
Vocational Education and Training: Now What?*

Ron Seidel

*Faculty of Engineering, Regency Institute of TAFE, Days Road, Regency Park,
Adelaide, SA 5010, Australia*

Many vocational education and training systems around the world are facing fundamental issues as they grapple with the political, economic and demographic changes of recent years, and are often failing to satisfy the needs of their established and emerging client groups. The challenges are encouraging educational institutions to ask again what their fundamental purpose is, and how this might be reconciled with the views of government, business and the community. Vocational education and training in Australia has experienced significant change in the past few years with the development of national standards and curriculum, the introduction of the funder-purchaser-provider financial model and demands for greater productivity. Educational institutions need to evolve at a rate just as fast as that of technology and business, but the change process needs to return continuously to the basic philosophy of purpose. This paper will outline some of the issues confronting vocational education and training in engineering in Australia, drawing some comparisons with other countries and suggesting some approaches that might be taken.

INTRODUCTION

A number of countries are reviewing their post-school systems of education and training in order to ensure that the strategic development needs of the country are met. For nearly a century Australia was largely a land of rural production with exports to England and aligned countries. After the 1980s Australia entered a period of significant recession due to a number of factors, including major shifts in international markets; the inefficiency of Australian industry and the increasing capacity of developing countries to manufacture commodities cheaply; drought; and, in retrospect, economic mismanagement. Until the mid 1980s, vocational education and training in Australia had developed in a relatively *ad hoc* manner with each state adopting its own system that was seen to best serve its needs. To a large extent the local needs that were served were served well, but vocational education and training was not national, did not adequately address emerging industries, such as community and health services, and in particular did not address the lower skill levels so critically affecting the quality of products and services.

Some eight years ago Australia embarked on

changes to reform vocational education and training, and given the economic context of the time and the need for Australia's manufacturing industry to become more efficient, much of the current development has its roots in vocational education and training in engineering. Industrial relations was a key feature of economic reform in Australia in the early and mid 1990s, and vocational education and training became inextricably linked to changes in industrial awards and work practice.

The current system of vocational education and training in engineering is in part based on systems in Germany and England. The features of vocational education and training in overseas countries that were economically stronger than Australia at the time were considered to be good, and these features were often imported without due consideration of the limitations, the cultural differences, geography and demographics, cost, and international developments. It has been proposed by Stern *et al* that youth employment is kept low in countries such as Germany and Japan where employers are involved in setting standards and maintaining incentives in the education and training system [1]. But the link between the two is questionable and youth and adult employment might be more a function of the current economic well-being of the country, and the economic well-being of many countries cycles over

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a decade or so. Countries such as Germany and Sweden, which had strong economies only a few years ago, now are in or facing recession.

ISSUES FOR AUSTRALIA

It is contended that there are now major issues and deficiencies in vocational education and training in engineering in Australia and that these need to be debated in both general and specific contexts. Vocational education and training, coming into existence in more recent times, has never been subjected to the level of debate that has surrounded schools and universities for centuries [2].

Except for Europe, it is unfortunate that vocational education and training in most parts of the world is subject to little research and debate, and as a result is largely *ad hoc* and overly influenced by ideology and political expediency. Without such debate to develop models and to identify areas of agreement and disagreement, there is little basis for innovation, reasoned development and evolution [3]. While avenues for debate exist, many teaching staff in vocational education and training have backgrounds where research and debate have been discouraged or do not exist. Many think, for example, that development is mostly a matter of some grand plan revolution, rather than, as is more the usual case, evolution. They often assume that the small successes and failures underlying fundamental change are not important or of interest to others, and staff need to be encouraged to share their ideas and experiences with others. It is contended that one of the greatest contributions that the UNESCO International Centre for Engineering Education (UICEE) can make is to encourage involved debate in vocational education and training.

Some of the issues before vocational education and training are discussed below, together with some suggestions of possible avenues of inquiry. The issues selected for brief comments are:

- Should there be a vocational education and training sector?
- The learning process
- Changing nature of work
- School-to-work transition
- Student recruitment

Should there be a vocational education and training sector?

Not all countries have a system of vocational education and training. In Sweden, for example, students at

the end of nine years of compulsory schooling, at about age 16 (about two years older than in Australia), move into the three year upper secondary school where they undertake pre-university education or vocational education. Using one example, those that enter university complete a nominally 4.5 year MSc or a 3 year BSc (about an Australian AQF Diploma or Advanced Diploma). A few of those that undertake vocational education in the upper secondary schools may undertake a University Certificate after a period of work experience, or perhaps even a BSc. While Sweden is facing a number of economic and political issues, it cannot be said that their education system has not been successful given their industrial and business successes of the past two or three decades [4].

Might not Australia be better served by moving the upper levels of public vocational education and training into universities and the lower levels into schools, leaving what is left to in-house industry training and small private training organisations? Would those in remote areas, those wanting a second chance, those with learning difficulties, those with literacy and numeracy problems be able to be adequately served by schools concerned with mass education, and universities for which the development of knowledge is a prime function?

If vocational education and training is to mature as an entity, then what should be the governance and structure of publicly funded institutions? Schofield argues that the proper and only sustainable possibility is autonomy, but is this a reality in all situations [5]. Autonomy would free publicly funded institutions from immediate political direction, but it would require the significant rationalisation of institutions to make them cost effective, and this would, more likely than not, see a reduction in service to those most in need. Autonomy, either through legislation or incorporation, would change the operational framework from education as a community service to education as a business.

Certainly, autonomy of further education colleges in England has made a fundamental difference to their operational framework and should bring benefits to business and the community in the longer term as the colleges develop and implement their strategic plans. While Australia can learn from these developments in England over the past five years, the situation there has some marked differences to the situation in Australia and these differences should be carefully noted.

The learning process

There needs to be considerably more attention given to how people in the vocational education and training

sector learn, and even what is meant by some of the terminology in common use. A shared understanding of terminology is critical for effective debate. To ask an audience of practitioners whether there is a difference between education and training, and if so, what that difference is, is usually sufficient to demonstrate the lack of shared understanding. (A simple model of the learning process often used by the author is outlined in the Appendix.)

Students in universities are probably more intellectually adaptable and those in vocational education and training have somewhat limited capabilities for whatever reason. Teaching staff need not just a better understanding of the learning process, but need a greater range of tools to assist and mentor learners. Regency Institute is currently trialing the 4MAT model, based on Kolb psychology, and early indicators suggest that the teaching procedures are effective whether it be due to the validity of the psychology or that the model focuses attention on teaching practice [6].

Language and the process of concept formation, especially for those for whom English is not their first language, is an area also needing attention. At Regency Institute for example, some 30% of students in engineering have only limited English literacy and often cannot yet think in English. Often these students translate the English to their first language, in the best way they can, *think* about the matter, and translate the results back to English. While this process may be adequate for social interaction, it is not adequate to handle the conciseness and precision of engineering. There is sufficient evidence that the translation processes are far from adequate, and that similar though different English words, for example *repair* and *re-work*, translate to the same concept. The student will obviously experience considerable learning difficulties and, more importantly, will not know why or how these difficulties have come about.

Currently, considerable resources are being directed to the development of *on-line delivery*, but on-line delivery of what? What the scope of on-line delivery in engineering is, and to what extent on-line delivery can replace traditional learning environments, are areas worthy of debate.

Changing nature of work

Vocational education and training in engineering currently assumes that the person is, or is about to be, employed in a well-defined career path, to become for example, an electrician, plumber or a computer programmer.

The idea of a young person embarking on a steadily developing single career over some 40 or so years

has little relevance today. Many current students are preparing for a career that is still in the formative stages, and many will not only change employers several times in their working life, but will increasingly make quite major changes in their career paths. It could well be that the traditional idea of a job for life is one that is quickly fading.

The current narrow focus of vocational education and training in engineering must be reviewed. Certainly the national curriculum in engineering allows for more than a narrowly focused study pathway, but most employers seem to assume that only immediate technical workplace skills are necessary. Work is increasingly requiring new skill sets and the absolute importance of technical competence is very much on the wane. Employers continuously ask that graduates be better able to communicate, to relate to customers, to work in teams and to demonstrate innovation and quality improvement, and yet the same employers retain the narrow technical focus of training. The adoption of a modular approach to vocational education and training in engineering allows study pathways to be flexibly designed to meet changing requirements even though the modular approach can lead to fragmentation, overlap and additional organisational overheads [7].

School-to-work transition

There is a well-established view in Australia of *leaving school and getting a job*, perhaps built on Australia's rural tradition of *leaving school and working on the farm*. The implication is that the person now knows enough and it is time to start working. In the contemporary world one does not stop learning because one starts work, and increasingly organisations are developing the concept of the *learning organisation* as they see continual learning in the workplace to be a key factor in sustainability and success.

It is contended that *leaving school and getting a job*, while not uniquely Australian, is well embedded in the Australian community. It is a concept that is not present in many countries, Japan and Germany, for example, and to a lesser extent the United States. In these times of significant youth unemployment, few young people immediately enter clear career paths on leaving school. Many will move to further study, but there will be a large number who will experience periods of unemployment or casual employment. This latter group will gradually be deskilled and demotivated.

Certainly for many young people, starting work signifies passage from childhood to adulthood, from parental dependence to independence, but they also re-

port it to be a time of uncertainty and of confidence sapping negative experiences. In former years, when work was more clearly defined through organisation and structure, those entering the work environment were given fairly clearly defined tasks and were more closely mentored by their immediate supervisors. Today, relatively inexperienced young people are expected to be effective in a work environment characterised by team work, uncertainty, decision making, and the need to resolve their own conflicts.

... the emergence of a more learning intensive economy poses new challenges, both for countries with hitherto successful systems (of vocational education and training) and for others. Employment is becoming increasingly fluid, occupational boundaries are changing or dissolving, and more jobs are temporary. Continual learning is a more important part of work... [8].

Many young people are unprepared for this and would be helped personally and career-wise by a better managed transition from school to work; they need to be helped through learning to be *at work* [9].

It is contended that urgent attention needs to be given within vocational education and training, in particular in engineering, to the school-to-work transition. The focus of vocational education and training in engineering on specific workplace skills that are more based on the past than the future is not suitable for those for whom immediate employment is unlikely. Australia needs another vocational education and training framework to accommodate the large number of school-leavers that are unlikely to move into immediate employment.

It is suggested that Australia should carefully examine the development of the General National Vocational Qualification (GNVQ) in England [10]. The present training framework in Australia in engineering with industry defined competency standards was largely based on the National Vocational Qualifications (NVQ) in England, and this framework in England has now been found wanting in spite of all the claims by the National Council for Vocational Qualifications (now the Qualifications and Curriculum Authority). The GNVQs at foundation, immediate and advanced levels provide a vocational alternative to school and provide education and training for later specific employment or further study in a university. It is understood that in England some 50% of new university students come from the GNVQ stream, rather than school 'A' levels.

The report by Stern *et al* is a good summary of some of the issues of the school-to-work transition [1].

Student recruitment

Another major issue before vocational education and training in engineering, and one shared with the university sector, is student recruitment. The number of students entering all levels of engineering education and training has been decreasing in most developed countries, including Australia, though not in some of the developing countries, India for example. It is possible that the number of engineering graduates is approaching the point where Australia will not have the capacity to support its current infrastructure.

Outreach programmes, both general and those directed to specific target groups such as women, appear to have only limited success. The present learning interests of those at school seems to be more aligned to the development of life style than the traditional disciplines of language, mathematics and science upon which careers in engineering, science and technology can be built. The situation in schools is exasperated by the relatively low importance attached to traditional studies by school management, the increasing age of teachers and the low level of recruitment of specialist teachers. Recent experience at Regency Institute with Vacation Schools, the Electronics Pathways Project and the Multi-Function Bus suggests that many students in schools are interested in a career in engineering, science or technology if such careers can be related to their interests and personal concerns.

The recent review of engineering education in Australia was quite clear that there needs to be a change in the culture of engineering, though just what that culture currently is and what it should change to are matters yet to be worked through [11]. However, some quite startling work is under way, for example the work by McLean *et al* in developing the concept of masculinity in engineering, and the work currently being undertaken by others in how the construction of language has cultural and gender implications [12]. Young people today do not identify with the culture of engineering and to attract more young people into engineering as a career, as is necessary to support the infrastructure and economic growth of Australia, the culture of engineering has to change away from its dysfunctional and entrenched traits and practices.

CONCLUSIONS

Vocational education and training in Australia is in the process of relatively fast evolution, particularly in engineering. Vocational education and training, in particular in engineering, has no established culture of,

nor mechanisms for, debating developments and directions, and a conduit for such debate is now of critical importance.

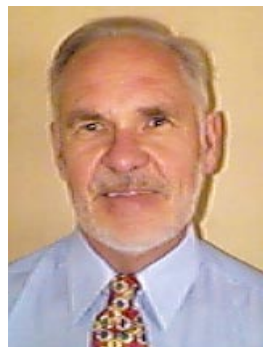
There are many issues facing vocational education and training. There needs to be a much better understanding of the learning process, especially for those students of limited scholastic ability. Students need to be helped to prepare for a work environment characterised by technological and organisational change, greater responsibility, more complex tasks and uncertainty.

Australia has largely ignored the issues of school-to-work and continues to focus on narrow workplace technical skills. A major rethinking of the transition from school-to-work is urgently required, and given that Australia has adopted from England the basics of the NVQs, it is appropriate to consider whether the GNVQs offer an education and training framework for the large number of young people for whom full-time employment will not occur immediately, if at all. The culture of engineering is starting to be examined and this should lead to a better understanding of why so many young people do not see engineering as a career when they have so much to offer and so much is needed in a world racked by social and environmental crisis.

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BIOGRAPHY



Ron Seidel is the Executive Manager of the Faculty of Engineering at Regency Institute, South Australia. Ron holds a degree in electronic engineering and postgraduate qualifications in computer science and education. He has had over 30 years teaching and management experience in vocational education and training.

His technical interest these days is in computer systems engineering, in particular software improvement processes. He has strong interest in equity and cultural diversity in education. He has been able to visit many educational institutions, mainly in Europe and Asia, and draws on recent overseas experience to question current policy in vocational education and training in Australia.

APPENDIX

The following is a simple model of the learning process that the author has found useful.

Learning is the process by which a person uses information to change their *knowledge* base. Learning is evidenced by the development and display of knowledge through behaviour. Typically the learner is presented with or obtains data through human communications, books, CD-ROMS and the many other sources of *information*. The learner needs to interpret or decode this data to provide information and then, through the learning process, structure the infor-

mation into knowledge. Hence:



A lot of data does not mean a lot of (learnt) knowledge. Providing students with data is easy, data is available everywhere. Teaching has little to do with providing data; helping students with the interpreting and learning process is the challenge of teaching.

Education is a divergent learning process whereby people maximise their individual differences; the learning outcomes for different people in the same learning environment will be quite different. Education can lead to innovation and process improvement because it encourages the exploration of alternative ideas unconstrained by current thinking. *Training*, on the other hand, is a convergent process whereby the individual differences are minimised and learning is constrained to essentially the same learning outcomes. Training will tend to lead to professionally and socially accepted

outcomes, but tends to entrench current practice. Education and training are complementary learning processes, both are *right* and both are necessary.

Though not an adequate definition, *skill* can be considered the behavioural outcome of learning. The behavioural outcome may depend upon highly developed knowledge, on the one hand ranging to conditioning, and reflex action on the other. Some skills, for example multidimensional problem solving, may depend upon a significant pool of knowledge, whereas other skills may be more the result of training, and the amount of knowledge required to support the skill is much lower.

Learning provides not only the content of intellectual schema, but also the tools by which the intellectual schema may be developed and manipulated. A highly intelligent person will have a schema of well-developed generalising concepts (such as mathematics) and models, these replacing a multitude of lower level individual facts. Likewise, a more highly intelligent person probably can do a *copy, edit and paste* transferring past learning to some new situation.