TECHNICAL AND VOCATIONAL EDUCATION VOICES FOR SUSTAINABLE ECONOMIES - ARE WE REALLY LISTENING?

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Abstract:

This paper presents perceptions of university-based, Technical and Vocational Education (TVE) teacher-educators in Malaysia, Australia and the UK in relation to the United Nations Educational, Scientific & Cultural Organization (UNESCO) statements on TVE. The study was conducted in Malaysia, Australia and the United Kingdom, February-May 2010.

In the 21st century we experience the world in an interconnected and 'global' way. It is unfortunate that much of that connectedness is at the price of negative experiences – economic crises, human rights violations, natural disasters and environmental mismanagement. Such experiences can stem from economic, social and/or environmental events that impact our capacity for a sustainable future, regardless of cultural context. Our capacity to deal with them through TVE is underpinned by guidance of organizations such as UNESCO and UNEVOC; providing a visible presence for TVE in the international context. But are teacher-educators for TVE really attending to their advice and direction? Less than 10% of those surveyed and interviewed (n=48) were even aware of UNESCO's statements on the global intent of TVE, yet all countries involved in this lead-in study are member states.

The central issue is to challenge that 'everything is going along nicely, thank you'. Arguably, the TVE community is attuned to mitigating risk factors for its own survival, and is perpetually focused on reporting the 'good news' about the effectiveness and penetration of programs. This lead-in project set out to get teacher-educators critically reflecting on technical education, and thinking about their role as the intellectual community that will inform economically, socially and environmentally sustainable futures.

The study involved extended stays and site visits in four countries. Data were drawn from structured interviews and surveys, plus over a dozen site visits to universities, polytechnics, specialist research centers and to national bodies governing technical education. Overall, almost 60 teacher-educator academics specializing in technical education, from more than 20 universities, were involved.

Introduction

We are routinely bombarded with reports and statistics that reflect the great work being done in TVE & VET. However, as a community of professional educators, we are prone to be conservative in our own practice and often resist the political awkwardness of critical reflection (Down & Hogan 2000, Graham & Phelps 2003, Wilson 2008).

Therefore we start here with the conundrum of where to shine the light on the issues within this discussion. In the discussion of Technical Education across sectors, there are separate and overlapping issues of Secondary Education, Further Education, Professional Education, Workplace Education, Vocational Education or Higher Education. This makes the locus of discussion paradoxically simple and complex.

Teacher-educators at universities are well placed to influence and implement improvements to curriculum and pedagogy in TVE. However, they are arguably set apart from the practice of TVE in schools, industry and institutes of 'further' education. This should bring us to question how we can utilize the existing expertise in universities to enhance the relationships between stakeholders in TVE, including universities. Ultimately these relationships connect technical education with the world at large.

This study was conducted in Malaysia, Australia and the United Kingdom between the months of February and May 2010. The study involved extended stays and numerous site visits in all countries. Survey sample was n=48.

A range of senior educators inform this project, many with decades of teacher-education experience in this field. The sites chosen coalesced on several dimensions, firstly as members of UNESCO, and consequently 'signed up' to the 2004 revisions of the technical and vocational education statements.

In the 21st century we have come to experience the world in a more interconnected and 'global' way. It is unfortunate that most of that connectedness has often come at the price of negative experiences – severe economic crisis, systematic violations of human rights, natural disasters. Those experiences can generally be recognized as economic, social and/or environmental events that impact our capacity for a sustainable future, regardless of cultural context. Organizations such as the United Nations Educational, Scientific & Cultural Organization (UNESCO) and their International Centre for Technical and Vocational Education and Training provide guidance and a visible presence for TVE in the international context. But are teacher-educators for TVE really attending to the advice and direction of these international groups and centers? Less than 10% of those interviewed in this project were even aware of UNESCO's (2004) normative instruments on the intent of TVE in its member states, yet all countries involved in this lead-in study are members. To be clear, this is in no way a criticism of the participants of the study, but rather a reflection that even on the grandest scale the needs of TVE are difficult to communicate.

The following outline of context positions discussion of this research amongst recurrent tensions in the status of TVE, flexible nomenclature and the perspectives on the educational 'place' of TVE.

Context

The status of technical education is something the Australian psyche has struggled with since the establishment of its formal education systems in the late nineteenth century – regardless of the social impact of technically oriented institutes of the time (Barker 2002, Jones 2003). The historic divide is also well documented and deeply

entrenched in the UK context (Edwards, Fitz-gibbon, Hardman, Haywood and Meagher 1997, Curzon 2003, Lewis 2008).   Malaysia cites the first government sponsored technical studies classes being held in 1904 in Kuala Lumpur (MoHE 2009). There is also a view of much of the current infrastructures being built on a colonial past and/or history of the commonwealth. This may have much to do with a cultural 'connectedness' within the project, but they have been brought together through collaborative practice between technical teacher educators. However, variations in meaning are important when we consider how policy intent is interpreted and contributions to external contexts (international) are perceived between countries. Reflecting on what is claimed as valuable in the domains of the sciences and technology, Pacey (2001) cites this type of ambiguity as continually problematic in international contexts. The same concern can be held for TVE. However, as the nature of work continues to be homogenized through globalization (Smyth, Dow, Hattam, Reid & Shacklock 2000) we need to work with broader statements of intent that act as frameworks rather than instrumental statements.

In Malaysia's technical and vocational education strategies, Mustapha (2001) cites the changing nature of work through globalization as a catalyst for reform. The argument for a renewed view of what is required in the globalised workplace is also well framed from the UK position by Young (2009) in review of Bernstein's (2000) focus on knowledge relations, and a tempering of the view of generic [skills] mode (p.156). With these issues in mind, there was a need to work from a common interpretation of TVE.

The UNESCO instruments that were used to develop the survey for this study include operational definitions of terms in an attempt to remove the ambiguity between contexts. However, even these agreed definitions support the 'framework' approach rather than explicit statements, viz.

> For the purposes of this Recommendation "technical and vocational education"
> is used as a comprehensive term referring to those aspects of the educational
> process involving, in addition to general education, the study of technologies
> and related sciences, and the acquisition of practical skills, attitudes, understanding
> and knowledge relating to occupations in various sectors of economic and
> social life.
>
> <div align="right">(UNESCO 2004, p.7)</div>

This framework position also underpinned the survey, as the UNESCO instruments represented reliable, widely informed policy statements in the public domain.

Utilising survey data from Australia, the United Kingdom (UK) and Malaysia, we can examine how teacher-educators conceptualise technical teaching in a variety of contexts. In the 21st century the move to sustainable practices is changing the nature of work (UNEP, 2008) . Changes in work may also be shifting the social-capital attached to TVE as vocational preparation. These perceptions consequently shape our thinking and inform decisions made in the delivery of technical teacher education. These decisions include the purposes for which the teaching is intended – arguably striving to meet the needs of all stakeholders.

The V word

One recurring issue with the conduct of this research was the intrinsic linking of Vocational and Technical aspects of education as if there is an unwavering symbiotic relationship between them. Indeed, in the contexts of this project the terms have been linked in theory, policy and practice for over three decades. However in countries such as the USA there has been a deliberate change in the nomenclature of education.

In 1998, due to downturns in public confidence in vocational education, the *professional vocational association* in the USA urged its members to cease using *Vocational* education and replace it with *Careers and Technical Education (CTE)* (Castellano, Springfield and Stone, 2003). During this project it was observed that in 2010, some universities have dropped 'vocational' from departmental divisions and realigned with 'technology' and/or 'engineering'. We can recognize similar, although less obvious, trends in other countries. For, instance *parity of esteem* is a term appearing frequently in discussions regarding the educational 'place' of technical and vocational programs in a range of international settings (Edwards, et al. 1997, Forward 2003, Polesel 2008, Young 2008). Reductionists will argue that there are sufficient definitions of the difference between vocational and technical. However, in the global discourse of education, the issue is a necessary discussion as TVE now means so many different things in differing contexts (Moodie 2008).

There is no suggestion here of any miraculous and instantaneous separation of the terms. They appear to be now intrinsically connected as a continuum of practice between the Vocational and the Technical extremes. TVE practitioners could easily interpret this notion of a continuum, however it is those outside the field of practice that will continue to see the Vocational and Technical as a monolithic entity, including policy makers and consultative bodies. There may well be a liberating function for both ends of such a technical vocational continuum, by identifying points of separation where technical and vocational knowledge are no longer mutually supportive. This is, of course, dependent on context. In such a dichotomous approach, Young (2008) contends that Bernstein's work on the vertical and horizontal discourse of knowledge can be cautiously applied. This is in light of the nature of vocational knowledge and issues pertaining to 'parity of esteem' with general education (p.150).

Inter sectional tensions

There is a long standing anxiety amongst technical educators about the intellectual status of vocational and technical education; particularly at the tertiary level (Tilak 2002, Canavan & Doherty 2007, Young 2008). However, what is not in question is the value of problem-solving strategies and the effectiveness of innovative and creative technologists.

The notion that the world of technical education needs to be divorced from (or at least separate to) other educational contexts is a conundrum. Maintaining a position of uniqueness should not mean a complete separation of intellectual goals or activities from those of the wider academy.

This myth of intellectual separation between further and higher education manifests in a deep-rooted subordination of further education from higher education (Edwards et al. 1997, Young 2008). Moodie (2008) suggests that this reflects the 'positional value' of educational systems in differing contexts, certainly this was the experience of the

current project. Further, the changing nature of university-state relationships is complicating the issue in the Malaysian context (Morshidi 2009).

The evidence cited of shortages of people with the skills required in the community (MacGregor 2007, UNESCO/ILO 2002) indicates a very real need for us to extend the reach of further education and widen the catchment for higher education. Divisions between further and higher education in the UK are so socially entrenched that it would require an extraordinary level of cooperation and collaboration to span the chasm between the two sectors. This is confirmed in documented accounts of the history of technical and vocational programs in England (Edwards, et al.1997, Lewis 2008, Young 2008).

The introduction of the (Vocational) Diploma scheme in the UK (offering distinct pathways to employment, further education and/or higher education) was set to rejuvenate opportunities for aspirational students who needed an alternative to traditional 'A level' frameworks (Lewis 2008). However, Stanley (2010) informs us the program now appears to be under threat via a number of separate but related means. Firstly, 'elite' research-intensive universities in the UK are demanding extra evidence from Diploma students for entry to programs than they are from A-level applicants. Secondly, student demand is lower than anticipated and finally the potential for change of government during a critical implementation phase (Stanley 2010, p.16-17).

In the context of this study the nomenclature is also a point of confusion. Diplomas and Advance Diplomas are positioned significantly higher in the Australian Qualifications Framework (AQF) and in the Malaysian Qualifications Framework (MQF) than in the UK framework. These points are well connected to the history of the status of technicians and technologists in Australia (Rushbrook 2007, Rushbrook and Preston 2009).

As the world turns…..

Some of the most significant changes for TVE teacher educators (with an aging knowledge base) are those that are connected to the redundancy of our own technical ways-of-knowing. Many of the technologies employed, and many of the materials, that the students of our students (the ultimate 'end users') will need to consider and employ have not yet been invented or are emergent (Australian Government 2004, Zanker 2008). There is an urgent call for innovative technicians and technologists in developing economies such as Malaysia to help them remain technologically competitive in their regional contexts (Lai and Yap 2004; Kamin, Cartledge & Simkin 2010). These examples underline a need to be vigilant about the role of technical education in secure and sustainable futures.

Carried along with this forward thrust of innovation and development is our history, including those materials and skills that need to be preserved; as fundamentals of how we work in the world and how we can maintain the markers of our sustained development. Again, this statement is relevant in all contexts of this project.

To illustrate the meaning of change in context, the following example outlines some

new thinking about old problems.

During visits to the United Kingdom (2010) the project was informed by an additional consideration of the technical skill debate, that is the retention of 'old craft' in the preservation of historic sites and artifacts of social development. At university site visits, facilities for the preservation and enhancement of craft skills were comfortably juxtaposed with new technologies. For example, at one site the 'block and hammer' room is nested in the same working spaces as the 3D rapid prototyping machines, CNC lathes, jewelry benches and the electronics lab, amongst a myriad of other creative and technical spaces. As an outsider, the impact of these shared creative places for engaging technology, history, design and science was profound. There is a legacy in technical fields of tacit knowledge developed through tactile and intellectual experience; it is bound to our ways of knowing the world. On this issue Pacey (2001) states 'it is as if some vestige of alchemy remains in the way we practice technology' (pp.74-75). There were many more examples of this experience that assist in the analysis of data from the UNESCO based statements on TVE.

Working past any romanticism attached to preserving our collective 'history', there is the harsh reality of increased global mobility, be it through economic developments (such as the affordability and abundance of air travel) or the recasting of international boundaries (such as the EU and ASEAN trade agreements). Social change is impacting the numbers of people visiting historic sites and how they get there, with even the most passive of human activity contributing to issues of environmental impact (carbon footprinting) and sustainability (Cassar, 2009).

Similarly, the impacts of increasing 'carbon footprints' abound in the developing economies of South East Asia. During visits to Malaysia in 2009 and 2010 it was observed that the affordability of transport, and the consequent mobility of the population (primarily for employment) were important areas of social and economic planning. In the context of this study peninsula Malaysia's economic circumstances were well considered; especially the vulnerability to the contemporary environmental cost of tourism. There is also significant connection with the issues of sustainability and the Australian economy that can be directly linked to the role of technical education as a precursor to understanding work in particular fields (Australian Government 2004).

If we consider the similarities and differences in the relationships, and practice, of TVE we should examine the effectiveness of statements of intent (such as those in the UNESCO instrument). There may be a reliable illusion of a cohesive and collaborative response across member states to these charters, but the response may not deliver what is intended. The following section outlines the tools and techniques applied in investigating these issues with TVE teacher-educators in universities.

The Survey Tool

Collectively, the community of technical educators has been engaged in attempts to meet with the UNESCO recommendations (or at least a range of very similar ideals) for more than two decades. But are we achieving these stated intentions or are we continually reiterating platitudes that are not really addressing the issues of social, economic and environmental sustainable practice?

An acceptable level of content validity and reliability was established through piloting the study with a small group of expert practitioners, including using English as a second language. Internal validity of the survey is established through its development from explicit statements from published normative instruments (UNESCO 2004).

Developing a tool from the existing UNESCO statements on TVE was in itself both helpful and problematic. The normative instruments contain multiple complex, compound statements about TVE in member states. The instruments stand as a general statement of intent, but lack specificity.

The survey consisted of 90 items, including nine on personal data, 77 Likert scaled responses, two semantic differentials, two open response questions and two open text comment sections. It was structured following related divisions of UNESCO normative instrument (2004) and the survey was administered in all cases by the same researcher.

Participants

To be eligible to join the purposive sample (n=53) participants in the survey (n=48) were required to be engaged in the higher education sector in the development and delivery of teacher-education programs directly related to the teaching of 'technical' subjects. This includes materials and systems technology in schools, and 'life skills' programs.

Institutional and demographic data included location, institution and personal data, such as type and level of qualifications held, age, and experience in teacher education. Data was not collected on gender, ethnicity or personal cultural dimensions.

The sample reflected the following noteworthy characteristics (Table 1).

Table 1

n=48	Sample %
Hold higher degrees (Masters+)	93.7
Hold doctorates	47.9
Do not have TVE qualifications	47.9
>10 years in Technical Teacher Education	58.3
>40 years old	74.0
>50 years old	37.0
Did not complete secondary school to year 12	33.3
Appointed as Senior Lecturer, Associate Professor, Professor	50.0

From these data we can infer that the sample includes a high representation of mature, experienced and highly qualified teacher educators, albeit that only slightly more than half hold TVE practitioner qualifications in concert with university credentials.

Limitations

Limitations of the study include:

1. Generalizations cannot be developed beyond the sample;
2. Cultural dimensions of the study are not fully evaluated (sample bias); e.g. the participation rate of UK practitioners was markedly lower than other sites - impacting comparative analysis between groups.
3. Small sample limits the statistical significance of quantitative data.

Tools and anomalies

The data were collected in both hard copy and online formats, preceded by telephone/email contact and where possible, a site visit. Note that any statistics cited from the survey are reported here as descriptive data only; consistent with its intent as a lead-in study. All figures reported are adjusted to two decimal places.

Analysis of the quantitative survey data has been juxtaposed with qualitative data from free-text fields of the survey and in-country field notes. All data were processed and tabulated via a secure online survey platform. Analysis of survey data includes filtering and processing variables through cross-tabulation to identify trends and anomalies within and between data.

Overall, the scaled survey data generated a universally positive result. Designed on a six point Likert scale (including 10 reversed items), the average of item responses only fell below the scale arithmetic mean (3.5) on 3 items across the 77 scaled items (see table 2). The three issues below scale mean were:

Table 2

	mean
1. Learners were introduced to a wide range of technologies in TVE	3.19
2. TVE programs are gender inclusive systems	2.91
3. TVE includes the study of at least one foreign language for vocational applications	3.36

Even with these indicators marginally below the positive threshold there is little impact to the overall result of 4.36 across scaled items. This has been interpreted as all participants sharing a high level of confidence in the current state of TVE teacher education against the key issues drawn from the UNESCO instruments.

This would be a more pleasing result if there were an equal amount of evidence to indicate that this perceived outcome was addressing the experienced skills gap. In its simplest analysis, university based teacher education for TVE is attending to the brief, but not addressing the problem.
The items rating highest in the survey were related to professional preparation of TVE

teachers (dimensions of participants professional work) with an average >5.00 on the six items related to elements of professional preparation in teacher education programs. Interestingly, these items are the only areas of the survey (items 62 – 67) where the Malaysian sample followed the positive trend but did not yield the most positive responses. Again, there is an overwhelming confidence in responses from teacher -educators that they are doing effective work in preparing TVE teachers.

Discussion

The survey data doesn't reflect any large variations in perceptions of progress toward stated objectives – this is at odds with the continued discourse on skill shortages. Again, awkward questions need to be asked about how to improve the situation. Measures of culpability and accountability will serve little good to any of the stakeholders in technical education, instead we should acknowledge problems and set forth to address them. We have been 'talking about it' for decades and now need to use that depth of reflection and collective understanding to reposition technical education as a key component of development (social, environmental and economic). From the activities and data attached to this lead-in project it can be speculated that, regardless of context, teacher educators are positive in their approach to what they are doing and skillful at producing graduates. However there needs to be some pause for thought about the needs of the world and how university programs can add value to the processes of technical education, particularly as the teachers of the teachers.

Predicting the specific skills for society, the economy and the environment is almost impossible, so perhaps we could be enabling technicians and technologists with better *process* skills. Design skills, both cognitive and physical, present a rich and adaptable framework to facilitate change. Injecting risk and creativity into the micro-tolerance world of the technician may be the key to success. In design terms, often the best design is of 'dynamic and adaptable' process and not product (Norman 2005). It is suggested here that a Design-Artificer concept warrants investigation as an extension of this project.

Well-informed, well-qualified, seasoned practitioners informed this study and what may be seen as lacking in quantity of views for survey data is balanced by hard won experience. The site visit data have illuminated some key issues. Firstly, that an abundance of resources does not operationalise technique and understanding in technical education; experience and realistic commercial/industrial experience are needed. However, this assertion is tempered by Cartledge and Watson (2008) in the caution from Kell (2007), that affording priority to the needs of government and industry in VET over the last decade has 'failed to produce a workforce for the future' (p.13).

A further issue is that these realistic experiences need not be some Dickensian or neo-Fordist model of industrial behaviours, but they should be thoughtful technically oriented approaches. There are arguments in the literature that strategies such as Project-Based Learning and Problem-Based Learning (often confused concepts – Capraro & Slough 2009, p.2) fulfil such a need, however the application is often outcome-focused with a few superficial artifacts to connect process to the product (e.g project folios, design briefs), and often developed post-project.

Summary

This lead-in project began with a remedial view, that something was somehow 'broken' and in need of review. Namely, that teacher-education in technical areas could be improved by better alignment of practice between universities and the communities they serve. It is clear that most technical teacher-educators are confident that in their context they perceive a general alignment with UNESCO's brief on TVE. However, this still does not acknowledge the universal issue of skill shortages in technical areas; and the increasing impost of skills for sustainable development. Therefore key issues for further research are; how widely these perceptions of a general alignment with the UNESCO brief are held amongst university educators in TVE, to identify if such views are shared in other tertiary education contexts, and to review how universities might improve alignment of TVE with sustainabilityle.

The data reflects potential for the current mismatch of program intent and the ultimate outcomes to continue. Universities continue to generate graduates to address the shortage of para-professional technicians and technologists in the labour-market, without addressing the skills 'gap'. This problem is identified by Cartledge and Watson (2008) as an issue in the Australian context of TVE in creative industries, one that has also been identified in the UK experience (UK Government 2007, p.10, Sapsed, et al. 2008, p. 36). These cases studies revealed an increasing number of qualified graduates entering the labour market without impacting the ongoing shortage of the skills required in the workplace.

There is a passionate regard for the work being done in technical teacher education and a similarly passionate anxiety about the fate of the field. Even amongst themselves, during this project technical teacher-educators openly criticize teachers for practicing the past, or longing for the good-old-days of tech schools and hand skills. However the participants in this study, dealing with technical education as their daily work, firmly believe in the preparation of technical 'thinkers' and 'doers' as the vanguard of sustainable futures. These impassioned positions are not reflected in the relatively conservative response to the survey, where perceptions of the current state of TVE are universally positive. Also, critical examination of available data (see Table 1) indicates compounding challenges to vocational currency, such as industry qualifications and timely experience, that may also need to be addressed to enhance the credibility of university-based teacher-education in TVE.

It is fair to state that, from the current data in this project, the link between the world-of-work and TVE remains vexed. On one hand there is a view of TVE as a fundamental process to facilitate understanding; a way of knowing and working with the world at all levels. On the other hand is an almost prescriptive requirement to satisfy technical roles and responsibilities in the economy; and somewhere deeply connected in both is the space for environmental responsibility.

Vocational and technical education may well be legitimately and authentically linked at a fundamental level, but lets not take that for granted. We must re-evaluate the practice of teacher-education for technical fields of practice. There should be a careful examination of the connection between vocational and technical approaches to teaching and learning.

The outcome of this project is a call to re-examine the relationship between discrete

elements of TVE, to allow each element to achieve its potential. In the daily work of teacher education in universities, we remain relatively distant from these questions. The distance is maintained in responding to compliance measures rather than risking innovative practice. Whilst this may be safe, it is incongruent with the passion shared by participants in this study for their programs and their students – both of which appear to be diminishing in developed economies. Technical educators cannot afford complacency on these matters, as we are preparing generations of learners for *their* tomorrows and not *our* yesterdays.

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