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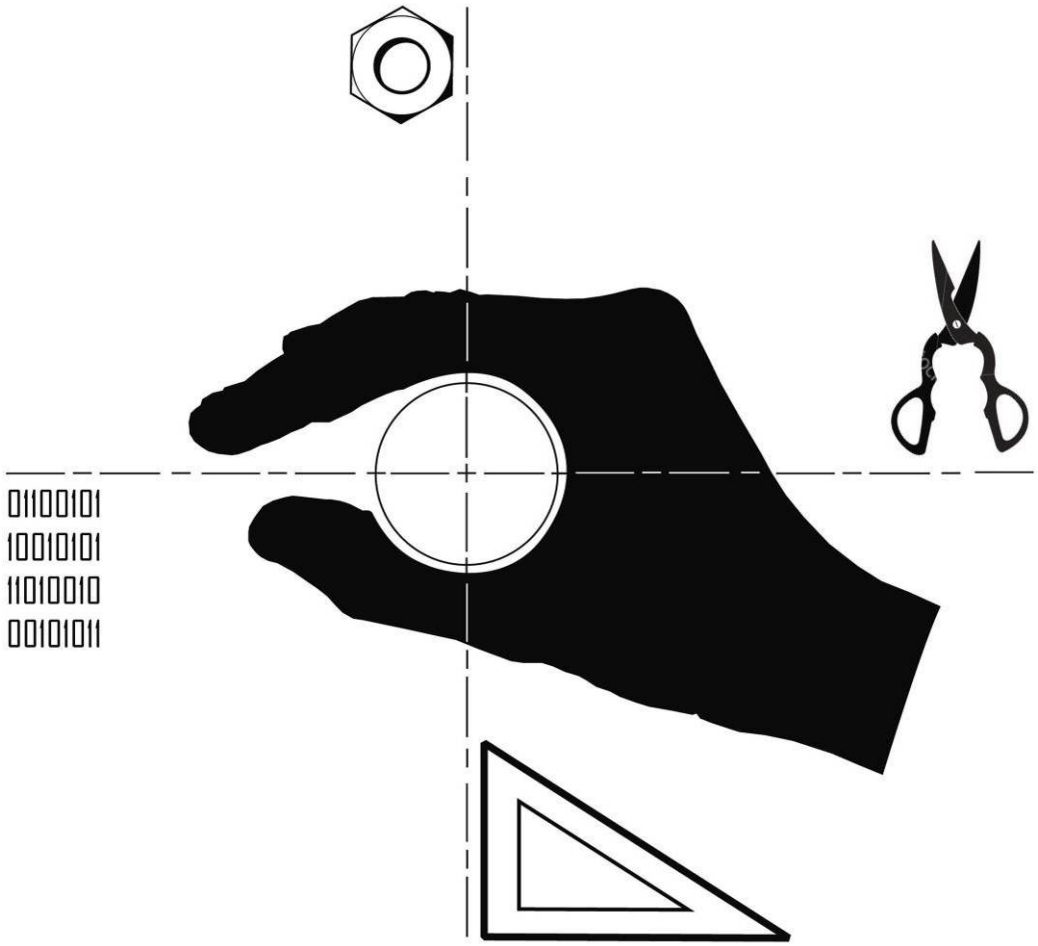

Technology: theory without practice?

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Contents

Acknowledgements

Thanks to the many teachers who generously gave their time to share their experience of teaching technology. Thanks also to the schools who provided space and time for the focus groups.

We trust technology teachers will find their views represented in this research. We hope that this research and the continued lobbying by technology teachers will influence policy to improve technology teaching for teachers, schools and students and ultimately the future of New Zealand.

Overview of Report

1. Introduction
The first section explains why this research was undertaken and gives some history of the technology curriculum. The research method is also explained in this chapter.

2. Literature Review
The literature review sets the scene. It sets out the issues raised by other commentators about technology teaching and the technology curriculum. This is perhaps the most disappointing section because so little has changed between previous research and this research.

3. The Curriculum
Teachers have found the actual technology curriculum document both helpful and unhelpful. They enjoy the flexibility, being able to teach according to students' learning needs, but many believe the academic focus of the curriculum potentially disenfranchises students. Teachers have concerns about the varied interpretations of the curriculum and it's 'wordy' terminology and have some concerns about consistency in delivery of the curriculum.

4. What hinders the teaching of technology?
This section provides a graph that shows how teachers responded to a set of factors that potentially hindered the teaching of technology and discusses the two top issues: the status of technology and professional development. This chapter also includes a section 'enjoying technology' as most teachers really enjoy teaching and sharing with students their enjoyment of technology.

5. Resourcing

The introduction of the curriculum was not well resourced and a general lack of resourcing affects most schools. Ancillary support would be of the greatest value to teachers of technology. This section also covers time, class sizes, facilities, budgets and paperwork.

6. Assessment

Assessment workload affects teachers at both junior and senior levels. Assessment for qualifications seems to drive the curriculum in many ways, but one of the key concerns for teachers was how previous assessment regimes provided valuable professional development that is not being provided in the current system.

7. G3 – Degree Equivalence

More than any other issue the 'removal' of degree equivalence for many technology teachers appears to have had a disastrous flow-on effect that includes recruitment and retention and the status of technology teachers and the curriculum. It would also seem that the 'solutions' thus far have discriminated against female technology teachers.

8. Recruitment and Retention

This section identifies that there is a recruitment and retention crisis in technology. It touches on initial teacher education and asks what qualifications are required in technology.

9. Technology Teachers in Intermediates and Technology/Manual Centres

These teachers have many of the same concerns as those in secondary schools but have a differing context in which they teach. In some intermediate schools they are specialists who are often not recognised as specialists, and find themselves not teaching their specialty subject but relieving for other teachers.

10. Expectation to perform miracles!

This concluding chapter is brief but pulls together the threads that make up teachers' concerns regarding technology and leads into the recommendations.

Snapshot of Findings

Curriculum

Technology is a complicated curriculum with three strands and seven areas, and allowing diverse methods of delivery. Many teachers say it is difficult to make sense of the various elements of the curriculum and to weave those understandings into their classroom pedagogy.

Some are disillusioned with the shift of emphasis away from the 'doing' side of technology to the academic process. The curriculum document requires of students a reasonably high level of literacy and abstract thinking and teachers see this as hindering the development of technology as a subject that combines and values both practical and theoretical knowledge.

Others are having success by reclaiming technology in a more traditional way to meet the needs of their students and their school community. In the senior area in particular, a growing number of schools are opting for courses with a strong practical and trades focus and with close links to industry.

PPTA believes that the revised technology curriculum should balance theory with applied concepts and use language that is accessible and clear in intent.

Status

Technology teachers believe that the subject they teach is as worthwhile and valuable as any other in the school curriculum. They enjoy working with students and seeing student success. They say the undervaluing of the technology curriculum in some schools reflects a lingering prejudice about the relative value of academic and vocational subjects. A lack of understanding of the curriculum, by some teachers of non-technology areas and by some school communities, also persists.

PPTA believes that professional development for school communities, that includes explanation of, and resource support for, the curriculum, would help resolve some of the issues about the status of technology.

Professional development & resourcing

Teachers have been disappointed by the lack of professional support for the technology subject. The provision of teacher professional development and support in

technology appears to have been shifted to industry bodies such as IPENZ (Institution of Professional Engineers New Zealand), some of whom received initial funding from government rather than via the education sector where teachers would seek to access this support in the first instance.

Technology is a resource intensive curriculum, in part due to the requirement to cover three strands across seven technological areas, and also because students and teachers value the learning that can be gained through practical hands-on activities. The materials required for practical activities cost both money and time to obtain and prepare. The rooms and equipment are also resource intensive. Teachers expressed concern about inadequate classroom support, preparation time, budget, equipment, buildings/spaces and classroom materials including assessment materials.

Sadly, the government approach to professional development and resourcing the curriculum has been to promote the curriculum as flexible and non-prescriptive and able to be delivered through existing school resources.

PPTA believes technology teachers need access to funded, ongoing professional development to enable them to keep pace with the developments in a constantly changing curriculum area with multiple fields of knowledge, as well as appropriately skilled ancillary support that frees them to focus on teaching.

The draft revised technology curriculum has been published for comment. PPTA believes it is essential that the problems to date are acknowledged as part of this consultation and teachers and schools should be fully involved in any change.

Technology facilities & class size

Teachers' concerns about their school technology facilities ranged from inadequate size and/or layout for the number of students in the class and a related shortage of equipment, to a complete lack of equipment and facilities, or – of even more concern - unsafe facilities. One of the focus group schools had a new purpose-built technology block and another had gradually managed to bring all the disparate technology areas together. However, in other schools visited the facilities ranged from modest to poor.

PPTA believes that all technology facilities should be subject to a full health and safety audit and where necessary non-compliant facilities should be brought up to standard to meet guidelines in the 'Safety and Technology Education' (1998) manual as well as

the requirements of First Schedule to the Health and Safety in Employment Regulations 1995, as referred to in the *Ministry of Education Health and Safety Code of Practice for State and State Integrated Schools.*

Assessment

Technology teachers say that the volume of assessment and associated paperwork undermines their ability to focus on teaching and learning. They are also concerned about constant changes in standards and in interpretation leading to inconsistent marking.

Difficulties interpreting achievement standards and their perceived lack of a hands-on focus are also prompting teachers to opt for unit standards. Many say the unit standards are often easier for students to understand, support a more practical focus involving less written work and clearly identify the skills and outcomes required. However, they reject the view that unit standards are an easy option.

PPTA believes that consistency in the interpretation of standards supported by clear documentation including exemplars, timely feedback and ongoing professional development, would go a long way to supporting an improved environment for the teaching and learning in technology.

G3 – degree equivalence

The 2003 decision by the Alternative Disputes Resolution panel abolished degree-equivalence and left more than 2000 teachers, many of them in technology, facing a salary disadvantage of some $3000 a year because they could no longer reach the top step 14 of the salary scale.

This decision has had repercussions for the recruitment and retention of technology teachers and for the status of the subject itself. It has formalised the academic/vocational divide in secondary schools and made the specialist skills and knowledge that teachers of woodwork, metalwork, clothing, home economics and typing appear less valuable than other subjects.

Teachers who had been teaching for many years and were involved in, if not leading the implementation of the new curriculum, felt particularly disenfranchised in being told their qualifications were no longer good enough to access the top salary step.

The G3 diploma (Diploma in Secondary Specialist Subjects) offered a pathway for about 1000 teachers to gain access to step 14 and many believe the diploma had been valuable. A second diploma is currently under development for teachers who were ineligible for the first one and should be available next year.

Recruitment and retention

Recruitment and retention of technology teachers is clearly problematic. The seven technological areas require a degree of specialisation at senior levels that is not readily available in the teaching workforce.

There is also a declining number of teacher education courses offering the full range of technology specialities and this may be reflected in respondents' views that many of the student and graduate teachers of technology do not have the practical skills or experience required to safely operate the equipment in technology workshops.

Teaching, as a career, also cannot compete with the superior employment conditions of most qualified technologists and tradespeople. An experienced trades professional or technologist wishing to move into a teaching career and to be able to move to the top of the teacher salary scale would usually need to upgrade their technology qualification to a level 7 qualification (equivalent to a degree) as well as completing a full year of teacher education, the equivalent of two years' full-time study for many trades people. Currently there is no course available that enables people to complete both of these requirements, and there are no financial incentives.

The G3 issue has made it abundantly clear to current and potential teachers entering teaching from a trades professional background that they will not be valued by policy makers or compensated in the same way as a person entering teaching with a bachelors degree.

Technology teachers in intermediate/manual/technology centres

The teaching of technology in years 7 to 8 provides an essential grounding for students learning in years 9 to 13, as well as providing valuable life skills for students.

But technology teachers in manual, intermediate and technology centres at these year levels say technology, and the specialist knowledge required to teach it, is perceived as less valuable than other subjects. Many say that their curriculum time is constantly being cut back or used by their schools for other activities. This reduces their ability to

teach the six required curriculum areas as well as limiting the kinds of projects they can carry out.

The inadequate focus on skills and the breadth of the curriculum are also difficult to cover in the time available. Some say their schools even discourage the teaching of basic skills (for example how to use a ruler, a file, a screwdriver, or a sewing machine), despite the fact that parent communities expect and ask for these skills.

The teachers also feel that despite being specialists they are not provided the same opportunities as their colleagues in secondary schools to undertake professional development.

PPTA believes that it is essential that specialist technology teachers be employed in technology centres and intermediates. The employment of these specialist teachers would help to ensure that students have learned the basic skills and knowledge necessary to move from year 7 and 8 on to senior secondary school.

1. Introduction

Marginalisation of technology teachers

New Zealand's secondary schools are facing a crisis in recruiting and retaining technology teachers thanks to a systematic undervaluing of their skills and experience. Technology teachers have faced:

- the lack of consultation over the existing technology curriculum;
- the 1995 Ministerial Reference Group review of staffing that disenfranchised specialist teachers of technology in years 7 and 8 (Manual training and technical centre teachers);
- implementation of the new curriculum with very little support or resourcing; and
- marginalisation through the Alternative Disputes Resolution panel's (ADR) decision in January 2003, that prevented many technology teachers from reaching the top of the secondary teaching salary scale.

That decision created a division between academic and vocational qualifications in secondary teaching through the requirement that teachers must have a level 7 (i.e. graduate) qualification to progress to the top of the salary scale.

Most technology teachers have vocational subject training – woodwork, metalwork, clothing, home economics and typing, subjects which were conflated to become technology when the curriculum was gazetted in 1997.

PPTA conducted this research in August 2005 in response to the issues and concerns of these members. In the first phase of the research technology teachers [1] were surveyed on their experience of teaching technology in their schools, and 373 technology teachers responded. Subsequently, in December 2005, seven focus groups were conducted to gain further in-depth knowledge of some aspects of technology teaching.

The History

The technology curriculum statement was published in 1995 and gazetted in 1997 to be fully implemented in 1999. The 1995 technology curriculum replaced the 'Forms 1-4 workshop craft syllabus for schools' (Ministry of Education, 1995). The other 'traditional' subject that was affected by the technology curriculum was the 'home economics syllabus'. Aspects of this syllabus were incorporated into food technology and materials technology but for the most part it was replaced by the health and physical education curriculum.

The 'home economics syllabus' and the 'workshop craft syllabus' could be portrayed as having a focus on life skills including cooking, sewing, woodwork and metalwork, and an emphasis on craftsmanship particularly toward trade training. The 1995 technology curriculum has a greater focus on process and problem solving to meet the needs of 'future' employment and to develop innovation and entrepreneurship (IPENZ, 2001; Fancy, 2005). The technology curriculum thus involved a shift in emphasis from life skills to developing competencies for the entrepreneurial market economy (for example Davies, 1998; O'Neill & Jolley, 1996). Despite academic protestations, the technology curriculum is focused on employment or vocation to a greater extent than the craft syllabus, pre 1995, but it is measured without the same emphasis on practical application and craftsmanship.

The implementation of the curriculum framework and the various curriculum statements over the 1990s was fraught. It was a period when teachers were being

[1] The term 'technology teacher' is used to include technical teachers, manual teachers and teachers of technology. 'Technology subjects' includes technical subjects, manual crafts, industry linked courses and technology.

deliberately excluded from government policy making. A contracting model that failed to be inclusive of teachers was used to develop curricula (Alison, 2006). The introduction of the new technology curriculum was no exception with implementation delayed several times due to concerns about content, definition, resourcing and secondary teacher industrial action (Davies, 1998).

Technology was imposed onto already tight school timetables, and no provision was made for improved equipment, facilities or staffing. Secondary teachers viewed the new curriculum according to their subject background and their previous experience (Stevens, 1992) creating a multiplicity of interpretations. These factors, and the limited school and teacher consultation over the development of the curriculum, created a difficult environment for teachers to implement technology in schools. The findings of this report are similar to findings of many previous reports, that technology is not consistently understood, implemented, assessed or resourced, and nor are technology teachers adequately supported to teach this essential curriculum area in New Zealand schools.

Research Method

The research used a mixed method. The primary data has come from a survey, collecting both quantitative data and responses to open-ended questions. This was supplemented by focus group interviews.

Survey

The survey of technology teachers teaching at years 7 to 13 was conducted in July 2005. The survey was sent to all PPTA branches and made available through the PPTA website. This approach resulted in 373 responses[2], 63% of these were from secondary schools, 28% were from intermediates and technology/manual centres, 8% from area schools, and the remaining 1% were classified as 'other'. Responses were anonymous and respondents did not have to be PPTA members.

The median age of the survey respondents was 50 years; the median number of years in teaching was 20 years. Fifty-two percent of the respondents were male and 48% were female.

[2] The 2004 Teacher Census (Ministry of Education) identified 2756 secondary teachers teaching technology. An estimate of the number of specialist technology teachers teaching in technology/manual training centres of 600 would suggest that this is a response rate of around 11%.

Teachers were asked what technology subjects they were teaching that year (2005). Over one third of the survey respondents answered that they mainly taught in the areas of food technology and/or soft materials; one third described themselves as primarily teaching hard materials / structures; of the remaining third 13% taught ICT / computing / information management; 9% were teaching graphics; 6% electronics and control technology; and 4% taught biotechnology[3].

Focus Groups

The survey was followed with seven focus groups with technology teachers, five of which comprised teachers working in secondary schools (see Table 1).

Table 1: Secondary School Focus Group characteristics

School	**Decile**	**Roll**	**No of teachers in group**	**Co-ed (C) or Single sex (SS)**	**Years**	**Geography North Island (NI) South Island (SI)**	
A	High	>700	6	SS	9-15	Urban	SI
B	Low	>500	4	C	9-15	Urban	SI
C	Low	>600	6	SS	9-15	Urban	NI
D	Medium	>1200	6	C	9-15	Rural / Urban	NI
E	Medium	>700	9	C	7-15	Rural / Urban	SI

Two groups, one in the South Island and one in the North Island, consisted of year 7 and 8 technology teachers who were employed in, intermediate schools and technology centres. The teachers in these groups came from schools whose catchment areas ranged from decile two to decile nine.

Forty-two teachers participated in the focus groups. Not all were technology teachers, although all were involved in the teaching of technology in some way. The median number of years teaching for these teachers was 19 years, ranging from a head of science who had been teaching for 40 years to a teacher in his first year of teaching. In terms of gender, 52% of the focus group participants were women, 48% were men.

[3] Some respondents did not answer this question.

While this report necessarily generalises from the self-selected sample of survey responses and the focus groups to the year 7 – 13 technology teacher population, PPTA believes the survey and focus group responses to be representative of this population.

Quotations

The quotations used in the report are representative of the views expressed by the teachers who responded to the survey or who participated in the focus groups. In the case of survey respondents, descriptors indicate the school type taught in, but in the case of focus group participants in secondary schools their subject area/position and school pseudonym (A, B, C, D or E). The technology teachers in the intermediate schools and technology centres who taught year 7 and 8 pupils are described by 'yr7&8', their subject area/position, an indicator of decile (low, medium, high) and South Island (SI) or North Island (NI).

2. Literature Review

Introduction

The research project indicates that many of the issues identified and concerns raised in earlier studies remain. These concerns included:

- the complexity and newness of the curriculum;
- a lack of agreement about what technology is;
- timetable constraints;
- management decisions;
- technology's status as a learning area;
- the lack of suitable facilities, resources, funding;
- the lack of staff; and
- teacher workload.

The concerns focused on here are: the curriculum, teacher attitudes and resourcing.

The Curriculum

Technology has been described as an "over-ambitious curriculum" (Irwin, 1996) of wide scope with three strands[4], seven technological areas and, for some commentators, too much emphasis on social science. The technology curriculum is acknowledged to be complex (McGee et al., 2002) and, unlike other curriculum statements, allowed schools a great deal of freedom in how it could be implemented. Schools were told that it could be delivered as a separate subject or integrated into other curriculum subjects.

The introduction of the new technology curriculum coincided with a review of school staffing, the results of which were published in February 1995. This review changed the designation of and reduced the number of specialist teaching positions used in the staffing of year 7 and 8 technology and manual training centres. The issues for manual training/technology centre teachers at years 7 and 8 who were directly affected by the staffing changes are the focus of section 9 of this report.

[4] Technology has three strands: Strand A Technological knowledge and understanding, Strand B Technological capability, Strand C Technology and society. Alongside the strands the seven technological areas are: Biotechnology, Electronics and Control technology, Food technology, Information and communication technology, Materials technology, Process and production technology, and Structures and mechanisms. Technological activities are carried out in contexts: personal, home, school, recreational, community, environmental, energy, business and industrial. The strands, areas and contexts combine to create a framework for technology education.

This loss of specialist teaching positions in combination with the publication of the technology curriculum raised tensions around the interpretation of the curriculum leading to a public debate. In 1995 the secretary for education, Maris O'Rourke, wrote to the Dominion Post outlining the Ministry of Education's (MoE) hopes for the new curriculum:

> From 1997, the curriculum content and skills currently provided by workshop craft teachers will in future be taught under the technology curriculum.
>
> The new curriculum will retain all the best of the old world of technicraft – woodwork, metalwork, home economics and clothing, along with the new skills and knowledge needed for today's technology and tomorrow's inventions. Some aspects of home economics are included in the social studies and health and physical education curriculum.
>
> The new staffing formula and technology curriculum will allow schools to be flexible in their approach to technology at all levels. They may decide to offer programmes which integrate the traditional manual training subjects in different ways than they do under the current arrangements (1995, p.4).

However, interpretation of the curriculum has not been as clear or consistent as O'Rourke's letter would suggest. The Education Review Office (ERO) provides an example of how interpretation has varied since the publication of O'Rourke's letter. In a report on technology implementation in schools, ERO described the workshop craft syllabus programmes in secondary schools as covering the technological capability strand of the curriculum and observed that teachers needed training to upgrade their knowledge in the 'understanding technology' and 'technology and society' strands. They concluded that the implementation of technology into schools had been "largely successful" (ERO, 2000). Yet in 2001 ERO contradicted its 2000 assertion, describing technology as "not based on past subjects or the teaching practices within them." This shift in perspective is an illustration of one of the major concerns of teachers, the lack of an agreed interpretation of technology. This report demonstrates that this problem continues today (see section 3).

Teacher Attitudes

Where the literature does not agree is in the description of teachers' support, or otherwise, for the curriculum. Teachers are variously described as positive and

adaptable (Mansell, Harold, Hawkesworth & Thrupp, 2001) and negative and resistant (IPENZ, 2001), and as unenthusiastic (Jones, Harlow & Cowie, 2003).

Even before the curriculum was gazetted secondary schools and teachers appear to have been targeted as reluctant implementers. Mawson (1998) and Stevens (1992) cite research reporting secondary teachers' unwillingness to change their existing programmes. Mawson writes:

> Previous research had indicated that secondary schools and teachers found real difficulties in making the transition from a traditional subject-centred, skill-based approach to the more cross-curricular, process-oriented approach of technology (1998, p.1).

This transition was made with professional development provided through MoE contracts. Chamberlain and Weenink (1998) found that most schools had valued this professional development, and ERO believed from their evaluation of the implementation of the technology curriculum (2000) that most teachers had undertaken adequate training. IPENZ (2001), however, have a differing view and describe teachers as choosing not to be involved in professional development for technology education.

> With the development of senior school qualifications, the professional development needs of senior school teachers have been highlighted. These teachers often chose not to be involved in earlier professional development programmes in technology education and must now be supported as they make the transition from past practices to those more consistent with the curriculum (p.3).

McGee et al. (2002) reported that some teachers had found the professional development unhelpful and had expressed concerns regarding the theoretical approach and the lack of practical experience of some advisors. The overall picture appears to be one of teachers requesting ongoing professional development in technology and describing whole school professional development as the preferred and most valuable form of professional development (Mansell, Harold, Hawkesworth & Thrupp, 2001; Chamberlain & Weenink, 1998).

Context is crucial to any description of teachers' behaviours. The development of the technology curriculum should be seen against a political background focused on an enterprise-driven ideology, in a constrained timeline (see for example Mawson, n.d.), and within a system that failed to adequately consult teachers and school

communities. To suggest, as some commentators appear to do, that any failure of the technology curriculum is a failure on the part of some schools and/or teachers ignores system issues and the context of individual school communities.

Resourcing

There is also a lack of agreement over whether the curriculum was adequately resourced for implementation in schools. ERO (2000) suggests that most schools had been provided with sufficient resources, but this appears to have been resourcing from within existing school resources. The MoE did fund professional development programmes as mentioned above, however additional funding for ancillary staffing, equipment and appropriate facilities was not provided (Davies, 1998). Teachers asked for guidance, resources and practical materials to support the curriculum (Chamberlain & Weenink, 1998; McGee et al., 2002) and while some resources were developed, most were focussed at junior levels.

Conclusions

The literature review is clear that there have been problems in implementing the technology curriculum. This PPTA report shows that despite the findings of published research, dating back to the draft curriculum, little has changed. There does not seem to be much will at the policy level to address these issues in a timely and consistent fashion.

3. The Curriculum

Introduction

Despite issues around interpretation of the curriculum, its terminology and its delivery, teachers have moulded the technology curriculum to meet the needs of their students.

Catering for Diversity

One of the claimed strengths of the curriculum is that it caters to a diversity of learning styles, as it encourages exploration and experimentation.

Survey respondents were asked how well the curriculum catered for the diversity of students in their school. The majority believed the curriculum was working well for the diversity of students in their schools.

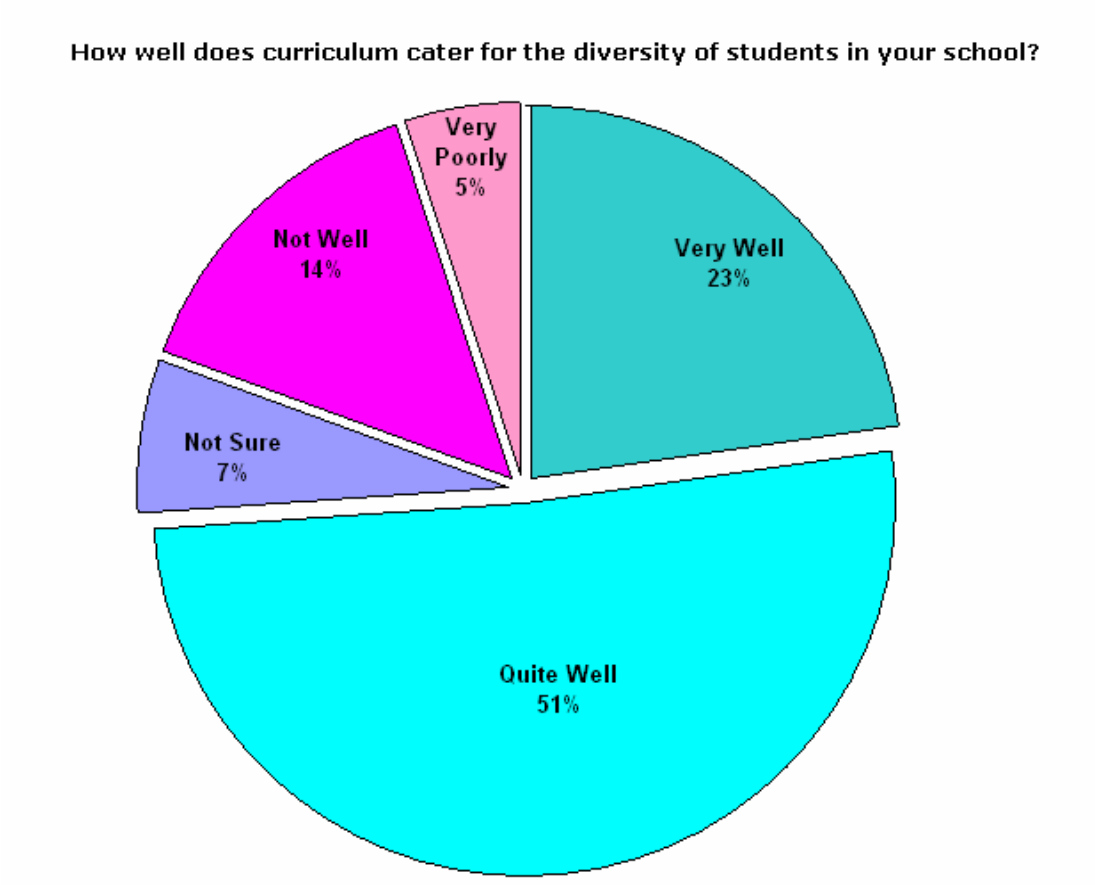

Figure 1: Response to survey question "In general how well does the technology curriculum cater for the diversity of students in your school?"

Teachers valued the flexibility in the curriculum that supported teaching across a wide range of abilities and interests; some were enjoying the opportunity to challenge academically able students in technology. However, the range of abilities in a class, combined with large class sizes especially at junior levels, created some difficulty for teachers in meeting the needs of all students in technology. Of those who responded "Quite well" to this survey question, 10% qualified their responses with comments related to the academic / practical divide in technology and many emphasised the need for more practical 'hands on' programmes to meet the needs of their students.

Teachers enjoyed the range of opportunities the curriculum offered students, the opportunity to experiment and take risks, to explore problems and discover diverse solutions:

> *[The] curriculum is diverse and interesting, as one can do just about anything in technology (Area school, survey)*

> *Student driven and centred - teacher more a facilitator. Students enjoy the scope of being able to focus on an interest within a broad topic. (year 9 –13, survey)*

The curriculum offers variety to students and flexibility to teachers. Many teachers commented on the opportunity to teach skills that students would carry throughout their lives and of the students' enjoyment of practical activities:

> *Combining life skills and enabling the students to design and create. (year 7-13, survey)*

Some teachers feel the curriculum is working well because they have "reclaimed" technology in a traditional way to meet the needs of their students and their school community:

> *Traditionally students come into our area of the school to make something, for the hands on. We can still do that through the furniture-making programme, which is under the technology umbrella. (Tech, hard materials, furniture making, School D)*

They need to have that practical hands on skill base as well. I'm actually moving away from technology and back to applied computing if you want to call it that, because that's what I think the students want and they need to be able to survive out there. (ICT, School A)

I think the pendulum has swung back. … it didn't take long for people to realise, I think, that you can't actually be designing stuff, if you actually don't know how the materials and the equipment that you are using actually work. (yr7&8, Foods, Biotechnology, high, NI)

The emphasis on practical technology was more obvious at years 7 and 8 and at senior levels (years 11 to 13). At years 7 and 8 there is often an expectation in school communities that the students will make a product and take it home. At senior levels, when teachers may be more focused on students' transition from school to work, there was a tendency to design courses that were more vocationally focused, such as those offered by Industry Training Organisations (ITOs).

Interpreting the Curriculum

The interpretations of the curriculum, as demonstrated by the technological areas covered, varied. In some schools a lack of time and high workloads resulted in the school being unable to offer some aspects of the curriculum or reducing the focus on particular aspects such as the 'technology and society' strand. Differences in delivery also related to how technology was interpreted in the school.

Teachers responding to the survey identified the curriculum areas that most schools covered at years 9 and 10 as hard materials, food technology, graphics, information and communication technology (ICT) and soft materials. The least taught areas were electronics and control, and biotechnology. At years 7 and 8, the areas most taught were hard materials, food technology and soft materials. The least taught area was graphics.

The cost of resources and the availability of expertise to teach in electronics and control affected whether the subject was offered:

For electronics? We don't [cover the subject]; the cost alone is quite horrendous until you get set up, and simply it doesn't fit the science curriculum, we do basic electrical stuff, which again is very necessary but we don't do very

much electronics at all. We were running an electronic programme for the senior school… But you have to have a teacher who can teach it. (Head of Science, School E)

In the focus groups the graphics teachers for the most part clearly identified themselves as part of the technology curriculum. While graphics has its own set of achievement standards, it does not have a separate curriculum – and in many schools is not considered a core subject even though the technology curriculum describes drawing and graphics as essential to technological practice.

There appear to be some issues for ICT teachers as to how their subject fits into – and indeed whether it should fit into – the technology curriculum. Survey respondents also commented about the differences between ICT and computing:

I'm heading towards a national certificate because that's what the boys want. They come in, they see it as computing, they don't see it as information and communication technology. Now I think it was thrown into technology to put it somewhere, because we've never had a curriculum document. Is that right? (ICT, School A)

One focus group, when asked about ICT's role in the curriculum, commenced a quite animated discussion about whether ICT was a subject in itself or simply a tool to be used and were there levels at which it became more than a tool? The discussion did not conclude with a consensus but quickly shifted into issues of resourcing.

Another focus group school had spent considerable time working with the draft curriculum in the early 90s and had created programmes that the school thought would mean they would be "on top of the eight ball" when the technology curriculum was implemented. However, multiple interpretations in terms of advice and draft changes made the entire process quite difficult. Even what subject areas technology encompassed was unclear:

When the technology curriculum was being developed we probably spent about two years on different courses and so on and that's exactly the question that we were grappling with and I think it really depended on where you were coming from, as to what your interpretation of technology actually was. You

had a lot of teachers that were teaching subjects that were looking at it from their particular angle. (Head of Faculty, School D)

That was very much a trial, a trial situation, literally taking this still hot-from-the-printers curriculum that was still in its draft output at that stage and then we were trying to make it work within how we saw it being able to be delivered. (Head of Faculty, School D)

When the final curriculum document was published some of the teachers felt disillusioned with what they saw as a shift of emphasis to the social studies side of technology from the 'doing' side of technology.

Teachers seemed to be quite sensitive to the debate around whether technology included practical activities and how these activities should be described and conducted. There were very strong opinions expressed about words such as craft and skill, and the place of these in the curriculum:

Even this questionnaire makes the mistaken allusion that technology is some sort of hybrid craft subject. (year 9 –13, survey)

I feel it's the interpretation of the curriculum, that you can't teach them [students] those things [the curriculum areas], through practical work, … I do feel strongly about it, I think the teachers are doing a really good job, I've seen some fabulous stuff going on in schools but the teachers are not taking the credit for it. They are doing a brilliant job, but they feel that other people might think that they're not doing the curriculum the way it should be. And I think they are. (yr7&8, Hard materials, electronics, structures and mechanisms, high, NI)

That the technology curriculum is academic or practical, not both, could be described as an "either/or binary" (Hipkins, 2004) and this perceived lack of balance appears to disenfranchise both teachers and students. The purported emphasis on the academic process was hindering the development of technology as a subject that combined and valued both practical and theoretical knowledge:

The emphasis on theoretical study does not enthuse our students. They are interested in making things and unfortunately the technology curriculum's academic direction doesn't allow that. (year 7-13, survey)

In year 10 we've got food technology, we find that likewise we're a bit caught between meeting the curriculum and offering our kids as many practical skills as possible. Many of them really need life skills more and so we sort of try and draw that fine line between meeting their needs and the curriculum. (Fabric technology, School D)

This school doesn't see that our subject is a place to do that practical and the academic together (Technology, Home economics, School B)

The interpretation of technology as either an academic or a practical subject by some teachers, schools and school communities has resulted in some schools creating separate programmes through, for example, academy structures that support the teaching of practical and vocational subjects. These schools often perceive the technology curriculum as discouraging this practical focus. The "either/or binary" also impacts on the perceived status of the subject. This is discussed further in section 4.

Terminology

Some of the difficulty in interpretation related to the terminology of the curriculum document. The language of the document was described as confusing:

I know as a new person coming through and only being a second year teacher this year, the technology curriculum I find is confusing.
It took me forever to even understand it. (Textiles, School C)

The inconsistency in teacher understanding of what they are expected to teach. (year 9-13, survey)

I feel very strongly that the curriculum for technology (choco doco[5]) must be written in a way that is user friendly, that the essence is clear with regard to its wording which is at the moment verbose, very difficult to interpret, (and) has no definite value in what is expected of the teacher or students. (year 9-13, survey)

[5] 'Choco doco 'or 'choccy doccy' or similar, is a term used by some teachers to describe the curriculum document, the document does have a chocolate brown cover.

Teachers were constantly translating the curriculum for their students and their school communities. "Wordy technological practice" was a phrase that occurred in responses to open ended questions as well as in comments from focus group teachers:

> *Wordy technology practice that students find really hard to understand. (year 9–13, survey)*

> *… but it just takes a lot of time for me to reword for evidence and judgement statements. Can't we make it easier, can't we have in technology somebody writing something down so that everybody understands it and comes from the same basis, the same base? This is what we want. That's got to be the end product. The words in getting to that I find are troublesome. (Graphics & Woodwork, School E)*

Teachers also identified that the curriculum document required of students a reasonably high level of literacy and abstract thinking:

> *Piaget … put his finger on it when he identified it wasn't until about age 13 or 14, and I shouldn't be mentioning this it's out of fashion I'm told, … but he articulated that around about 13 or 14 year olds were better able to formulate ideas and see linkages, whereas we're striving for it, or at least I am, with a younger age group. (yr7&8, Hard technology, high, SI)*

> *Maybe we try to do it too young, maybe we need to focus more on skills. You have to have a little package of knowledge before you can start coming up with random ideas. (ICT, School B)*

> *In technology you have to have, really, I would almost say almost University-style evaluation skills and analysing skills to be able to link your stakeholders' data through to your end production, using your production line. You're talking high level. …Ministry speak language needs to stay in the Ministry and teaching language needs to be out there … to be taught with and to be given to students to work with. (HoD Technology, School C)*

There was a general feeling that the curriculum had been university-driven and lacked teacher input:

How many years teaching children (in schools) have the experts in universities who wrote the choccy doccy spent? I think they are not up with the play! (year 9-13, survey)

I just got the feeling that there have probably been a lot of people involved in the writing of the curriculum who haven't had a lot to do with kids for a long time, if ever. Lots of classroom teachers have said the same thing to me, "I've read this thing from back to front, what do I teach?" (yr7&8, Workshop technology, low, NI)

Delivery of Technology

As mentioned earlier, the curriculum allows flexibility in delivery, which means that some strands and areas may be taught in other curriculum subjects, for example 'technology and society' (strand C) can be delivered in religious studies, or ICT can be taught in English.

Over half of the survey respondents (54%) answered that only the technology teachers and/or the technology department delivered the curriculum, however 43% stated that the curriculum was delivered partly by technology teachers and partly through other subject departments/teachers[6].

The technological area that was most commonly delivered by another subject department was biotechnology, which was taught in science. Electronics and control was also being taught in science by some schools. The 'technology in society' strand was often covered in social studies.

In one school the science department had been instructed to teach biotechnology and electronics and control. Just as technology teachers have found some difficulties in teaching across the seven technological areas one head of science noted that there were also difficulties in expecting specialist teachers in other curriculum areas to teach technology:

We would really prefer to have appropriate places in our teaching that we could do biotech, that we could do electronics if we felt the need, as with all curriculum we're constantly changing, but I didn't really like "you must do

[6] Some teachers, particularly in technology centres, were not sure if/how their schools were covering the curriculum as required by the document.

electronics", I would rather be more flexible and it depends on … the strength of your staff. Science teachers have to be physicists, chemists, biologists and now we have to be technology teachers as well and that's a pretty big ask - to be a jack of all trades. (Head of Science, Electronics, School C)

ICT was also likely to be integrated into other curriculum areas, especially in intermediate schools. Aspects of ICT were taught in English and other curriculum areas such as mathematics in secondary and area schools. In one school the art department taught materials technology, while in another the music department had incorporated the 'technological capability' and 'technology and society' strands.

For some teachers the idea of an integrated technology curriculum caused difficulty:

There's too many waffly things like you can integrate Strand C in social studies, Strand A into woodwork and metalwork and cooking and there was all that kind of stuff in the late 1990s which I think made it really confusing rather than giving us some very clear guidelines on how to go about it and some support. (Technology, Home economics, School B)

I believe aspects are taught in science, social studies, possibly maths. It is certainly not organised. (year 7-13, survey)

The "mix and match" description of one focus group participant would seem to be an accurate measure of technology delivery in schools – that is, delivery according to teacher, student, school, and community need, but limited by the availability of resources:

But I would like to see a bit of vision where technology is going. I can't see it, people mix and match up and down the country, … (HoD Graphics and Technology, School B)

And often in a school it's the timetabling situation constraints, the use of the room, all of those other things that restrict the type of technology that you ideally should be teaching. …. In actual fact in our heart of hearts the students' needs and what the parents expect is the practical component and I for one will fight to keep that forever and a day because that actually is the appealing part of our subject, but it is difficult to encompass everything and that

document is so wordy and it really doesn't relate across, translate in human terms, to what we are doing. (Textiles, Food & Nutrition, School E)

Conclusions

On the one hand, technology's three strands and seven areas, and the flexibility for schools to deliver them as stand alone subjects or integrated into other areas, allows for diverse methods of delivery. On the other hand, these components, when combined with a technology document considered by many to be too wordy and too academic, makes technology a complicated curriculum that is difficult to interpret and use for many teachers and schools.

The draft revised technology curriculum has been published for comment. PPTA believes it is essential that the problems to date are acknowledged as part of this consultation and teachers and schools should be fully involved in any change.

4. What Hinders the Teaching of Technology?

Introduction

Almost every teacher who responded to the survey and all of those who participated in the focus groups enjoyed teaching technology but many of the difficulties they experienced in their day-to-day teaching could be summed up as the following teacher did:

> *I enjoy teaching the subject, it's the lack of equipment, resources and professional development/professional support in this area. (year 9-13, survey)*

The survey asked technology teachers to what extent a number of listed factors hindered the teaching of technology in their school. The top three factors that hindered the teaching of technology were:

- perceptions of the status of technology (75%);
- professional development (71%); and
- lack of ancillary support (71%).

The first two of these are discussed in the next two sub-sections; the third, 'ancillary support', is discussed in the Resourcing section that follows.

Figure 2 details how teachers responded.

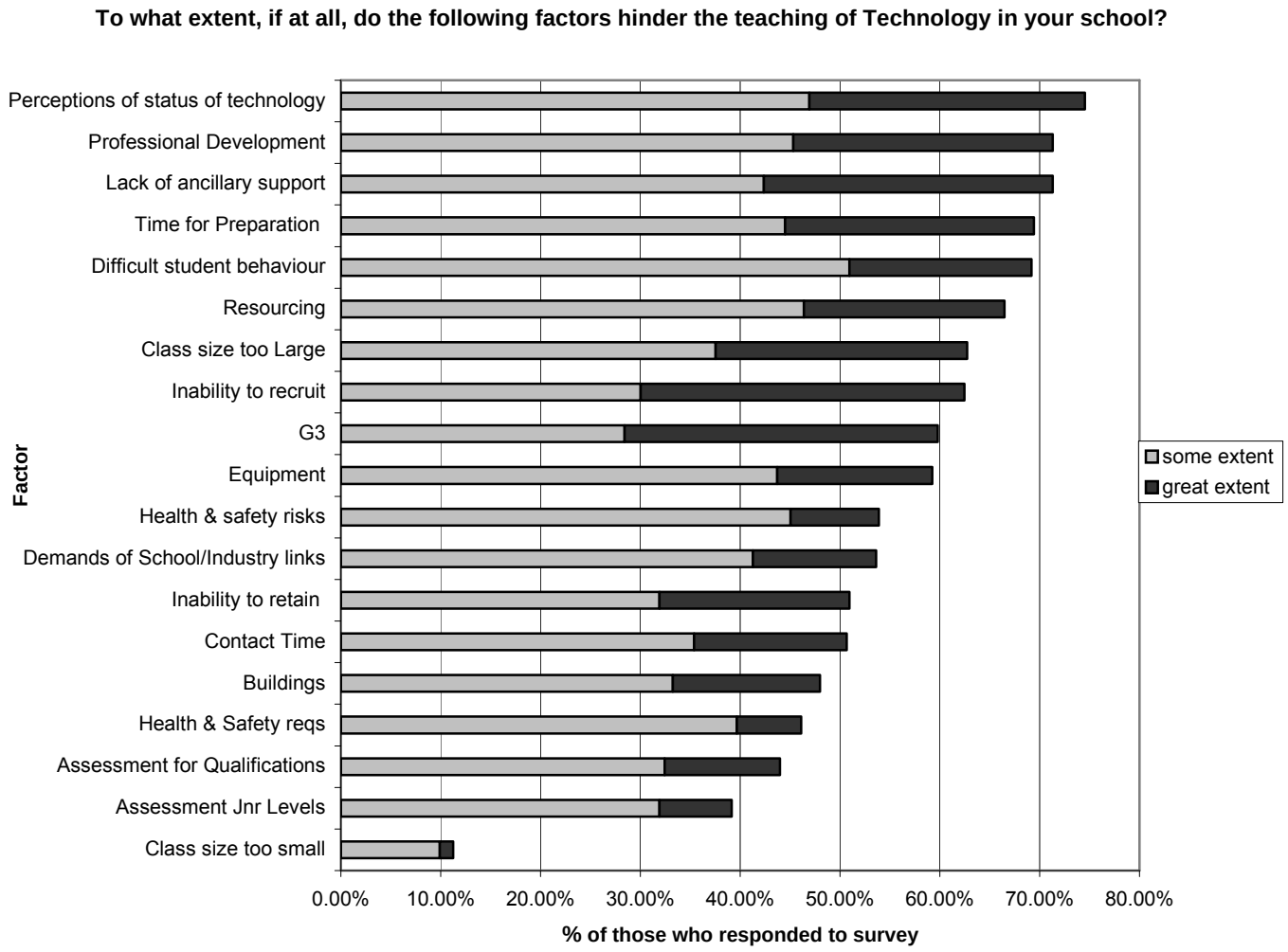

Figure 2: Factors that hinder the teaching of technology

Status of Technology

The factor rated by survey respondents as most hindering the teaching of technology was the status of the subject. The status of technology lies, to some extent, in the history of technical education in schools (for example Mawson, n.d.). Technology lacks the established history, tradition, and pedagogy and thus teacher influence that curriculum areas such as mathematics and English, for example, have held in schools and education policy.

At government policy level many technology teachers have been disenfranchised through the recent and explicit undervaluing of their skills, qualifications and

experience in relation to salary. This obvious status differential is discussed further in section 7 on G3 – Degree Equivalence.

The status of technology as a subject emerged as an issue much more strongly in the survey than it did in the focus groups, with 75% of teachers identifying that "perceptions of the status of technology as a subject" were hindering the teaching of technology in their school. In both the survey and the focus group responses there were many examples of both explicit and tacit undervaluing of technology as a subject:

> *I think the technology curriculum caters well to a diverse range of students - the problem is the misconceptions about the subject and the relative lower status of the subject compared to other subjects. (year 9-13, survey)*

Technology teachers were considered "Mr Fix It" at some schools:

> *Assumption that my job included fixing any/all broken school equipment in my release time. (Area school, survey)*

The primary concern of teachers who rated status as an issue was that the school community was not supportive of the curriculum. In some schools technology teachers felt that other subject teachers were unwilling to work collegially or to integrate aspects of the technology curriculum into other classes. Careers advisors treated technology as a subject for low achievers and school management slotted 'difficult' students into technology:

> *Management perception of subject status and consequent lack of funding. (year 9-13, survey)*
>
> *Subject profile gets little mention by senior management. (year 9-13, survey)*
>
> *Lack of respect for this subject from colleagues - they see it as an easy option. (Intermediate, survey)*
>
> *Unfortunately technology is still viewed by a number of career advisors and teachers who advise student which courses to take as a "dummies" subject. We have a long way to go to get over the old view that these subjects (technology subjects) are for non-academics. (year 7-13, survey)*

The difficult kids I have to deal with. This is treated as the drop out class. (year 9-13, survey)

The negative attitude of non-technology teachers was identified as affecting students, both in uptake of the subject and in attitude towards the subject:

Seeing students taking the subject as a poor 'third' choice and displaying this attitude in commitment. (year 9-13 survey)

Lack of status means the subject does not attract academic students. (year 9-13, survey)

There were, however exceptions to this general impression of an undervalued subject:

We are a large (1000 pupils) intermediate, decile 10 with 43 ethnicities. Tech is one of the most popular aspects of the school program (this is supported by pupil & parent feedback through surveys). (Intermediate, survey)

The subject is highly valued in the school; popular subject choice with students. (year 7-13, survey)

It is a programme of work that develops students' thinking and planning skills. The work presented for assessment in two forms, written and practical, is "visible" and I believe that our subject status has improved. (year 9-13, survey)

Teachers raised the issue of technology not being an approved subject for University Entrance at the time of the survey:

The 'not approved' tag is especially frustrating, and prevents some of the brighter students from taking the subject. Yet the level of higher order thinking required for the Tech achievement standards is so detailed and the projects involve so much sustained effort, motivation and initiative from students (and the teacher). (year 9-13, survey)

Not being a University Entrance subject affects our ability to retain students at year 12 & 13 and also affects the credibility of the subject at lower levels. (year 9-13, survey)

Since the research was conducted, technology has been added to the list of approved subjects for University Entrance from 1 June 2007 (NZQA, 2006).

Some technology teachers expressed concern about their career prospects, saying that there was little opportunity for promotion and restricted access to management units. Many technology teachers identified what appeared to be a class divide in some schools, where the lower class of teachers were considered to be technology teachers:

How many DPs and Principals in New Zealand would be technology based, woodwork, metalwork, foods and fabric? I know of one woman, she is retired now, she was a senior woman, but she only got there because she shoved herself over into science and maths. (yr7&8, Food & Fabrics, low, SI)

Do not seem to qualify for HoD status with a management unit, they are given to other subjects but not us. (year 7-13, survey)

The view that the curriculum was a way to gain status came through in some teachers' comments. In some cases, this shift of status was attributed more to recognition of higher qualifications and NCEA than to the curriculum itself:

(Status) will increase because of the situation with universities and the criteria for intake. (year 7-13, survey)

The achievement standards did give us a footing with other subjects though, and did lift us, which we haven't had in the past. But we've just found the levels, haven't we, that we get success at. And it gave everyone a level footing when the achievement standards came about, it lost that stigma "it's only foods" or "it's only textiles." (Head of Nutrition, Foods & Health, School E)

Participants did not appear to be worried that as the status of technology education increased it might deny access to some of the students who would have taken it if the status was lower (McGee cited in Gusscott, 2000). Teachers continued to adjust their teaching of the curriculum according to the needs of the students:

We drive it [technology programme] based on our gut feeling on what the kids want and their successes, if you're not having success why do you keep doing it. Now if we're losing numbers – why are we losing numbers and what have we got to do to keep them in our area? (HoD Technology, School A)

Within schools the status of technology is perhaps best illustrated in the findings of the 2004 school sector report where only 4% of analysed school charters had a technology target (MoE, 2005, p. 52)[7].

[7] The 2005 school sector report (MoE, 2006) does not provide an update on this information.

Professional Development

Teachers considered the inadequacy of professional development as the second major factor hindering the teaching of technology. Technology is a new curriculum and the nature of the curriculum and the technological areas require teachers to constantly update their knowledge. Teachers felt strongly that they needed curriculum support, through relevant professional development. There was clear consensus in the survey regarding a lack of accessible, appropriate and regular professional development.

Access to professional development for technology teachers was a problem in most schools:

> *There has been a lot of change in the technology area – more so than any other subject yet there has been very little help whether it be PD [professional development], qualifications, resources etc. (year 9-13, survey)*

> *With the lack of financial resources and lack of experienced relievers, the ability to gain professional development is a major concern. (Technology centre, survey)*

One suggestion from respondents was for a time allowance for teacher professional development, but if this was available there would be other issues to deal with, such as a lack of relief cover to enable teachers of technology to leave classes for professional development.

Relief teachers with the required technological skills and knowledge are simply not available in many schools, and this creates problems regarding supervision of students in areas that include machinery such as workshops. This is touched on in section 5 on Health and Safety.

When professional development is offered outside of school time, thus not requiring relief teacher time, there are other difficulties. Teachers from the more rural focus groups noted the difficulty of trying to get to courses after work:

> *We can't leave [school] to get to a course at four o'clock in [the city] with the traffic etc and expect to come home at seven or eight o'clock at night. (Head of Faculty, School D)*

There were comments about inadequate professional development provision:

> *PD is pathetic – we are expected to keep up to date - going to courses at evenings etc isn't the best time to be learning after a busy day at school.(year 9-13, survey)*

> *Lack of quality professional development out of city areas. We do not have the funds to send people to Wellington/Christchurch for PD e.g. course in Ch-Ch = flights, accommodation, food allowance, course fees, taxi etc. (year 7-13, survey)*

Teachers acknowledged that the curriculum required teachers to work outside their speciality areas and that they needed support to do this:

> *By now some teachers are working out of their trained areas – eg Graphics trained teaching w/shop. (Area school, survey)*

There was some frustration expressed regarding the apparent belief, both at policy and school level, that any teacher could adequately and safely teach any of the technological areas without the necessary pre-requisite knowledge, training, skills and experience.

A need was also identified for professional development specifically related to the types of assessment being used:

> *And yet I have not been, for years and years, to any unit standard training course in my area and there are a lot of teachers going to unit standards because achievement standards are beyond the capability of 90% of the kids. (Textiles, Food and Nutrition, School E)*

Advisory services were not seen as adequate:

> *Met previous technology advisor, but the advisor is in the field of hard materials technology. Was not able to help us ICT teachers. There should be one Advisor in each area of technology! (year 9-13, survey)*

It was noted by survey and focus group teachers that professional development should be considered a means of updating and extending teachers' qualifications.

> *We get PD but none goes towards increasing our qualifications. (year 7-13, survey)*

This would require a systematic approach to the design and delivery of professional development for teachers. The comments around qualifications were particularly pertinent to the G3 issue; teachers want to undertake recognised qualifications that are not subject to the whims of future governments.

Teachers also saw a need for whole school communities to be further educated about the curriculum as a way of spreading responsibility for its implementation across the school, and also as a way of addressing the status issues discussed in the previous section:

> *It is not only technology teachers who need PD in the technology curriculum especially looking at the impending changes and new essence statements but principals and senior staff who appear to have limited understanding of what technology is all about and how to spread it throughout the whole school. (year 9-13, survey).*

Schools have implemented whole school numeracy and literacy professional development programmes with additional funding from the government, but to date the technology curriculum has not been supported in this way. The provision of teacher professional development and support in technology appears to have been shifted to industry bodies such as IPENZ and ITOs, some of whom have received initial funding from government[8], rather than via the education sector where teachers would seek to access this support in the first instance.

Enjoying Technology

Despite all the barriers identified here, many respondents expressed enjoyment about the teaching of technology.

[8] See for example the GIF taskforce papers http://www.med.govt.nz/templates/StandardSummary____564.aspx .

Almost all found immense satisfaction in the interaction with students, seeing students enjoy the subject, develop creativity, confidence and skill, demonstrate pride in their achievements and learn transferable concepts and skills:

> *Applications used in every-day life situations. Students can transfer skills learned to other subjects. (year 9-13, survey)*

> *Teaching the students skills that can transfer into employment or they can use for hobbies, [and to] maintain and repair their own property. (year 9-13, survey)*

> *This is an area of education that allows all students to make practical use of material that may have been given to them as a theory subject. (middle school, survey)*

The language used often included the words challenge, creativity, variety, success, pride and enthusiasm:

> *It is a challenge, interesting, fun – for me and the students. Involves many aspects, knowledge, applying knowledge, making, reflecting, talking – discussing issues. (year 9-13, survey)*

> *The creativity and enthusiasm of the students. Working with the students from an idea to completion. (year 7-13, survey)*

> *The thrill of students completing practical projects. To see students pride in work. To see students wearing/using things made. (middle school, survey)*

Survey respondents and focus group participants felt a sense of accomplishment and validation from student achievement, particularly when for some of their students, technology was one of the few 'places' in school that these students achieved results and felt successful:

> *The sense of achievement seeing children achieve high standards in their end product, for many children this may be the first success they have had in the school environment. (Technology / manual centre, survey)*

Seeing children excel in class that often don't shine elsewhere. (Intermediate, survey)

Love seeing the students achieving success – often for first time in any subject. (year 7-13, survey)

I often get children who have now left school and gone to work and are saying when you taught me I felt good and I had success at something and look at what [how well] I'm doing now. (Food & Fabrics, Intermediate).

Teachers in both the survey and the focus groups commented on the economic value of the curriculum:

I really like the curriculum; I'm quite passionate about it. Having worked in industry and having done a lot of the philosophy behind the document I can see how it relates to the learning of students ... the importance of it as far as the development of New Zealand as an economy. (Technology, Home Economics, School A)

I think that using the curriculum document, I think probably we bend it a bit to fit in .... but having said that I think it's really important, ... and I think I'd like see the curriculum document tweaked, ...so that it actually is more cognisant of the significance of primary production in New Zealand. (Agritech, School B)

Conclusions

Teachers of Technology believe that the subject they teach is a worthwhile and valuable subject in the school curriculum. They enjoy working with students and seeing student success. Where teachers and the curriculum are valued by the school community this is shown by adequate resourcing, respect for the knowledge and skills of the teachers, respect for the students who participate in technology-based programmes and explicit recognition of the curriculum as an essential learning area.

On the other hand it seems the undervaluing of the technology curriculum in some schools reflects the "either/or binary", a lingering western prejudice about the relative value of academic and vocational subjects. Although such a viewpoint is no longer accurate, a lack of understanding of the curriculum, by some teachers of non-technology areas and by some school communities, persists. Professional development for school communities, that includes explanation of, and resource support for, the curriculum, would seem to be one way to resolve some of the issues about the status of technology.

While some professional development for technology teachers was provided at the time of implementation of the curriculum, it appears that this was the extent of the government commitment to this new and compulsory curriculum. This was a tight-fisted approach that avoided acknowledging that what teachers were asking for was an ongoing professional development plan to help them stay up to date with multiple fields of knowledge in a constantly changing curriculum area.

5. Resourcing

Introduction

Teachers have found that interpreting the curriculum, the emphasis on an individualised approach and the associated variety of learning opportunities involve significant costs in terms of workload and time. "Lack of resourcing" is a very generic description for inadequate provision of a variety of identifiable components such as classroom support, preparation time, budget, equipment, buildings/spaces and classroom materials including assessment materials. Teachers expressed concern about inadequate provision in many of these areas. One teacher described the resourcing provided to implement the technology curriculum in this way:

> *I could put it in a nutshell in some ways that, it's like giving me a 1985 Toyota, bashed up, no warrant. Giving me a suit, getting it (the Toyota) a spray of paint, putting me inside it, filling it up with people, giving me ten dollars and telling me to drive to Wellington [from the South Island]. That's sometimes the way I feel that the Government has been implementing technology (HoD Graphics and Technology, School B)*

The impression of an under-resourced curriculum is expanded below.

Ancillary Support

Among survey respondents, the lack of ancillary support was one of the top three issues of concern (71%), and 29% of respondents believed this issue affected their teaching to a great extent. Many teachers observed that science and ICT technical support was commonly available in schools, and that if this kind of ancillary support was available in technology it would provide some workload relief, would ensure that teaching time was used for actual teaching, and would improve the work environment for both students and teachers:

> *A technician in our workshop so that teachers are not actually the ones who have to sharpen the chisels and the planes. The ripsaw broke the other day and I'm still trying to get it fixed. The science department has got two technicians, ICT's got one full time technician. We're running as complicated a workshop and we've got nobody. (HoD Technology, School A)*

Time preparing for classes was another key concern among survey respondents with 69% saying it hindered the teaching of technology. Preparation activities specifically

mentioned by teachers were sourcing, obtaining and assembling / preparing materials for practical lessons, and cleaning, repairing and maintaining equipment and rooms:

> *Cleaning up! Constantly. Accounting for all equipment. Keeping facilities up to scratch with no technical support. (year 9-13, survey)*

> *Huge amount of prep time, organising resources, maintaining room and equipment, budget constraints, weekend shopping for groceries etc. (Area school, survey)*

> *Our knowledge base changes very quickly, yes even in "woodwork" with societal expectations, trends, new applied sciences (wood treatments etc) - resources therefore become outdated quickly so resource production is a massive part of workload. (year 9-13, survey)*

> *Taking care of your room has to be priority. I mean the first thing I did this morning was making sure, knowing the relief teacher was going in, the machines were all working. To let your lesson run smoothly all the equipment has to be. You know how frustrated kids get if something breaks down and isn't right. (Textiles, year 7-8, School E)*

Ancillary assistance would enable teachers to spend more time teaching, doing what they enjoy and what benefits students most.

Teaching Time

Finding the time to adequately meet the needs of all their students was a big issue for teachers. In one school a teacher was giving up lunchtime breaks and had three subjects timetabled at the same time in order to support a talented student doing a subject that otherwise would not have been available at year 13. Many teachers reported working with students before school, after school and during lunch breaks in order to finish projects:

> *If they don't complete the work you can't assess the final product, you can look at the process but you can't get the final product done. So you get the kids finished, in their own time, your own time, you do it at lunchtime, I'll often take a few kids after school I'll ring the parents and say so and so hasn't finished*

doing this, I'm looking at Wednesday night is it suitable for you to come and pick them up at four, half past four? (yr7&8, Food & Fabrics, low, SI)

This teacher felt it was very important that students and their families saw a completed project from the resources the school community provided.

There were timetabling issues:

We've got real issues in the workshop, we've got one workshop and we've got 39 classes, something like that, to fit into 30 periods. So twice a day this year we were operating two classes in there at a time, at times of the year when one class wasn't out designing, and it's just bloody chaos, organised chaos except it wasn't organised at times. (HoD technology, School A)

It's [the curriculum] not resourced properly from a financial point of view, but it's not resourced properly from a time point of view, timetabling time, because there's the document which has got some wonderful ideas, but if you've got ten lessons and year 7 students, what you can achieve shrinks, you've got a huge range of abilities, far too many people in a workshop. (yr7&8, Food and Integrated materials technology, high, SI)

Time is pretty significant I think. …Our time has been whittled right back to a 20 hour module which is very compact. Very much compressed to get everything in and with the numbers we have in the workshops as others have already said once you've got more than 20 kids in a workshop situation I think you need an assistant, or a technical assistant, someone who's actually capable. (Hard materials technology, Electronics, year 7-8, School E)

Curriculum coverage in addition to public and political pressure on schools to squeeze more options into a day impacts heavily on technology teaching time. Some schools were looking at teaching senior classes outside of the timetabled school day, for example 6pm to 8pm, however when this was mentioned to focus group participants in a low decile school they said this would be impossible in their school as senior students had jobs to go to after school.

Class Size

Large class sizes impacted negatively on the ability of teachers to manage the classroom learning according to the individual needs of each student and the philosophy of the curriculum document:

> *Class sizes, it is impossible to teach individual solutions to design brief work. (year 9-13, survey)*

> *Class sizes of 26-30 make the teaching of the subject according to the philosophy of the curriculum document impossible. (year 7-13, survey)*

Multi-level classes also created some difficulty for some teachers:

> *I've got year 11, year 12 and year 13 doing the same thing. In the same class, it's difficult to teach three different levels. Although I do it. The positive on that side is that I've got pupils in year 11 doing level 2, level 3 stuff which is really good. (Graphics and Woodwork, School E)*

Teachers reported difficulties working with multiple ability classes, including English as a second language students (ESOL) and special needs students. These issues were often resourcing issues such as a need for a second teacher or assistant in the class:

> *In spite of having has some kids with severe behavioural issues I have never had a teacher aide in my class. Also, very little is done to aid ESOL students with their comprehension difficulties. (Area school, survey)*

Curriculum choice impacts on the organisation of the timetable and class size. However, appropriately skilled ancillary support would enable teachers to better meet the needs of individual students within a class and reduce some of these pressures on technology teachers.

Facilities

Technology teachers work in a wide range of facilities from modern purpose-built technology blocks to ageing, inadequate facilities inappropriate for the new curriculum. While one of the focus group schools had a new purpose-built technology block and another had gradually managed to bring all the disparate technology areas together, in other schools visited, the facilities ranged from modest to poor. Technology teachers

talked a lot about the need to be able to work together in the same office to organise, coordinate and plan their lessons. For one focus group this was the kind of workspace they did not currently have:

> *The big one I think, first to be able to get technology going in this school properly is that we need to have a technology suite. (Technology, Graphics, Maths, School B)*

Many survey respondents commented that the design of their existing facilities was not adequate for the new technology curriculum:

> *Old buildings that do not fit into the technology curriculum. (Intermediate, survey)*

Teachers' concerns ranged from inadequate size and/or layout for the number of students in the class and a related shortage of equipment, to a complete lack of equipment and facilities, or – of even more concern – unsafe facilities:

> *I believe my classroom is not a safe environment both for my students and myself. (Intermediate, survey)*

Teachers in two of the focus groups even described their facilities as having been "illegal", illustrating how inadequate and/or unsafe the facilities were.

Health and Safety

Teachers in both the survey and the focus group responses identified health and safety as an issue. Concerns about health and safety related to both students and teachers in 'practical' rooms. Teachers said that large class sizes constrained their ability to supervise students working with different materials and potentially dangerous equipment:

> *Especially if you want to introduce different materials, which is what Technology is all about, it's experimenting with different materials, when you just can't because there is only one teacher but you've got these different areas and it can't properly be done because it's unsafe. (Technology, Graphics, Maths, School B)*

An accident at Kaitaia College[9] in 2005 highlighted health and safety issues for some teachers:

> *You know when that school in Northland had that huge accident I sat there with bated breath …I really went into orbit and management's directive back to me was "everyone needs to be certified". With what!? (HoF Technology, School C)*

Teachers expressed interest in how findings of accident investigations in schools, such as the Occupational Safety and Health (OSH) investigation into the Kaitaia College accident, were promulgated. This information does not seem to be easily available. PPTA (Harris, 2005)[10] has argued that industry health and safety standards should be applied to secondary schools, and Te Whaiti (2005) has raised the concern that school funding does not account for health and safety compliance. The anomaly of government overlooking schools' non-compliance while expecting industry to comply with health and safety standards was also commented on by teachers.

Some teachers said examples of problems that could have been easily resolved had not been, for example the lack of a landline phone in a technology department. In some schools teachers had needed to intensively lobby for necessary safety equipment. One teacher using hard materials had been working in a room built in the 1940s without a dust extraction unit and the school did not rectify the situation until:

> *I ended up getting taken away in an ambulance from asphyxiation of dust.(yr7&8, Hard materials, low, SI)*

Others noted that the new materials students and teachers were using also had risks:

> *There are so many more materials we're supposed to be teaching now with plastics, different sorts of polys, bonding things, the new wood that's out there, the (mdf) board that's quite carcinogenic. I've heard of one teacher who is using quite a bit of it and he's always coughing and spluttering. (yr7&8, Hard materials, low, SI)*

Concerns were also raised about the safe storage of these materials, with some workrooms having inadequate storage areas. Teachers commented that in general

[9] April 2005. Six students and a teacher were injured in a gas explosion.
[10] Accidents waiting to happen, PPTA News, Volume 26 Number 3

the space allocation for technology was inadequate, with some referring to food technology classes of 30 students in facilities designed for a maximum of 24 students.

In some schools teachers were unable to leave relief teachers in charge of practical classes, opting for them to supervise written work, in the interest of teacher and student safety.

Many teachers believed that health and safety in schools had been deliberately ignored by government:

> *Well to me there does not seem to be a system in place as there is in industry to make sure that things are done properly. (yr7&8, Food and Textiles, mid, SI)*

The perception of health and safety legislation amongst some in industry also impacted on teachers' and schools' abilities to provide students with opportunities for interaction with business and industry as part of their technology programme, with access of schools to workplaces restricted in some cases:

> *A lot of industries are now refusing visits because of the pretty stringent regulations governing visitors to their working establishment. (Design Technology and Graphics, Materials technology, School A)*

The responses indicate that intermediate teachers appear to have the greatest concerns about the conditions they and students were required to teach and learn in. The survey responses do not provide any explanation for this finding.

The guidance manual 'Safety and Technology Education' (1998) is readily available from the MoE website[11]. The document is not prescriptive but the provision of financial support for schools to ensure that the guidance in this document is followed would provide improved and safer learning and teaching conditions for students and teachers.

[11] The Ministry of Education *Health and Safety Code of Practice for State and State Integrated Schools* covers more generally schools' health and safety requirements but some sections relate specifically to technology areas, such as dealing with machinery, electrical equipment and hazardous materials and the removal of steam, fumes and dust. Issues such as overcrowding, noise and heating are also covered.

Budgets

School budgets for technology were often seen as inadequate, especially in relation to practical activities and the invitation to "rework and refine outcomes to achieve a solution" as outlined in the curriculum (MoE, 1995, p. 36):

> *Finance restricts resources for practical activities. (year 7-13, survey).*

> *It's great to go through that process of experimentation and actually attempting to make something and along the way they [students] keep on critiquing it and find the limitations of what they can actually achieve. There is not a budget for that, there is not a budget for mistakes, and there is not a budget for experimentation. (yr7&8, Hard materials, low, SI)*

Other teachers in both survey and focus groups observed the thousands of dollars regularly spent on ICT in their schools, often to the detriment of other activities:

> *Replacement of equipment [is a concern]. I know it comes under the school but it never seems to be any problem putting in brand new computers here and brand new computers there…(Textiles, School E)*

> *There's a huge amount of money being spent on computers and things like that which is fantastic but it somehow seems it's not a problem to spend $1000 on each computer with 20 computers or whatever but it is a problem to spend $500 on a machine which is going to last for another 15 years. (year7&8, Technology, high, SI)*

Teachers involved in computing and ICT, however, noted that it was a very expensive area to resource:

> *Cost of software is a big issue for schools continually trying to balance budgets. (year 9-13, survey)*

> *There must be a realisation that computer technology moves quicker than the funding to replace redundant equipment. (year 9-13, survey)*

The provision and ongoing cost of ICT and associated support is well documented as is school/principal concern regarding this issue[12].

The practical activities in technology are resource intensive, so much so that some teachers cynically commented that perhaps the perceived shift to an emphasis on theory in the curriculum was about saving money and not about student learning:

> *I think the kids are missing out, because it's an expensive thing to provide, it's an easy area to have a trim of and still be able to say well we're covering the curriculum even though the kids aren't actually getting to do a lot. (yr7&8, Workshop technology, low, NI)*

Teachers are fully aware of the difficult financial balancing act schools must carry out, and the policy arguments around the 'how' and the 'who' of the funding of school 'consumables'[13] such as the materials required for technology.

It was observed that when schools chose to charge for these 'consumables' it often added to the technology teacher's workload.

> *Lack of funds - I have to chase fees! (year 7-13, survey)*

Paperwork

Of the survey respondents, 9% referred to an overload of paper work. There was a general feeling amongst both survey and focus group respondents that much of the paper work was unnecessary and it was certainly one of the least enjoyed aspects of teaching technology:

> *Far too much and irrelevant paper work. (Area school, survey)*

> *Frustrating paperwork. (year 7-13, survey)*

> *Then we've got all the other paperwork issues as well. Administration. The fun's gone. (Graphics, workshop, School A)*

[12] For example Hipkins, R. & Hodgen, E. (2004). *National survey of secondary schools 2003*. Wellington: New Zealand Council for Educational Research.
[13] For example see Wylie, C. & King, J. (2005). *An increasing tightness – pressure points for schools financial management*. Wellington: NZCER regarding the difficulties schools experience managing their budgets.

I want to enjoy doing what I love, I feel that the paper work is too much, all over, definitely, the paperwork is too much, that's what I would change. (Graphics & woodwork, School E)

Conclusions

Technology is a resource intensive curriculum, in part due to its complexity and the requirement to cover six technological areas, but also because students and teachers value the learning that can be gained through practical hands-on activities. The materials required for practical activities cost money and take time to obtain and prepare. The rooms and equipment are also resource intensive.

Unfortunately, additional government resourcing of technology in schools appears to have been minimised by promoting the curriculum as flexible and non-prescriptive and therefore able to be delivered through existing school resources.

The reality is that schools are struggling to implement the curriculum with their current levels of resourcing and in many cases teachers' effectiveness is being constrained both by the absence of ancillary support and inadequate and unsafe facilities.

PPTA believes that schools need to be financially supported to resource ancillary support for technology departments and where necessary, to upgrade their facilities to meet health and safety standards.

6. Assessment

Introduction

Teachers rated both the volume of assessment and assessment terminology as two of the least enjoyable aspects of teaching technology. However most assessment concerns at senior levels centred around assessment for qualifications, compared to assessment for reporting at years 7 to 10. At both levels there was also a call for assessment exemplars.

Assessment Load

The volume of assessment, including junior level assessment, was a major issue for teachers because of the workload and time required to cover all the paperwork:

> *Excess assessment. (Intermediate, survey)*

> *Constant time pressure – long and arduous assessment procedures. The paper work associated with above (year 9-13, survey)*

Teachers felt that there were few suitable existing assessment resources available. But as writing their own resources was time consuming, they wanted to see more and better MoE resources, particularly exemplars:

> *The curriculum exemplars that are available probably need extending, some of the ones that are quite useful in the way they're set out are actually junior school levels and so they need to be, even if it was the same unit of work, reworked through to a senior situation … because then you'd actually see level one, two, three, four, five, six, so you'd actually see the expectation at the different levels of the curriculum. (HoD Technology, School C)*

> *Lack of good examples of students work / exemplars [hinders the teaching of technology]. (year 9 –13, survey)*

> *Exhausted because I have to constantly write new resources, schemes, assessments etc. (year 7-13, survey)*

> *HELP! You/me need to get better resources to assist our programmes. (year 7-13, survey)*

There was some feeling that the differing interpretations of technology, and therefore the inconsistency in technology teaching between schools had resulted in a subject that could not be easily assessed:

> *There's no easy solution because technology is such a wide 'thing'; it's very hard to actually put assessment criteria on that and make it fair for every one involved. (Technology, Graphics, Maths, School B)*

At senior levels of assessment this was identified as a policy level problem that schools were being left to solve:

> *Assessment criteria expectations (NZQA/MOE) – Poorly written/understood/communicated. (year 7-13, survey)*

Some teachers commented that the focus had become teaching to the assessment instead of a focus on student learning in technology:

> *Technology is assessment driven. As a teacher trying to gain results for your students you cannot help students unless you teach to the assessment criteria. (year 9-13, survey)*

Assessment for Qualifications

Schools were using a mix of achievement and unit standards at the senior levels. Figure 3 below shows the responses to the survey question regarding assessment method:

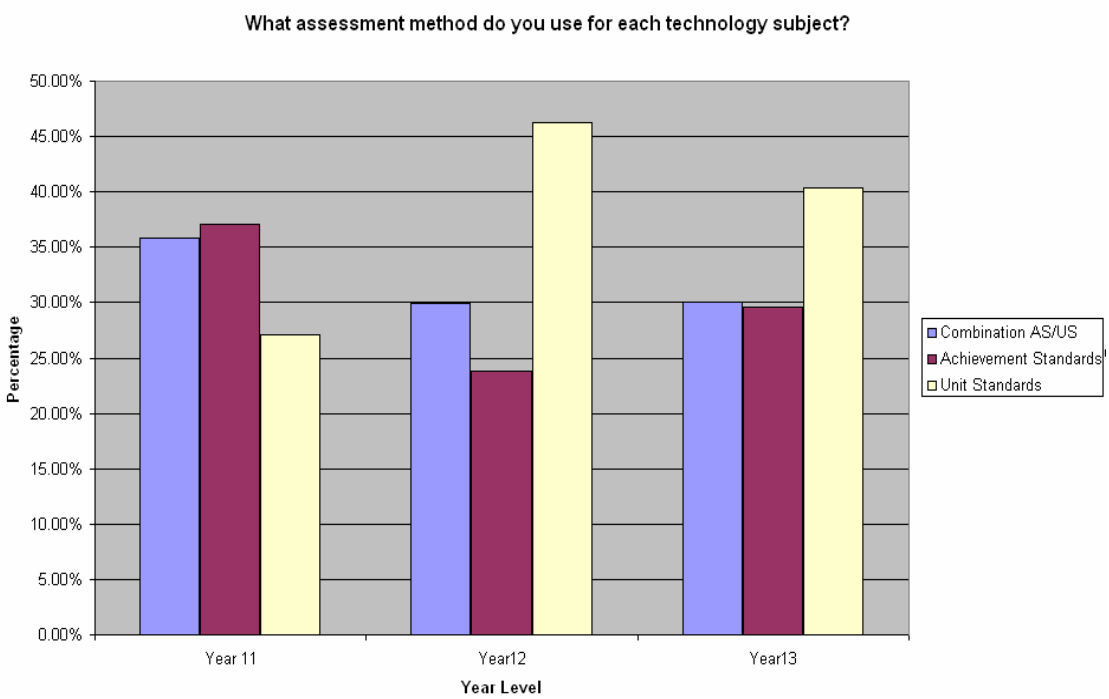

Figure 3: Methods of assessment in senior secondary

> *I use both. I aim for Achievement Standards but where students are struggling with all the written stuff, the technological understanding and not wanting to contextualise it or situate it, that's when I, I set my programmes up so that I can slide the assessment in, so if they're not achieving at achievement standard level, then they can achieve at unit standard level. (Technology, Home Economics, School B)*

The secondary school focus groups were asked about the stereotype of unit standards being 'easier' for students but most opined that this was clearly not the case. For example, another focus group participant responded to the above comment by saying:

> *You surprised me saying that, you said if they can't reach the achievement standard level you'd slot in a unit standard, and that gets my back up. Unit standards should not be considered to be a lower level. However I can understand why they are in some subject areas. (ICT, School B)*

Those using unit standards felt the requirements of unit standards were often easier for students to understand, the skills and outcomes required were clearly identified, the work was broken up into more manageable units, they supported a more practical focus and involved less written work for the student, but that did not make them 'easier':

Unit standards in some instances are just as challenging as the achievement standards are. (English and Drama, School E)

A reason given for the introduction of more unit standards from level two was that the gap between level one and level two achievement standards in technology was considered too great for many students:

The emphasis on the paper work between level one and level two – there is a huge step and the marking that is expected when you read the descriptors and if you go through all the, both the internal and the external, …, the amount that the student is expected to produce in the four hours a week that you see them just doesn't happen and if it does it's because it's a subject that they really love and they forget everything else. (Graphics, Hard materials, Engineering, School D)

There were clearly issues around NCEA assessment – particularly the amount of work required to gain credits in technology compared to other curriculum subjects. Some survey respondents also felt that unit standards undervalued the work of students.

Amount of work required for students to achieve at NCEA levels – especially when compared to other subjects. Lack of support with NCEA. Level of work to complete an AS [achievement standard] course is forcing most students to complete US [unit standards] which in reality is pushing school-based technology back to woodwork and metal work – not good! (Area school, survey)

NZQA needs to listen to the majority of teachers at the 'coal face' Achievement standards are difficult due to time constraints, interpretation of AS, inconsistent assessment (externals). (year 9-13, survey)

On the other hand, one teacher felt NCEA had opened up pathways and opportunities for students in design technology that had not been available in the past:

Whereas before she [student] would have just done art and then gone off and not done sewing at all but now she can combine the two, her two interests art and sewing. (Technology, Home Economics, School B)

The student could combine her interests and the assessment credits and go on to university to study fashion and design.

It is not clear how much of the division of technology into academic and vocational 'streams' is the result of NCEA and the development of achievement standards for technology. In the secondary focus groups it seemed clear that senior programmes were designed according to the students' needs and that in most cases this required a more practical focus:

> *Achievement standards - well at level 2 onwards do not use as they lack the practical emphasis required to meet student needs at doing rather than writing/talking about 'doing'. Revert to unit standards. (year 7-13, survey, information management (TIM) teacher)*

> *We still keep big elements of hands-on practical work in the programme as big an element as we can to attract the students into the subject. Personally I think if that wasn't there, we wouldn't have, if any, takers for technology in the school we've got …(Technology, Hard materials, Furniture making, School D)*

In some schools, this was driving the type of assessment chosen:

> *We started out doing more achievement standards and we've dropped away because the achievement standards were too paper driven, whereas the unit standards you can actually pull off the hands-on. And you have to look to teachers' survival you look at the numbers in your classroom, they start to drop, you go why, you're not doing enough practical work. So you have to look at how your course is put together … (HoD Technology, School C)*

> *NCEA is too academic and stifles most students in this area. Since introducing BCITO and FITO unit standards my class numbers have risen dramatically and so has the student satisfaction and achievement. (Area school, survey)*

Teachers also commented about constant change in standards, apparent changes in the interpretation of what was required, and inconsistent marking:

You find it very difficult to explain to the students, I know last year one of the externals, one of the students did brilliant work. And compared to what had 'Achieved' the year before I would have said she was probably three times better. But she failed … and she said "why did I fail" and I said "I don't know" and that's hard, that really is hard to say to your students. We don't know why she failed. Everything was there and met all the requirements, year before she probably would have got excellence, because she is, but last year she failed. (Head of ICT, School D)

It was summed up in these three wishes:

But the three things I'd like to see: agreement amongst whoever sets the programme for the year, so that they're all thinking on the same line, because you can get different information from different people on the same question, or different answers to the same question; I would like schools to know exactly, to be given a lot more information as to what the markers or the assessors are going to be looking for at the end of the year; and if need be, and there probably is a need, the up-skilling of the teachers expected to present the technology programme. (Technology, Hard materials, Furniture making, School D)

Teachers requested professional development on how to interpret and assess the achievement standards:

Worry about how to assess and how to make situations meaningful and in context. (year 7-13, survey)

I know I'm not the only one,…. we can't see why something is a merit or an excellence and we need to be able to do that. I need to be able to answer the kids, why did they get a merit and I didn't pass this, what's the difference? (HoD Graphics and Technology, School B)

It was clear that teachers had, in the past, relied on and used the assessment and moderation process as an effective way of improving their own practice; it was a form of professional development that was greatly missed:

So I really miss that individual feedback that I used to get with School Certificate. I'd like some feedback saying well this part of your programme needs to be developed or you should leave that part of the programme out. I would like feedback on my programme. (Head of Technology, School C)

When we first started unit standards we had personal contact with moderators, yes it was by email or phone. But you could talk to them … We need the personal contact … to be able to talk to them on the phone or email them and find out exactly what is happening and what we need to do. (Head of ICT, School D)

Design technology moderation teams gave instant feedback and professional advice to teachers after moderation. (year 9-13, survey)

A key concern for the majority of teachers in the secondary school focus groups as well as a number of teachers in the survey was the lack of timely and constructive feedback:

Give us a bit of feedback – because now we don't know until the 31st of January when we find out who passed and who failed and in the meantime their projects have all gone and you're starting a new year. (Technology, Graphics, Maths, School B)

It's not giving you the information you need. The information you need to know is why your students aren't achieving and you need to know it early enough so you can change what you're presenting to them for the following year. (Technology, Hard materials, Furniture making, School D)

Conclusions

Many of the issues presented in this section around workload, the volume of assessment and paperwork, changing standards and poor communication from those making the changes at policy level are nothing new.

But some of the changes that technology teachers seek should not be difficult to provide: consistency in standard interpretation supported by clear documentation including exemplars, timely feedback and ongoing professional development. These

would go a long way to supporting an improved environment for the teaching and learning in technology.

7. G3 – Degree Equivalence

Introduction

It has always been difficult to recruit technology teachers. Traditionally they have entered secondary teaching either through a purpose-designed pre-service teacher education course in one or more of the technology areas or as qualified and experienced trades people who completed a course of teacher training.

Once teaching, their vocational qualifications were accorded "degree-equivalence" (G3) status so they could achieve the same salary levels as other teachers.

Unfortunately this solution came unstuck in 2002 when an ADR panel was called in to solve a 16-month salary dispute. It put paid to the G3 mechanism by ruling that all teachers must hold a Level 7 subject qualification (degree level) to progress to the new top step 14 (G3+) of the salary scale. As most trade qualifications are ranked at level 5 or 6 on the national qualifications framework, many technology teachers were barred from the top step of the salary scale.

The ADR panel's decision formalised the academic/vocational divide in secondary schools and labelled the specialist skills and knowledge of teachers of woodwork, metalwork, clothing, home economics and typing less valuable than other subjects. This has had repercussions for the recruitment and retention of technology teachers (discussed in section 8) and for the status of the subject itself (section 4).

> *I feel like a second-class person and I have been treated like one by the Govt, PPTA and my colleagues. (year 9-13, survey)*
>
> *G3! I'm a PR3 - MMA1 - Head of Faculty and I apparently do not qualify!! I AM NOT HAPPY ABOUT THIS - I HAVE HELD PR's SINCE 1988 and as of 2002 am now not good enough! As a subject area (HEC - Techno) we have been battered since 1984… When is this to stop? No other subject area has had to train, retrain, etc and then be told they are still not good enough. ... I have huge enough battles to fight around the curriculum table here at school, let alone having to fight another one just to be paid! (year 9-13, survey)*
>
> *I have chaired curriculum and assessment at my school for the past 14 years, yet I am paid less than my graduate colleagues. A sham! (year 9-13, survey)*

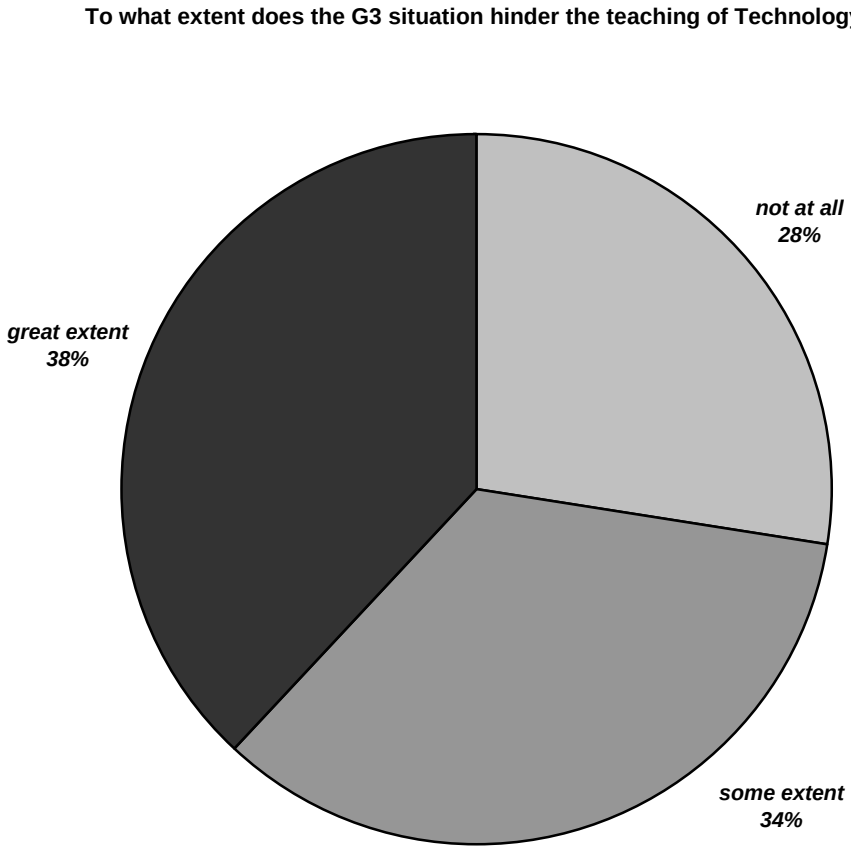

Figure 4: Responses to the survey question: To what extent does the G3 situation hinder the teaching of technology in your school?

When asked to what extent the G3 situation hindered the teaching of technology in their school, 38% of respondents felt it hindered teaching of technology to a great extent and another 34% to some extent.

PPTA actively pursued solutions to restore salary parity for technology teachers but was constantly blocked by the MoE and the minister of education at the time, Trevor Mallard. Both were fearful of the cost implications should any solution for secondary technology teachers flow on to the largely non-degree qualified primary sector.

Eventually a solution for some of the affected teachers was brokered between PPTA and the MoE in the form of the Diploma in Specialist Subjects (Secondary Teacher). Christchurch College of Education was contracted by the MoE as the provider of the

Diploma. The College in turn contracted the Centre of Assessment for Prior Learning (CAPL) to assess the prior learning component of the diploma (many teachers described the Diploma in terms of CAPL, for example “doing CAPL papers”). This diploma had many restrictions including a time limited existence, but allowed a number of the affected teachers to gain a level 7 qualification and move to the top salary step.

The MoE provided a “wrap around” package of support that included back-paid salary for teachers who were eligible for, and completed the diploma. Part of this package provided study leave, and the MoE suggested that schools organise the timing of teachers’ absences “so as to minimise disruption” (MoE, 2005, p. 1). However, teachers experienced difficulty in managing the additional workload of the diploma and many felt that the situation at their schools did, or would, hinder their participation:

> *I started these (CAPL papers) but was unable to take any study leave and the workload I have at school running a department of 8 teachers … was too great to add CAPL papers too. My family life and health are too important for me to be faced with that sort of stress. (Intermediate, survey)*

> *Having just returned from a 2 day CAPL course to up-skill group 3 qualification – I am not feeling good about the HUGE load that is involved in completing unit standards. We are supposed to carry on teaching, try and find a reliever, plan for when we are away to do our research etc for our assessment & try and see something of our family and have a life. (Technology/Manual Centre, survey)*

> *The 'G3 course' was a waste of time / money and energy, all it did is repeat teachers’ college work and remove me from in front of the students. The students’ work suffered. (year 7-13, survey)*

> *To now have to undertake extra "studies" to "prove" that I can do that which I have been doing for the last 30 years is a huge waste of time by too many. It also will have a negative effect on the classes I have to leave while I undertake the so-called training. (year 9-13, survey)*

Teachers were reluctant to jump through hoops to meet the G3+ requirements, and queried how long the diploma would protect them, given the lack of consistency in previous MoE decisions:

I was granted degree equivalence along the line and I keep teaching and I'm still teaching and I got slapped in the face when they whipped it out from under me again. I actually went back and did more training to get that equivalence, and I'm still angry about it. I've been putting off filling in the specialist documents because I really don't think I should have to after all these years of teaching. (HoD Technology, School C)

Despite these reservations 31% of teachers who responded to the survey indicated they were either enrolling in the diploma, were enrolled, or had completed the diploma. Of these teachers 50%, all male, indicated that an advanced trade certificate was their highest formal subject qualification.

Women who had obtained the appropriate qualifications at the time they entered teaching and had now been teaching many years and were involved in, if not leading, the implementation of the new curriculum, felt particularly disenfranchised when told their qualifications were no longer good enough to access the top salary step.

Only 29% of the teachers who were either enrolling in, had enrolled in or completed the diploma were female. Over half of these had the Home Economic Teachers Advanced Diploma as their highest subject qualification.

Of the total female responses to the survey, 40% replied that their highest level of qualification was either the Home Economics Teachers Certificate or Home Economics Teachers Advanced Diploma. Teachers with the certificate were not eligible to enrol for the new diploma. A number of these and other survey respondents commented that the level 7 requirement unfairly discriminated against women:

'Equal work for equal pay' is a joke! The refusal to allow some teachers the opportunity to up-skill is surely a breach of Human Rights. (year7-13, survey)

G3+ status has certainly meant a lot of female technology teachers don't fit entry criteria (disappointing). (Intermediate, survey)

The G3 equivalence qualification we gained in the 1980's is now useless and we as Home Economics teachers now have to do 40 more credits than others. When will this stop!! When will we be given credit for the years of experience we have had? (year 9-13, survey)

Nevertheless, many of the focus group teachers and some of the survey respondents who had completed the diploma made positive comments about the programme; they believed that the process of study had been valuable for them.

> *In retrospect you look back and think it (the Diploma in Specialist Subjects) really did make me have to focus on things and think about what I thought. It was a good experience but I don't want to do it again. (ICT, School B)*

> *I think … it really made us look at what we did (Graphics and Workshop, School A)*

> *I appreciate the system that was set up giving us ten days off to address that and the tuition we had (and the) training that was fantastic, but it (the G3 situation) should have never eventuated. (yr7&8, Technology, mid, SI)*

> *Fortunately I have still been held in high regard by my fellow staff members as they see the important work we do at school. Having said that I am rather enjoying doing the Diploma course and coming from a small school the mental stimulation of mixing with some very positive like-minded colleagues. (year 7-13, survey)*

Conclusions

The ADR panel decision disenfranchised a number of teachers and the effects of this decision would appear to be long lasting, especially in terms of the recruitment and retention of technology teachers.

On a positive note, though, the G3 diploma has enabled nearly 1000 teachers to reach the top of the salary scale. In addition, the approval of a division II diploma, which will be offered to teachers who were not able to access the initial diploma, is evidence of the current education minister's commitment to resolve the G3 issue.

8. Recruitment and Retention

Introduction

Recruitment and retention issues are a major concern to technology teachers. McGee et al (2002) argued that in order to meet the needs of individual students there was a need for greater resourcing, in particular staffing numbers were not sufficient. Despite McGee's report and its implicit warning to the MoE on technology staffing, the staffing situation has deteriorated. The MoE survey of staffing 2006 found that vacancies in technology represented "19.7% of all vacancies in secondary schools" with "hard material technology and food technology the highest proportions of vacancies in the technology area". In 2005 the subject area "most sought after in secondary schools" was technology at 15.5% "of all entitlement staffing vacancies[14]". Teacher education providers also report that they have very small numbers of technology students preparing to enter teaching[15] and some have difficulty matching applicant qualifications to the technology curriculum:

> *Identifying the qualifications that actually fit the technology curriculum areas is a challenge at times and requires us to carefully go through relevant degree papers to see if the content and skills are embedded in papers … not always evident by the paper title! (Teacher education provider, PPTA survey of Colleges of Education, 2005)*

Teachers' Experience of Shortages

Schools are experiencing difficulties in filling technology vacancies:

> *Our school has advertised for a HoF [Head of Faculty] three times in the last 12 months and as yet have been unable to appoint a suitable applicant. (year 7-13, survey)*

With the median age of technology teachers at 50 years, many are intending to retire or nearing retirement:

> *That once again brings up the issue … we're sort of ten years or so off retirement if we last that long. … I don't know who's going to be teaching*

[14] Ministry of Education, Research Division (2005, June). Monitoring teacher supply: survey of staffing in New Zealand schools at the beginning of the 2005 school year. Wellington: Ministry of Education.
[15] PPTA survey of Colleges of Education 2005.

technology in the next number of years in the way that we're teaching it now. (Textiles, School E)

Of the teachers who responded that the G3 situation did hinder the teaching of technology, 84% believed that difficulty in recruitment and retention of technology teachers was also hindering the teaching of technology. Many comments indicated an obvious relationship between recruitment, retention and the aforementioned ADR panel decision that created the salary distinction between academic and vocational qualifications.

It is incredibly short sighted to have ignored the huge experience, knowledge & skill that 'technology' teachers have, by creating the G2/G3 barrier. It is insulting, stressful and demoralising! I expect in a very short time that it will be impossible to fill technology positions. (year 7-13, survey)

I am still very dissatisfied with the performance of the Ministry and PPTA over the G3 issue. The hugely insulting way the whole issue has so far been dealt with is far from the sort of thing I would expect in a professional organisation. This has had a very negative effect on myself and the overall position of technology in the school. As a direct result I am aware of five very good teachers who have resigned. These people have been replaced by much less experienced staff and/or staff with what amounts to inadequate skills. (year 9-13, survey)

G3+ issue has driven out some of our best technology teachers. Two, I know well. The subject seems to be being stuffed by academic arrogance that thinks anything 'hands-on' is second rate. (Technology/Manual Centre, survey)

This is a crisis situation. The subject is dying! The minister will not accept that we have a problem that will not go away. The G3 issue has made it worse. (year 9-13, survey)

Teachers in both the survey and focus groups worried that inappropriately qualified teachers were being required to teach technology in secondary schools and intermediates. Teachers felt the recruitment of non-specialist technology teachers was doing the subject of technology, the schools and the students themselves a disservice and was counterproductive to encouraging the learning and future development of

students. Concerns were also raised about the health and safety of students using equipment that the teacher was neither qualified nor experienced in using.

> *I am concerned by the number of non-technology trained teachers teaching the subject. It is not a hobby. (year 9-13, survey)*

Of the survey respondents, 62% believed the inability to recruit new technology teachers hindered the teaching of technology in their school. Of these, 32% felt that this issue affected their school to a great extent. An inability to retain experienced technology teachers was reported by 51% of respondents as a concern and a hindrance to their teaching:

> *We experience a lot of technology teachers "coming and going". This makes it really hard to establish programmes and systems and procedures. (year 7-13, survey)*

It was also difficult for schools to find relief teachers of technology:

> *We are also so short of specialist relievers. Very difficult to set practical work with staff with no specialist knowledge. (Intermediate, survey)*

Most of the focus groups reported that finding relief teachers was difficult and in some schools it was policy that practical class work was not to be undertaken with relief teachers to ensure student safety and to prevent damage to equipment:

> *Well what's happened in the senior school to cover that sort of thing is we just can't leave any practical work if we're not going to be here, it's all got to be written work. We're not allowed to leave any practical work. (Head of Nutrition Foods and Health, School E)*

As discussed earlier in this report, trying to match teacher skills to all the areas of the curriculum adds to the difficulty of recruiting technology teachers in schools:

> *Lack of training for teachers to teach across the full width of the curriculum. (year 9-13, survey)*

No one "technology teacher" would reasonably have expertise in anywhere near all 7 areas of tech. This is no problem in a large school but with 2.5 tech teachers in a small school how do you effectively cover the requirements of the curriculum?! (Area school, survey)

There was recognition that the trade skills of 'traditional' technology teachers were in high demand and teaching couldn't compete with the salaries of many tradespeople, although the following interchange between two focus group participants recognises that most teachers go into teaching for intrinsic rather than financial rewards:

Graphics and Metal, new teacher, School E *: Why would a tradesman who's getting $25 an hour want to go and train as a teacher and then teach kids? Teachers aren't paid enough for tradesmen to do it. I mean people are crying out for tradesmen so you're in this Catch 22 situation and so it's got to be some sort of incentive to get like a specialist person, like for electronics for instance, they get paid even more. Why, nobody in their right mind would do that, you'd have to have a real passion to want to see kids learning, to even contemplate doing that.*

English and Drama School E*: Isn't that why we're here?*

Graphics and Metal, new teacher, School E: *It is. Yeah that's why we're here.*

Initial Teacher Education

One teacher felt more needed to be done to encourage graduates from various university courses to become technology teachers and that perhaps colleges of education were not recruiting these graduates actively enough:

… and she said we have 90 graduates this year with food, with nutrition in their degrees, 20 of them have gone to dietetics, so you've got 70 of them looking for jobs, why aren't some of them going teaching? So I rang, well the marketing person at the college of education, and she said oh it's not our job to go [out recruiting], they know that if they want to become a teacher they'll come to us. That horrified me. (Technology, Home Economics, School B)

While the survey did not ask about the initial teacher education of technology teachers, it was a recurring theme in the focus groups:

I have a real fear that we're not going to have good quality technology teachers in a few years. All the students that we get coming in now are just not really the right type, they don't come from the right background. (HoD Technology, School A)

Technology isn't their [teacher trainees] number one subject any more. It was our number one that's what we were there for. They take it now as another, it's like an option …, they'll be social studies so they'll have done their Bachelor of Arts and language or whatever, or Masters, then they just take it [technology] as a fill in. And they have no real practical skills and that comes through in trying to find replacement staff. When you look at what the community here wants, to find people with the necessary skills, it's getting harder and harder to do. (Graphics, Hard Materials, Engineering, School D)

Most of the focus group schools identified that student teachers and beginning teachers in technology were struggling:

Well we had a student teacher one year who came under the umbrella of technology in the College of Education … no materials background, no foods background, no metalwork, no wood, his technology was purely computers. And he struggled immensely. (Head of Nutrition, Foods and Health, School E)

The programme just doesn't seem to actually be covering what people needed to come out…. (HoF Technology, School C)

We had one of the lecturers … he was really surprised that there were still hand saws and hammers and stuff like that in the workshop. He was teaching technology but working from the document you wouldn't know that manual training centres still exist. (yr7&8, Workshop Technology, low, NI)

When asked what kind of background technology teachers should have, one teacher responded:

Those people if they went and did a four-year degree in teacher training … who hadn't come from a trade background, they would make what
I call 'born again' technology teachers and they may well teach technology very well in a really modern way. We're all sort of old fashioned technology

teachers that have been dragged over and so I sort of consider myself, not a born again technology teacher, but one of the middle people trying to fit my skills into there, combining technology and the skills … Now I'm quite comfortable with producing teachers that are either (or) if they came from a trade, or a university degree type person who can teach the sort of a modern ethos of technology. You see what I'm saying. It doesn't have to be one or the other, it can be both, it enriches. (HoD Technology, School A)

Others emphasised that secondary schools and technology teachers should be asked what and how they were teaching technology:

[There] needs to be more looking at what's actually going on in secondary schools with regards to the calibre of some of the students that are coming through, they all now have to have degrees but not necessarily in specialist subjects and are they getting enough practical hands on training. They stopped a very good scheme, a number of decades back, where a specialist student teacher spent a term in a school with a master teacher and that was really ideal, and there needs to be a lot more hands-on training before they're going out into classrooms as beginning teachers. And often they're generalists, that means they can do a lot of things but not well, rather than specialists in a narrow field. (Textiles, Food and Nutrition School E)

Conclusions

Recruitment and retention of technology teachers is clearly problematic. The seven technological areas require a degree of specialisation at senior levels that is not readily available in the teaching workforce. It is an immense task for current teacher education institutions to provide adequate coverage of the technology curriculum for new teachers and respondents believed many of the student and graduate teachers of technology do not have the practical skills or experience required to safely operate the equipment in technology workshops.

Teaching, as a career, cannot compete with the superior employment conditions of most qualified technologists and tradespeople. Should an experienced trades professional or technologist wish to move into a teaching career and to be able to move to the top of the teacher salary scale, they would usually need to upgrade their technology qualification to level 7 as well as completing a full year of teacher education. There is no two-year course available currently that enables people to

complete both of these requirements in the same course. There is also a declining number of teacher education courses offering the full range of technology specialities. No extra financial support is provided to experienced technologists or trade professionals wishing to undertake what would need to be at least two years' full-time study away from full-time paid employment, apart from student loans, unless they have or are studying for university degree qualifications in technology, in which case there are scholarships or trainee allowances. Most applicants for technology do not come from university degree courses.

The G3 issue has made it abundantly clear to current and potential teachers entering teaching from a trades professional background that they will not be valued by policy makers or compensated in the same way as a person entering teaching with a bachelor's degree.

9. Teachers in Intermediates and Technology / Manual Centres

Introduction

Approximately 28% of the survey responses came from intermediate schools and technology/manual training centres. The demographics of these teachers differed slightly from the demographics of the overall survey – the teachers were slightly older (median age 53 years compared with 50 years), they had been teaching technology for longer (17 years compared to the overall survey figure of 13 years), and more of these responses were from female technology teachers (54%).

The two year 7 and 8 technology teacher focus groups consisted of 11 teachers; they had been teaching, on average, 16 years.

Disenfranchising Technology

Specialist teachers of technology at years 7 and 8 in intermediates and technology centres had their specialist position designation removed as the result of the 1995 Ministerial Reference Group (MRG) review of staffing. This coincided with the introduction of the draft technology curriculum. While many schools recognised that there was still strong parental desire for children to be taught specialist skills within the technology curriculum framework, others sought to capture the staffing for other purposes. This undermined the specialist delivery resulting in job losses and precarious employment for many technology teachers. It has also meant that some technology teachers have had to share their teaching spaces, teach in other curriculum areas, and generally struggle for recognition of their specialty knowledge within their schools.

The review of teacher resourcing in schools, which informed the MRG review of staffing, glibly suggested "that persons with trades skills have a variety of opportunities for part-time work, and most such teachers are capable of also teaching other subjects and hence filling part-time teaching entitlements within the school" (Ellis, 1994, p.22). One of the year 7 to 8 focus group teachers, from a technology centre, commented:

> *I thought it was really unfair, I remember being at meetings where people who had trained years ago as tech teachers and some of them had a pressure cooker course, they might have only had six weeks teacher training in*

Christchurch as a woodwork teacher or whatever. And that was after the MRG report was implemented they, principals at intermediates especially, just took it on, they could do anything they like with people, there was no longer a requirement for a certain number of hours of technology a week. And these people [tech teachers] were being asked to teach maths, science, god knows what and they really weren't trained. Different, like I've done full primary [teacher] training, it wouldn't be so terrifying for me, but they had a genuine cause for grievance but they all just left. (yr7&8, Workshop technology, low, NI)

You actually mentioned about our teaching out of our subject (areas), we get dragged into a lot of it, on a regular basis, … we are expected to teach one of three curriculum areas, which might be music, PE or science. (yr7&8, Electronics, Structures and mechanisms, mid, NI).

In 1996 PPTA reported that there were approximately 800 technical teachers employed in the 'manual service', most if not all of whom would have been members of the PPTA. This number has reduced to approximately 420 specialist technology teachers (PPTA members) in intermediates and technology centres in 2006. In the past 10 years schools have reorganised, including some closures, and some year 7 and 8 pupils have been incorporated into secondary schools. There is some evidence from teachers and PPTA staff that indicates specialist technology programmes have been curtailed and specialist technology teaching positions have disappeared from year 7 and 8 in some schools, particularly intermediates. As technology teachers have left, some primary and intermediate school principals have chosen to use the staffing to support other positions in the school, and have used other non-specialist technology teachers to teach the compulsory technology curriculum:

… because the music teacher had been told that she had to teach electronics, the art teacher had been told she had to teach structures and mechanisms and they hadn't got a clue. But they wanted to keep their jobs, it was "what do I do, give up my job altogether or do I accept that I've got to teach this?" And they came in to [our technology centre] for a couple of weeks regularly to get what they could from us. "Please can you help us?" … We were just amazed at this but that was it. That's your job, the principal had said, Music teacher you do electronics, Art teacher you do structures and mechanisms. (yr7&8, Workshop technology, low, NI)

Alternatively some technology teachers are used by principals to teach other classes and/or cover for other non-technology teachers:

> *Tech hours reduced, we are being used in classrooms. (Intermediate, survey)*

> *I'm getting very close to getting out of teaching and a lot of the issues for me are burn out issues, I think it is extremely draining in technology and the support systems are not there in place, …never mind being dragged off to relieve for people in general classrooms (and sort out problems). (yr7&8, Food and Integrated materials technology, high, SI)*

Factors that Hinder Technology Teaching

The concerns of this sub-sample of teachers closely mirrored the findings for the total sample with one major exception and that was non-contact time (classroom release time), which rated ninth in their list of factors that hindered the teaching of technology, but rated fourteenth in the total sample (see Figure 5 below):

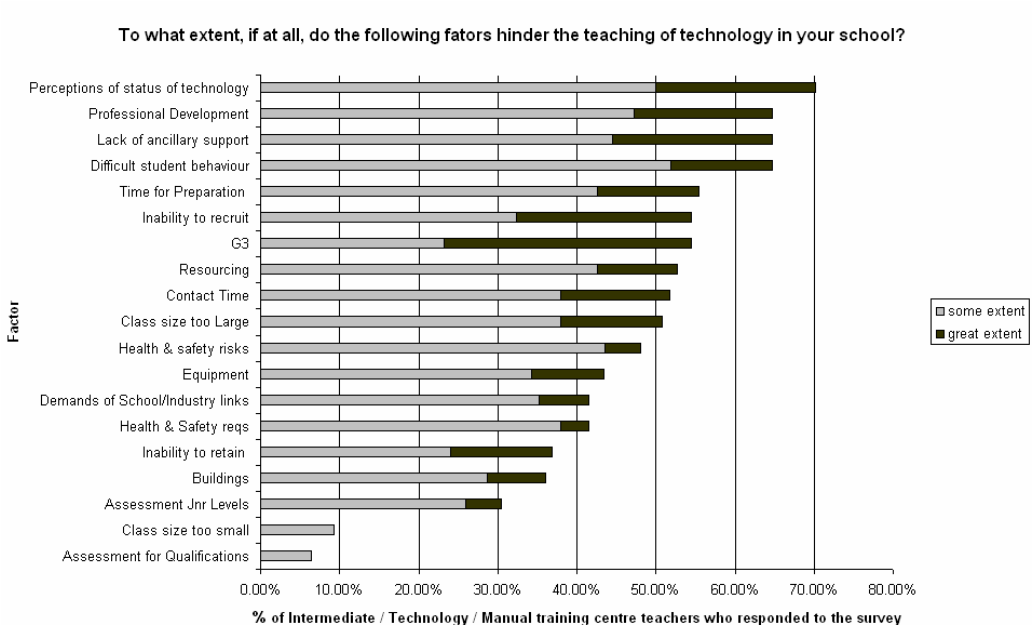

Figure 5: Factors that hinder the teaching of technology for intermediate/ technology/manual training centre teachers

Of concern is a measure identified in the Ministry 2006 survey of staffing where some primary principals indicate that they use technology teachers to cover primary teacher

classroom release time (Ng, 2006). Technology teachers who are covered by the PPTA collective agreement are entitled to 'non-contact' time of 5 hours a week (4 hours at the time of the survey) but many technology teachers at year 7 and 8 appear to be either not aware of this or misinformed about their entitlement, or are forgoing this condition of employment under pressure from their principals. It is not surprising that contact time is more of an issue in intermediate schools and technology / manual training centres as the following survey responses illustrate:

> *Lack of our non-contact time – hasn't happened! (Intermediate, survey)*

> *Given a hard time about our non-contacts, as government not giving funding to cover release time for PPTA members in Intermediates. (Intermediate, survey)*

> *As I work at an intermediate I feel my main role here is to give classroom teachers release time because while their students are at technology they do not have to teach them. A glorified babysitter. (Intermediate, survey)*

Some intermediate teachers acknowledged that the expectations placed on the general classroom teacher to cover a very wide curriculum including technology might be unrealistic:

> *There are so many demands on the general classroom teacher, it's an impossible job. (yr7&8, Food and integrated materials, high, SI)*

Teachers in many schools noted how difficult it could be in their own schools to cover the technology curriculum in the time available:

> *Only four technological areas are covered in year 7 and year 8, and not six areas as mentioned in "Technology in the New Zealand curriculum" document. (Intermediate, survey).*

Many teachers reported that their curriculum time was constantly being cut back or used by their schools for other activities. This reduced their ability to teach the six required curriculum areas as well as limiting the kinds of projects that could be carried out.

We have lost half an hour this year per week on our technology, we had three hours per week per child for thirteen weeks, we're now two and a half hours per week per child over thirteen weeks. (yr7&8, Food & fabrics, low, SI)

School choir, Kapa Haka, school sports days, drama; technology teachers taken on camp; [interruptions to technology teaching] because technology teachers are needed to supervise any other activities that might be on; saves them [the school] using a pool teacher, saves them funding if they can afford to drop a manual/technology class.(yr7&8, Hard materials, low, SI)

They also identified funding as difficult to obtain and inadequate. Most schools sought contributions from parents, which added other pressures to the teaching of the curriculum:

… [there] seems to be a huge following through schools, and probably principals, that ICT is technology, and they've totally resourced that and not resourced anything else. The funding or the budget that we're supposed to produce a unit of work with is, for example, about $2 …. (yr7&8, Hard materials, low, SI)

[What I least enjoy about teaching technology] Tight budget, chasing students/parents for course and material fees. (Area school, survey)

If I have parents buying material for, like my year 8's, … Parents provide that material because part of that design process is [students] choosing a material that is suitable. And I know this parent is virtually on the bones of their bum, you know the kids don't have much money at home. I'm not going to say well hey look you haven't finished these, the process is finishing, I'm going to say to the child well your parents have bought you this material, they have made a sacrifice, you are going to finish this to a high standard and you are going to take it home and say hey look what I did with the effort you made to get me this material. (yr7&8,Food and fabric, low, SI)

Like we're working on $2 per student per unit of work, well I went to a professional development course in electronics and at the end the guy, really good guy, came out with these little kits, the kits are $8 each, so how do you fit that into a $2 budget …(yr7&8,Technology, high, SI)

For some teachers in intermediate schools professional development had been interpreted in interesting ways:

> *Our non contact time at our school is called professional development time or PD time … (yr7&8, Production process and materials design technology, mid, NI)*

> *Please note that the time taken to pack up [room] and put away is considered to be part of my professional development time. (Intermediate, survey)*

Transition Issues

Teachers raised concerns about the lack of basic skills and knowledge students took with them through primary to intermediate and then into secondary schools. Davies (1998) cites research by Heald who surveyed primary teacher trainees on their attitudes toward curriculum subjects, and "technology had replaced mathematics as the least enjoyable subject and replaced Māori as the one seen as least important" (p. 136).

While the 2005 research did not specifically ask about this transition, teachers in both the survey and focus groups indicated that this could be a problematic area:

> *Basic knowledge to undertake full projects is lacking – due to overloaded primary curriculum students are poorly prepared for the subject in general. (Intermediate, survey)*

> *The impracticality of the curriculum at [year] level 7-8 not enough skill based concepts – students not arriving with curriculum concepts from prior teaching/learning as the planned technology document had foreseen. Need to start right from the beginning. Which puts time pressure on curriculum cover expectations. (Intermediate, survey)*

> *And when you've got a number of feeder schools coming in, to actually isolate and look at what their technology programmes are and also then to look at the level of technology that they've gained … Because the thought was originally that because technology was at primary schools and intermediates that skill base would have grown by the time they [students] got here and so you could*

actually, as the years went by, the theory was you could pick it up and move forward. That's theory and that's all it's ever been … you really have to start from scratch in lots of ways. (HoD Technology, School C)

For many schools and students there is obviously no seamless transition from one technology programme to another.

Valuable Skills

Teachers at years 7 & 8 felt that in technology they were providing students with life skills – skills that set students up for hobbies and careers as well as basic living skills. But they were disillusioned that some schools were discouraging the teaching of what they considered to be basic skills (for example how to use a ruler, a file, a screwdriver, or a sewing machine). Teachers believed that these skills were what the parent community were expecting and asking for:

I think there is a big need for it, I find children from the middle class, two parents working, they perhaps have a housekeeper come in and do the housework, they have got a dishwasher, no close family, they have no idea on how to hygienically wash dishes by hand, I know it's a silly thing but it's a basic thing when you're working with food. And often it's the children from the really poor families who have to knuckle in and do know those skills. But it's the middle class ones that don't have the skills. Ask how many families have a sewing machine these days and out of a class of 20 you might be lucky to have two or three. (yr7&8, Food and fabrics, low, SI)

Gone are the days when your grandfather or your uncle had a whole workshop out there and you were working with him, … those particular people are now out there working just to earn a dollar, they haven't got the time to spend with the kids anymore and teach them (yr7&8, Hard materials, low, SI)

Teachers were clear the skills they taught in technology could be used across the school curriculum:

I think what we do is teach them a set of interchangeable skills, systems and processes that move them through life more successfully. But I don't think that the fact that I work a lot of my time in food technology means that what I teach them can only be used in food technology because if we're dealing with

measuring systems, we do all sorts of things that are transferable skills. And I think if we are all teaching a set of transferable skills and working across the curriculums [sic] and we do, then what we teach them takes them a lot further than we actually probably take credit for. (yr7&8, Food and Integrated materials, high, SI)

Some schools surveyed their communities and this provided very positive feedback from parents regarding the value of the technology being taught at years 7 and 8 in technology centres and intermediate schools. One teacher observed that the school principal had been surprised at the level of support:

Our community goals [were] set, just reset recently, our community are actually asking for those basic skills to be taught and since that's come through very strongly we've sensed a backing off by our principal. I think he was really surprised that parents still want those basic skills to be taught, but since the end of last year we've resurveyed and the message came back loud and clear, there's been quite a change in the emphasis there. Which is nice. (yr7&8, Food and Integrated materials technology, high, SI)

Professional Development

The year 7 and year 8 teachers in the focus groups enjoyed the opportunity to come together and share ideas and survey respondents commented about feeling professionally isolated. The environment of Tomorrow's Schools over the 1990s and the competition for pupils that occurred was described as inhibiting teachers from different schools meeting, networking and sharing ideas:

We actually stopped meeting as manual teachers because of Tomorrow's Schools, we used to meet and share ideas. We used to meet regularly and when it became Tomorrow's schools we weren't encouraged to because we were all competing for the same age group in a certain number of kids and we weren't allowed to share and therefore we had to keep it within our schools so we could keep our numbers. (yr7&8, Food and fabric, low, SI)

I guess the isolation of being a technology teacher too though, we've found our whole networking was lost. (yr7&8, Hard materials, low, SI)

These year 7 and 8 technology teachers requested greater opportunity to come together regularly in regions for professional development and networking. They also noted that invitations to NCEA technology training days would be useful to them, especially if they wished to apply for positions in secondary schools.

Conclusions

The teaching of technology in years 7 to 8 provides an essential grounding for students learning in years 9 to 13, as well as providing valuable life skills for students. It is essential that specialist technology teachers be employed in technology centres and intermediates. The employment of these specialist teachers would help to ensure that students have learned the basic skills and knowledge necessary to move from year 7 and 8 on to senior secondary school.

Technology teachers in years 7 and 8 should be provided with opportunities to take advantage of NCEA training days as well as included in secondary level technology professional development.

10. Concluding remarks

Expectation to perform miracles!

Introducing a new curriculum area that is not grounded in an established body of knowledge and expertise within the profession is necessarily challenging, but to have endeavoured to implement this large and complex curriculum in an era when teachers' views were marginalised, and they were provided with minimal resourcing and professional development support, did not bode well for the development of the subject.

As the research shows, teachers have struggled to make sense of the various elements of the curriculum and to weave those understandings into their classroom pedagogy. To the extent that good practice has developed it has been almost entirely at the initiative of classroom practitioners. The assistance provided centrally has been insufficient given the size of the changes and the breadth of the curriculum. Most disappointing has been the inability of the MoE to respond to teachers' expressed concerns for more guidance, assessment examples, professional development and feedback. It has been left to PPTA to advocate for some belated support for technology teachers in the form of access to three senior subject advisors in technology as part of pilot to help all secondary teachers with moderation and assessment. This scheme will commence in 2007.

The evidence of the fragility of the implementation process for technology was already apparent in 2002 when the decision of the ADR panel to abolish degree-equivalence status subjected the majority of technology teachers to a salary disadvantage of some $3000 a year. Under these circumstances, the MoE ought to have been considerably more proactive in its moves to resolve the salary disparity. Four years later, the staffing vacancies in technology stand at 19.7% of all vacancies and 62% of respondents to this survey reported an inability to recruit new technology teachers. The MoE has yet to develop a comprehensive strategy for recruiting and retaining technologists in the profession.

The failure to respond to these problems in a timely manner may reflect a lack of policy consistency across those MoE units responsible for curriculum, industrial relations and teacher supply, an issue that has supposedly been addressed by recent restructuring.

For a country that has a frequently avowed goal to become a “knowledge economy” this research makes concerning reading. While some solutions have recently been proposed for some parts of the problem, a coherent approach aimed at arresting the malaise and realising the full potential of the subject in schools is still missing. The intention of the recommendations appended to this report is to begin the process of developing a strategy that will underpin the growth of technological skills and knowledge in New Zealand.

11. Recommendations

1. That the Education and Science Select Committee urgently initiate an inquiry into the staffing, resourcing and delivery of the technology curriculum.

2. That the Ministry of Education urgently develop a strategy that ensures:

    a. The establishment of a well-funded two-year pre-service teacher education course designed to produce technology graduates with a level 7 subject qualification and teacher education.

    b. That students in years 7 and 8 in technology centres are taught by specialist technology teachers.

    c. That the revised technology curriculum balances theory and applied concepts/skills and uses language that is accessible and clear in intent.

    d. That high quality curriculum exemplars across the full range of technological areas in levels 3 to 8 of the revised curriculum are produced and made available to teachers.

    e. That priority is given to improving the range and quality of assessment exemplars for NCEA technology.

    f. That adequate professional development along with in-school support in all aspects of technology is provided for technology teachers throughout New Zealand.

    g. That priority is given to covering the full range of technological areas in the allocation of senior subject advisor positions over at least the next three years.

    h. That tagged funding is provided to schools to resource ancillary support for technology departments.

i. That technology facilities in all schools are subject to a full health and safety audit, to ensure compliance with Occupational Safety and Health requirements, followed by appropriate funded remedial action.

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