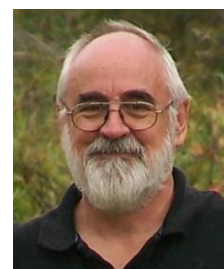


Exploring the Dual Approaches to Technology Education in NZ Secondary Schools

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ABSTRACT

NZ secondary schools are able to offer their senior students either industry-based vocational technology education programmes or NZ Curriculum-based general technology education programmes. Each of these approaches is designed to teach knowledge and skills that will help students to successfully transition into the workplace. Through conducting five case studies of recent secondary school vocational and general technology education graduates this research presents data around the perceptions the five students have of their technology education. It focuses on what knowledge and skills were valued by those students, and which pedagogical approaches engaged them.

The research indicated that contextualising learning within a practical project, whether it is a component of vocational technology education or general technology education, seems to engage students more deeply and make learning more meaningful.

Keywords: vocational and general technology education, school to work transition, contextualised learning.

INTRODUCTION

This research presents the findings of five case studies of NZ secondary school graduates who chose to study subjects from within the broad area of technology education. It seeks to provide insight into the question of what knowledge and skills taught in upper-secondary school technology education are perceived as valuable by these students in their transition from school into the labour market or further education. Results are presented in light of the perceived benefits of the dual pathways of vocational and general technology education and how the provision of a contextualised setting in which learning takes place allows students to make meaning within both approaches.

DEFINITIONS

Technology education in New Zealand secondary schools incorporates two approaches, each with a different assessment structure. In this research these two approaches will be referred to as general technology education (GTE) and vocational technology education (VTE). VTE courses and assessment criteria are perceived as emphasising the development of practical

capability, whereas GTE is perceived as placing greater emphasis on the understanding and application of theoretical concepts in design and technological practice and developing an understanding of the nature of technology. VTE, in teaching competencies involved in specific trades, tends more to be ‘teacher-driven’ where the teacher is the expert and imparts his/her knowledge to the student (Bjurulf, 2010). GTE, on the other hand, lends itself more to be ‘student-driven’; the student is the investigator, researcher, designer and problem solver, while the teacher is available for guidance and support if needed (Williams, 2006; Jones, Harlow & Cowie, 2004). By definition, GTE is designed to provide benefits to all students; VTE benefits primarily those who are pursuing a specific technical vocation (Williams, 2006). However, both could be said to be grounded in an instrumentalist approach to education with goals related to serving the economic and industrial needs of the nation as well as providing for the economic imperatives motivating an individual to transition from education into an enjoyable, well paid job.

Recent Developments within Secondary School Technology Education

In 2007 the New Zealand Ministry of Education published a new National Curriculum document giving technology education a broad more academic focus. At the time the new Curriculum was introduced Gawith, O’Sullivan and Grigg (2007) described NZ technology education as following an international trend of swinging away from a practical, skills-based paradigm towards an education involved in innovative design and problem-solving in a “critical social context” (p.109). However, this swing has created its own issues and concerns including:

1. Ongoing expectations that GTE would provide students with similar specific manual competencies that had traditionally been taught in craft areas of the curriculum (Williams, 2006; Jones, 2003).
2. Students lacking these basic manual competencies are unable to successfully complete technology projects at school (Hendley, 2002; Evans, 1998).
3. Employers are voicing concern over new employees’ lack of these basic manual competencies (Sianez, Fugere & Lennon, 2010; NZIER, 2006).
4. Practically-orientated secondary school students may struggle to find an educational pathway that meets their needs and they may leave school with few or no formal qualifications (Bowskill, Williams & Forret, 2011; Kelly & Price, 2009; Vlaardingerbroek, 2005).

Developing practical competencies and engaging in the process of design and product development are not mutually exclusive, and may in fact be complementary. To this end, the Ministry of Education has recently attempted to rebalance the assessment matrix at upper-secondary school level to include more practical work. ‘Teaching and Learning Guides’ have been written that draw from subject specific ‘bodies of knowledge’ outlining specific competencies for each technology subject area (Te Kete Ipurangi, 2011).

In the mean time, VTE has experienced a huge rise in popularity (Dalley-Trim, Alloway & Walker, 2008; Karmel, 2007; Williams, 2006). In New Zealand secondary schools VTE is run effectively as a partnership between schools and Industry Training Organisations (ITOs). The ITOs liaise with industry to ascertain the skills they require and then write and register assessment standards and teaching guides that teachers can use in schools. Schools can then deliver entry level trade National Certificate courses, and students can use these qualifications to ease the transition into trade apprenticeships without needing to complete initial, expensive tertiary training in polytechnics. NZ educators, like their international counterparts (e.g., Karmel, 2007; Malley, Keating, Robinson & Hawke, 2001; Yeomans, 2002) are using VTE

programmes to help engage all students in education through the provision of practically focussed programmes.

In spite of the link between industry and schools through ITOs, there is an argument that students would be more successful in transitioning into employment if they were taught more general transferable competencies rather than specific practical competencies (Guile & Young, 2003; Winch & Clarke, 2003). With the fast pace of industrial technological development, secondary school VTE programmes may risk losing touch with the skills needed in industry, teaching outdated techniques on outdated machines. Further, the extensive research that has been conducted to identify the skills that employers are looking for when they hire new employees (e.g., ISC, 2011; NZIER, 2006; Tufnell, Cave & Neale, 2002; Curtis & McKenzie, 2002; Mayer, 1992) identifies core competencies such as basic literacy and numeracy, communication, IT, teamwork and problem solving. These competencies have been suggested as a way of linking the dual pathways of GTE and VTE (Pavlova, 2009; Stevenson, 2003; Williams, 1998) by providing meaningful vocational contexts in which students can “make meaning by engaging in significant activity” (Stevenson, 2005, p. 335). Stevenson (2003) predicts that as vocational education evolves to meet the needs of an industry that “can no longer rely on the predictable tools, equipment, materials, processes and skills that characterised the relatively static jobs of the past” (p. 202), the distinction between VTE and GTE will diminish further.

In light of the changing context within which technology education is delivered, this study seeks to provide some insights into what elements of technology education are valued by and serve young people most effectively in their educational journeys.

METHODOLOGY

Research Participants

Five students were purposely selected with the aim of providing five different stories that could best allow for maximum comparability in terms of Cohen, Manion & Morrison’s (2007) ‘critical cases’. Three secondary schools were selected that represented different socio-economic status, urban or provincial settings, and large or small student populations. The Head of each of the schools’ technology departments was approached and asked to recommend students who had studied technology and finished all five years of their secondary schooling. All participants were aged over eighteen and gave their informed consent to participate in the research. Their confidentiality was assured from first contact and each respondent is identified by a pseudonym. Background information relating to each of the student participants is summarised in Table 1 below.

Table 1: Introducing the five primary research participants

Pseudonym	School	Senior Technology Education Studies			Post school Occupation
		Yr 11	Yr 12	Yr 13	
Emma	Small (<500 pupils) Low socio-economic Provincial	GTE (Graphics)	GTE (Graphics)	GTE (Graphics) VTE (ICT)	University study (Law and Business)
Lorenzo	Small (<500 pupils) Low socio-economic Provincial	GTE (Graphics) VTE (Carpentry)	VTE (Carpentry)	VTE (Carpentry) VTE (ICT)	Semi-skilled labourer in the building industry

Hemi	Small pupils) (<500 socio-economic Provincial	VTE (Carpentry) VTE (Engineering)	VTE (Carpentry) VTE (ICT) VTE (Engineering)	VTE (Carpentry) VTE (Engineering)	Pre-police training course
Darcana	Large pupils) (>1500 socio-economic Urban	GTE (Materials)	GTE (Materials) VTE (Electronics)	GTE (Materials) VTE (Electronics)	Unemployed
Chester	Large pupils) (>1500 socio-economic Provincial	VTE (Furniture)	VTE (Engineering) VTE (Automotive)	VTE (Engineering)	Diesel mechanic apprenticeship

DATA COLLECTION AND ANALYSIS

Data were gathered through interviewing the student participants, their caregivers and principal technology teachers. The interviews followed a semi-structured interview protocol aimed at generating qualitative, rich, in-depth data. Thematic analysis based on a variation of the methodology of Marshall and Rossman (1999) was applied to the raw data through a process of listening and re-listening to the interview recordings to initially identify themes and then to extract the thematic data. The variation involved the predetermination of possible themes.

The data were validated through triangulation with the participant's caregivers and teachers. Further validation was achieved by asking the research participants to review their responses through reading the partial transcriptions and seeing the thematic categories the researcher made from their interviews.

FINDINGS AND DISCUSSION

Key competencies and life skills in technology education

As discussed above, the skills and knowledge needed for employment in the future world of work are becoming more and more the general transferable skills needed for life. Technology education is seen as an effective means to develop students' general competencies and dispositions and prepare them for future employment. Key transferable competencies that were identified as common in all the participants' technology education are discussed below.

Cooperative skills: Different students show different inclinations within their technology education; some prefer conceptualising, negotiating and documenting a design process, while others are more interested in fabrication. This research reveals that the pathways and assessment criteria of both VTE and GTE provide opportunities for students to work cooperatively on a variety of projects without appearing to compromise the validity of the assessments.

Hemi and his classmates worked cooperatively on a single project in the context of a Building and Construction ITO (BCITO) competition. Evidence for judging the competition was not solely based on the quality of the build, but also on the students' documentation of the design process and negotiation with their client. While the manual construction skills required for these cooperative projects are assessed under VTE, they are important in GTE programmes. It seems that having students who are skilled craftspeople together with students who are skilled at negotiation, documenting and describing what their team has done, not only reflects real-world practice, but is also the key to success in the competition.

Young (2010) suggests education must challenge students to move out of their ‘comfort zone’ to discover capabilities that they may otherwise never discover in themselves. In response to this challenge, this research shows that working cooperatively on completing ‘real life’ projects not only gives students the opportunity to become more aware of their own strengths and value the strengths of others, it also allows them to be exposed to a variety of skills that may well be new and unfamiliar to them.

Problem-solving skills: Responses from the participants in this study indicated a range of pedagogical approaches to problem-solving, with differences between VTE and GTE and also within the VTE pathway. For example, GTE students seemed more likely to encounter unforeseen problems in their work that their teachers also did not immediately know how to solve. Consequently their teachers were more likely to model their own ways of problem-solving rather than just provide an immediate answer. VTE students, on the other hand, were more likely to encounter problems that their teachers had already learnt to deal with many times, and consequently were more likely to provide the student with an immediate answer.

Emma described her GTE graphics teacher as a ‘guide’, who would help clarify the overall, bigger picture of her project rather than the detail of what she did within that project. She explained that he would work with her to solve problems rather than knowing and providing solutions immediately. Darcana described using the problem solving strategy of researching existing solutions and modifying them to suit the context of his GTE project.

If Chester encountered a problem in the practical tasks of his vocational training and asked the teacher for help, his teacher would not just tell him what to do, but also explain the reasons for doing it that way. Hemi described his two different VTE teachers as having two different approaches to teaching problem-solving. He said he always stopped work if he encountered a problem and asked his teachers to explain what he should do. His engineering teacher would use the problem to model his own problem-solving skills to the whole class, whereas his carpentry teacher would describe the solution directly. Lorenzo tells of asking the same carpentry teacher how to do something and sometimes receiving a hint about how to solve the problem and sometimes a full explanation. Interestingly, Hemi felt he learnt more problem-solving in his carpentry class than in his engineering class. He described how working on a ‘real job’ and asking for help when he needed it helped him understand when and why certain skills or tools were needed. In contrast, Lorenzo felt that if he had to figure out the solution by himself, it ‘stuck in his brain’ more easily, but if he was told the answer straight away, he had to try and remember it without having made sense of the problem first.

Vocational ‘habitus’

VTE programmes emphasise the preparation of students to transition successfully into trades-based employment through teaching specific competencies around using tools and machinery. However, rather than the research participants indicating that these specific competencies were of themselves the most valuable in their lives after school, they ascribe greater value to the process of acculturation into the values and attitudes needed for success in the practical world of work or ‘vocational habitus’ (Taylor, 2008) that VTE provided.

Chester described his VTE education involving the skills needed for developing an appropriate ‘vocational habitus’; skills that he says will “stay with you forever and set you up for when you work in a real workshop...the tricks of the trade.” Similarly, Lorenzo said the specific competencies he learnt in graphics around sketching and drawing plans gave him a “head start” knowing what to do on a building site and successfully communicating with other trades people about specific jobs.

These findings support Dalley-Trim et al.’s (2008) Australian study of secondary school vocational students who perceived their vocational education as providing valuable qualifications and “life skills” that would give them a “head start” in their quest for employment (p. 63). It is also consistent with Taylor’s (2008) description of school based carpentry

apprenticeship trainees becoming acculturated into the values and attitudes needed for successful employment.

Providing a meaningful context

In a report by the Centre for Education and Industry, University of Warwick (2009), technology education is described as having the potential to...draw out the applications of scientific and mathematical ideas...[to] produce better links between skills, abilities and types of career and be the bridge between academic study and real life activity. (p. 10)

The findings from this research provide evidence that demonstrate this potential, particularly for students who might not otherwise have engaged with more traditional academic study. For example, Darcana described himself as both an academic and practical student. He engaged in, benefited from and succeeded in senior GTE. However, he had difficulty with mathematics and described understanding decontextualised general academic concepts as the “logical side”, that is, “more detached...not real...all in your head...existing in a dimension we can’t exist in...it just doesn’t make the same sense.” He reported needing a physical reason or application to actually engage in the learning activity, and then he had no problem working things out even when they involved physics or mathematical knowledge. Darcana believes that education should be about making conceptual knowledge more accessible to students by making links between that type of knowledge and the real world that students can relate to. He was full of praise for his school’s VTE programme, which he believed gave students struggling with mainstream education basic literacy and numeracy skills by delivering them in a vocational context.

Hemi described having difficulty with maths assessments compared to his VTE assessments because maths questions did not have any real-life context from which he could draw answers. Chester saw relevance in studying academic subjects only for students who know they want to go to University. He explained that practically-minded students do not see the relationship with what they want to do and what is being taught in many of their subjects.

Emma took GTE in the subject context of graphics. Both she and Darcana described transferring and using knowledge and skills from other subjects, researching when they did not know something, and using conceptual knowledge from maths and science in the process of completing their projects. Emma says of her consideration of costings and the economics of her designs; “[I] guess it was kinda like the real life application of maths.”

Contextualised project based learning experiences that reflect real world practice and intertwine theory and practical capability in both VTE and GTE, engaged the students interviewed for this research, and are valued as useful in preparing them for their life after school. The findings support literature that stresses the importance of contextualised learning that provides students a more holistic approach to their education (e.g., Stevenson, 2003; Stevenson, 2005; Bjurulf, 2010; Woods, 2008).

CONCLUSIONS

After analysing the responses made by the participants in the case studies, it appears that it is the general life skills, taught in both VTE and GTE programmes, which were perceived as more valuable than those that are subject specific and specialised. In addition, they more readily recognized their learning as relevant when it was contextualized. Within such contexts students identified their exposure to a variety of knowledge and skills including:

1. the more academic GTE achievement objectives around planning, critical evaluation, design process and societal and environmental considerations in technological development;

2. the more practical goals of VTE to gain competency in the use of tools, machinery and manipulating materials;
3. general life skills around key competencies such as communication, co-operation, perseverance and basic literacy and numeracy.

Many schools do not have the space in their timetable, the staffing, or the student numbers to be able to offer both GTE and VTE as separate subjects. However, teachers do have the ability to provide their students engaging, real-life contextualised projects. In this way teachers are able to focus the learning experiences of their students on preparing them for the reality of the workplace rather than structuring the learning solely around providing evidence for assessment. At senior school level, there is an extensive suite of vocational and general technology assessments available to tie the authentic learning students are undertaking to national qualifications, and provide a range of students with different abilities and interests, opportunities to succeed in their schooling.

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