

# **NSW TECHNOLOGY TEACHER EDUCATION: Y2K A TIME FOR OPTIMISM?**

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## **Abstract**

This presentation addresses recent changes in technology teacher education in NSW and the current status of supply and demand.

The current supply situation and 1999 supply pool are examined with particular emphasis on the various undergraduate, postgraduate and specially developed programs throughout the state. This is followed by an analysis of 1999 enrolment patterns. The paper concludes with a discussion that focuses on a number of related issues, such as the review of the long term supply of technology teachers, the university connection, the notional oversupply of technology teachers, the long term viability of retraining programs, the impact of retraining on school staffing, and the increasing demand for technology teachers as the NSW secondary school technology curriculum continues to expand, which impact on the effective provision of qualified technology teachers for the various school systems.

## **Introduction**

This paper presents some data, collected in the latter part of 1999, on the current numbers of students enrolled in the various technology teacher education programs throughout the state of NSW. It forms the first part of a much larger project that aims to critically examine the issues with technology teacher supply and demand. It also provides some discussion on a number of related issues.

## **The current situation**

There has been a long history of shortages in the supply of technology teachers for secondary schools in NSW (Gibson, 1998) and for that matter in other Australian states. Yon (1999), for example, has noted the critical shortage of technology teachers in South Australia and some measures aimed at alleviating the problem.

In NSW the shortage of technology teachers is particularly apparent in the industrial arts component of the technology learning area when compared with the food and textile technology, hospitality, information technology and agriculture components. Although, in recent years these areas too have been subject to a growing shortage in the supply of teachers which has resulted in some retraining programs in food technology and computing being offered by the NSW Department of Education and Training (DET).

The most common form of technology teacher education program in NSW, and mostly across Australia, since the late 1970's, has been college of advanced education (CAE) based four year integrated bachelors degree programs. Prior to this, three year integrated diplomas and two year integrated certificate programs were offered in the CAE (former teachers college) sector. In particular, CAEs in Sydney and Newcastle provided significant numbers of appropriately qualified technology teachers. The integrated program comprised a program of education studies linked with a program of method and curriculum (specialty) studies all completed within the one institution. Smaller numbers of trained technology teachers were also prepared through undergraduate and graduate diploma programs offered by the university and CAE sectors. For example, the University of New South Wales offered a four year BSc program in Industrial Arts while Sydney Teachers' College offered a one year Diploma in Education program which included provision for a technology curriculum option for appropriately qualified graduates.

Following the Dawkin's review of higher education for the Australian government in the late 1980's the CAE sector largely disappeared with the establishment of the unified national system of higher education. Teacher education then became the province of the university sector. Universities have continued with graduate diploma programs, together with significant changes in the nature and provision of undergraduate programs. The University of Sydney, for example, has extended their graduate diploma programs from one year duration to a two year Master of Teaching programs following a first degree from a faculty other than education. Other universities have introduced more flexible undergraduate programs. The Australian Catholic University, for example, has implemented a BTeach/BA double degree program providing students with the opportunity for exiting at the end of year 3 with a BA qualification if they decide not to complete a teaching qualification in technology.

Notwithstanding these changes, the output of technology teachers from universities has been insufficient to meet the continuing demand experienced across the entire NSW secondary school sector which includes DET schools, systemic and non-systemic Catholic schools, as well as the various independent school associations. A recent report on initial and continuing teacher education "...predicts by the year 2004 a shortfall in New South Wales of 11% in the number of primary teachers and 30% in the number of secondary teachers." (MACQT, 1999, 56) The same report acknowledges an existing shortage of technology teachers. This is also confirmed by a MCEETYA report (MCEETYA, 1998, 38). Further, Lette (2000, 6) reports that Dr. G. Ramsey, head of the current review into teacher education in NSW, has put on record his concerns about the reductions in numbers of teacher education graduates in the fields of science, mathematics and technology. In addition, shortages of trained teachers prevailing in both interstate (MCEETYA, 1998, 50 - 64) and overseas school systems has meant that the NSW secondary school sector has been unable to meet demand by employing teachers from these alternative sources which has been one of the mechanisms traditionally utilised as a means for solving supply deficiencies. Banks (2000, 2) provides significant data from England suggesting an 1176 shortfall of technology teachers during the 1999/2000 recruitment period. There is also some evidence from the media to suggest that there is a considerable shortage of qualified Mathematics, Science and Technology teachers in the United States.

In response to the current supply shortage of technology teachers a number of strategies have been implemented by the DET and at least two Catholic Education Offices (CEO) - Sydney and Parramatta. These include:

1. A comprehensive promotion campaign distributed throughout the secondary school sectors encouraging school leavers to consider a career as a technology teacher.
2. The development and implementation of retraining programs for existing teachers at Charles Sturt and Sydney Universities.
3. DET and CEO sponsored Diplomas of Education in technological and applied studies at the Australian Catholic University and the University of Newcastle.
4. Programs in technology teacher education, offered by the University of Newcastle, for people in BHP who were to face redundancy as a part of that company's restructuring program.

The impact of the school leaver promotion campaign is yet to be assessed. However, 2000 University Admission Centre (UAC) numbers for the technology teacher education program at Australian Catholic University are up by about 20% on corresponding figures for 1999. This may also be the case at Southern Cross University. While these figures cannot be extrapolated across the state, it is at least encouraging.

The programs outlined under points 2 and 3 together with the on-going programs already in place provided the supply pool for technology teachers in NSW during 1999. Some graduates from the program outlined under point 4 will also add to the supply pool in 2000.

## The 1999 supply pool

During 1999 the following technology teacher education programs were offered by universities throughout NSW. These programs can be categorised as either:

- undergraduate,
- postgraduate, and
- specially developed programs.

These programs reflect both the range and distribution of what might be termed on-going or established programs as well as those programs that have been specially developed in an attempt to help alleviate the current supply shortage.

### *Undergraduate programs*

Undergraduate programs are currently offered by:

- Australian Catholic University (BTeach/BA),
- Avondale College (BEd),
- Charles Sturt University (BEd),
- Southern Cross University (BEd).
- University of Newcastle (BTeach/BD&T), and
- University of Sydney (BEd TAS).

These are all four year programs offering a range of specialisations including design and technology, industrial technology, food technology, textile technology, engineering science, computing studies, and technics. It should be noted of course that not all of these programs address all technology specialisations. In addition, it should be noted that the existing University of Sydney program is being phased out and will cease to exist at the conclusion of the 2000 academic year while the current Industrial Technology program conducted by Avondale College has been discontinued with the 2000 student intake being the last. By way of contrast, the Charles Sturt (commenced 1997) and Southern Cross (commenced 1999) University's programs are being phased in.

### *Postgraduate programs*

Postgraduate programs are currently offered by:

- Australian Catholic University (DipEd),
- University of Sydney (BTeach/MTeach), and
- University of Western Sydney (DipEd/MTeach).

These are one or two year programs for students with a relevant first degree from a faculty other than education. Entry to these programs varies depending on university enrolment policies.

It is also expected that a Graduate Diploma of Education program in technology education will be introduced by the University of Technology, Sydney in the year 2000.

### *Specially developed programs*

The University of Newcastle and Australian Catholic University offer a sponsored Diploma of Education that includes a specific component focussed on workshop competencies. For example, students enrolled in the program at ACU complete two workshop units that are designed to complement skills these students bring to the program as a consequence of their first degree. More often than not these students present from a mechanical engineering, architecture, or industrial design background. Anecdotal evidence would suggest that the industrial design graduates bring with them the most appropriate skills base. Unlike established Diploma of Education programs, entry to these programs is based on a student's performance at an interview conducted by the DET. In addition to DET sponsored students, the Parramatta CEO has also sponsored a limited number of students in the program conducted by the Australian Catholic University. Students sponsored by DET are also provided with a mentoring program during their first year of employment.

Retraining programs leading to the award of a Graduate Certificate are offered by the University of Sydney (Faculty of Education Professional Development Unit). These programs are based on the retraining of existing teachers in a concentrated full-time mode over six months followed by a period of in-service mentoring. Entry to these programs is based on an interview conducted by the DET. Four programs for industrial arts retrainees were provided between 1996 and 1999. In addition, programs for food technology and computing were offered in 1999.

In late 1997 DET negotiated with the University of Newcastle and the Management of BHP (Newcastle) to develop two programs suited to appropriate people made redundant through the restructuring of BHP. The BEd program is a 320 credit point integrated degree program in which BHP participants are granted 140 credit points as recognition of prior learning (RPL) for earlier qualifications and experience. This program commenced in 1998 with about 54 enrolled participants. It includes two periods of practicum and a one (school) term of internship. The second program was a Diploma of Education suited to BHP employees who possess existing professional qualifications. While both programs were initially focused on BHP staff, the University of Newcastle continues to offer them as a basis for the preparation of technology teachers. The intakes for these programs are now drawn from appropriate persons who are currently employed in an expanded base of local industries.

As a follow on from the successful implementation of the Newcastle/BHP model the University of Newcastle has cooperated with the University of Wollongong to organise and provide a similar BEd program for retrenched workers from BHP (Pt. Kembla). The award for the pilot group will be made by the University of Newcastle. This program has about 10 students enrolled in 1999. It is expected that it will be expanded in 2000.

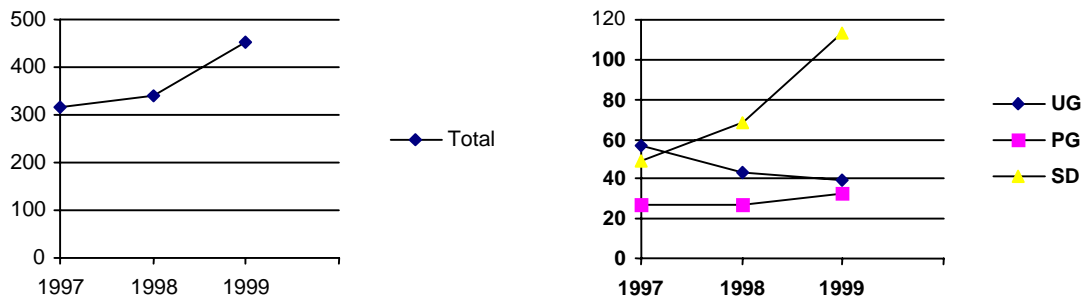
### **Current enrolment patterns**

A recent survey of the seven universities offering technology teacher education programs resulted in five returns relating to the relevant programs. The survey was designed to determine the numbers of students, and their gender, enrolled in the various programs during the three year period: 1997 - 1999. Information was also sought on the

technology specialisations of current students for the same period.

### General enrolment trends

The raw data is presented in Appendix A. Tables 1, 2, 3, and 4 summarise student enrolment patterns for the period 1997 - 1999 in technology teacher education programs



Graph 1: Total program enrolments 1997 - 1999

Graph 2: Trend data for potential graduands 1997 - 1999

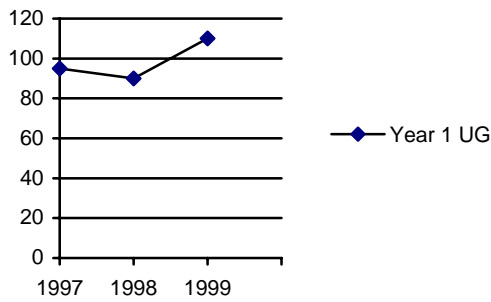
at the institutions providing data. Tables 5, 6, and 7 summarise the number of potential graduands in each technology specialisation for the period 2000 - 2002.

Graph 1 provides a summary of the aggregated data. It indicates that over the past three years the total number of students enrolled in the various technology teacher education programs is trending up, from 318 in 1997, 341 in 1998, to 454 in 1999. However, while these numbers are encouraging, the short-term reality, depicted in graph 2, is somewhat problematic. Student numbers in the fourth year of the various undergraduate (UG) programs have declined from 57 in 1997, down to 43 in 1998, and 39 in 1999. This in itself is indicative of the current supply shortage and the reason why, in part, other strategies have been required to help alleviate the impact of the current shortage. During this same period postgraduate (PG) programs had 27 students enrolled during 1997 and 1998, and 33 in 1999, while the specially developed (SD) programs had 49 students enrolled during 1997, 68 in 1998, and 113 in 1999.

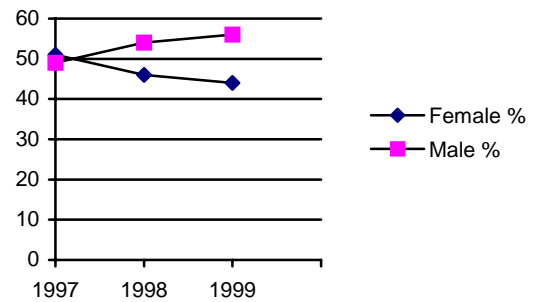
Significantly graph 2 illustrates the increasing reliance on the output from specially developed programs to provide technology teacher numbers. More importantly though, these programs have been instigated by DET to help meet their work force needs while the other school systems continue, in the main, to rely on the teacher employment market to satisfy their work force needs.

Graph 3 provides a summary of the first year intakes for the various undergraduate programs during 1997 - 1999. An analysis of this graph does suggest however, some room for guarded optimism. These figures suggest a potential improvement in fourth year undergraduate numbers of about 77 for 2000 (95 year 1 students enrolled in 1997), 75 for 2001 (90 year 1 students enrolled in 1998) and 87 for 2002 (110 year 1 students enrolled in 1999) if normal attrition rates are factored in. This is an important observation, given that the preferred employer entry of persons to the profession of teaching is generally by the completion of appropriate pre-service (undergraduate) qualification. This position is supported by professional teacher associations such as the Institute of Technology (ITE) and the Australian Council for Education Through

Technology (ACET).



Graph 3: Trend data for year 1 UG enrolments 1997 - 1999

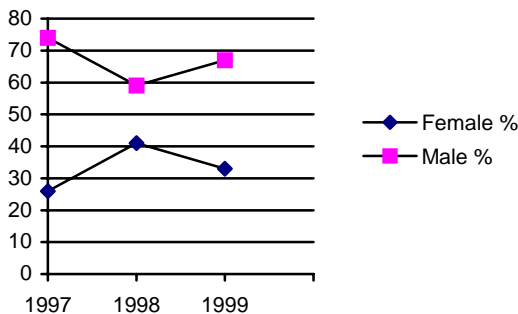


Graph 4: Gender distribution in UG programs 1997 - 1999

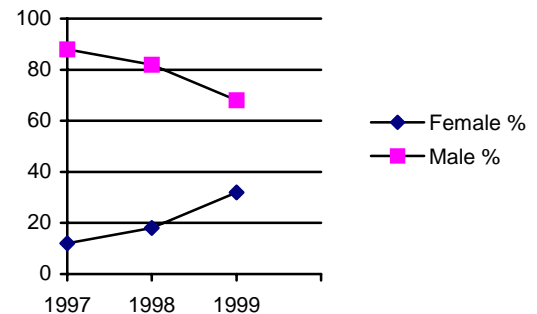
*Gender distribution trends*

Graph 4 plots the gender distribution for students enrolled in the undergraduate (UG) programs. It shows a steadily increasing gap between the percentage of female students and male students for the period 1997 - 1999 from 51% female during 1997 (124 female, 118 male), 46% female during 1998 (109 female, 129 male), to 44% female during 1999 (127 female, 163 male).

Graphs 5 and 6 plot the gender distribution trends for post graduate (PG) and the specially developed (SD) programs.



Graph 5: Gender distribution in PG programs 1997 - 1999



Graph 6: Gender distribution in SD programs 1997 - 1999

Graph 5 shows a consistent gap between the percentage of female students and male students for the period 1997 - 1999 from 26% female during 1997 (7 female, 20 male), 41% female during 1998 (11 female, 16 male), and 33% female during 1999 (11 female, 22 male).

Graph 6 also shows a consistently narrowing gap between the percentage of female students and male students for the period 1997 - 1999 from 12% female during 1997 (5 female, 19 male), 18% female during 1998 (7 female, 21 male), and 32% female during 1999 (26 female, 34 male).

Analysis of these graphs indicates that there are consistently more male students enrolled than females. It is important to note that this trend is also reflected in NSW

HSC candidature for technology subjects. This is an interesting result in itself given the gender distribution in favour of females which currently exists across all sections of the teaching profession. Anecdotally, at least, it would appear that the gender balance amongst currently employed technology teachers is reasonably even.

### *Technology specialisations*

Data collected for this study (tables 5, 6 and 7) shows current numbers of potential graduates across a variety of technology specialisations from a range of NSW university programs. Significantly, this recent data does not align with projections of specialisation supply made in the MACQT (1999, 60-61) report. This suggests the need for caution in the various decision-making processes associated with the provision of technology teacher education program.

Analysis of the technology specialisation pattern (tables 5, 6 and 7) of potential graduands for the period 2000 - 2002 presents an interesting picture. Graduands appear to be acquiring knowledge across 6 or 7 technology specialisations. This reflects the disparate knowledge base required of contemporary technology subjects. Technology teachers have generally prided themselves in their ability to competently teach a wide range of technology subjects. However, three problems face program providers:

1. Providing for a large range of specialisations means cohorts have to be placed in smaller groups. These are less viable than larger groups.
2. The discipline base continues to expand - *essentially it reflects the nature of technology.*
3. Meeting the needs of emerging technologies must be balanced by the need to provide teachers for the equally important and popular established technologies.

Notwithstanding all of this, universities need to recognise their collective responsibilities for providing technology teacher education programs whose combined output supplies teachers who have been prepared to teach all subjects in the current technology curriculum.

The implication of this is that universities may need to develop core programs that meet the needs of teachers for the mandatory and most popular electives in years 7 - 10: Design and Technology, Technics (30 046), Computing Studies (28 872) and Food Technology (17152) while at the same time providing ongoing professional development programs for other elective subjects such as Technical Drawing (7677), Agriculture (6827), Textiles (5195), elective Design and Technology (3980) and senior school Engineering Studies, Food technology and Industrial Technology). Figures in bracket are the 1998 School Certificate enrollment numbers for these subjects. This is a particularly important observation given the recent changes to the various NSW HSC technology syllabuses.

### **Related issues**

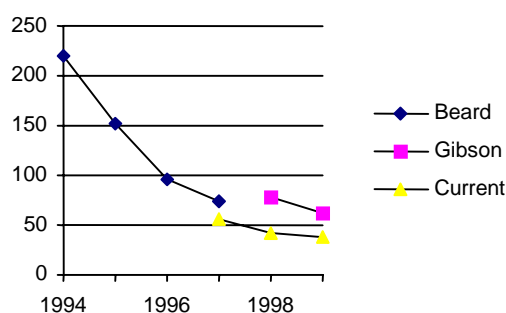
The data provided by the various universities raises a number of related issues. These include, but are not limited to, the review of the long term supply of technology teachers, the university connection, the notional oversupply of technology teachers, the

long term viability of retraining programs, the impact of retraining on school staffing, and the increasing demand for technology teachers as the NSW secondary school technology curriculum continues to expand. Taken independently, these issues are important in themselves. However, taken together they reflect the complex nature of the total situation.

### *Review of the long term supply of technology teachers*

The data collected for this paper affords an opportunity to investigate trends in undergraduate program outputs. In this instance data reported by Beard (1998) and Gibson (1998) have been compared with the current data. Table 8 appendix A summarises the data which is also shown on graph 7.

On the basis of this graph, a number of observations can be made. The three sources of data do not coincide. In part this is understandable given that there is no evidence that each set of data measured the same item. The data reported by Gibson are essentially projections based on early 1997 information of students enrolled in undergraduate programs whereas Beard's data claims to represent actual students enrolled in the final



Graph 7: Trend data of final year undergraduate numbers 1994 - 1999

year of their undergraduate programs for the period 1994 - 1997. Moreover, comparison of the Gibson data with the current data for 1998 - 1999 may indicate the influence of natural attrition experienced by all undergraduate programs. Significantly however, the overall output trend of the various undergraduate programs is, unfortunately, consistently downward over the period 1994 - 1999. This is an undoubted tragedy. This no doubt accounts for the gradual but increasingly notable rise in output from the various specially developed programs. Indeed it suggests that the increase in output from these programs is predicated more on a critical short term need rather than the result of any long term strategic labour market planning. The data reported in graph 2 therefore becomes even more significant.

### *The university connection*

One of the major problems facing the technology teacher education supply side is the finite capacity of the universities to provide a range of degree programs. While the number of potential undergraduate students might indeed be on the increase, there is no guarantee that these students can be accommodated in the various programs. The effective full time student units (EFTSUs) allocated to any one technology teacher education program is determined in the wider context by university enrolment and budget policies. There are a number of factors contributing to this situation:

- Universities allocate EFTSUs to their various programs based on the institution's academic profile negotiated annually with DEETYA.
- This in turn determines the total Australian government funding universities receive.
- During the two terms of the present Australian government this has resulted in a continuing decrease in the government funding base.
- As a result, universities are increasingly relying on non-government income sources, including financial endowments from private persons and industry, as well as an increasing willingness to enroll full fee paying students to alleviate their budgetary constraints.

The implication for undergraduate technology teacher education are complex. While there is undoubted continuing demand for such teachers, in an academic environment driven by the need to survive with severely constrained budgets, technology teacher education is confronted by a fundamental conundrum. These are programs which are in demand by employers and now it would seem once again by potential employees. Unlike the 'glamorous' and 'saleable' programs in Business and Information Technology, for example, these programs have suffered from low intakes in recent years, are expensive to present, and unlikely to attract full fee paying students. In other words, these programs are not attractive to university administrators. Indeed these programs will continue to be unattractive to university administrators until they receive some form of differential funding, perhaps in the form of supplementary financial support from the various employing bodies. For example, targeted student scholarships with a component paid directly to the enrolling university.

The problem with university graduate programs is the continued difficulty of attracting large intakes from technology graduates such as mechanical engineering, architecture, or industrial designers which would provide significant output for employment. For example, the technology curriculum specialisation within the MTeach program offered by the University of Sydney has attracted less than 10 students since inception. Gibson (1998, 39) canvassed some reasons for this situation. These included more lucrative employment opportunities, lack of true part-time study opportunities, the length of the first degree, and the consequent HECS debt.

A new pressure on intakes into established graduate programs is competition from institutions offering sponsored graduate programs. While growth in these types of programs has contributed to the supply of new technology teachers, sponsored programs may ultimately suffer from a lack of appropriate students in the longer term. These programs may also be terminated by the sponsors at short notice. The real issue here is the need to develop strategies for attracting students in large numbers to the technology curriculum specialisation within the established graduate programs. For example, this might be achieved by making technology teaching a lot more financially attractive though the introduction of differential teacher salaries which recognise the knowledge base that a technology teacher brings to the classroom.

#### *Notional over supply of technology teachers*

One of the most significant strategies DET has employed to deflect concern about the impending or existing shortage of technology teachers is to claim that there is indeed an

oversupply of such teachers. Information provided by Beard (1998), for example, indicates that there were 603 technology teachers on the NSW waiting list for permanent appointment as of September 1998.

Interpretation of the waiting list data needs to be undertaken with caution for a number of reasons:

- Demographic constraints – some people are only prepared to accept appointment in restricted areas of the state.
- Accreditation issues – many teachers seeking re-employment in DET are no longer considered appropriate for accreditation in some subjects. This is particularly important when considering design and technology.
- Employment status – many teachers appear on the DET waiting list who already hold positions in others school systems and industry. They are reluctant to accept appointment where it means they have to resign existing, satisfactory, employment.
- School based issues – there are many schools and regions within the state which are notoriously difficult to staff. This is evidenced by DET schemes to attract people into these schools. Many people on the waiting list would be as reluctant as permanent staff to be appointed in these areas.

Further, data provided by Beard (1998) indicates that teacher resignations have declined from 1361 in 1990 to 360 in 1997. Of the 360 resignations in 1997, 45 were technology teachers. At the same time 50 technology teachers also retired in 1997.

In essence, the waiting list, resignation and retirement data are a convenient means for deflecting the real concerns of the teaching profession and the wider community in regard to the shortage of classroom technology teachers.

#### *Long term viability of retraining programs*

The trend identified on graph 2 would seem to indicate a shift in supply from established programs to specially developed shorter duration programs. These programs rely heavily on DET financial support targeted to meet an immediate staffing need, and a pool of specially selected students (existing teachers and redundant BHP employees). Consequently these programs are transient and at best provide an interim supply pool. This again emphasizes the need for technology teacher labour market planning to be based on established programs.

#### *Impact of retraining on school staffing*

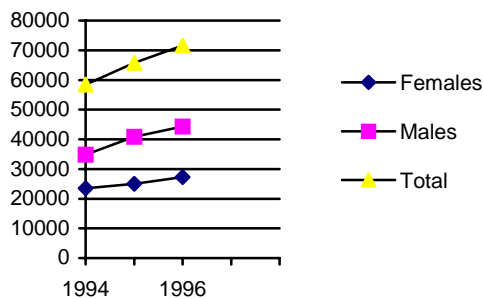
During late 1998 and early 1999 the NSW Industrial Arts State Equipment Committee carried out a survey of schools to determine the level of staff teaching in Industrial Arts (IA) /Technological and Applied Studies (TAS) departments that had been appointed following participation in retraining programs. No attempt was made to distinguish between staff who have been involved in recent (late 1990's) programs or earlier programs. Returns were obtained from 132 DET schools, with three independent school respondents. This sample represents a significant proportion of DET secondary schools and can be considered as representative of the state. Most were from IA departments with a small number of returns from designated TAS departments.

The results of this survey are provided in the appendix to this paper. The data indicates that the average size of departments in schools is 3.9 across the state. On average 78% of the departments have a head teacher (84.6% for Sydney metropolitan schools and 66.6% for rural schools). The survey also sought to determine the type of professional education that members of staff had completed as preparation for teaching the various IA/TAS technology syllabuses. No attempt was made to separate the various types of formal university/college programs completed by staff. The results indicate the following:

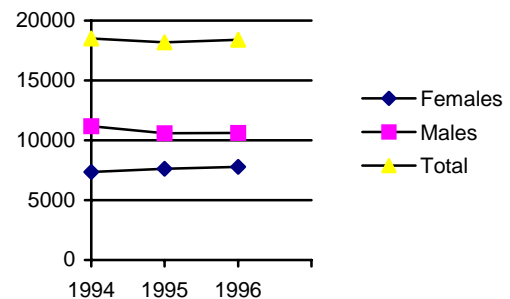
Proportion of staff from established university/college programs	76.4%
Proportion of staff from retraining programs	12.5%
Proportion of staff as non-IA trained casuals	4.4%

The 12.5% proportion of staff from retraining programs in DET schools needs to be interpreted carefully. This percentage is somewhat inflated since there are no known retraining programs providing supply to the various private school systems. In addition, it should be noted that these percentages do not total 100% since there is some likelihood that not all staff members have been accounted for in the various school returns.

### *Increasing Demand*



Graph 8: NSW SC candidature in technology subjects 1994 - 1996



Graph 9: NSW HSC candidature in technology subjects 1994 - 1996

There is some evidence to suggest that the level of demand within schools for technology teachers will be sustained into the medium term, particularly if the current curriculum offerings remain across the sector. This stems from an examination of data from the NSW Board of Studies relating to the NSW School Certificate (SC) and Higher School Certificate (HSC) examination candidatures in technology subjects plotted on graphs 8 and 9. It is reasonable to assume that increasing, or even continuing, demand for technology based subjects in schools will result in a subsequent need for the provision of adequate numbers of technology teachers to staff these subjects.

Data from the NSW office of the Board of Studies would suggest increasing numbers in secondary school technology classes. For example, 1994 - 1996 data shows a consistent and substantial increase in SC candidature. Graph 8 represents a 22.5% increase over the

period clearly indicating an increasing trend over the period. Graph 9 reflects a HSC female candidature increase of 21.8%, male of 22.6% and the total of 22.3% over the four year period 1995 - 1998. Over the same period, total HSC candidature grew by only 3%. Clearly this indicates the increasing popularity of the technology curriculum in NSW senior secondary schools.

It is interesting to note a special correlation. The recent increase in output from the latest round of specially designed programs has also occurred at a time when demand for technology teachers has continued to increase through continued expansion of SC and HSC candidatures. Data presented in this paper has already indicated that in recent years the level of technology teacher supply from university undergraduate programs has been steadily declining. There has been some minor compensation from postgraduate programs and significantly from specially developed programs (graph 2). Indeed the total output from specially developed programs has increased by close to 40% between 1997 compared with 1999.

### **The re-emerging role of TAFE in NSW Technology teacher education programs**

The involvement of the NSW technical college system (now known as TAFE) in the training of technology teachers is not new. Both Sydney and Newcastle Teachers Colleges used TAFE links for skills based courses in their manual arts teacher training programs in the 1940's and 1950's. However, the profession pressed for a move away from this mode of teacher preparation to a structure in common with other teaching curriculum disciplines where education, curriculum, and discipline specific academic studies are integrated and taught at the one institution. This led to the development of various university and college technology teacher education programs in the 1960's and beyond.

The late 1990's has seen the return of TAFE as a provider of practical courses articulated with university based technology teacher education programs. Initial schemes have been developed at Charles Sturt University (Wagga Wagga campus) and more recently at Southern Cross University (Coffs Harbour campus). These initiatives will undoubtedly impact on the competencies developed by new graduates.

A number of recent initiatives have also occurred and are summarised below:

- Australian Catholic University  
The current BTeach/BA course is under review with the aim of introducing a new program in 2002 involving TAFE articulation.
- University of Sydney  
There is a proposal for a new program, articulated with a TAFE design fundamentals course, to be probably introduced in 2001.
- Southern Cross University  
This program is founded on the integration of university and TAFE resources located on the one site. However, it appears to have experienced initial implementation problems.
- University of Western Sydney.  
A new undergraduate BEd (Secondary: Technology) program is being

developed for implementation at the Penrith campus, probably in 2001. It is important to note that this program, while possibly involving some TAFE studies, will combine a core study of technology with a number of elective specialisations such as computing, electrical, engineering science, industrial design and materials.

Significant here is the expanding role of the NSW TAFE in technology teacher education. It appears that from 2002 TAFE will be involved, in some manner, in all technology teacher education programs conducted by NSW universities. The reasons for and the implications of this development are no doubt quite complex. Indeed, a full analysis requires a detailed examination of the situation. However, a few brief comments can be made:

- Perhaps the most significant issue here is what might be described as the apparent mutual financial benefit of the major parties: universities, TAFE, and the various school systems. Much of their planning in the area of technology teacher education seems to be driven more by budgetary requirements rather than genuine curriculum concerns. This has been discussed in part earlier in relation to the university sector. However, the use of the TAFE sector certainly permits the universities to indulge in cost shifting particularly in relation to the provision of adequate staff and appropriate infrastructure.
- The vocational education component of the present NSW secondary school curriculum is currently undergoing major expansion. This in turn has required an increase in the number of appropriately qualified VET teachers. The present pre-service technology teacher education programs have not been able to provide an adequate supply of these teachers. TAFE involvement may be seen as a convenient strategy for solving this supply problem.
- There appears to be potential for a clash of technology teaching philosophies. TAFE teaching strategies are largely focused on competency based learning which to some degree might conflict with the problem solving philosophy underpinning secondary school subjects such as Design and Technology. It is essential that strategies be developed within the management of the new articulated programs to ensure the appropriate integration of these disparate teaching methodologies.

## **Conclusion**

This paper has presented some data on the current numbers of students enrolled in the various technology teacher education programs throughout the state of NSW and also examined a number of related issues. On the basis of the issues examined in this paper the question arises: *Y2K a time for optimism?* While a great deal of work still needs to be undertaken in order to maintain and even increase the supply of suitably qualified technology teachers, it would be reasonable to assume an optimistic albeit vigilant outlook.

A number of observations are important:

- Technology continues to be a popular curriculum area across the NSW

secondary school sectors.

- While there is a current shortage of technology teachers available to meet this continuing demand, first year enrolments in university technology teacher undergraduate programs seems to be on the increase.
- Employers, such as DET, have responded to the present shortage of technology teachers in NSW by actively investing in strategies aimed at alleviating the problem through specially developed Diploma of Education and targeted retraining programs.
- However, there is a serious bias away from the preparation of specialities in Agriculture, Engineering Studies, Technics, Textile Technology, VET, Food Technology, and Electronics in favour of Design and Technology, Computing and Graphics.
- The preparation of technology teachers through more flexible delivery modes needs to be investigated. This could include part-time study enabling a new cohort of teachers to be prepared through transfer from the existing workforce.

## Appendix A

**Table 1: Total number of students for the period 1997 - 1999 - in all programs (UG, PG and SD programs).**

Institution	1997	1998	1999
Australian Catholic University	50	90	124
Avondale College	23	23	44
Charles Sturt University	12	34	75
Southern Cross University			35
University of Newcastle	52	69	90
University of Sydney	181	125	121
<b>Total</b>	<b>318</b>	<b>341</b>	<b>489</b>

**Table 2: Total under graduate (UG) enrolments in technology teacher education programs.**

Program year		1			2			3			4			Σ
Institution	Year	F	M	Σ	F	M	Σ	F	M	Σ	F	M	Σ	
<b>Australian Catholic University</b>	1997	12	8	20	4	6	10	1	7	8	2	6	8	46
	1998	20	20	40	11	7	18	4	4	8	1	7	8	72
	1999	26	24	50	18	18	36	10	6	16	3	4	7	109
<b>Avondale College</b>	1997	3	5	8	2	4	6	1	4	5	1	3	4	23
	1998	1	4	5	3	4	7	2	4	6	1	4	5	23
	1999	1	5	6	1	4	5	3	4	7	2	4	6	24
<b>Charles Sturt University</b>	1997	4	8	12			0			0			0	12
	1998	10	17	27	3	4	7			0			0	34
	1999	17	13	30	8	12	20	3	4	7			0	57
<b>Southern Cross University</b>	1997													
	1998													
	1999			35										35
<b>University of Newcastle</b>	1997		9	9			0			0			0	9
	1998	6	12	18		8	8			0			0	26
	1999	4	18	22	6	10	16		8	8			0	44
<b>University of Sydney</b>	1997	25	21	46	16	15	31	19	11	30	34	11	45	152
	1998			0	17	18	35	11	15	26	19	1	30	91
	1999			0			0	14	14	28	11	15	26	54
<b>Total</b>				293			199			149			139	811

**Table 3: Total post graduate (PG) enrolments in technology teacher education programs.**

Program year		1			2			Σ
Institution	Year	F	M	Σ	F	M	Σ	
<b>Australian Catholic University</b>	1997	2	2	4				4
	1998	2	2	4				4
	1999	2	2	4				4
<b>University of Newcastle</b>	1997	1	17	18				18
	1998	4	13	17				17
	1999	2	20	22				22
<b>University of Sydney</b>	1997	4	1	5				5
	1998	1		1	4	1	5	6
	1999	6		6	1		1	7
<b>University of Western Sydney</b>	1997							
	1998							
	1998						n/a	
<b>Total</b>				81			6	87

**Table 4: Total specially developed (SD) program enrolments in technology teacher education programs**

Program year		1		
Institution	Year	F	M	Σ
<b>Australian Catholic University</b>	1997			
	1998	3	11	14
	1999	4	7	11
<b>Charles Sturt University</b>	1997			0
	1998			0
	1999			18
<b>University of Newcastle</b>	1997	1	24	25
	1998	2	24	26
	1999	0	24	24
<b>University of Sydney</b>	1997	5	19	24
	1998	7	21	28
	1999	26	34	60
<b>Total</b>				230

**Table 5: Number of students studying particular technology specialisations - year 2000 potential graduands <sup>1</sup>**

Technology Specialisation	Australian Catholic University	Avondale College	Charles Sturt University	University of Newcastle	University of Sydney
Agriculture	0	0	2	0	0
Computing	5	2	6	0	30
Design & Technology	7	4	0	21	87
Electronics	7	3	0	0	36
Engineering Science	7	3	1	0	10
Food Technology	0	1	2	0	30
Graphics	7	3	0	21	25
Industrial Technology	5	3	1	21	36
Technics	5	3	1	21	37
Textile Technology	2	0	0	0	6
VET	0	0	18	0	20

**Table 6: Number of students studying particular technology specialisations - year 2001 potential graduands <sup>1</sup>**

Technology Specialisation	Australian Catholic University	Avondale College	Charles Sturt University	University of Newcastle	University of Sydney
Agriculture	0	0	4	0	0
Computing	40	2	2	7	19
Design & Technology	40	5	7	9	34
Electronics	30	2		0	15
Engineering Science	18	2	4	3	5
Food Technology	18	3	3	0	14
Graphics	36	2	0	0	8
Industrial Technology	18	2	4	8	15
Technics	18	2	4	8	15
Textile Technology	8	0	0	0	6
VET	0	0	7	0	0

1. These numbers do not take account of any likely program attrition.

**Table 7: Number of students studying particular technology specialisations - year 2002 potential graduands <sup>1</sup>**

Technology Specialisation	Australian Catholic University	Avondale College	Charles Sturt University	University of Newcastle	University of Sydney <sup>2</sup>
Agriculture	0	0	5	0	0
Computing	50	2	5	6	0
Design & Technology	50	3	20	0	0
Electronics	20	2	0	0	0
Engineering Science	20	2	8	9	0
Food Technology	20	1	8	5	0
Graphics	40	2	0	18	0
Industrial Arts	20	2	8	18	0
Technics	20	2	8	18	0
Textile Technology	20	0	0	0	0
VET	0	0	20	0	0

1. These numbers do not take account of any likely program attrition.
2. The numbers for the University of Sydney are likely to increase marginally depending on the institution's continued involvement with specially developed programs.

**Table 8: Comparative numbers of final year technology students 1994 - 1999**

Source	1994	1995	1996	1997	1998	1999
Beard	220	153	97	75		
Gibson				78	63	54
Current				57	43	39

**Table 9: NSW HSC and SC candidature 1994 - 1996**

Year		1994	1995	1996
School Certificate	Female	23550	24977	27278
	Male	34834	40844	44262
	Total	58384	65821	71540
Higher School Certificate	Female	7342	7611	7793
	Male	11168	10582	10610
	Total	18510	18193	18403

Source: NSW Board of Studies

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