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The Role of Values in Graduate Performance in Cross-Cultural and Innovation Education

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This paper provides authentic case study examples of how the role of values contributes directly and indirectly to task performance of graduates from cross-cultural to innovation education programs focussed on the study of technologies. Values have long been regarded by many stakeholders concerned with the output of technology education courses as an essential element, whether these courses are vocationally, professionally or developmentally oriented (Australian Science Technology and Engineering Council, 1996; Department of Education Science and Training, 2003b; Schwartz, Merten, & Bursik, 1986; Seemann, 1997; Walker & Seemann, 1990). However, there is minimal literature available linking how values may be a factor in shaping graduate performance or in the effective delivery of contemporary educational content in case study and authentic situations.

Two case studies are critiqued in terms of the role values played in forging skill and task performance. The First case study presents learning in a vocationally oriented cross-cultural and Australian indigenous outback technology education context. The second case study presents the shift in values expected for the new economy and its role in developing professional graduates in secondary technology education where the focus is on innovation education and new pedagogy practice.

The paper discusses comparisons and highlights contrasts between the two case study contexts and offers the reader a basis to plan more effective educational experience that may lead to improved graduate attributes and performance.

Introduction

The opportunity for technology educationist to access in the literature examples of how values affects task performance is significant as authentic case studies in this topic area is limited. The available literature is largely restricted to the macro level of how values broadly affect the development of a *field* of knowledge, rather than how, at the micro level, values are a teaching and assessment factor affecting task performance in technology studies. Accordingly, the paper explores the proposition that learner performance on task can be significantly affected by the degree to which *task-values* are fostered compared to the traditional teacher focus where performance is driven by a 'watch-and-follow' approach that focuses on skills with tools. Educating *task-values* is argued to be based on teaching and learning about *judgements of importance* for how tasks are selected and executive. This is especially the case when task importance is in competition with what the learner perceives are other values of higher importance to them. The learner is faced with *committing to matters of*

importance for a learning requirement, and this '*values contestation and revaluing importance*' dilemma forms the central idea for how values drive the well executed tasks.

The reader is taken on an authentic journey with the author as he offers critical reflection on two case examples of where values appear to drive task performance more than any other factors. The first case study presents learning in a vocationally oriented cross-cultural and Australian indigenous outback technology education context. The second case study presents the shift in values expected for the new economy and its role in developing professional graduates in secondary technology education where the focus is on innovation education and new pedagogy practice.

In the knowledge neighbourhood of technology curriculum, some literature exists in science education that links how values affects the way a field of knowledge takes its course at the general macro level. In the field of science, for example, educationists note that "the spiritual, moral, social and cultural contexts within which science has developed [are] … factors [that] can affect the choice of scientific theory" (Poole, 1995). While in Technology Education, similar macro links to what influences the general choices we make in technology innovation, and so perceptions of solutions, are correlated with the underpinning values of the dominant culture (Barric, 2003; Memmott & Australian Housing and Urban Research Institute., 2003; Memmott & I.B. Fell Research Centre., 1991; Memmott, Moran, & Australia. Environment Australia., 2001; O'Rourke, Memmott, & Cooperative Research Centre for Sustainable Tourism., 2005; Pacey, 1983, 1990, 1999; Seemann, 1987, 1997, 2003; Seemann, Walker, Centre for Appropriate Technology, Australian Conference of TAFE Directors, & Alice Springs College of TAFE, 1990; Seemann, Walker, & Centre for Appropriate Technology (Alice Springs N.T.), 1991).

For the purposes of this paper, *values* is defined as one's judgment of what is important in life. Accordingly, teaching and fostering what is important in technology and innovation education are critical concerns to the technology educator and learner for improving task performance.

Case Study One: Values in a Cross-cultural Technology Setting

The author used to work for a most innovative organisation, now earning over 8 million dollars per year in research projects in appropriate technology, advising the Federal Australian Government and managing a 24 million dollar renewable energy program called Bush Light for all desert indigenous settlements across Australia. This organisation, the Centre for Appropriate Technology Inc./Desert Peoples Centre (CAT-DPC) is run by a handful of indigenous and non-indigenous technicians, professional engineers, architects, industrial designers, and educationists. Its main expertise is cross-cultural technology transfer, education and research and manufacture of new innovations for desert settlements. Its core business is innovation and cross-cultural technology, diffused as either research or teaching and learning, as its also a Registered Training Organisation in its own right. It produced the first national VET curriculum in Australia and so offers a very useful case study for understanding values, both in cross-cultural technology education and in cross-cultural innovation research and diffusion processes. In business speak, it is a vertically integrated organisation controlling the *value chain* from research, development and innovation (RDI) diffusion, to production and education, and to government policy and program advice. The author spent a little space introducing this organisation's résumé because a certain realm of *values* drive their performance, rather than skills.

Values for construction tasks: steel frames, concrete slabs and mud brick

The education and training programmes at CAT were mostly in the field of construction. Training was on the job and typical projects included stand alone (not connected to mains systems) toilet, shower and shelter constructions. Typically, an experienced builder-trainer lead the work teams as indigenous 'labourers' learned on the job skills in construction. These teams worked on many projects, and it was expected that by the completion of the many hours of repeating the skills, the task performance would be clearly evident.

Steel Frame Concrete Mud Brick

Figure 1: Values required for different technical tasks
Photos curtesy Centre For Appropriate Technology Inc.

However, it became apparent that most of the labourers continued to struggle with basic skills especially those that required more sustained demands in the timing of executed tasks. One illustration of this was comparing the value of laying concrete slabs to steel frame construction to mud brick construction (Figure: 1). The nature of the task of concrete laying required a relatively simple set of manual skills after the slab formwork was located in place for filling with concrete. However, the training crews were not initially taught about the importance and personal ethic or value of the timing of critical tasks. The indigenous students would on occasions have conflicting values to break off and attend to cultural family demands leaving wet concrete curing just when it was necessary to be ready to trowel off the surface. This task is not one based on skill or knowledge but one that demands a '*judgement of importance*' against a *competing value* of family and obligation.

The author recalled how the experienced builder would lament on the situation, and how the few that stayed to trowel off were automatically regarded as better skilled! What became apparent however, was that the builder instructor didn't invest in values development for the task, and instead 'showed' students the industry skill and tool processes as a normal pedagogy mode. What was missing and more important was teaching and learning about how the process of slab construction 'will' create a need to put the slab laying process first above personal importance once wet concrete is laid, else its ruined and may prove very costly.

In contrast, steel frame construction seemed to more naturally fit with students having to reconcile family and cultural competing demands. Steel frame assembly, especially where it arrives on site in kit form, permit stop start activity with little negative effect on the final job.

Further, mud brick construction presented two very interesting values issues in the process of production. Mud brick is in theory a logical choice for the outback if the soil types prove appropriate near the site of construction. It is a cheap resource, can be reproduced on site, has excellent thermal properties for extreme temperature climates and does not need accurate construction methods in most domestic cottage style housing. However, it is very labour intensive and once the mud slurry/quarry is created near the site, time and water factors are critical. The team effort is essential for good brick production while weather patterns permit. This work ethic in the process of mud brick production is core to the success of the task, much more than the lower level of manual tool skills actually required.

The second feature of values in mud brick housing is the perception of 'value' for the aesthetic of the material. Mud brick construction looks unusual and for most directly contends with conventional cement block constructions that dominate the landscape in desert communities. In theory, mud brick is arguably a far more appropriate building technology permitting locally sustainable constructions with good climatic properties using lower levels of skills so all local unskilled members in the community could participate. This applies to both local employment production of housing, extensions and renovations, and repair and maintenance. However, my personal discussions with indigenous community members and mainstream builders in the few locations where mud brick houses have been constructed is a strong values bias against it, despite the facts. Mainstream builders dislike it often because of myths about its technology and its non-conventional knowledge base to their mainstream training. While community people are both influence by the mainstream builders views and feel it's a risk to learn to use more appropriate and innovative solutions to their situation.

In summary, the values required to execute steel frame contractions, are different to those for concrete slab laying and mud brick construction. Steel construction is a forgiving process, permitting stop start activity. Concrete is less forgiving demanding one attends to its cure-timing as a critical task value for its laying. Mud brick is highly labour intensive, demanding sustained timing on processes and drying of bricks. Each process, however, in technical modules of training do not assess or emphasise learning that maps personal values required to correctly executive the different demands of the tasks and processes involved. Modules of learning instead focus on tools, sequence and practice, but not learners being taught and assessed on their work process values demanded by the nature of the technology itself.

Case Study Two: Values in an Innovation Education Program for Undergraduate Technology Teachers.

The author has also been working in the mainstream higher education sector for several years researching, developing and teaching progressive ideas to new technology teachers for the secondary school sector. The Southern Cross University's course in Technology Education is built on valuing innovation, the holistic study of technology as a social and human process, and the idea that 'craftspersonship' skill performance and the quality of problem solving decisions are tied to managing and displaying the *values embedded* in the nature of the technology choice itself. Fine furniture production, for example, demands that the producer displays a very high value on working carefully and accurately when executing each step in

production. Fine furniture producers often refer to 'having respect for the material and the processes': 'respect' is a statement of value, a judgement of what is important in the process. This second case example, however, explores how studying innovation education requires the very demanding *value* that a person embraces new knowledges and new ideas at often great conceptual and reputation risk. Students are asked to show a commitment to research (often *devalued* by their peers), and feel good about working through periods of idea failure among often criticized by peers. Here, *values* rides close to 'faith in oneself' and the underlying research that backs-up one's drive to press on. The task to *be* innovative and *do* innovative things in technology education is highly related to one's judgement of what is important. Teaching to be innovative, if done well, is normally very difficult to foster and sustain. The most difficult part of fostering and teaching pre-service teachers to '*be innovative*' is not the skills with tools and equipment, but the resocialisation process individuals must journey through. This journey challenges traditions in technical education such as the dominant focus on valuing traditional skills over research, design and the applied study of innovation. Students are asked to study innovation education in technology studies. They are expected to move on to a more liberated personal ethic that *values* adaptive thinking, using and experimenting with different technologies (including simple things like moving between the latest Apple and Windows computer software without bias) and seeking to explore and relearn new tools and technologies putting personal ego and 'popular perceptions' aside in many cases.

Many undergraduates in technology teacher education, peers and community observers are almost always very conservative. Change and shifts in what ought be valued is most contested in the technology teacher field. This pattern is a paradox because at the same time, most people in the public and among peers will be ready to advise that knowledge change is in technology studies is occurring at a ferocious rate and demands a new innovative look at the subject area. This context makes innovation education in technology teacher training highly political, rather than academic.

Innovation education is a most critical field for technology educators world wide. In Australia it is so critical as requirement that technology teachers fully understand and teach innovation and foster innovative attributes with students that the Federal Government has release $33.7 million towards schools to change their culture (DEST, 2006). This shift to move Australian schools and workplaces toward a culture of innovation is so significant; the Australian Federal Government has posted priority research funding to facilitate this shift in work place values. They seek research proposals that address the following national theme:

> "Understanding the factors that lead to highly creative and innovative ideas and concepts, and the conditions that lead to their introduction, transfer and uptake is critical for any nation that aspires to lead the world in breakthrough science, frontier technologies, and in other forms of innovation. Promoting an innovation culture and economy requires research with a focus on developing and fostering human talent, societal and cultural values favourable to creativity and innovation, and structures and processes for encouraging and managing innovation." (Department of Education Science and Training, 2003b)

To support this shift, technology teachers are now asked to model and foster the follow attributes and values.

> "At all levels, our society will require creative individuals able to communicate well, think originally and critically, adapt to change, work cooperatively, remain motivated when faced with difficult circumstances, who connect with both people and ideas and are capable of finding solutions to problems as they occur—in short, individuals with the array of skills constituting a well-developed capacity for innovation." (Department of Education Science and Training, 2003a, p. 5)

There is good reason to examine how, at the moment, technology education is in its nature a values driven field of study more than a field based on research and innovation. Most technology undergraduates expect to reproduce the traditions of their school experience. When pre-service technology teachers encounter the university reality that the new economy is in flux eddying between a labour (not necessarily traditional skills) shortage and a highly knowledge driven innovation economy, their values are contested. This challenge to re-value technology education in a new innovation frame of reference has often become the biggest limiting factor for undergraduate learning in technology studies, rather than manual skilling. In the experience with educating undergraduates in the task performance to *be* innovative, those that on anecdotal evidence appear to succeed are those most open to re-valuing their assumptions about technology education. Indeed, there is some evidence that the more technically skills undergraduates are in a traditional technical field, the less that are likely to successfully journey through a process of '*values contestation and revaluing importance*' of new ideas and knowledges. There is some evidence to suggest that values, more than skills drives the task to perform in being innovative.

Conclusions and Implications

This paper asserted that values, more than manual skills, can drive task performance in technology education. Core to this is the notion that teaching *task-values* is about *judgements of importance* for how tasks are selected and executive. It was argued that this assertion is especially important when task importance is in competition with what the learner perceives are other values of higher importance to them. This '*values contestation and revaluing importance*' process forms the central idea for how values drive the well-executed tasks.

Two case examples were illustrated with the author's authentic reflection. One case was based on cross-cultural technical education while the other on the issues faced by new undergraduates expected to embrace innovation education as secondary technology teachers. In both cases, values were suggested to be the dominant drivers of success for task performance.

Skill statements and teaching, skill performance and learning, in both technical application and in developing new innovations, were highly reliant of values driving both. Cross-cultural vocational performance required that learners valued the expectations upon them for the learning task, and innovation required that undergraduates learn to press on when faced with difficult situations and to let go of deep assumptions to permit new solutions to be explored.

Bibliography

Australian Science Technology and Engineering Council. (1996). Developing Long-Term Strategies for Science and Technology in Australia: Outcomes of the Study: Matching

Science and Technology for Future Needs 2010. Retrieved 7th Feb, 2006, from http://www.dest.gov.au/archive/Science/astec/future/findings/execsumm.html
Barric, S. (2003). *The utility and feasibility of technacy education for students with special needs.* Unpublished Honours Research Project, Southern Cross University, Coffs Harbour.
Department of Education Science and Training. (2003a). *Australia's Teachers: Australia's Future. Advancing Innovation, Science Technology and Mathematics. Agenda for Action*. Canberra: Australian Government.
Department of Education Science and Training. (2003b, 22 December 2003). Frontier Technologies for Building and Transforming Australian Industries: Priority Goals - Promoting an Innovation Culture and Economy. Retrieved 1 Sept, 2004, from http://www.dest.gov.au/priorities/transforming_industries.htm#5
DEST. (2006). Australian School Innovation in Science, Technology and Mathematics. *Department of Education, Science and Training* Retrieved 04 September, 2006, from http://www.asistm.edu.au/
Memmott, P., & Australian Housing and Urban Research Institute. (2003). Categories of Indigenous 'homeless' people and good practice responses to their needs. from Archived site http://nla.gov.au/nla.arc-37409
http://www.ahuri.edu.au/attachments/20168_final.pdf
Memmott, P., & I.B. Fell Research Centre. (1991). *Humpy, house and tin shed : Aboriginal settlement history on the Darling River*. Sydney: Ian Buchan Fell Research Centre, Faculty of Architecture, University of Sydney.
Memmott, P., Moran, M., & Australia. Environment Australia. (2001). Indigenous Settlements of Australia. from Publisher site http://www.ea.gov.au/soe/techpapers/indigenous/index.html
Archived at ANL http://nla.gov.au/nla.arc-26055
O'Rourke, T., Memmott, P., & Cooperative Research Centre for Sustainable Tourism. (2005). *Sustaining indigenous cultural tourism : aboriginal pathways, cultural centres and dwellings in the Queensland wet tropics*. Gold Coast, Qld.: CRC Sustainable Tourism. from http://www.crctourism.com.au/bookshop
Pacey, A. (1983). *The culture of technology*. Oxford, England: B. Blackwell.
Pacey, A. (1990). *Technology in world civilization : a thousand-year history* (1st MIT Press ed.). Cambridge, Mass.: MIT Press.
Pacey, A. (1999). *Meaning in technology*. Cambridge, Mass.: MIT Press.
Poole, M. (1995). *Beliefs and values in science education*. Buckingham ; Philadelphia: Open University Press.
Schwartz, G., Merten, D., & Bursik, R. J. (1986). *TEACHING styles and performance values in junior high school the impersonal, nonpersonal, and personal*. S.l.: s.n.
Seemann, K. (1987). *An Argument for Industrial Arts in Education: An Alternative to the Current Manual Arts model in NSW Schools.* Unpublished Honours Thesis, University of NSW, Sydney.
Seemann, K. (1997). *The socio-technical sustainability of shelter systems and hardware in remote indigenous Australian communities.* Unpublished Ph D, University of New South Wales.
Seemann, K. (2003). *Technology curriculum : course material*.
Seemann, K., Walker, B., Centre for Appropriate Technology, Australian Conference of TAFE Directors, & Alice Springs College of TAFE. (1990). *The Aboriginal technical worker feasibility study report (ATWORK) : a national co-operative curriculum development project of the Australian Conference of TAFE Directors*. Alice Springs: Centre for Appropriate Technology, Alice Springs College of TAFE.

Seemann, K., Walker, B., & Centre for Appropriate Technology (Alice Springs N.T.). (1991). *Remote controlled waste : an introduction to waste management and appropriate technology in remote Aboriginal communities*. Alice Springs [N.T.]: Centre for Appropriate Technology Inc., Alice Springs College of TAFE.

Walker, B., & Seemann, K. (1990). *The Aboriginal Technical Worker Feasibility Study Report*. Alice Springs: Centre for Appropriate Technology Inc.