ATTRACTING STUDENTS INTO TECHNOLOGY TEACHER EDUCATION PROGRAMS

The future of the Technology Education profession depends not only how attractive the syllabus is to students in schools but also on the viability of the Technology teacher education programs that provide future graduates. This paper will provide a brief overview of Technology teacher education in Australia as a context for a discussion of the elements of exemplary Technology teacher education programs and the manner in which these differ from other disciplines. Factors in the literature that encourage student participation in teacher education are then identified. These factors are discussed in the context of the results of a longitudinal study undertaken at Griffith University.

Technology Teacher Supply

A review of the current supply and demand for Technology teachers suggests that the current shortage of Technology teachers in Australia is by no means either a recent or an isolated phenomenon. Gibson (1998) points out that the potential shortage of Technology teachers within Australia had been identified as early as 1982 when Taylor (cited in Gibson, 1998) predicted a shortage commencing in 1985. This was further supported by a Department of Employment, Education and Training (DEET) report in 1989 (cited in Gibson, 1998) which predicted a shortage commencing in 1990. A more recent national survey by Williams (2002) reported shortages at the secondary level in New South Wales, South Australia and Victoria, a projected shortage from the year 2000 onwards in Western Australia, at best a break even situation in both Queensland and Tasmania but with a predicted shortage developing in Tasmania, a significant shortage in the Australian Capital Territory and no shortage in the Northern Territory. There is evidence to suggest that while this situation may have improved slightly in some states such as Victoria and NSW it has grown worse in others such as Queensland.

Williams (2002) maintained that the period between 1996 and 2000 had seen the demise of technology teacher education programs in New South Wales and more particularly Victoria where no current program existed. However, since that time new programs in Victoria have begun at the University of Ballarat and La Trobe University while in New South Wales a program has commenced at Southern Cross University. At the same time a number of retraining programs have arisen in NSW mainly through the political imperative of retraining workers made redundant through industry closure. This led to the federal Department of Education and Training (DET) negotiating with the NSW Universities for programs to retrain BHP workers made redundant through the closure of the Newcastle steel mill and the Pt Kembla BHP facility as well as other retrainees from trade backgrounds in both Sydney and Wagga Wagga.

While the trend appears to be positive it needs to be considered in light of the shift in program emphasis from four-year undergraduate programs to both graduate and retraining programs of shorter duration. The number of graduate programs continues to expand particularly in Victoria, NSW, South Australia, Queensland and Tasmania however Williams (2002) points out that the choice of a relevant initial ‘degree’ continues to be an issue. In some cases a trade qualification is being accepted while design degrees or technology degrees are accepted in others. The nature
of the technology degree is in some cases problematic as any degree with technology in the title is at times accepted. The difficulties associated with the identification of a “relevant” initial degree was highlighted in view of the fact that “quality in teacher education is dependent on a research based, practical study of a range of industries and technologies and a critical approach to the social and environmental contexts of technology, not a study of a narrow range of specific vocations” (Williams, 2002, p. 6). Some of the new programs are utilising existing facilities either within the Technical and Further Education (TAFE) sector or in secondary schools. Gibson and Barlow (2000) suggest that this is a result of budgetary constraints rather than concern for curriculum delivery and caution the use of the TAFE sector for technology teacher education due to the “potential for a clash of technology teaching philosophies. TAFE teaching strategies are largely focussed on competency based learning which to some degree might conflict with the problem solving philosophy underpinning secondary school subjects such as design and technology” (p. 14).

The need for increases in pre-service Technology teacher education is further highlighted by the Department of Education, Science and Training (DEST), (2003) which points out that while “Australia’s primary and secondary school-age population is likely to remain relatively stable over the next half century” (p. 79) the percentage of students enrolled in the Technology KLA is rising. In relation to the supply of teachers DEST (2003) maintains that, for secondary teachers, supply would be only 70 per cent of demand by 2005 but that the gap between supply and demand would widen in subsequent years. This is in part due to the changing age profile of the teaching profession. The average age of teachers is rising sharply thus increasing the rate of retirements which is further exacerbated when combined with research suggesting that approximately two thirds of teachers intend to retire between 55 and 60 years (DEST, 2003).

The shortage of Technology teachers is not restricted to Australia. In Britain there is evidence of teacher shortages in some geographical areas, especially London and the South East of England, and in some subject areas including mathematics, science and technology (Ross & Hutchings, 2003). In a finding similar to the Australian situation Ross and Hutchings (2003) found that a significant proportion of teachers will retire in the next decade. Snyder (2004) points out that, in America, the Bureau of Labor Statistics (BLS) “tells us that the number of teachers will need to increase by 16 percent between now and 2010, but the American Association of Colleges of Teacher Education expects the supply to grow no more than 6 percent through 2010. What's more, the BLS projects that 25 percent of all elementary teachers, 33 percent of all high school teachers, and 40 percent of all school administrators will reach retirement age in the next 10 years”. The Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) (2003) provides evidence that a similar situation is also found in both New Zealand and Canada. There is therefore a need to recruit and train new Technology teachers. However, the nature of that training needs to be established.

**Teacher Attributes**

In 1998 the Australian Council of Deans of Education (ACDE) published a report of the National Standards and Guidelines for Initial Teacher Education project. They suggest that teacher education graduates should possess a range of attributes including:


- “an appreciation of entering a profession of rich complexity, which is of profound value to society, and which carries great responsibility, challenge and satisfaction.
- understanding and commitment to maintain the highest professional and ethical standards.
- a coherent sense of themselves as professionals who should be able to make judgements about their competence in particular circumstances, and know when and how to seek assistance.
- be committed to, and capable of, lifelong learning.
- be able to communicate effectively and appropriately to the range of audiences (students, colleagues, school administrators, parents, and others) and in the range of circumstances expected of a beginning teacher.
- have an active sense of themselves as part of the education research community. They should be practitioner-researchers for whom research is a normal part of teaching practice. They should be explicit and analytic about their practice. They should have the capacity to access, evaluate and incorporate research findings into their work.
- should have developed their individual talents and interests as they relate to teaching - fostered their critical and reflective capacities, aesthetic sensibilities, and creative and physical skills” (p. 9).

In relation to content studies ACDE maintain that graduates should have;
- “a broad general education as a framework for critically developing their understanding of their subject/learning areas, for developing understanding and capability in new areas, and for providing a basis for responding effectively to a range of issues which will arise in their professional work.
- understanding, at a level appropriate to higher education, of the areas they are prepared to teach: those areas' historical development, central concepts and language; relevant content knowledge, capabilities and appreciations; structures and characteristic modes of inquiry.
- the deep understanding of content and pedagogy which enables them to transform (organise, adapt, present) content in ways which are powerfully responsive to the particular characteristics of learners, curricula and teaching environments. They need to have such 'pedagogical content knowledge' thoroughly integrated with their other knowledge and capabilities” (p. 10-11).

Few would argue that all teachers need to possess these attributes, particularly those relating to the ability to be analytical or reflective about their practice which is a common theme in teacher education. However, do these general attributes vary in relation to technology teachers? Banks and Barlex (2001) point out that whereas teachers of other disciplines come to the task of teaching with a vision of how they were taught and are therefore able to initially model their teaching on that memory, the short curriculum history of technology means that this memory is often not available. The teacher education of technology teachers is therefore faced with the challenge of creating a framework of practice within which graduates are able to operate. This includes subject content knowledge about technology, pedagogical knowledge and school subject knowledge about how to teach specific content. Furthermore Hansen (1993) proposes that technology teacher education programs should include the following aims; the development of reflective practice, the development of an understanding of the curriculum development.
process, the ability to link critical thinking, independent learning and other higher order learning outcomes to the classroom experience of undergraduates and the development in student teachers of a ‘context’ or philosophy for technology education. Burke (1999) supports these with the addition of abilities related to understanding technological systems, making ethical decisions about the use of technology, using practical based resources in teaching technology, and an understanding of technology-based careers.

Changes in curricula are particularly relevant to the technology educator at this time with the advent of new syllabi in the Technology key learning area. Changes in curriculum such as those occurring in the technology education field often require changes in the roles and relationships of teachers with the introduction of new teaching and learning methods. The new proposals generally advocate a change in pedagogy that will affect lesson organisation through the use of a design or problem solving approach and may necessitate a change in the individual role of the teacher as they move from a director to a facilitator of learning. Changes or increased role interaction with other teachers may also result from the introduction of team teaching, teaching across traditional subject boundaries, or increased subject integration. Familiarity with these pedagogical shifts therefore needs to be a key component of Technology teacher education programs.

Wash, Lovedahl and Paige (1999) highlight the necessity of technology teachers to be receptive to change through their observation that there has been more change in the last two decades than in the entire history of the profession. Their research into receptivity to change among traditionally and alternatively certified technology teachers found no significant differences, however they maintain that alternate certification in the USA usually involved rigorous candidature screening, a requirement for ongoing professional development and an initial degree of teaching qualification. This is unlike the Australia experience whereby retraining programs are often for ex-tradespersons who were found by Chester (1994) to be significantly less innovative than their colleagues. Further research into this area is therefore needed in order to identify the potential implications of the current trend in technology teacher education in Australia on the future of the profession.

Welty (1999) adds to the list of potential problems facing technology teacher education by pointing out that “it is becoming increasingly difficult to believe that pre-service education programs can prepare a new generation of technology teachers who have mastery of a knowledge base that is expanding at an exponential rate” (p. 1). He goes on further to make the point that many administrators see the employment of technology education graduates as means of upgrading the existing program within their particular school. This is not a problem unique to America as there is a similar trend within Australia placing additional pressure on teacher educators to not only produce good teachers but innovative leaders as well.

It would appear therefore that while exemplary technology teacher education has much in common with other education disciplines there are a number of specific characteristics that need to be addressed. These include the need to understand and make ethical decisions about technological systems, and the ability to use practical based resources (Burke, 1999), the difficulties associated with an exponentially growing content base (Welty, 1999), the lack of an historical framework of practice (Banks & Barlax, 2001) and high receptivity to change (Wash et al, 1999). These factors, when combined, tend to point towards the need for the focus of undergraduate technology teacher education programs to be on breadth and innovative practise
rather than depth of curricular offerings. The provision of exemplary Technology teacher education programs is, however, only part of the equation. Potential students need to be attracted into the profession.

**Attracting Technology Teachers into the Profession**

What are the factors that attract potential teachers into teaching? A recent report “Atitudes to teaching as a career” (Department of Education Science and Training (DEST), 2006, p.4) highlights a number of reasons why the choice of teaching is not seen as attractive. These include:

- a perceived low status for teaching
- low pay
- negative publicity about teaching especially for males due to paedophilia publicity
- poor career opportunities
- highly demanding occupation – long hours, poor student behaviour, critical parents
- boring and repetitive

Conversely the DEST report found that a teaching career was attractive to students:

- in low socio-economic and rural groups as it would “enable them to live in their region and play a rewarding role in their community
- who could teach a subject they liked or would be interested in learning
- wanting the opportunity to work with children or adolescents
- wishing to make a contribution to society
- seeking job security
- wanting career mobility and the opportunity to travel and work overseas.

A number of these factors have received support from other agencies and authors. Kyriacou and Coulthard (2000) supported the desire for a career that provided opportunity for responsibility, the ability to contribute to society and job mobility. Ososki, White, Morago and Sickle (2006) found that wanting to make a difference, a desire to share knowledge, supportive teachers and family friendly working conditions were all factors leading to the choice of a teaching career. Reid and Cauldwell (1997) found that working with children and the possibility of a rewarding career were the two most important factors for wanting to become a teacher. They also found that a positive experience at school, for example being influenced by a good teacher, was more important than other forms of advice when making a career decision to become a teacher. Milanowski (2003) identified a number of factors influencing teaching career choice; the opportunity to work with children, the ability to work in a discipline of interest, family friendly working conditions, teacher role models and job security. Of interest was that the approval of parents and important others was rated as a very low influencing factor. Finally, Watt and Richards (2004) confirmed that intrinsic values (shaping the future, work with children, make a social contribution) were the highest influences of teaching career choice followed by family friendly working conditions.

A pilot study by the Centre for the Advancement of Teaching and Learning (CALT, 1995) at the University of Western Australia Identified a number of factors influential in career choice. In order of importance these were, interest in the area of study, current and future career prospects, tertiary entrance requirements, parents, length of course, teachers, friends and the media. The
low rating of the impact of parents on the choice of teaching as a career is supported by Mau and Mau (2006) who found that no family related variables had a significant impact on the persistence of students to maintain teaching career aspirations.

The finding that low socio-economic and rural groups are attracted to teaching provides impetus to the need to establish the factors that lead to the career choices of these groups. Richards (1999) found that both groups are less likely than other groups to believe that university will improve their chance of getting an interesting and rewarding job and are less likely to gain parental support (often for economic reasons). Mau and Mau (2006) also found that rural students were much less likely to persist in their aspirations to become teachers. Richards (1999) found that much of the advertising done by universities overestimates its effectiveness. Glossy brochures often use specialist language and target those who have already made most of the key career decisions. Instead students need “comprehensive information — about the styles and approaches to teaching, about the access to technology, about the overall teaching quality, and so on” (Richards, 1999, p. 10). Richards also maintains that students need more information about the experience of university in order to overcome initial shock and for rural students.

A number of influential factors in the choice of a career as a teacher have therefore been identified. These are:

- wishing to make a contribution to society
- a desire to work with children or adolescents
- interest in the subject
- employment availability and security
- positive teacher influences
- career related issues such as family friendly work conditions and the opportunity to travel and work overseas.

These compare favourably with the findings of Wright and Custer (1998) who identified the factors influential in the choice of technology education as a teaching career. They found that personal interest and enjoyment of the subject was the most important factor followed by the influence of a teacher as a role model. Parents, peers and other adults such as school guidance officers were found to be much less influential. There is thus some congruence between the general findings on the influences affecting teaching as a career and those factors found to influence technology education as a career choice. Wright and Custer (1998) also found that the most effective recruitment strategies involved personal interaction with university staff with commonly used recruitment practices such as brochures being very lowly rated. There is, however, little recent research relating to technology education as a career choice.

The Griffith Study

A longitudinal study at Griffith University does, however, provide some insight. The project commenced in 2000 and involves surveying all year one students at the commencement of their studies. The current research has helped to identify the factors that lead to student choice of a career in Technology education and how students became aware of the appropriate undergraduate study program, in this case the Bachelor of Technology Education. Table 1 presents the factors that influenced students to commence a career in Technology Education.
Responses are presented as a percentage of subjects who identified each factor as influential in their choice and are presented in order of relative importance.

Table 1. Factors influencing the career choice of Technology education teachers.

<table>
<thead>
<tr>
<th>Factor</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good job prospects</td>
<td>76</td>
<td>79</td>
<td>75</td>
<td>84.4</td>
<td>58</td>
<td>79</td>
<td>90</td>
</tr>
<tr>
<td>Secure future</td>
<td>66</td>
<td>77</td>
<td>62.5</td>
<td>71</td>
<td>61</td>
<td>55</td>
<td>93</td>
</tr>
<tr>
<td>I liked this subject at school</td>
<td>73</td>
<td>61</td>
<td>55</td>
<td>60</td>
<td>51</td>
<td>66</td>
<td>76</td>
</tr>
<tr>
<td>Opportunity to work with students</td>
<td>48</td>
<td>56</td>
<td>47.5</td>
<td>62</td>
<td>41</td>
<td>55</td>
<td>35</td>
</tr>
<tr>
<td>Looking for a change of career</td>
<td>53.5</td>
<td>46</td>
<td>42</td>
<td>52</td>
<td>44</td>
<td>45</td>
<td>28</td>
</tr>
<tr>
<td>Good working conditions</td>
<td>37.5</td>
<td>47</td>
<td>20</td>
<td>46.6</td>
<td>39</td>
<td>38</td>
<td>62</td>
</tr>
<tr>
<td>Good salary</td>
<td>30</td>
<td>39</td>
<td>12.5</td>
<td>33.3</td>
<td>27</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>I thought I would have the necessary Uni entrance score</td>
<td>21</td>
<td>21</td>
<td>17.5</td>
<td>24.4</td>
<td>19</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Didn't know what else to do</td>
<td>3.6</td>
<td>1</td>
<td>2.5</td>
<td>4.4</td>
<td>2</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Availability of University residence</td>
<td>0</td>
<td>6.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

The data shows that the most influential factors are those relating to employment prospects and future career security. This is followed by enjoyment of the subject at school and a desire for a career that afforded the opportunity to work with students. In this respect the results are similar to the findings of other research. Salary and working conditions were considered far less important factors when selecting a career in Technology Education. Of particular interest is the high percentage of students who have chosen to become Technology Education teachers as a career change. This factor has remained consistently high for most of the period of the survey but has dropped markedly in 2006. It is hypothesised that this is due to two related conditions. One is the mix of students entering the program and the other is the prevailing shortage of qualified tradespeople within Australia. Figure 1 shows the percentage of mature entry and school leavers entering the program. It is clear from this figure that mature entry students, and therefore career change aspirants, are trending down. The reasons for this may vary but as Gray (2006) points out “While most recent graduates from university were earning A$45,000 to A$65,000 a year… many tradesworkers were earning A$100,000 to A$150,000.” This societal factor may well have an ongoing effect on the recruitment patterns for other Technology Teacher education programs that rely on the recruitment of trade qualified candidates.
Table 2 presents the sources of information that students used in order to find out about Technology Education teacher preparation programs. Responses are presented as a percentage of subjects who identified each source and are presented in order of relative importance.

<table>
<thead>
<tr>
<th>Source</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tertiary Guide</td>
<td>55</td>
<td>41</td>
<td>52.5</td>
<td>55.5</td>
<td>61</td>
<td>62</td>
<td>69</td>
</tr>
<tr>
<td>Teachers</td>
<td>25</td>
<td>47</td>
<td>27.5</td>
<td>37.7</td>
<td>46</td>
<td>45</td>
<td>24</td>
</tr>
<tr>
<td>Friends</td>
<td>9</td>
<td>32</td>
<td>22.5</td>
<td>28.8</td>
<td>31</td>
<td>31</td>
<td>14</td>
</tr>
<tr>
<td>Parents</td>
<td>10.7</td>
<td>6</td>
<td>7.5</td>
<td>11</td>
<td>22</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>Tertiary Expo</td>
<td>35</td>
<td>5</td>
<td>7.5</td>
<td>11</td>
<td>5</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Previous Student</td>
<td>12.5</td>
<td>8</td>
<td>1</td>
<td>6.6</td>
<td>10</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>Web</td>
<td>1.8</td>
<td>2.1</td>
<td>5</td>
<td>11</td>
<td>10</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>Direct University Contact</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>8.8</td>
<td>7</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>University open day</td>
<td>7</td>
<td>11</td>
<td>1</td>
<td>15.5</td>
<td>7</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>School guidance officer</td>
<td>9</td>
<td>6</td>
<td>7.5</td>
<td>8.8</td>
<td>7</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Course brochure</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

It is clear from this data that the single most important source of information is the Tertiary Entrance Guide provided to students applying to universities in Queensland. This is an interesting finding as the prominence of this as a source of program information has not previously been highlighted. When combined with the finding that more than 20% of students
choose their tertiary program on the basis of their university entrance score the potential to use this document as a marketing tool is considerable. The remaining data confirms much of the existing research. Teachers and teacher role models (Milanowski, 2003; Reid & Cauldwell, 1997; Wright & Custer, 1998) are found to be a major source of information and influence followed to a lesser extent by friends. The data also confirms the relatively low impact of parents in career decisions and highlights the ineffectiveness of traditional sources of information such as school guidance officers and university advertising and careers events. In this respect it supports the data of Richards (1999) and Wright and Custer (1998).

**Conclusion**

It is argued in this paper that the Technology Education profession is likely to face an ongoing shortfall of teachers not only in Australia but in many overseas countries including Britain, America, New Zealand and many countries of the OECD. Further, due to the particular demographic of the teaching workforce this situation is unlikely to change in the near future due to the aging of the teaching population. The desirable attributes of teacher education graduates is then discussed and compared with the specific nature of the needs of the Technology teacher education graduate. It is found that there are specific factors about Technology Education that are unique and therefore need to be addressed. These include the need to address the creation of a framework of practice, the ability to understand technological systems and make ethical decisions about their use and to deal with constant technological content and curriculum change. Having identified the attributes necessary for a pre-service Technology Teacher education program the paper then addresses the factors influencing students to choose a career in Technology Education. These include those attributes that attract teachers into the profession and the manner in which potential students find out about Technology teacher education programs. The results of a longitudinal study are presented confirming that Technology teacher education students are attracted to the career for similar reasons to other teachers. The research does, however, highlight that the number of mature entry students is trending down and hypothesises the reasons for this trend. When combined with the number of graduate or trade entry programs available in Australia this has the potential to have a real impact on the future of the profession.

The research also highlights the influence of teachers, both as an information source and as a role model, on the decision making process of potential teachers. This needs to be considered when marketing Technology Teaching as a career. Further, the research found that, in common with career choice research in other teaching fields, parents an guidance officers provide only minor influences in career choice and that the traditional advertising processes undertaken by tertiary institutions (e.g. brochures, open days) are largely ineffective in getting the message to potential Technology Education teachers.

**References**


