
| *Phase three: Enactment of the curriculum* | How do teachers enact the concepts presented within the official technology curriculum? | Lesson observation for between 45 and 60 minutes. |

Data collection led to the identification of themes, within an inductive model and to allow for the ongoing comparison of emergent findings. By using two case study sites, teachers' perceptions and the nature of technology education in each school could be explored (Miles, Huberman & Saldaña, 2014; Thomas, 2006).

This article reports on the findings from data analysis, which included making meaning and the interpretation of all evidence, to explain its pertinence and to make propositions. To enable this process, activity systems were presented using Engestöm's (1987) model to illustrate the differing views, traditions and interests, as represented by both the individual participants and the case study sites. The development of technology education in New Zealand and the historicity of the school context informed these propositions.

## Findings and discussion

The findings reported on here are based on the data from the two schools, where the department meetings were the activity of focus. Attendance at department meetings was arranged when the schools indicated that professional discussions would be of benefit to the research focus, which considered the ways that teachers appeared to be making meaning of the technological concepts being discussed, how they communicated their ways of thinking, and the language that they used to mediate this process.

*School A*

Prior to the meeting reported on here, School A's participants had taken part in a national, online discussion forum where teachers were exposed to knowledge about the essence of the Nature of Technology strand, from the official curriculum perspective.

During the meeting of focus, Bob, Helen and Margaret were engaging in professional development about the Nature of Technology strand of the curriculum (MoE, 2007). Their perceptions of the purpose of technology education, as described during the baseline interviews, are considered pertinent to this article's focus and are outlined below:

> Bob: … Not only do they learn how to make things, that is one of the parts of it, but it's got so many other aspects to it … it prepares students to go out and be citizens and to go into the workforce, and be prepared to learn, and be prepared to work with people. Prepared to make decisions….
>
> Helen: I think it's become quite clear to me now, that because we don't do senior Technology here, in [Junior] Food Technology, I've got to bear in mind that there are certain skills that it's my responsibility to get through to the kids, before they start [NCEA Level 1] Hospitality … So I do make it my business to make sure they get as many of those [practical] skills as they can.
>
> Margaret: I really want them to enjoy the creative plan of [learning in technology education] … Because that's wh[o] one day will be our Engineers. They need to have the creativity. It doesn't need to be perfectly built; the gearing doesn't have to be right … University will teach them all of that. I need to send them to University with an open mind, and with a creative and investigating mind, ready to go the next stage. That's my job.

Bob led the professional development by disseminating his knowledge, which had resulted from his previous teaching experience. He facilitated discussion about the curriculum content of the Nature of Technology strand and the differing pedagogical approaches that could be used in its enactment.

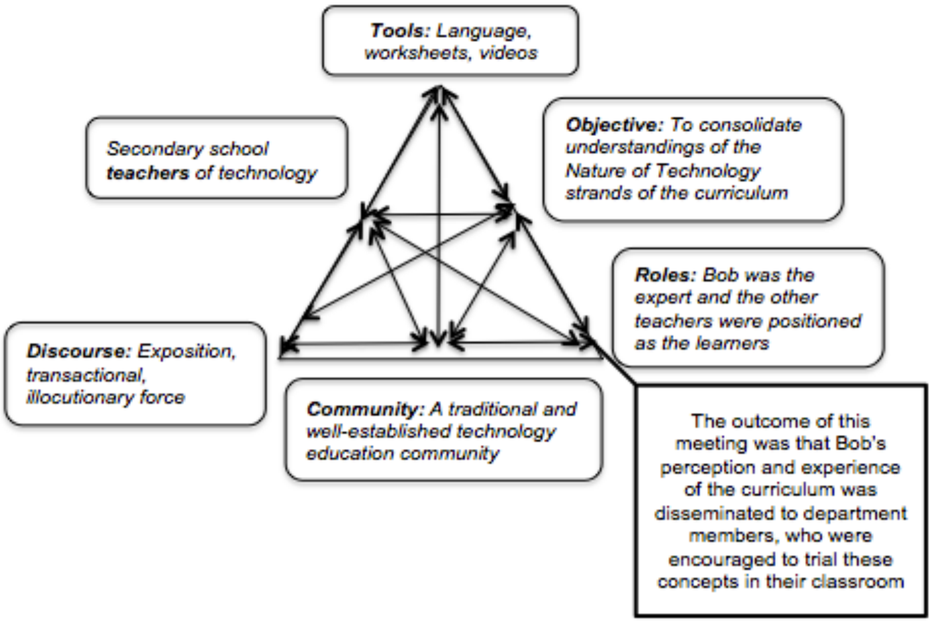


Figure 2: A professional development activity system for school A.

The activity system for School A shows that Bob led discussions, positioned himself as the expert, and determined the discourse within the department. He acknowledged that the information presented was from his perspective, the result of his previous experience of teaching these technological concepts, at a variety of year levels. To explain further, he stated that the focus of discussion was to be:

> …The Nature strand because we've talked about it before…it gives us that depth in our projects, the depth of knowledge for the students from the 'get-go' and I know that there are people here saying that I've got to give my kids [the opportunity] to know more about a product and get them to look at a product properly, you know, existing products and that sort of stuff and this is exactly where it comes from.

Both Bob and Margaret used illocutionary force in their *roles*, to assert their beliefs in their own practice within their culturally defined setting, and to reinforce how the technology curriculum should be interpreted and could be enacted, from their perspectives. Throughout the meeting, Bob checked for understanding of the concepts being presented and emphasised the importance of the Nature of Technology strand for students' work in technology education. Bob regularly focused his attention on Helen, because she was experiencing difficulty engaging with the concepts from the curriculum but had also expressed a motivation to develop her knowledge for practice. Helen had indicated during the baseline interview that:

> Professionally, well I've tried my best to get up to speed with Technology, but it's been a bit hard because my family kind of come first. They always have. So I've done whatever I can within the school hours, like if I can take a day off to do Professional Development, I do it… And I think I'm gripping it. I mean Technology was new to me, and I didn't really make that a secret. I knew that I had to learn a lot. But I'm really keen to learn, you know, I really am.

To achieve his *objective* of the meeting, Bob provided food-specific examples for Helen, who appeared to engage with the content and made meaning of the examples cited. She referred to the worksheets being exemplified by Bob, as *tools* to verbalise her thinking, and asked questions about its use in practice.

Bob: So they just fill out this product reading sheet…So you know, you're extending understanding at Year 10 level, to be able to identify these attributes and bits and pieces and apply that to their product design…

Helen: So, almost working backwards….

Bob: Yeah….

Helen: And then they are going to take it from there and move forward….

The *outcome* of Helen's meaning making was that she was motivated to identify where her new knowledge for practice might fit into her junior technology programme.

Helen: So you think that we should do that in Year 10… and in Year 9 as well?

Bob: *[Nods]* Year 9, if you want to. What I suggest you need to do is, if you are going to do it in Year 10, is have a look at the Progression Indicators[5] and see what it's asking to be done.

Towards the end of the meeting, Bob re-iterated its *objective* by referring to the teachers' expertise, encouraging them to use his approach, and indicating that the concepts within the Nature of Technology strand were easy to enact. However, there was some tension between the ways that Bob and Margaret perceived that the Nature of Technology strand should be delivered. Bob asserted that the curriculum components should be approached separately to avoid confusion, and Margaret argued for an approach where content could enable naturally occurring learning opportunities in the classroom. This is illustrated below.

Margaret: If I showed you the latest mouse, it's a tiny little cube about 2 cm big and it sits on your desk and it turns your hand into the mouse.

Bob: So you're looking at the specific product? You're looking at Characteristics of Technological Outcomes, you're looking at the outcome itself…

Margaret: Well yes and no. We're looking at the mouse and we're looking at the story of the mouse because it's not just the mouse any more, I mean, you wear suits now and you have a 3D environment… How will we interact with the computer at the end, what's it going to look like? By the time [the students] are forty, what's it going to look like then? It's how we interact with the computer. The mouse is just the vehicle.

Bob: It would be really good to see if you could plan it so that you could look at the Characteristics of Technology of the mouse and why it's developed without looking at the physical parts of how it has developed. You know, it's developed to become portable. When you

[5] The Indicators of Progression document was developed to support the implementation and enactment of technology education in the New Zealand Curriculum (Ministry of Education, 2010). They enable the interpretation of Achievement Objectives from Levels 1-8, to explicate the learning that students should be exposed to.

look at the mouse, you look at the specific mouse itself in terms of its ergonomics, so that's the outcome itself…

Margaret: But we have to do that to understand it…

*School B*

In School B, there were two meetings and the first is the focus here. The agenda for meeting one was determined by the Principal who wanted his staff to consider what the "essence" of their subject was, and how their future teaching might 'look' within a modern learning environment. At this point, all teacher dialogue was conceptual, but occasionally drew upon previous teaching experience and much of the discussion during this meeting was centred upon the terminology and philosophy of the official curriculum (MoE, 2007). Fred, Paul and Gayle were at this meeting and their perceptions of the purpose of technology education, as described during the baseline interviews, are outlined below.

Fred: I guess my personal philosophy of education, is that I see my job as to make myself obsolete and the sooner that I am no longer needed, the better I've done my job … so to have the opportunity for these students to make and do stuff and push things and fail, as it were, have things fall over and just go, okay, so what did you learn from that? … You and I both know that everything [can] look right and it ticks all the little boxes but it's not innovative and the kid is just a robot in the sense that they go over and they drill that hole there because that's where they are supposed to drill that hole and they haven't thought 'Well what happens if I drill that there?'

Paul: We want our students to be able to solve problems and make stuff to solve those problems that make a difference to them, to the community, to the world and present that to an authentic audience and I believe that we can get there … That's really powerful, rather than taking a pencil case home, and mum and dad say, 'That's nice.'

Gayle: I personally believe that innovation and sustainability, all the things that we talk about in the nature strand, and all of the strands, are all very important in how we structure our teaching and the students learning…The parents and others might not understand that so much because they feel like all their children need to do is learn skills, so that they can make it when they get older.

Below is the activity system, which represents the department meetings in School B.

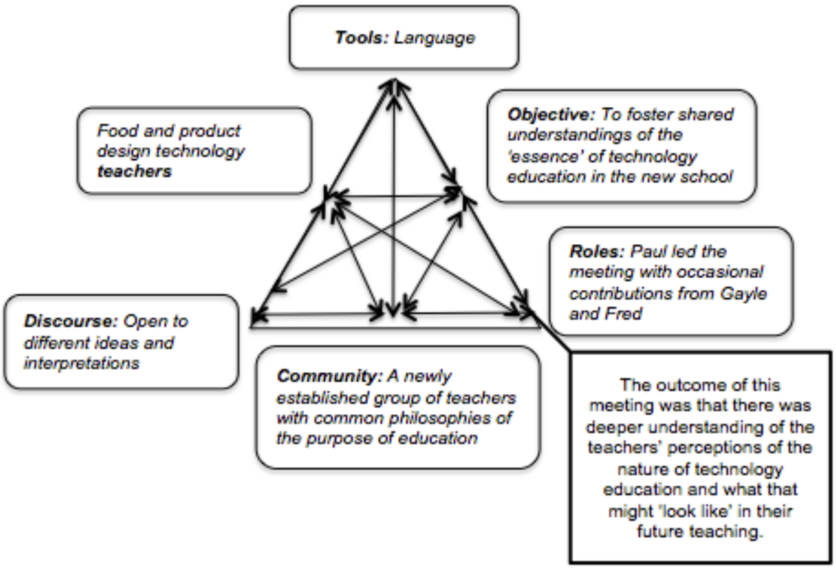


Figure 3: A professional development activity system for school B

Paul encouraged discussions between a *community* of *teachers*. The *discourse* was established from the outset of the first meeting where Paul asserted that whilst he was leading the meeting, his *role* was not from a position of authority; he encouraged contributions from all teachers.

Much of the discussion gave the impression that the *objective* of the meeting was met, because teachers' utilised common terminology, reflective of the New Zealand curriculum document (MoE, 2007). The meeting's purpose appeared to emphasise a focus on the development of collegial relationships rather than to engage in meaningful discussion about the 'essence' of technology education in the new school context. An example of the discussion is illustrated below.

Paul: If we want to talk about what the essence of technology is and that's all that I think we really want to do this time, I think. What do you people think technology is?

Gayle: Ideas informing future decision-making… Understanding relationships between each [learning] area…

Paul: [Fred], it's not like you to be quiet?

Fred: I'm trying to look smart but I'm thinking [*Laughter*] … Fit for purpose? *[General agreement.]*

Paul: Lead the way to the curriculum, awesome!

Fred: Just throw those words around….

Gayle: Done….

During this first meeting, Paul asked teachers to describe their anticipated learning activities, once the students were attending the school. These descriptions serve as indicators to the participants' view of the nature of technology education. For example, Paul explained that one of his projects was called:

> 'Rebel Sports' … because the idea is that it's got to be a crazy game, it can't just be a game of tennis or cricket, it's got to be a made up game or something. One of the things that we are doing is that students have to choose a letter out of a hat, and they have to report back on a sport that is played in a country with that letter. So, what are the rules? … and look at the game and make the connections with the culture of that country and make the connections.

Gayle too, described one of her projects

> … So food and literacy are paired and we are going to be connecting relationships through food and we'll be doing that through story telling. It could be in any shape or form, we are leaving it really open and we're thinking that lots of different things could happen, like authors coming in, you know, we all have a story to tell, where learners can go ahead and do a food blog or create products by going out into the community, and keeping it very open.

Fred was not teaching technology during the research phase at School B, but he did make an interesting observation about the tensions he had experienced during his first year of teaching technology education:

> … You go to the kids and you say, 'Now you're the stakeholder but you are going to build this' and then you say 'So why are you building this?' and it's like, 'Because you told me to' … Then it's like, 'The teacher said I had to make this …' It's like, you can have any colour you want, as long as its black. You can do anything you want in technology as long as it….

## Concluding remarks

There appear to be persistent, and disparate perceptions of the nature of technology education in the New Zealand context. These findings suggest that teachers' understandings of the concepts within the technology curriculum can be deduced from their actions and practice, which are shaped in culturally meaningful ways. For example, because School A was going through a period of change, where Bob was establishing himself in a leadership role and asserting his expert knowledge, there was limited discussion about the differing interpretations of the curriculum, despite evident tensions between teachers' beliefs underpinning its design and classroom delivery. The priority was on developing a shared understanding of Bob's expectations of the delivery of technology education, rather than reviewing the curriculum structure across the department.

In contrast, the professional development focus in School B assumed that all teachers had a well established understanding of the concepts within the technology curriculum. The focus was on establishing collegial relationships, to foster collaboratively developed approaches to learning, which could drive curriculum implementation and enactment. Teachers were actively encouraged to develop learning opportunities that were student-centred, and curriculum coverage and enactment was to be responsive to student need.

These two disparate approaches to technology education can be attributed to historically situated attitudes, community influences, as well as the perceptions of the technology teachers within each school context. The way professional development was mediated in the case schools was determined by the school or curriculum leaders, and both intended to consolidate teachers' evolving knowledge of the curriculum, in their context. Despite these curriculum leaders modelling different management approaches, most teachers engaged in surface level discussions about the meaning of the technological concepts within the curriculum. This was partially due to time limitations during the meetings but also because of the culturally defined practices within each social setting, which avoided dialogue that might be considered controversial to collegial relationships.

All teachers acknowledged or alluded to the practical nature of the subject when describing their professional experiences; there was some reference to the influence of community expectations on practice, and the perceived philosophical aim of the subject to prepare students for their future role in society. Three teachers alluded to the innovative and creative nature of the subject.

The challenge for technology teachers in New Zealand is to enact knowledge for practice which is derived from understanding of the current curriculum (MoE, 2007). To secure technology education's position as a subject that offers future-focused and innovative learning opportunities, there needs to be a rejection of practices that reproduce outdated interpretations of the curriculum, even if they can be rationalised as being responsive to or as the result of school structures. The effectiveness of school-based professional development is influenced by the way that it is mediated, and by teachers' perceptions and motivation to interpret and enact the curriculum, and to further develop their knowledge for practice within their classroom context.

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## References

Apple, M. W. (2000). *Official knowledge* (2nd ed.). New York, NY: Routledge.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report,13*(4), 544-559. Retrieved from http://nsuworks.nova.edu/tqr/vol13/iss4/2

Cresswell, J. W. (2012). *Educational research: Planning, conducting and evaluating quantitative and qualitative research.* Boston, MA: Pearson

de Vries, M. J. (2012). Philosophy of technology. In P. J. Williams (Ed.), *Technology education for teachers* (pp. 15-34). Rotterdam, The Netherlands: Sense. doi:10.1007/978-94-6209-161-0_2

Diamond, I., & Quinby, L. (1988). *Feminism & Foucault: Reflections on resistance.* Boston, MA: Northeastern University.

Ellis, V., Edwards, A., & Smagorinsky, P. (Eds.). (2010). *Cultural-historical perspectives on teacher education and development: Learning teaching*. London, England: Routledge.

Engeström, Y (1987). *Learning by expanding: An activity-theoretical approach to developmental research.* Helsinki, Finland: Orienta-Konsultit. Retrieved from http://lchc.ucsd.edu/mca/Paper/Engestrom/Learning-by-Expanding.pdf

Gee, J. P., & Green, J. L. (1998). Discourse analysis, learning, and social practice: A methodological study. *Review of Research in Education*, *23*, 119–169.

Institute of Professional Engineers New Zealand [IPENZ] (2001, July). *The role of technology education in New Zealand's future prosperity.* Retrieved from http://www.ipenz.org.nz/ipenz/forms/pdfs/Info_Note_3.pdf

Jones, A. (2009). Towards an articulation of students making progress in learning technological concepts and processes. In A. T. Jones & M. J. de Vries (Eds.), *International handbook of* *research and development in technology education* (pp. 407–417). Rotterdam, The Netherlands: Sense.

Jones, A., Buntting, C., & de Vries, M. J. (2013). The developing field of technology education: A review to look forward. *International Journal of Technology and Design Education, 23,* 191–212.

Jones, A., Harlow, A., & Cowie, B. (2004). New Zealand teachers' experiences in implementing the technology curriculum. *International Journal of Technology and Design Education, 14*(2), 101–119. doi:10.1023/B:ITDE.0000026549.08795.9e

Mansell, H. L., Harold, B. D., Hawksworth, L. J., & Thrupp, M. P. (2001). The perceived impact of the technology curriculum. *Set*, *1*, 23-28.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook*. Thousand Oaks, CA: Sage.

Ministry of Education (MoE, 2004). *The national education guidelines.* Retrieved from http://www.education.govt.nz/ministry-of-education/legislation/negs/

Ministry of Education. (2007). *The New Zealand curriculum*. Wellington, New Zealand: Learning Media.

Ministry of Education (MoE, 2010). *Technology curriculum support.* Retrieved from technology. Retrieved from tki.org.nz/content/download/11407/36592/file/technology-curriculum-support-oct-10.pdf

Ministry of Education. (MoE, 2011). *The New Zealand school property strategy, 2011-2021.* Wellington, New Zealand: Learning Media.

Myers, M. D. (2009). *Qualitative research in business & management*. London, England: Sage.

Lodico, M., Spaulding, D., & Voegtle, K. (2006). *Methods in educational research: From theory to practice.* San Francisco, CA: Jossey-Bass.

O' Brien, L., Alison, J. & Cross, B. (2006). *Technology: Theory without practice?* Wellington, New Zealand: New Zealand Post Primary Teachers' Association.

Paechter, C. (1995). Sub-cultural retreat: Negotiating the design and technology curriculum. *British Educational Research Journal, 21*(1), 75–87. Retrieved from http://www.jstor.org.ezproxy.waikato.ac.nz/stable/1501284

Reinsfield, E. (2014). Secondary school technology education in New Zealand: Does it do what it says on the box? *Teachers and Curriculum, 14*(1), 47–54. Retrieved from http://dx.doi.org/10.15663/tandc.v14i1.94

Remillard, J. T. (1999). Curriculum materials in mathematics education reform: A framework for examining teachers' curriculum development. *Curriculum Inquiry. 29*(3), 315-342.

Sewell, A. (2011). Developing dialogue in the classroom: A cultural tool for learning together. *Classroom Discourse*, *2*(2), 268-281.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, *22*(2), 63-75.

Singh, P., Thomas, S., & Harris, J. (2013). Recontextualising policy discourses: A Bernsteinian perspective on policy interpretation, translation, enactment. *Journal of Education Policy*, *28*(4), 465-480.

Stake, R., & Kerr, D. (1995). René Magritte: Constructivism and the researcher as interpreter. *Educational Theory, 45*, 55–61. doi:10.1111/j.1741-5446.1995.00055.x

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research* (Vol. 15). Newbury Park, CA: Sage. Retrieved from http://www.li.suu.edu/library/circulation/Stein/Comm%206020ksStraussCorbinBasicsQualitativeFall07.pdf

Te Ara Encyclopedia New Zealand (2011). Story: Whakapapa – Geneology. Retrieved from http/::www.teara.govt.nz:en:whakapapa-genealogy:page-1

Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *American Journal of Evaluation, 27*(2), 237-246. doi: 10.1177/1098214005283748

Williams, P. J. (2009). Technological literacy: A multi-literacies approach for democracy. *International Journal of Technology and Design Education, 19*(3), 23–254. doi:10.1007/s10798-007-9046-0

Williams, P. J.. (2012). *Technology education for teachers*. Rotterdam, The Netherlands: Sense. doi: 10.1007/978-94-6209-161-0_2

Williams, P. J., & Lockley, J. (2012). An analysis of PCK to elaborate the difference between scientific and technological knowledge. In *PATT 26 Conference* (pp. 468-477) at Stockholm, Sweden: PATT.

Yin, R. K. (2003). *Case study research: Design and methods* (3rd ed.). Thousand Oaks, CA: Sage.