

**A COMPARATIVE STUDY OF THE
METAL FABRICATION AND
WELDING (HEAVY) TRADE
COURSE IN TAFE NSW BETWEEN
2001 and 2004**

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**A thesis submitted to the University of Newcastle
in total fulfilment of the requirements for the
degree of Doctor of Philosophy in Education**

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DECLARATION

I hereby certify that the work embodied in this thesis is the result of original research and has not been submitted for a higher degree at any other University or Institution.

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26th October 2007

ABSTRACT

This comparative study between the old Metal Fabrication and Welding (MF&W) trade course 7792 and the newly introduced MF&W trade course 3449, focuses on the data, discussions and recommendations which are likely to help establish what benefits or deficiencies this major change has had on the knowledge base of the current apprentices from the trade course. This is being accomplished by comparing the results from an exit test undertaken by stage III MF&W (Heavy) 7792 apprentices at the Hunter Institute of TAFE in 2001 and the results from exit tests for stage III MF&W (Heavy) 3449 apprentices in New South Wales (NSW) in 2004. These data are supplemented and complemented by an analysis of phone interviews with teachers of MF&W (Heavy) TAFE NSW conducted in 2005.

A comparison of the data collected from the stage III Metal Fabrication and Welding (Heavy) apprentices who completed the exit tests in 2001 with those who completed the exit tests in 2004 at TAFE NSW, showed that there was a decline in exit knowledge in the mean scores of the apprentices. When the results of Institute 1's relating to 2001 was compared with the results of 2004, the same pattern occurred, whereby it was shown that there was a decline in exit knowledge. This was due to the employers not understanding and embracing the change, or even favouring the changes. In 2004, there were no significant differences between the results of different NSW Institutes. This indicates that the level of material taught on-the-job and off-the-job did not differ across the State.

A majority of the MF&W (Heavy) Teachers in NSW who were interviewed indicated that the course did not meet industry needs. The teachers expressed the opinion that the welding component was reasonable in its outcomes but felt that the fabrication part of the course lacked substance in the drawing interpretation, trade calculations and the computer aided drawing components of the course. They preferred the old method of teaching lock-step delivery over competency based training (CBT) method and overwhelmingly indicated that the CBT method had not improved the learning outcomes of the apprentices since the changes that occurred in 1991. The findings indicate that the on-the-job

assessment of the apprentice's training was largely ineffective due to the reluctance of the employers to participate in the system. The teachers felt that this was due mainly to the fact that the employers 'tick and flick' approach (whereby the apprentices are given a pass for the competency without completing it) towards doing the assessments. A large majority of those interviewed indicated that the changes to the trade course that occurred from 2001 to 2004 did not result in any improvements in the knowledge base of the apprentices.

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Chapter One

Introduction

1.1 Focus of the Study

Each and every country around the globe has some form of an educational system leading to a Vocational Education and Training system. Vocational training is post secondary education but in some countries it is initiated during the schooling years. The developed countries such as the United Kingdom have similarities in their competency based education system to that of Australia (Gunning, 1993). The challenges facing vocational education and training in the United States of America from the mid to the late 1990's had parallels with those changes occurring in New Zealand at that time. These challenges are now being confronted by the Australian Vocational Education System (O'Connor, 1993).

Technical Education in New South Wales (NSW) evolved from the privately funded Sydney Mechanics' School of Arts in 1833. The NSW State Government assumed control of this institution in 1883, resulting in the expansion of Technical Education at a rapid rate and its development into what is now called a Vocational Education and Training (VET) system (Cobb, 1993).

Up to 1990 the Metal Fabrication and Welding (MF&W) trade course had not changed a great deal in its delivery mode or subject matter. The introduction of the Competency Based Training (CBT) format into the MF&W area of training

in 1991 changed it from lock step to modular based delivery. During the decade that followed, there have been two major reviews of the MF&W (Heavy) trade, which have impacted on delivery; that is what is taught and how it is taught.

This comparative research study between the old MF&W trade course No 7792 and the newly introduced MF&W trade courses 6059 and was superseded by 3449, focuses on the data, discussions and interpretations and the recommendations which are likely to help establish what benefits or deficiencies this major change has had in the knowledge base of the current apprentices from the trade course. This is being accomplished by comparing results from an exit test undertaken by stage three MF&W (Heavy) 7792 apprentices in the Hunter Institute of TAFE in 2001 and the results from the exit test for stage three MF&W (Heavy) 3449 apprentices in New South Wales (NSW) in 2001-2004.

1.2 Global Trends

International comparisons are always difficult to make in the Vocational Education and Training area because institutional structures and cultural differences between countries mean that apparently common concepts such as apprenticeships can vary quite significantly from one country to the other.

In Europe, for instance, apprenticeships vary from an informal approach in Britain to the highly regulated “dual” systems approach typical in Germany, Austria and Switzerland. Training in apprenticeships similarly varies from the largely on-the-job orientation of the British and Dutch systems to the classroom-based system in France or the Competency Based Modular system in Scotland (Misko, 2005).

The United States of America has traditionally supported only a very limited apprenticeship program. The Federal and State Governments are responsible for managing the national apprenticeship system as prescribed by the National Apprenticeship Act of 1937 (Fitzgerald Act). The Bureau of Apprenticeship and Training and State Apprenticeship Agencies are responsible for registering apprenticeship programs that meet Federal and State standards.

The employers or labour/management sponsor the provision of registered apprenticeship programs and are responsible for all the training costs and wages paid to their apprentices. The duration of the apprenticeship programs varies from one to six years, in contrast with some European countries where apprenticeships are viewed as a mechanism for providing vocational training for young people. In the USA registered apprenticeship training programs aim to provide employed adults with opportunities to upgrade their skills or for retraining (Wonacott, 1992).

In the UK the traditional apprenticeship system has undergone a radical change since the era of the Thatcher Government. The industrial relations and training reforms of the UK government during the 1980s and early 1990s, together with the decline in the manufacturing industry, resulted in almost the complete disappearance of the traditional apprenticeship system. In 1995, in response to the severe decline of the system and the skills shortage that beset the UK economy in the early 1990s, the current apprenticeship system was introduced. This modern apprenticeship system is standards-based and, like traineeships in Australia, has seen the introduction of structural training into industrial sectors that have not supported traditional apprenticeships in the past. Government funding for training is provided by the Department for Education and Skills (DfES) and is delivered

through a network of Training and Enterprise Councils (TECs), a role being taken over by new learning and skills councils (Robinson, 2001).

1.3 Evolution of Apprenticeship Training in Australia and New South Wales

A research study was commissioned by the National Centre for Vocational Education Research (NCVER) into Australia's apprenticeship system and its report was published in two volumes. The first volume, *Australian Apprenticeship: Facts, Fiction and Future*, by Robinson (2001) provides a comprehensive analysis of the development of apprenticeships in Australia. The rapid growth and transformation of the system over the past decade is examined in detail and proposals for the future of apprenticeships in Australia are explored. The second volume *Australian Apprenticeship: Research Readings*, by Smart (2001) reports the findings of 11 new research studies into various aspects of apprenticeships, traineeships and new apprenticeships.

Robinson (2001) put forward the view that apprenticeships are a long-standing system of combining training and employment so that people entering an occupation can receive instruction in the specific skills needed while working in that particular occupation.

1.3.1 Apprenticeships

In the past, apprenticeships were the main feature of a training system whereby the skilled (masters) passed on skills of their craft to novices. Apprenticeships have a long history dating back to ancient Egyptian and

Babylonian times. However, the apprenticeship system as we know it did not emerge until the 14th Century during the Middle Ages. Journeymen or artisans organised themselves into guilds or associations to protect payments and working conditions. It was this system of apprenticeships that became the mechanism for skills acquisition and entry to the guilds (Beattie, 1968).

This is the system that spread to the New World and to Australia in the late 18th Century and early 19th Century. In colonial Australia, apprenticeship practices were established on the basis of the British system, with conditions being governed through the English Apprentice Law in respect of the relations between the master and apprentices. In the colony, the number of free settlers was limited, the demand for skilled craftsmen was high and many convict tradesmen were offered pardons in return for their labour. The Victorian and Queensland legislation regulating apprenticeships also followed the British Law. The first legislation anywhere in Australia governing apprentices that differed from British Law was enacted in New South Wales in 1894. By the end of the nineteenth century, apprenticeship systems were well established throughout Australia, whereby the master-servant approach to apprenticeship training was implemented, that being the apprentices was contracted for a period of time to be trained in that particular trade by a craftsman.. During the latter part of the 19th century, Australia experienced considerable changes as a result of the Industrial Revolution as was the case in Britain (Beattie, 1968).

The Commonwealth of Australia was formally created in 1901. With the birth of the Federation, the responsibilities for education and training were retained under the State jurisdiction. At the beginning of the 20th century (Beattie, 1968,

p.105) noted that the New South Wales Apprentices Act of 1901 made provision to:

- increase the minimum age for apprentices from 12 to 14 years of age;
- bind all apprentices by indenture and introduce a new “model” form of indenture;
- specify the persons who could bind apprentices under the Act;
- set the maximum term of an apprenticeship at seven years;
- set the maximum age limit for an apprentice by requiring all apprenticeships to expire when the apprentice turned 21 years of age;
- have a provision that no apprentice was to serve his master for more than 48 hours per week, with the exception of farmers and domestic servants;
- establish procedures for the settlement of differences and disputes between master and apprentice; and
- incorporate penalties for breach of contracts such as absenting without permission (NSW Apprenticeship Act of 1901).

The arrangements established over the first thirty years of the 20th Century were extremely important in setting the foundations for Australia’s modern apprenticeship system. These arrangements were maintained up to the Second World War. During this period the system was stretched to the limit and when skills shortage occurred, the industry resorted to the use of ‘dilutees’. Dilutees were people who had limited technical skills and experience, but entered the industry for the first time to boost the civilian workforce (Beattie, 1968).

Since 1944 the requirements for formal off-the-job training in apprenticeships have been relaxed and other flexibilities have been introduced

such as pre-apprenticeship training, part-time apprenticeship and school-based apprenticeships.

The study also indicated that apprenticeships in Australia have mainly been confined to the skilled trades' occupations (i.e. MF&W, Hairdressing, Hospitality and Construction Trades). These occupational groups make up some 14% of all jobs in Australia.

Robinson (2001) explains that traineeships were introduced in 1985 to complement traditional apprenticeships by extending the coverage of 'apprenticeship-type' training and employment to a much wider range of jobs across the whole labour market. Most of this training occurred within contracts of training of one year's duration combining both employment and off-the-job formal training. This type of training was mainly in the clerical and hospitality areas.

The late 1970's and early 1980's saw an increase in the number of apprentices employed in the Metal Fabrication and Welding industry in the Hunter Region but by the mid 1980's the industry was in decline. The Scott Report (1990) was the catalyst for change in the vocational education sector in NSW. In 1991 Competency Based Training (CBT) was introduced into the NSW Metal Industry, with an immediate impact on the apprenticeship system.

1.3.2 New Apprenticeships Scheme

In 1998 a single integrated system of employment and training was established with the incorporation of the formerly separated apprenticeship and traineeship systems.

This New Apprenticeship system introduced in Australia in 1998 had been viewed by the Australian National Training Authority (ANTA) as being successful in the UK. Later, the system was expanded to include wider occupational and industry sectors than previously undertaken by apprentices (Robinson, 2001).

1.4 Current Trends in Apprenticeship Training

During the last 17 years there has been a significant change in the development of apprenticeships in Australia. The abolition of age restrictions for entry into an apprenticeship and the belated introduction of traineeships in the early to mid 1990's are two developments that have impacted on the system.

The Australian Vocational Certificate Training System (AVCTS) was established on 21 July 1992. This included Competency Based Training (CBT), Recognition of Prior Learning (RPL), the Australian Qualifications Framework (AQF) and the National Framework for Recognition of Training (NFROT). The newly formed Australian National Training Authority (ANTA) was directed to play a key role in implementing the new system.

The AVCTS was designed to be a comprehensive system of training involving:

- industry participation in development and provision of training;
- quality training to national standards;
- achievements and recognition of competencies, however achieved;
- many different training providers;
- a national framework of vocational qualifications; and
- provision for those with disadvantages of different kinds (Ray, 2001: 28).

In November 1994, the Ministerial Council on Employment, Education, Training and Youth Affairs (MCEETYA) agreed to support the merger of both apprenticeships and traineeships to AVCTS by December 1996 (Ray, 2001).

Fully on-the-job training re-emerged in terms of arrangements made by the National Employment and Training Taskforce (NETTFORCE) established by the Federal Labour Government in 1994. This gave employers the capacity to provide training entirely on-the-job in a contractual form of training if they wished. This development ignited a debate about the relative worth of on and off-the-job training in both traineeships and apprenticeships and the appropriate balance between the two (Robinson, 2001).

In 1996, the Howard Government overhauled the apprenticeship system in Australia by introducing 'New Apprenticeships'. This saw the combining of apprenticeships and traineeships under one umbrella titled 'New Apprenticeships' and extended the occupational coverage of apprenticeship-style training (Ray, 2001).

The New Apprenticeship system introduced new features, such as training packages and user choice of Registered Training Organisation (RTO) providers. Training packages were combinations of the training agreement (in place of indentures), training plans, competencies to be attained and the method of assessment and assessment guidelines. The legislative approach used by the States and Territories for the administration of apprenticeships and traineeships depended largely on the age of the legislation (Ray, 1998, p15). However,

distinctions between trades' apprentices (blue-collar trades) and non-trade trainees still continue.

This system has initiated a growth trend that has resulted in a very large increase in the number of apprentices and trainees in non-trades' occupations. It has also led to a substantial increase in the amount of training undertaken outside the TAFE system, including wholly on-the-job training (Ray, 2001).

Originally, apprenticeships were introduced to Australia on the basis of on-the-job training. Ray reports that throughout the last half of the twentieth Century, 'the provision of formal training (typically for one day per week for three years) became universal and on-the-job apprentice training virtually disappeared' (Ray, 2001).

Controversy about fully on-the-job training continues. In its report, *Aspiring to excellence*, the Senate Employment, Workplace Relations, Small Business and Education Reference Committee (2000) notes that the term "on-the-job training" is often confused with "workplace training". The committee's report goes on to note that many employer groups in their submissions strongly supported on-the-job training and expected to see that it increases.

In 1999 the MF&W (Heavy) course (6059) was introduced with indentured apprenticeships of four years duration and a three year trade training course. The on-the-job component (30% of end result) introduced in 2001, which made the employers responsible for training the apprentice in the trade competencies. It has not impacted on the trade as such but in the years to come these changes are likely to affect the trade quality significantly, especially in relation to how and when

training should take place. The employer sees trade training as the responsibility of the TAFE or Private provider and has not taken the responsibility for on-the-job component of the trade training.

1.5 The Research Problem

With the implementation of the MF&W (Heavy) trade courses 6059 and superseded by 3449 there has been an increase in the administrative structures for training in the industry especially with on-the-job component of the course, evaluated at 30% of the course, having the biggest impact. In this context, the project investigated: whether the changes have improved the knowledge base of the apprentices in the MF&W (Heavy) trade area in NSW, who graduated with the stage three of the program.

This present study investigated whether there were any substantial differences in the knowledge base of the apprentices who completed the MF&W (Heavy) Trade Course 7792, when compared to 3449 at TAFE, NSW due to the introduction of on-the-job training.

The outcomes of the study reported in chapters 4 and 5 have helped determine whether there is a difference in the knowledge bases of the graduates who completed the MF&W (Heavy) trade course 7792, when compared to 3449. The study also helped determine whether there were any substantial differences in the knowledge bases of the apprentices who were completing their courses in the MF&W (Heavy) trade course at different institutes and whether changes in the modes of delivery were necessary.

A further set of objectives was set to identify the opinions of Metal Fabrication and Welding (Heavy) Teachers of NSW. These were to: examine whether the current course meets industry needs and if not what improvements are needed; ascertain which teaching delivery technique is preferred; and whether the employers consider on-the-job training of apprentices as an important component of the current course.

1.6 The Purpose and the Specific Objectives of the Study

The main purpose of this study was to ascertain whether there has been an improvement in the knowledge base of the apprentices who were completing the MF&W (Heavy) trade courses 6059 and 3449 conducted by the TAFE NSW when compared to the old MF&W trade course 7792. The study attempted to identify, clarify and record the past developments and future directions of the courses in providing the training to meet the industry requirements. It also considered the impact of the rapid changes that have occurred within the industry such as: the closure of BHP Newcastle in 1999; the economic rationalisation of some companies; and the introduction of new heavy industries. The study provides a basis for the implementation of strategies for improving the delivery of training and providing direction for future research.

The specific objectives of the study were to:

1. Identify whether there has been an improvement in the knowledge of the apprentices who completed the MF&W (Heavy) course stage three as a result of the introduction of changes to the course.

- 2 Identify whether there were any substantial differences in the knowledge base of the apprentices graduating from different TAFE Institutes in NSW in the MF&W (Heavy) trade area.
- 3 Ascertain from the results of the exit tests undertaken from 2001-2004, whether there has been a difference between the old course 7792 and new courses 6059 & 3449 at the Hunter Institute of TAFE and the other institutes in NSW.
4. Evaluate whether the changes introduced to course 7792 were necessary to improve the knowledge base of the apprentices.

An additional number of objectives were also set to identify the opinions of Metal Fabrication and Welding (Heavy) Teachers of NSW. These were to:

5. Examine whether the current course meets the industry needs and if not what improvements are needed.
6. Ascertain which teaching delivery technique is preferred by the teachers as the one more effective.
7. Ascertain whether the employers consider on-the-job training of apprentices as an important component of the current course.

1.7 Research Methodology and Sample

The methodology adopted for the study was a combination of both quantitative and qualitative dimensions of research. The data were collected by an exit test, using a structured questionnaire relating to an exit test and a phone interview. For the exit test the sample population comprised of the apprentices who completed the MF&W (Heavy) course numbers 7792 and 3449 of TAFE

NSW. The sample was divided into three parts, one for each year, with a population of 75 apprentices in 2002 and 2003 in the Hunter Institute of TAFE and 224 apprentices across NSW TAFE in 2004. This sample was bench marked against 60 apprentices in 2001 at the Hunter Institute of TAFE for the course number 7792 that were given a similar test.

The exit test had four parts. These parts contained Part A multiple choice questions, Part B short answers, Part C calculative and Part D developmental questions. The exit test was designed from the format of the MF&W (Heavy) stage three examinations between 1980-1990 and covered the subject matter that a stage three apprentice was expected to know at this stage of his/her training in the trade area.

This exit test was discussed and distributed amongst the Hunter Institute of TAFE MF&W teaching staff for their comments and suggestions and the refined version was piloted at the Cessnock Campus (refer appendix L).

In June 2005 phone interviews were undertaken with the teaching staff of the Metal Fabrication and Welding (Heavy) Trade sections in NSW TAFE who offered stage three trade course program. These seventeen teaching sections involved in the study comprised of one hundred and two teaching staff.

The phone interview schedule comprised two sections:

- Section 1. Included six open ended and closed questions relating to general information about location, teaching experience and age.

- Section 2. Included eleven open ended and closed questions relating to trade courses delivery, employers on-the-job attitudes (refer appendix E).

The data was analysed by employing the SPSS computer software package.

1.8 The Theoretical Framework for the Study

The Theoretical framework for this study was based on a combination of two theoretical concepts: 1) Competency Based Training in the VET Area; and 2) Workplace Learning and Assessment.

One of the key areas in vocational education for the Australian Government is Apprenticeships and Traineeships that is aimed at increasing the quality and quantity of entry-level training. This area has seen considerable changes and debates during the implementation of training reforms over the last decade. Issues relating to participation rates, industrial relations and wage policies have all received significant attention (Australian Education Council Review Committee 1991; DEET 1991; Kemp 1996; Lundberg 1997).

1.8.1 Competency Based Training (CBT)

Since the introduction of CBT into Australia in the early 1990's away from the more traditional method of lock-step learning, there has been considerable debate as to whether this system will meet the training needs of Australia. From the inception of this training system there have been rapid changes to the Vocational Education and Training area with little research, in particular in the area of the Metal Fabrication and Welding (Heavy) industry.

The Carmichael Report (1992) outlined a staged strategy for meeting Australia's training needs into the new millennium.

On the recommendations by the Employment and Skills Formation Council (ESFC) the National Training Board is implementing the competency based Australian Vocational Certificate Training system. The focus of a CBT system was based on outcomes, the attainment and demonstration of specific knowledge skills and applications by individuals, rather than on inputs, such as time served. The key areas of competence targeted were generic competencies which under-pin the acquisition of vocational and occupational-specific competencies.

1.8.2 Workplace Training and Assessment

In 2002 DET through the Industry Training Authority Board (ITAB) changed the way students were to undertake Vocational Education and Training Courses and how they were to be assessed. Before these changes, students were assessed on their competency to complete a module or unit of study in a learning institute (e.g. TAFE Campus) to be successful. The change now involves on-the-job assessment of that unit of work. Now on-the-job and off-the-job assessments are needed for a student to be deemed competent.

Research confirms that the “focus in teaching should be on the learner the individual’s active construction of knowledge” (Stevenson, 1994: 29).

"Contemporary work-based learning is grounded in teaching and learning research emanating from the cognitive sciences, psychology, and pedagogy. Consistent with research from these various disciplines, work-based learning blends into an integrated curriculum the mental and tactile, theoretical and applied, and academic and vocational. This blending appears for most students most of the time resulting in increased retention of knowledge, deeper understanding of the subject matter, and the ability to apply (i.e., transfer) knowledge and skills in ill-structured environments."(Lynch, 2000: 19)

Because the focus is on the learner, "vocational practice needs to be conceptualised as a learning process rather than a teaching process". (Billett, 1994: 64).

The vocational teacher's role is not to set tasks, but to organize experiences that allow learners to develop their own knowledge and understanding. Using the methods of cognitive apprenticeship, the teacher is a coach who provides guidance that gradually decreases as the learners become more proficient. The learning environment should reproduce the key aspects of the components of practices authentic and sequenced in complexity. Multiple experiences and examples of knowledge application, access to experts, and a social context in which learners collaborate on knowledge construction should also be provided. (Kerka, 1997).

However, issues relating to learning and assessment of apprenticeships have not received the same degree of attention. Little attention has been paid to what actually happens to apprentices and how their experiences affect their training. The most recent Australian studies include Wilson and Englund (1994), Smith (1998) and Harris, Willis, Simons and Underwood (1998). The question of quality in apprenticeships also has been only a minor aspect as is evident from Western Australian Department of Training Report (WADOT) (1998) and the studies and evaluations by Schofield (2000) and Smith (2000). However, Robinson (2001) asserts that such issues relating to learning and assessment go to the very heart of the quality of Vocational Education and Training (VET) for

apprentices as well as the ability of the system to deliver outcomes relating to the promotion of lifelong learning (Robinson, 2001: 28-29).

1.9 Definition of Terms

Apprentice: A person undertaking training in Metal Fabrication and Welding (Heavy) industry as a trade apprentice.

Competency Based Training: Refers to the training system based on developing skills and conceptual abilities used in Vocational Education in Australia.

Campus: Refers to TAFE NSW's centres where TAFE training is conducted.

Department Education, Science and Training: Refers to the Federal Administrative structure responsible for Vocational Education in Australia.

Faculty: TAFE NSW Institutes are divided into different discipline/subject areas and each of these is called a faculty.

Hunter Institute of TAFE: Refers to the vocational education body in the Hunter Region. It comprises eleven campuses.

Metal Fabrication and Welding (Heavy): Refers to the teaching section which is part of the Engineering Faculty that is involved in this study.

OTEN: Open Training and Educational Network.

TAFE NSW: Technical and Further Education Commission of New South Wales. Is the largest provider of Vocational Educational within Australia.

TAFE: Technical and Further Education is the main vocational training system in Australia.

VET: Vocational Education and Training. Is the vocational educational and training system used in Australia.

1.10 Significance of the Study

The study highlights whether the changes in the course structure have improved the knowledge level within the MF&W (Heavy) trade in NSW. In the absence of any other significant study in this area, this study is likely to provide a deeper and sound insight into the metal industry training area, improving our understanding of apprenticeship training and whether the changes made were necessary.

The findings of this study are likely to add to the existing stock of knowledge in this area of trade training and make a significant contribution to our understanding of the two TAFE courses.

The findings of this study will provide valuable data to educational planners and leaders within HIT, NSW Metal Industry Employers, Australian and National Training Authority and to others interested in such data.

1.11 Limitations of the Study

One of the major constraints was the time allowed for the study with the window of opportunity only being opened to enable the apprentices in the HIT in the MF&W (Heavy) trade course 7792 to sit for the exit test before the introduction of the new courses 6059 and 3449. Under the circumstances, the exit test of this study was limited to HIT (2001) as a benchmark compared to MF&W (Heavy) trade apprentices in NSW between 2002-2004. As the findings were based on the responses of MF&W (Heavy) trade apprentices in NSW between 2002-2004, the conclusions are likely to have direct reference to the trade courses and the metal industry in New South Wales only as the structure of courses in other states is not identical.

1.12 Format of the Thesis

Chapter one is focused on the whole study with particular attention to the aspects included herein and sets the framework for the investigation to follow. **Chapter two** contains a comprehensive review of the literature on the topic including the Australian Apprenticeship and Trainee system and the impact on the MF&W trade. This chapter also reviews overseas developments in the Vocational Education and Training area. In particular, consideration is given to the developments in the United Kingdom and the United States of America and how those developments impacted on the Australian system.

Chapter three discusses the research methodology and design. It focuses on the selection, development and application of the research instruments, research sample and the processes followed in the collection and analysis of data. **Chapter four** presents the analysis of the data collected from the Hunter Institute of TAFE 2001 (benchmark data), the data collected from NSW TAFE stage three MF&W (Heavy) 2004 and the data collected from the phone interviews in 2005 with teaching staff. **Chapter five** focuses on the analysis of the data and discussions on the outcomes from data collected in NSW from 2002-2004 compared to 2001, exit tests, and phone interviews in 2005, including discussions, possible interpretations and implications. **Chapter six** contains a summary of the findings of the research, conclusions, implications and recommendations both for practice and further research.

Chapter Two

Review of Related Literature

2.1 Introduction

This chapter focuses on a review of related literature on apprenticeship training and in particular apprenticeship training in the MF&W (Heavy) vocational training area.

Global influences from Germany, England, Scotland, Asia, USA and the Nordic countries are outlined. Consideration is also given to the evolution of apprenticeship training in Australia, particularly New South Wales, and the milestones in the development of Australian apprenticeships such as: the Kangan Report (1974); Kirby Report (1984); Scott Report (1990); Finn Report (1991); and Carmichael Report (1992) are discussed. Then, the establishment of the Australian Qualification Framework (1995); the formation of the New Apprenticeship system (1998); Schofield Report (2001); and Life Long Learning: The future of Public Education in NSW Report (2003); and Skilling Australia's Workforce (2005) are examined.

The workplace training and assessment processes within the apprenticeship training system which will include Stevenson's (1994) and Lynch's (1997) research focuses on teaching and learning as an individual activity in the vocational training area are also presented. Attention is also given to outline the strategies adopted in implementation of CBT in Australia. The MF&W (Heavy)

trade evolution is explained outlining the changes that have impacted directly on trade training in Australia.

The current trends emerging in the apprenticeship training area such as: Australian Vocational Certificate Training System (AVCTS); Competency Based Training (CBT); Recognition of Prior Learning (RPL); the Australian Qualification Framework (AQF); The National Framework for Recognition of Training (NFROT); and the Australian National Training Authority (ANTA) are examined. The Australian Senate Report Statistics (2003) highlighting the skills shortages in the trade areas in Australia, Skilling Australia's Workforce 2005 indicating the Federal Government's approach in addressing the current skills shortage are also presented in the review. It is important to emphasize that research into the Metal Fabrication and Welding (Heavy) Vocational Education and Training (VET) sector has been limited and only a few studies are available.

2.2 Definition of an Apprenticeship

The term "apprentice" is defined succinctly in the Macquarie Dictionary as "one who works for another with obligations to be instructed and learn a trade; a learner or a novice". This definition illustrates that the term has both a specific meaning and a more generic one. The specific term implies a bonding or contractual relationship between employee and employer, while the generic meaning suggests a relationship, not necessarily a contract, between the employee and employer.

The concept of apprenticeship has its origins in the medieval craft guilds of Western Europe, when young people were required to live, work and learn with

a master craftsman until they became qualified craftsmen themselves. Today apprentices do not live with their employer, but they are contracted to him or her to undertake learning and work until they have completed their time and acquired their qualifications (Misko, 2005).

2.3 Global Influences

International comparisons are always difficult to make in the Vocational Education and Training (VET) area because of the legal requirements, differences between institutional structures and national cultures between countries. This has resulted in wide variations in common concepts such as apprenticeships quite significantly from one country to another.

A study conducted in 1995 by the Ministry of Education, Skills and Training (MEST) in the Province of British Columbia, Canada, for example, reported that VET systems in the United Kingdom, Scotland, Canada, Australia and New Zealand had introduced quite specific reform measures to achieve a more vocational focus in VET. These measures included:

- work competency standards development;
- competency-based education and training;
- the development of modularised curricula;
- increased quality assurance and accountability;
- increased industry involvement in VET;
- increased school to work transition programs; and
- increased focus on the quality of teachers and teaching.

(MEST, 1995: 7).

Since then similar reforms have also been occurring in other countries including Mexico, Thailand, Singapore, Vietnam, South Africa and China (Arguelles, 1996; Rongguang, 2000). The reason for these developments was the supposed need for education and training systems to have closer and more explicit links with the requirements of the economy (Chappell, 2003).

Increasing globalisation of national economies, rapidly changing markets, increased global competition for goods and labour, new technology and the movement from mass production to flexible specialisations in the productive processes were labelled “the new vocationalism” by a number of commentators (Pollard, 1988; Ball, 1994; Grubb, 1996). New vocationalism emphasises the need for all educational institutions to contribute to national economic imperatives and for the most part, are embedded in human capital theories of economic performance. These theories promote the idea that economic performance is intimately connected to the level and ability of the workforce, and remain a common feature of the educational discourses of many governments worldwide (Papadopolous, 1996).

During this period of reform much more interest was also directed towards the learning that occurs outside educational institutions. The discourse of “Learning in the Workplace” (Marsick & Watkins, 1990); “Learning organisations” (Senge, 1994); “Work-based Learning” (Boud & Solomon, 2001); and “Informal Learning” (Garrick, 1998), all promote learning that takes place at and through work and learning, unmediated by educational institutions.

In Europe, for instance, apprenticeships vary from an informal approach in Britain to the highly regulated “dual” systems typical in Germany, Austria and

Switzerland. Under Germany's *Vocational Training Act* (Bundesministerium für Bildung und Forschung 1969), students undertaking training for skilled worker qualifications are entitled to a broad-based education. This must be well organised and provide students with adequate practical and vocational experience. Section 28 of the *Vocational Training Act* decrees that training for recognised trainee occupations must only be given in accordance with the relevant training regulation and ordinance. Misko (2005) asserts that there are 354 occupations requiring formal training. These occupations are organised under seven training sectors: industry and trades, craft trades; public services; liberal professions; domestic service; agriculture; and maritime and shipping.

Training in apprenticeships similarly varies from the largely on-the-job orientation of the English and Dutch systems to the classroom-based system of France or the Competency Based Modular system of Scotland.

In the United Kingdom, once the students complete full-time compulsory schooling they have the option to take up apprenticeships. Traditional apprenticeships have existed in the U K since the medieval times, their popularity among students and employers have declined dramatically during the 1980's and 1990's. This in turn has led to significant shortages in skills and the technical trades. Modern Apprenticeships were introduced to help meet this shortage and to equip larger numbers of young people for participation in the rapidly changing economic environments.

Apprentices must have a job placement with an enterprise with full-time employment. As in Australia and Germany, they are paid a training allowance or a

basic wage. The on-the-job training is provided by the employer and off-the-job training is provided by the learning provider. The monitoring and assessing of the training is also largely left to the learning provider. Apprenticeship “frameworks” comprise the mandatory outcomes of the apprenticeship. This includes the level of the qualification, key skills (core skills in Scotland), and technical certificates, and in some frameworks, employment rights and responsibility requirements (These requirements refer to the rights and responsibilities of workers, the role of their organisation within the wider industry and the effect of public law and policy on industry). The contract does not specify the duration of the apprenticeship (although there is an expectation that individual contracts will have an expected end date which takes account of the different needs of individuals). These frameworks are developed by sector skills councils, national training organisations or other sector skills bodies.

In UK the traditional apprenticeship system has undergone a radical change since the era of the Thatcher Government. The industrial relations and training reforms of the UK government during the 1980’s and early 1990’s, together with the decline in the manufacturing industry, resulted in the almost complete disappearance of the traditional apprenticeship system. In 1995 the modern apprenticeship system was introduced in response to the severe decline of the system and the skills shortage that beset the U.K. economy in the 1990’s. Modern apprenticeships are standards-based and, like traineeships in Australia, have seen the introduction of structural training into industrial sectors that have not supported traditional apprenticeships in the past. In the UK the Government funding for training is provided by the Department for Education and Skills

(DfES) and this is delivered through a network of Training and Enterprise Councils (TECs) - a role being taken over by the new learning and skills councils.

The reforms initiated during 1994-95 in England and Wales, and Scotland, for the Apprenticeships was to enable 16 to 24-year-olds to undertake work-based training pathways leading to a National Vocational Qualification (NVQ - Level 3) for these in England, Wales and Northern Ireland or for those in Scotland, Scottish Vocational Qualification - Level 3. Another aim of these reforms were to enable the industry to develop the skills and qualifications required for economic competition. Today, modern Apprenticeships are open to individuals who have reached 16 years of age (Misko, 2005).

The USA has traditionally supported only a very limited apprenticeship program. The Federal and State Governments are responsible for managing the national apprenticeship system as prescribed by the *National Apprenticeship Act* of 1937 known as the Fitzgerald Act. The Federal Bureau of Apprenticeships and Training and the State Apprenticeship Agencies are responsible for registering the apprenticeship programs that meet the Federal and State standards.

The employers or labour/management sponsors providing registered apprenticeship programs are responsible for all the training costs and wages paid to their apprentices. The duration of the apprenticeship programs varies from one to six years. In contrast to the European countries where apprenticeships are viewed as a mechanism for providing vocational training for young people, in the USA, the registered apprenticeship training aims to provide employed adults with opportunities to upgrade their skills or retraining them (Wonacott 1992).

Jay Rojewski, the editor of the American Vocational Education Research Association Journal AVERA (2003) believes in the need to incorporate and nurture a clear, articulated emphasis on international issues relevant to career and technical education. Given the nature of the emerging workforce throughout the world and the international nature of work and national economies, it is clear that the issue of globalisation serves as a primary catalyst for career and technical educators in the United States adopting an international focus in research and educational programs (Doherty, 1998; Hobart, 1999; Zeszotarski, 2001).

Globalisation or internationalisation then refers to the United States' growing reliance on a worldwide market and an increasing interdependence of the world's economies on that market-place, as well as the diminished national autonomy that results. Trends towards globalisation, market deregulation, the worldwide influence of capitalism, and the need for knowledgeable workers have broad economic, social, and cultural implications that are reshaping entire segments of the US and other economies. Additional issues requiring an international focus on career and technical education include the growth of a mobile, global labour surplus poised to compete for jobs anywhere in the world. The restructuring, merging, and downsizing of many work organisations have resulted in a contingent workforce around the world that no longer enjoys job security (Herr, 2000).

The modern apprenticeship system in Australia has been viewed in the UK as being successful because the system has been expanded to include wider occupational and industry sectors (Robinson 2001). However, today there is increasing evidence that many countries are experiencing enormous changes to

work and the organisation of work (Marginson, 2000; Imel, 2001; Kerka, 2001) as a result of continuing economic changes brought about by rapidly globalising economies. These, together with quite profound social and cultural changes associated with these developments, call into question many of the assumptions that once underpinned earlier VET reforms.

2.4 Evolution of Apprenticeship Training in Australia and New South Wales.

A research study commissioned by the National Centre for Vocational Education Research (NCVER) into Australia's apprenticeship system was published in two volumes. The first volume, *Australian Apprenticeship: Facts, Fiction and Future*, by Robinson (2001) provides a comprehensive analysis of the development of apprenticeships in Australia. The rapid growth and transformation of the system over the past decade is examined in detail and proposals for the future of apprenticeships in Australia are explored. The second volume, *Australian Apprenticeship: Research Readings*, by Smart (2001) reports the findings of 11 new research studies into various aspects of apprenticeships, traineeships and new apprenticeships.

Robinson (2001) put forward the argument that apprenticeships are a long-standing system of combining training and employment so that people entering an occupation can receive instruction in the specific skills needed while working in that particular occupation.

2.4.1. Apprenticeships

Apprenticeships were a training system whereby the skilled (masters) passed on skills of their craft to novices. Apprenticeships have a long history dating back to the Egyptian and Babylonian times (Beattie 1968). However, the apprenticeship system as we know it did not emerge until the 14th century during the Middle Ages. Journeymen or artisans organised themselves into guilds or associations to protect payments and working conditions. It was through this system that apprenticeships became the mechanism for skill acquisition and entry to the guilds.

It was this system that spread to the New World, including Australia in the late 18th and 19th Centuries. In colonial Australia, apprenticeship practices were established on the basis of the British system, with conditions being governed through the English Law of apprenticeship relating to the master-apprentices relations. In the colony, as free settlers were few, the demand for skilled craftsmen was high and many convict tradesmen were offered pardons in return for their labour. In Victoria and Queensland the legislation which regulated apprenticeships also followed British Law. The first legislation anywhere in Australia governing apprentices that differed from British Law, timed served, was enacted in New South Wales in 1894. By the end of the 19th century, apprenticeship systems were well established throughout Australia. During the latter part of the 19th century Australia experienced considerable changes as a result of the Industrial Revolution as did Britain.

The Commonwealth of Australia was formally created in 1901. With the formation of the Federation, the responsibilities for education and training remained with State jurisdictions. At the beginning of the twentieth century (Beattie 1968, p.105), it was noted that the New South Wales Apprentice Act 1901:

- increased the minimum age for apprentices from 12 to 14 years of age;
- bound all apprentices by indenture and introduced a new “model” form of indenture;
- specified the persons who could bind apprentices under the Act;
- set the maximum term for an apprenticeship at seven years;
- set the maximum age limit for an apprentice by requiring all apprenticeships to expire when the apprentice turned 21 years of age;
- had a provision that no apprentice was to serve his master for more than 48 hours per week, with the exception of farmers and domestic servants;
- established procedures for the settlement of differences and disputes between master and apprentice; and
- incorporated penalties for breach of contract such as absents without permission.

The arrangements established over the first thirty years of the 20th century were extremely important in forming the foundations for Australia’s modern apprenticeship system. These arrangements were maintained up to the Second World War. During this period the system was stretched to the limit and when a skills shortage occurred, the industry resorted to the use of “dilutees”. Dilutees were people who had limited previous technical skills and experience, but who entered the industry for the first time to boost the civilian workforce.

The NCVER study also indicated that apprenticeships in Australia have mainly been confined to the skilled trades' occupations (i.e. MF&W, Hairdressing, Hospitality and Construction Trades). These jobs make up some 14% of all jobs in Australia which is an important proportion of the overall workforce.

Robinson (2001) explained that traineeships were introduced in 1985 to complement traditional apprenticeships by extending the coverage of "apprenticeship-type" training and employment to a much wider range of jobs across the whole labour market. Most of this training occurred within contracts of training of one year's duration combining both employment and off-the-job formal training. This type of training was mainly in the clerical and hospitality areas.

2.4.2 Milestones in the development of Australian apprenticeships.

With the formation of the commonwealth in 1901 also came the *NSW Apprenticeship Act of 1901* which was enacted establishing new regulatory arrangements that were followed in other States. These new regulatory arrangements included raising the minimum age for apprentices from 12 to 14 years and requiring apprenticeships to expire when an apprentice reached 21 years of age.

State Governments and territories of Australia enacted legislation that entrenched apprenticeships in industrial award systems, setting out rates of pay, hours and conditions of work during the period of 1901-1939.

During World War II period of 1939-1945 "Dilutees" (unqualified tradespeople) were introduced to industry to make up for the loss of skilled tradesmen who were serving in the armed services.

In 1946 the Tradesman Rights Regulation Act was passed to protect the rights of pre-war tradesmen who had returned from service in World War II. The Commonwealth Reconstruction and Training Scheme (CRTS) was established to retrain returning service personnel as quickly as possible.

Mr. Justice Wright carried out the first national inquiry in 1952 into apprenticeships in Australia and recommended that apprenticeship training periods be reduced to 4 years. By 1954 the national apprenticeship numbers had reached from 65,000 to 70,000 a rapid increase.

The first national apprenticeship body, the Australian Apprenticeship Advisory Committee (AAAC), was established in 1957 and the Commonwealth government established the first national scheme for financial support for those who took up apprenticeships in 1963.

By the late 1960's national apprenticeship numbers reached 100,000 for the first time and in 1973 the Federal government established the first national employer subsidy scheme, the National Apprentice Assistance Scheme (NAAS).

In April 1973 the Appointment of the Australian Committee on Technical and Further Education (ACOTAFE) was announced by the Australian Minister for Education, the Hon Kim Beazley.

The committee adopted two guidelines early in its deliberations on the nature and scope of the report:

- Recurrent opportunities for technical and further education (TAFE) should be available to people of all ages regardless of minimum formal educational entry requirements or of current employment status. Opportunities throughout life for recurrent education should give priority to the needs of the individual as a person and to his or her development as a member of society, including the

development of non-vocational and social skills that affect personality.

- The broader the approach in technical and further education the more the likelihood of creating an environment in which self-motivation may be regenerated in people who have lost it.

The committee emphasised that vocational courses in TAFE institutes should be relevant to employment opportunities; that there were problems of access to TAFE by various sectors of the community; that recurrent education has to be understood as a concept before it can be implemented as a social objective; and that teachers have to be prepared to help to create an environment conducive to active self-learning as an alternative to the present near-monopoly of teacher instruction within institutions.

The report found that there was a lack of reliable information against which the anatomy of TAFE institutions could be appraised. It also found that there was no comprehensive statistical data for a comparison to be made between States or confident analysis of trends in vocational education as evidenced by the growth or contraction of courses.

The committee reported that if TAFE was to fulfil its role and be accessible to adults without discrimination in the manner in which the committee recommended, research should take place with reference to the problems and the potential of TAFE as an integral part of the education system.

The Committee of Inquiry into Labour Market Programs, chaired by Justice Peter Kirby, was established in 1984 to review apprenticeships and other employment and training programs (i.e. pre-apprenticeships).

The inquiry into Labour Market Programs that was instituted by the then Minister for Employment and Industrial Relations, the Hon Ralph Willis MP in December 1983 led to the Kirby Report 1984. The inquiry was given a broad charter to examine labour market policy and programs and the context that has been developed, and to recommend improvements. The consultation phase of the inquiry lasted eight months from February to September 1984. During that time the committee received over 6000 pages of written submissions. The committee also visited each State and Territory to listen to the views of interested individuals and representatives of employers, trade unions, community organisations, industry training committees, government departments and academic institutes.

The committee interpreted the terms of reference in which they focused on the fundamental, philosophical, systemic and structural questions that needed to be resolved to develop a coherent framework for government intervention into the labour market for a new direction for the labour market policy in Australia.

The state of the future labour market and the demands it would make on institutions, organisations and people could not be predicted accurately at that time. While full employment was a major commitment of the government, it would not be a sufficient rationale or organising principle for labour market intervention.

The inquiry through a new strategy for labour market intervention suggested that the Government must attempt to fulfil this commitment to full employment mainly through conventional macroeconomic policies, which expand employment. The committee at the same time thought that it should encourage people to move more freely from employment to retirement, between employment

and education and training, and from full-time to part-time employment or education and back again. The report predicted that there would be substantial gains for the individual and community if greater freedom was achieved in timing of work, the extent to which people worked, and the way in which they combined work with education, training, family responsibilities and leisure. This, they forecast, would translate into a commitment to full employment that embraces the concept of recurrent education and training that meets with the people who wanted to acquire new skills and update their existing skills to cope with a variety of situations, both at work and outside of it. The aim of this approach was to reduce the number of people who at that time had no opportunity to participate in education, training and employment, either full or part-time.

The view of the committee on full employment provided a setting for enunciation of the objectives of labour market policy. Against this background employers and unions could develop new approaches to education and training of those in employment, those responsible for post-secondary education, training and other labour market programs that could take greater account of combinations of employment, leisure and learning than they did at that time. Jobs were the currency of the labour market and access to employment was there for a central concern of labour market policy. The committee believed the latter was of paramount importance to all Australians.

The committee suggested that the most appropriate rationale for labour market policy was to help people control and direct their working and non-working lives. This implies an approach which focuses on the individual and an individual's needs, and a set of priorities which reflects those measures which can

enhance the experience, knowledge and skills of people, and hence their long term employment prospects. Commitment to this approach would lead to a greater attention to education and training in the mix of labour market programs. An increased emphasis on education and training would also assist employers and the economy by developing the nation's skill base and the capacity of the labour force to adjust.

The recommendations for change by the committee to an existing array of programs administered by the Department of Employment and Industrial Relations were concerned with two major goals. The first was the introduction of new traineeship arrangements intended to expand the range of training opportunities available to young people. The second was the rationalisation of the labour market programs into more compact and less complex arrangements.

The recommendations that had an impact on NSW TAFE were:

Technical and Further Education (TAFE) statistics should be developed into a consistent national series of commencements and completions by field of study.

- A system of traineeships combining work and formal education and training should be developed, initially for young people.
- The new traineeship system should have the following basic features:
 - ◇ formal off-the-job education and training complemented by work in a related occupation;
 - ◇ training arrangements and conditions should be consistent across States and Territories;
 - ◇ TAFE should be the predominant provider of the off-the-job component, but industry and private organisations should be encouraged to participate; and
 - ◇ the program should be appropriately accredited and provide avenues to further accredited education, training and employment.

- To improve the quality and relevance of instruction there should be much greater interchange between industry instructors and TAFE teachers, supported by the TAFE council's grants to States.
- State training authorities, industry training committees and TAFE should continue to develop (where justified) industry skills centres, and TAFE should co-operate with industry and commerce when making arrangements for the recurrent education of teachers and on-site training of TAFE students.
- The Commonwealth should extend to the TAFE sector the financial support it makes available to the other sectors of post-secondary education to provide emergency assistance to students in need.
- The Commonwealth should establish, through legislation, a National Council for Training and Employment. (Kirby Report 1984:17-23)

The Australian Traineeship System (ATS) was established in 1985 and in 1988 there were about three-quarters of a million enrolments in TAFE and Adult Education courses of all kinds. The extent of post-school and mature age commitment to, and investment in, educational programs was a striking indicator of its crucial role in a society of accelerating change.

Government recognised this emergent demand for all kinds of educational training. While it was widely recognised that TAFE had a vitally important role to play in the State's economic well being, it was also at a crossroads for several reasons.

Firstly, industry's demands on post-compulsory education and training had grown enormously, and would continue to grow. Virtually all growth industries at that time were knowledge based, and new processes and techniques required constant retraining and new training. Secondly, industry demands were increasingly becoming customised in character, requiring new kinds of courses

and forms of delivery. This was not simply a logistical challenge - it required a shift in managerial mind-set. Third, TAFE inexorably had to move into a vastly more competitive environment in the marketplace. Technical and Vocational Education had to become obviously a fast-growth business. In some areas private providers had taken more than half the market, even though they charged commercial fees in the areas where TAFE's courses were basically free (Scott 1990: xiii-xv).

TAFE's rapid growth since the Kangan Report of 1974 has been matched by enormous diversification of its range of courses. However, managerial capacity to cope with the expansion and spread had lagged. The Management Review of TAFE NSW found that it was operating at a level far below its potential in terms of value and effectiveness.

A major restructuring of TAFE was called for and the Review's initial briefing paper, *TAFE Restructuring*, outlined a strategic approach to achieve this.

The Scott Report (1990), commissioned to deal with Technical, Further and Adult Education, was part of the Management Review of NSW Education Portfolio. It was presented to the then Minister for Education and Youth Affairs, the Hon Terry Metherell MP on 4 June 1990.

TAFE's Commission for the 1990's sought to expand on the general recommendations presented in *TAFE Restructuring*, providing, in particular, more detailed analysis of a number of issues and areas where there appears to have been some uncertainty or controversy. This report was not as detailed as the Review's report on school education, *School-Centred Education*. This was because the core recommendation in the report was to establish a TAFE Commission

(TAFECOM), to provide a radically new organisational framework within which TAFE could operate. The TAFE Commission's Board of Directors would need to make many judgements on directions and priorities, and the Management Review did not wish to disrupt its freedom to do so by being overly prescriptive in spelling out the details of its proposals.

The restructuring of TAFE as TAFECOM had fundamental implications on both management and financial fronts.

On the management side, the challenge was to build a more responsive, high quality education enterprise, rather than the centralised, sluggishly bureaucratic educational administration, which had existed. Great improvements were needed in productivity: substantial upgrading of quality control; a full transformation of human resource management; and the introduction of an entrepreneurial marketing approach.

Financially, TAFECOM had the challenge of becoming at least 50% self-funded by 1999 (a target which had not been reached by 2003). There were three major areas which in the Review's opinion, were capable of achievement:

- Productivity improvement opportunities, as implied above, are abundant in TAFE. Greater delegation of authority, reduction of the central executive staff numbers by about 66%, better utilisation of facilities and resources, and removal of a whole series of deleterious work practices which have been rife in TAFE, should have provided savings reaching 25% during this period through greater internal efficiencies.
- Fee-for-service courses, including, importantly, education export services, should have been capable of netting more than 5% of TAFE's total budget by the late 1990's. NSW TAFE's achievements in fee-for-service courses had so far been minimal, and despite the enthusiasm of some institutes in NSW, others lagged well behind a number of other State institutes.

- Industry contributions, as firmly pointed out in TAFE restructuring, have been much less than appropriate. The legacy of the “free education” era of the 1970’s had led many companies to take for granted the courses offered by TAFE. Many in industry openly acknowledge that the “user-pay” principle must now apply to a good deal of technical and vocational training that TAFE supplied (Scott 1990: xiii-xv).

The Scott Report (1990) indicated TAFE NSW could legitimately boast of some remarkable achievements. During the next decade (the 1990’s) its potential and its national importance would be even greater. While the changes proposed for TAFE NSW were fundamental, the new structures introduced (that of 22 Institutes) would in the mid 1990’s be reduced to 11 institutes. Due to the duplication of services this structure is currently under review again as it is becoming uneconomical.

The 1991 Finn Report advocated the convergence of general and vocational education with both individual and industry needs focusing in that direction. There was an increasing realisation internationally that the most successful forms of work organisations were those which encouraged people to be multi-skilled, creative and adaptable. At the same time schools were broadening their programs and curriculum to offer greater access to vocational education for the increasing proportion of young people staying on past Year 10. There was also a related process of convergence between the concepts of work and education. Increasingly, as regular updating of skills and knowledge become essential to maintaining and enhancing productivity in the workplace, the concepts of working and learning would converge.

This view implied that in order to serve their clients' needs, both school and TAFE would need to change:

- Schools would need to become more concerned with issues of employability and provision of broad vocational education;
- TAFE would need to recognise that initial vocational courses must increasingly be concerned with competencies that are more general than those which, for example, characterised the traditional craft-based apprenticeship.
- All parties in industry would need to take a more active role in the development and support of on-going training, which is integrated with employment.

The committee believed that Australia should continue to develop both the quality and quantity of skills and knowledge in our society in general and our workforce in particular. This meant that there should be continuing growth in education and training in all educational sectors and in the workplace. The growth and skills were required across a wide span of disciplines and occupations, not just those which had been associated traditionally with higher levels of education. As part of that process the committee recognised a need to re-emphasise the importance of vocational education and to recognise its increasing convergence with general education (Finn 1991: 1).

The Finn committee (1991:2) also believed that these imperatives should be recognised in the establishment of a set of new national targets for post-compulsory education and training which encompass schools, higher education, TAFE and other training, and which identify target levels for attainment as well as participation. In essence, the committee proposed that almost all young people should take sufficient post-compulsory education and training to complete Year 12

or some other initial post-school qualification, and at least half should go on to higher levels.

Age restrictions in apprenticeships were removed in 1992. It was about this time, a committee to enquire into Competency Based Training was appointed with Laurie Carmichael, a retired prominent union leader, as the chairperson. The letter from the Minister for Employment, Education and Training, the Hon John Dawkins MP, asked for advice on the following issues:

- a new integrated entry level training system for Australia;
- Commonwealth subsidies for employers under the CRAFT (apprenticeship) and Australian Traineeship System (ATS);
- allowances for education and training, including the possible extension of AUSTUDY to part-time students and people being trained by private providers of vocational education and training; and
- co-ordination of consultations on the above three matters with those relating to the council's discussion paper *TAFE in the 1990's: Developing Australia's Skills*.

The Minister requested that Employment and Skills Formation Council (ESFC) should take into consideration the changes proposed in the Finn Report (1991) on post - compulsory education and training (Minister's Letter to Carmichael 1992).

The ESFC was able to propose a new entry training system with a range of quite advanced features. The system builds on the "Finn Committee" report on post-compulsory education and training. It further developed the means of meeting the growing convergence of work and learning and of general and vocational education.

The ESFC saw the fundamental task of devising a system that would extend structured entry level training for that large number of young people who did not have the opportunity to participate. At the same time the system needed to be able to retain the good features of existing entry level training, particularly of apprenticeships. It also needed to ensure a real advance in access and equity.

The vocational certificate training system recommended by the ESFC met the requirements. It was capable of providing vocational education and training opportunities to the Australian Standards Framework (ASF) level 2 (or higher) for virtually all school leavers by:

- increasing the occupational and industrial areas covered by articulated structured training arrangements;
- providing multiple flexible pathways to accommodate the needs and circumstances of most young people;
- contributing significantly to the task of producing a more skilled and productive work force and generating new employment opportunities in an internationally competitive market; and
- facilitating the articulation of the credentials held by young people with career paths established in most occupations and industries through the award restructuring process (Carmichael, 1992: v).

The ESFC's advice had been prepared in the light of extensive consultations and debate. The Council recognised that acceptance and implementation of its advice would require some fundamental institutional and cultural adjustments by sectors of the community.

The report outlined a staged strategy for meeting Australia's training needs for the future and was not a short term response to the current levels of

unemployment, but an essential part of a broad structural reform. (Carmichael 1992: v-vi)

Changes that occurred improved international competitiveness to complement changes to work organizations and industrial relations, and to improve the coverage, quality and equity of vocational certificate training in Australia.

The ESFC proposed that a competency based Australian Vocational Certificate Training System be established. The focus of a competency based training (CBT) system was on outcomes, the attainment and demonstration of specified knowledge, skills and application by an individual, rather than on inputs, such as time served.

Education and training pathways in the system would provide training in the key area's of competencies as well as vocational competencies. All pathways provided recognition of prior learning, and articulation and credit transfer to higher levels of competence.

The ESFC found the key area's competencies were generic competencies, which underpin the acquisition of vocational, and occupation-specific competencies. The National Training Board's (NTB) ratified vocational competency standards were seen as the mechanism through which a CBT system could operate to ensure that vocational education and training could be delivered to meet the needs of the industry.

The ESFC was impressed by the level of support for the introduction of CBT, and advocated an accelerated implementation of CBT in all industry sectors and almost all enterprises by 1995. However, modification of the Australian Standards

Framework, particularly levels 1 and 2, was clearly necessary (Carmichael 1992: vii).

The ESFC proposed that apprenticeships and traineeships should merge into the new Australian Vocational Training System, which would provide a flexible range of fully articulated, substantially work based, vocational certificate training pathways.

TAFE should develop as institutions with a predominant focus upon advanced vocational education and training, from AFS certificate 2 levels up to a diploma level.

Closely linked local networks of Senior Colleges, TAFE Colleges, and private and community providers of “off-the-job” education and training, including arrangements for work experience and “on-the-job” training with local firms, skill centres and group training companies should be developed for the flexible delivery of vocational education and training. The networks should incorporate open learning methods.

The ESFC proposed a flexible approach, having each industry or enterprise develop preferred plans for work based vocational certificate training by the end of 1993. However, to ensure that implementation of competency based vocational certificate training was achieved by 1995, the State and Territory training authorities should be vested with authority to negotiate and supervise at the industry or enterprise training levels which define the obligations of employers and trainers under work based training programs (Carmichael 1992:viii-ix).

The National Employment and Training Taskforce (NETTFORCE) was established in 1994-95 to encourage employers to take on more traineeships and

the Australian Qualifications Framework (AQF) was established in 1995 as a single integrated national system incorporating all qualifications from senior secondary schooling, vocational education and training and university.

The New Apprenticeship System was set up in 1998 to combine apprenticeships and traineeships into a single integrated system. User choice was introduced to enable a choice of registered training providers (RTO) and New Apprenticeship numbers (incorporating apprenticeships and traineeships) expanded rapidly to reach 275,000 by June 2000 (Robinson 2001:xviii).

2.4.3 Metal Industry Award 1984 Provision on the Implementation of Competency Standards Guide

2.4.3.1 Competency Standards

In 1997 Commissioner Justine Oldmeadow handed down a variation to the Workplace Relations Act 1996 which inserted the Competency Standards Implementation Guide. To understand the guide an understanding of competency standards and how they work is required.

Competency standards are a set of descriptions of the level of skill and the depth of knowledge employees require to work competently at various skill levels in an industry. The industry parties (the unions and employer organisations) have agreed that they are the national benchmark for the recognition of skills. They are *national* because governments have agreed that these Competency Standards, once endorsed by the parties of Manufacturing Engineering, and Related Services Industry Training Advisory Board (MERSITAB) and the Standards and

Curriculum Council (SCC), form the basis for the recognition of skills, accreditation of courses and the ability to transfer qualifications across Australia.

Each description is called a "competency unit". In the metal and engineering industry, these competency units were developed by the National Metal & Engineering Training Board (NMETB) in conjunction with employer groups and unions. They have been arranged into levels which can be matched to the levels in the award classification structure. The National Metal and Engineering Competency Standards have been endorsed by the MERSITAB and the Standards and Curriculum Council (SCC), and they form the basis of curriculum development for training programs accredited by the State Training and Accreditation Authorities, and for workplace recognition of skills.

Workplace recognition of skills means that an employee's skill is recognised by the employer and also in the pay and classification structure. Such recognition may also be accepted by the training system, for the purpose of "advanced standing" (that is, training credits) in courses, or for issuing national qualifications.

The Competency Standards for the metal and engineering industry consist of over three hundred separate competency units which identify the elements of skill and performance criteria necessary to perform a vast range of jobs in the industry.

Some examples of competency units follow. They show a wide range of types, tasks and skills presently covered by the Competency Standards. These are:

- Use hand tools
- Work with others in a team
- Apply quality procedures
- Weld using gas tungsten arc welding process (GTAW)
- Perform jig boring operations
- Plan a complete activity
- Terminate and connect electrical wiring
- Purchase materials
- Perform emergency first aid
- Perform laboratory procedures
- Communicate in formal interpersonal situations
- Tool and die maintenance
- Diagnose and repair microprocessor based equipment
- Modify fluid power system operation
- Mechanical assembly

The large range of competency units gives the employer ample scope to describe the skills needed for the full range of jobs the enterprise has. Competency units for a particular job or skill area are described as "job profile" or a "skill profile". The employer can package competency units together to cover and define each particular job or skill area to help identify the requirements for a

classification level, and to help identify the training needs for a job or skill area.
(Oldmeadow, 1997:3-5)

The move to a competency-based training system gained momentum in the late 1980's as part of a national strategy to reform the training system. In developing Competency Standards since then, employer organisations and unions have been part of a national movement towards a training system that is more relevant to industry's needs, and in which these needs dictate the training that is carried out. The aim has been to integrate more closely education and training with the use of skills in employment, and enhance the skills base of the industry. So the development of Competency Standards in the metal and engineering industry was being matched by similar activity in other industries throughout Australia at that time.

In changing the way we train and the way we work, one of the major initiatives of the Metal Trades Industry Association (MTIA), Australian Chamber of Manufactures (ACM) and the metal trades unions was to create a new 14-level classification structure in the award. The industry parties began this process, costly and outdated procedures were common in the work environment, and there was no career path for many workers. They consider that a classification structure based on *skills* was essential to reform in the workplace, to recognise and make the most use of employees' skills.

To achieve this reform, what was needed was to:

- encourage people to acquire a wider range of skills (called "multi-skilling");
- reduce barriers to employees using their skills and training;
- redesign work;
- introduce a wider range of career path options;
- recognise employees' additional skills through reclassification; and
- develop a more consultative and participative approach to work and management structures - this includes of more cooperative and team-based approach to solving problems at work. (Oldmeadow, 1997:5)

The first role of the National Metal and Engineering Competency Standards was to form the basis for all national metal and engineering curriculum design, the accreditation of training courses, and the issuing of national qualifications. It applies to all accredited training provided by TAFE or by private providers (including companies that are registered providers RTO).

The existing national TAFE curriculum for metal and engineering training has been compared to these Competency Standards. Where necessary, the curriculum was modified to reflect them. The curriculum consists of accredited national training modules.

Through the National Metal and Engineering Competency Standards, it was envisaged that there would be:

- uniform recognition of skills nationwide, regardless of whether that skill is acquired on the job or through a formal course;
- articulation, i.e. there is no need to repeat training - completion of the relevant parts of one course counts towards the completion of a higher-level course;

- advanced standing (that is, credit) given for skills already held; and
- transfer of training credits between courses and registered private providers and TAFE. (Oldmeadow, 1997:6)

The second role of the Competency Standards was to provide an objective tool to help the employer recognise skills needed in the industry and workplace.

They did this by providing:

- skill descriptions that are recognised industry-wide;
- a way of assessing whether an employee has the skills to match the requirements of their position within the enterprise;
- a way of accurately identifying any gap between the skills an employee has and the skills they need to perform that particular job within the classification to which they have been assigned;
- a tool to help you identify the additional training that an employee needs to close the "skills gap" (the gap between the skills the employee has and what they should have for work they are required to perform); and
- a means of checking whether an employee's classification is appropriate. (Oldmeadow, 1997:6)

The industry was committed to Competency Standards because of the gains to be made in work reorganisation, skills enhancement and labour flexibility; and the opportunities for employees, who will gain access to career paths, skills portability and work classification based on competency. It was expected that the implementation of the Competency Standards would revolutionise the training system in the industry and enable the 14-level classification structure to operate as it was intended. The Competency Standards are designed to:

- help identify the skills needed to carry out existing jobs and new jobs in a more objective, precise and comprehensive manner;
- facilitate work reorganisation and job redesign based on higher, broadly based skills;
- help the employer assess the current skills gap in order to develop training plans at the enterprise, as provided for in clause 6C, "Training", of the award;
- provide a flexible data base of skills needed in the industry that reflects the industry's changing skill needs and provide a basis for determining formal training curricula;
- facilitate and encourage workplace change and skill development across the whole industry;
- provide the mechanism for appropriately classifying employees and giving them access to a career path; and
- provide the basis for nationally recognised and portable qualifications that can be used in a wide range of industries, and for industry leadership of the education and training system, including better integration of on- and off-the-job learning and improved recognition of prior learning and transfer of learning credits. (Oldmeadow, 1997:7)

The Competency Standards were available to be used by all enterprises covered by the award. From 18 March 1996 there was a requirement to use the Competency Standards and this guides whenever management, employees and the relevant union or unions at the enterprise had agreed to implement them. This requirement to use the Competency Standards and the Guide also applies whenever there was a query about the classification of an employee except where that employee holds the minimum training requirement for the classification he or she is seeking. (Oldmeadow, 1997:8)

There had been a number of trials of the standards and there was also a Model Implementation Program where a number of enterprises introduced the Competency Standards in a carefully monitored way.

During 1996 a number of special procedures were put in place to facilitate the introduction of the Competency Standards.

- There is a National Oversighting Committee which is chaired by a member of the Commission which meets regularly to monitor the implementation of the standards. This committee is also oversighting necessary reviews and refinements and coordinating further information and advice to enterprises.
- Enterprises are required to forward all skills profiles finalised at the end of the implementation process for jobs currently classified above C10 to the National Oversighting Committee to allow for proper monitoring of implementation.
- Where a party at an enterprise is concerned about the implications of any skill profile which involves significant use of toolmaking, electrical, electronic or instrument units arrived at through the first four steps of the process, then the process shall not proceed to implementation of Step 5 (reclassification), for those profiles until it has been considered by the National Oversighting Committee. That committee will make a recommendation to the parties at the enterprise to ensure that the outcomes are consistent with the Guide and the Competency Standards.
- Special procedures apply where there is a dispute about the implementation of the Competency Standards. Problems or disputes at an enterprise level are to be dealt with by the relevant industry parties or the parties at the National Oversighting Committee. If they are not resolved they are referred to a Board of Reference constituted to deal with Competency Standards implementation. If more major concerns arise the award sets out further steps to be followed by the parties and the National Oversighting Committee. (See clause 6E appendix L). (Oldmeadow, 1997:8-9)

The function of the Competency Standards was never intended to replace the minimum training requirements in the award. Rather, they are a way of helping to determine an employee's skill level, particularly when they do not hold the minimum training requirement in the form of a recognised qualification for a classification level in the award.

If an employee holds the minimum training requirement for a particular classification level in the award, and they use or will be required to use those skills in their job, then the employer must establish a base classification for them on the basis of that qualification, *not* the Competency Standards. The base classification is the classification associated with the minimum training requirement the employee holds that is relevant to his/her employment. If any problems arise during the implementation of the Competency Standards that cannot be resolved through the consultative mechanism in the enterprise, then the matter should be referred to the employer association or the union or unions. (Oldmeadow, 1997:9)

The Competency Standards are useful as a tool for:

- ensuring employees are correctly classified under the Award;
- reorganising and designing work;
- identifying training needs; and
- classifying new jobs.

To implement the Competency Standards the employer should use the five-step process:

- Step 1: Consultation;
- Step 2: Skills analysis and redesign;
- Step 3: Matching skill requirements to the Competency Standards;
- Step 4: Skills audit; and
- Step 5: Implementation.

Before implementation, it is important that understanding the industrial relations principles will need to be followed during implementation. (Oldmeadow, 1997:25-26)

The insertion of the Guide into the Act had an impact on industrial relations issues, competency standards and training. Competency Standards were implemented throughout the industry from the 18th March 1996 (see clause 6E of the Award Appendix L). (Oldmeadow, 1997:26)

The way the enterprise implements the Competency Standards must be consistent with the principle issued by the Australian Industrial Relations Commission in its February 1989 Review of Wage Fixing Principles in relation to skills acquired and used. In plain English, this means that when the parties are working out what classification level an employee should be classified at, and therefore how much his/her should be paid, the only skills that need to be taken into account are the ones he/she uses for the job. This applies no matter how the employee acquired his/her skills, whether through accredited training or in some other way.

The whole idea of the Competency Standards was to improve people's skills throughout the industry and in this way increase everyone's efficiency and productivity. Accordingly, provided it is consistent with the enterprise's needs, employers should provide every reasonable opportunity for employees to use the skills they have gained.

2.4.3.2 Classification Levels

When determining what classification level to classify an employee at, the parties at the enterprise should carefully determine the skills that the employee needs to do his/her job in the enterprise. Any skills he/she may have that the enterprise does not need do not count. But if the employee does have skills he/she is not using at present, but which could be useful and productive for the enterprise, it makes good sense to explore (through the consultative mechanism) ways of putting those skills to good use and to classify the employee accordingly. To maximise productivity, efficiency and flexibility, the emphasis should be on expanding the skills base in the enterprise through a structured approach to work reorganisation and training using all relevant skills. (Oldmeadow, 1997:26-27)

When the enterprise is implementing the Competency Standards, the parties may identify skills which are not regularly used by an employee. These skills may be included in training plans and in the skill or job profile agreed on for work in the enterprise.

When considering these skills, note that:

- When the skills are needed occasionally but are regarded as part of the employee's duties and are used when needed, then they count towards the employee's classification.
- When the skills are *not* regarded as part of the employee's duties, and are only used when the employee is specifically requested to do so, or is temporarily transferred to a different position, then by agreement the skills could count towards his/her reclassification, or the "mixed functions clause" in the Award could be used.

It is recommended that the employer take a broad view when the skills used in a position are being defined and the parties should distinguish the skills used from a narrow definition of the tasks performed so as to increase the flexibility available to the employer and the career path and the opportunities for skill recognition for the employee. (Oldmeadow, 1997:27)

The effect of reclassification on the actual wages of an employee will vary as outlined in the following examples:

- When the extra skills or knowledge identified in the Competency Standards are *exactly the same* as the ones for which the employee is already receiving a *specific* additional payment (such as through a certified agreement, or an Award or over-Award payment), then there is no double counting. Any increase as a result of reclassification may be discounted by the specific additional payment already received - in other words the additional payment already received can be subtracted from any increase due to reclassification.
- When there are already other employees in the enterprise doing work of a nature similar to the employee being considered for reclassification, and they are correctly classified at the higher level, then the rate of pay should be based on the employee's skills and competencies, taking into account the rate already being paid to the employees who are at the higher classification level.
- When there are *no* other employees in the enterprise already doing work of a nature similar to the employee being considered for reclassification, then a new wage rate for the higher level will need to be determined for the enterprise. This should provide at least a wage increase of the difference between the minimum Award rates for the

employee's old classification level and the minimum Award rates for his/her new classification level. (Oldmeadow, 1997:28-29)

Competency Standards, the classification of employees and minimum training requirement, are when:

- an employee has a qualification that is recognised as the minimum training requirement for a classification level in the Award; and
- he/she is using or will be required to use the skills and knowledge gained from that qualification in accordance with the needs of the enterprise

In these instances he/she must be classified at that level, consistent with the minimum training requirement.

This also applies to any training which a registered provider (such as TAFE) or a State Training Authority (STA) has recognised as equivalent to an accredited course which the NMETB recognises for that level. This can include advanced standing (i.e. credits for a training program) through recognition of prior learning and/or overseas qualifications.

This means that an existing employee or a new employee can progress beyond the level in which he/she has been initially classified, if he/she possesses a Certificate, Diploma, Degree or part-qualification specified for a particular classification level. For example, an employee with a Trade Certificate and currently classified at C10 can progress to C9 when he/she has completed three appropriate additional Modules of:

- training in addition to the requirements for C10 level; or
- an Advanced Certificate; or

- an Associate Diploma;

and is using or will be required to use the skills in accordance with the enterprise's needs.

Note that governments are currently implementing changes to national qualification titles. The new titles for the qualifications in the Australian Qualifications Framework will be: Certificate 1; Certificate 2; Certificate 3; Certificate 4; Diploma; and Advanced Diploma.

Another example is the case where an employee can progress from C13 to C12, when he/she has completed an Engineering Production Certificate level 1, and is using or will be required to use the skills gained from the EPC (Engineering Production Certificate) in accordance with the enterprise's needs. (Oldmeadow, 1997:29-30)

In 1990, employees under the Award were transferred from the old classification structure to the new 14-level skills-based structure of the new Award. The Award outlines which old classifications are to be associated with each new level. Any new employee joining an enterprise between 1990 and when Competency Standards became available had been classified by referring to the old structure and then transferred to the new classification structure. For example, a person employed to work under the old definition of Boilermaker would be classified in the new structure at C10, and a Storeman and Packer would be classified at C12.

In addition, employees who acquired and used the appropriate formal qualifications specified for a particular level under the old classification definitions continued to be reclassified to the new level corresponding with the old level.

From 18th March 1996 (see clause 6E of the Award Appendix L) this only applies where Competency Standards are not available in respect of that class of work and this is necessary for determining an employee's classification. From this date, employees will be classified within the Award classification structure according to the minimum training requirements or by assessment against the Competency Standards in all areas for which Competency Standards have been completed. (Oldmeadow, 1997:30)

If management, employees and relevant union or unions at the enterprise have agreed to implement the Competency Standards or if an employee or a union makes a reclassification claim, the Competency Standards can be used to determine the appropriate Award classification level of employees. (Oldmeadow, 1997:31)

As previously mentioned, using the Competency Standards and the Weighting points system to classify employees may have implications for wage levels in the enterprise. However, more time is needed looking at the impact of the Competency Standards on an employee's classification level and what that might mean in terms of additional training and existing qualifications.

In the arrangements for transfer to the skills-based classification structure under the Award in 1990, employees were transferred to the new classification structure on the basis of their classification under the old structure. This first phase of moving to a skills-based classification structure was simply a paper exercise.

Once an employee has transferred to the skills-based structure, he/she can be reclassified on the basis of meeting the minimum training requirement specified for a level in the Award. The minimum training requirement is also met by a training qualification or course recognised by a registered provider as being equivalent to a course recognised by the MERSITAB for that level (such as an Engineering Production Certificate, Trade Certificate, Advanced Certificate, Degree etc.).

An additional method of reclassification is now available, based on the employee meeting the requirements of the Competency Standards for a particular level, as determined by using the process outlined in the Guide.

If Competency Standards have not been finalised for a particular skill or work area, and the skills required for the area are necessary for determining an employee's classification, then reclassification using the Competency Standards has to be delayed until Standards are available for that classification. However, in

the meantime reclassification procedures can be used, based on the minimum training requirement or meeting the old Award definition requirements.

When Competency Standards have been implemented, the “indicative tasks” listed in the classification definitions will be deleted as they will no longer be relevant in determining the appropriate Award classification. (Oldmeadow, 1997:31)

When an employee possesses the necessary minimum training requirements specified in the Award definition for a particular classification level (e.g. Trade Certificate at level C10), and if he/she is doing work at that level, then he/she must be classified and paid accordingly. Although an employee may possess a qualification such as an Engineering Production Certificate, Trade Certificate, Advanced Certificate or Associate Diploma, this does not mean Competency Standards have no relevance for him/her. In relation to employees with qualifications, Competency Standards may be used to determine what competencies the employee has which may count towards a classification higher than that warranted by the qualification he/she actually possesses.

2.4.3.3 Toward Higher Classification Levels

In determining whether an employee with a qualification should be classified at a higher level, it is first necessary to obtain agreement on the *base* from which any additional competencies can be assessed - hence “Base Competencies”. For example, take an Engineering Tradesperson with a Trade Certificate who is currently classified at C10. It would be necessary to determine

which of the Competency Units in the list compiled for the job or skill area are associated with the employee's classification at C10. Having done this, these competencies would constitute the Base Competencies for any individual working in that job or skill area.

Base Competencies consist of the following:

- Those competencies acquired in gaining the qualification. Thus, all the competencies acquired in the course of undertaking an apprenticeship, for example, are regarded as part of an employee's Base Competencies.
- Those competencies which are commonly used by other employees in the workplace doing work of a similar nature at the same classification level as the employee concerned, provided that:
 - these competencies are generally regarded in the workplace as required for the performance of work at that classification level corresponding to the qualifications held by the employees; and
 - those competencies are consistent with the Award definition for that level

This ensures, for example, that the Base Competencies for C10 include all those expected of a competent tradesperson at that level in the enterprise.

This could include:

- competencies acquired through on-the-job training and experience during an apprenticeship;
- competencies commonly acquired at the enterprise as part of the necessary qualification for C10, but which may have been acquired subsequently by other employees doing similar work at your enterprise
- competencies accepted as necessary for doing work similar to other people already employed in the enterprise to use their trade qualification skills to perform work which is at the C10 level; and

- Competencies which are of an incidental and peripheral nature - that is, competencies which are not essential for classification at a particular level, but which contribute to the employee's ability to perform a whole job or task.

In deciding through the agreed consultative process whether the skills are incidental or peripheral, the principal test is what is fair and reasonable taking into account the employee's award classification definition, his/her competence and training and the enterprise's training requirements. Just because certain skills are not usually needed at a particular classification level, it does not necessarily mean that they are therefore "additional" skills. Usually, any skills gained through formal technical training, additional to the relevant qualification, are not incidental or peripheral.

2.4.3.4 Additional Competency Category

The employer cannot take any of those competencies into account for the purpose of determining whether an employee should be classified at a higher level.

This ensures that when skills are in the Base Competencies category for a group of employees doing work of a similar nature at the same classification level, the skills cannot count for reclassification for anyone in the group. If an individual employee does not have the skills specified in a particular Competency Unit in the Base Competencies category, he/she cannot count that unit towards reclassification when he/she acquires those skills.

When the employer are using job or skill area lists for a broad skill area, the employer may need to create different Base Competency categories for the various

relevant qualifications (such as for those with a machinist qualification background or those with a maintenance qualification background).

Additional Competencies are any competencies held and used by the employee which are additional to the Base Competencies. They may count towards classification at a higher level. The Competency Units in this Additional Competencies category could, for example, be skills that are now required as a result of technological change or changes within the workplace.

By agreement between the parties in the enterprise, needs to decide on which Competency Units in each relevant job or skill area list are Base Competencies and which are Additional Competencies.

It does not matter which the employer do first. Once the employer has identified one category, the rest of the Competency Units fall automatically into the other. Clearly the employer needs to do this exercise separately for each relevant qualification and its associated classification level.

After identifying from within the Additional Competencies category the units held by each individual:

- add up the Weighting Points total for each employee;
- identify the Core Band points; and
- identify the Specialisation Band points.

The employer then needs to compare this result which indicate how many additional points of what type are required to move from the base classification (associated with the qualification) to a higher level. The outcome will be one of the following:

- The result meets the requirements for a higher classification - in this case the employee is reclassified.
- The result meets the requirement for the existing classification only - this would apply when the total of the Weighting Points is less than that required for classification. There is no change in the employee's classification, but future training and career path opportunities may be identified.
- The result does not meet the requirement for the existing classification - this could only apply if the employee was already classified at a level higher than the classification applicable to his/her qualification, such as an employee with only a Trade Certificate who is already classified at C8. The provisions described under "Gap training" apply when the employee is seeking to progress to a higher classification level (Oldmeadow, 1997:36).

It should be noted that after properly considering what may or may not be included in the base and ensuring that those competencies included in the base are consistent with Award definitions, then as an example, these may be more or less than 96 points in a C10 base. (Oldmeadow, 1997:33-36)

As part of his/her career progression, an employee who has worked in one skill area may need to change to a new skill area. Such an employee may need to pick up some fundamental grounding in the new skill area. That is, the employee may not have the prerequisite skills or the incidental and peripheral skills held by other employees who have customarily worked in the new skill area in your enterprise.

It is a fundamental principle of the flexible career path and Competency Standards model that individual employees at the same classification level may have a different mix of skills and competencies. Such diversity increases the flexibility and skills available to the employer. However, there need to be some limits on the extent to which employees with qualifications performing similar work are classified at different levels.

On occasion, the parties at the enterprise might agree that in order to provide for a career path (consistent with the enterprise's agreed training plan) an employee needs to move to a new skill area and hence would need to complete training in addition to that required for other employees who have traditionally worked in the skill area the employee aspires to. In this case:

- The employee is to be reclassified when he/she completes and uses the amount of additional training specified by the minimum requirement of the Competency Standards for the movement to a higher level.
- The extra training undertaken because of the need for additional prerequisite skills cannot count towards further reclassification to an even higher classification level. This only applies when, because of the career path the employee is following, the range of skills he/she originally used are no longer required in the new classification (Oldmeadow, 1997:37).

Of course, there will be many occasions when a change in work duties will be accommodated within an employee's existing classification level.

2.4.3.5 Assessment of Competency

Following this procedure means that employees in the enterprise who have traditionally worked in the skill area are not disadvantaged in terms of further

career progression compared to those who have come from a different skill area. Without this arrangement, those from a different skill area would be on their way to a higher classification. It also means that the employer does not have to pay extra for skills that are no longer required. (Oldmeadow, 1997:36-37)

If during the implementation of the Competency Standards into the enterprise any of the parties believe they are being placed under undue duress, should not proceed until the problem is resolved.

If this or any other problem arises when implementing the Competency Standards in the enterprise, should advise the relevant union or employer organisation. It is up to the relevant parties to the Award to sort out the problem. If they are unable to do so, they will refer it to a specifically constituted Board of Reference.

Clause 6E (See Appendix L), which is the Award provision concerning the Competency Standards implementation, also deals with the process for dealing with problems with implementation under the Award. (Oldmeadow, 1997:38)

For the purposes of the Competency Standards, "assessment" is the process of determining whether or not an individual employee (who does not hold an appropriate recognised qualification or is working at a higher level than that specified in the Award for the qualification held) is competent when his/her skills and background are compared to the Performance Criteria set out in the relevant Competency Units. (Oldmeadow, 1997:53)

The overall aim of the assessment process is to develop a permanent universally accepted competency assessment process for the metal and engineering industry, to improve the understanding of the Competency Standards and the consistency of their application, and improve the relevance, efficiency and quality of training delivery in the industry.

Once the management and employees in the enterprise agree to accept an assessment process, in accordance with the guide, then the results of the process will be officially recognised both within the enterprise, and at enterprises that decide to accept the assessment process as equivalent to their own. The results of this assessment are accepted for determining award classification.

The unions, employer organisations and government are still discussing how to make sure that registered training providers (such as TAFE) recognise competencies that have been assessed in accordance with the Implementation Guide for credit transfer towards qualifications they issue. When this is achieved it will become a part of a permanent assessment process for the industry.

To finalise such a permanent assessment process, the industry parties have established a project team which consults with State Agencies and Training Providers. The aim of the project is to create a system where on-the-job assessments which meet established criteria are recognised by all training

providers for qualifications under the Australian Qualifications Framework and the Award. (Oldmeadow, 1997:53-54)

The need to assess the skills of an employee against the Performance Criteria of a Competency Unit can arise in one of four ways:

- the structured process;
- the training process;
- request by employee; and
- request by management.

The structured process will be the most common reason for assessment and will require the need to match the skill requirements the employer have identified with the skill held by the employees.

This involves assessing the employees' skills whenever:

- it is not possible to demonstrate competency by means of relevant qualifications; and/or
- you are unable to reach agreement that the skills are actually held and are being used to the level described in the Competency Standards.

The employer can use the assessment process to determine the outcome or progress of competency-based training programs. Training programs can be either accredited external courses with an on-the-job element incorporated into the course structure, or training delivered by the enterprise in accordance with your agreed enterprise training plan.

An employee may request to have his/her skills assessed against the Competency Units. The employer needs to base the assessment on Competency

Units which are agreed between the employer and the individual employee, as relevant to the enterprise.

Management, through the consultative process, can request that individual employees or groups of employees have their skills assessed to help them develop a training plan, or as part of work reorganisation or job redesign. (Oldmeadow, 1997:55)

2.4.3.6 A Guide for Assessment

This Implementation Guide concentrates on assessment processes inside the enterprise. Accordingly, before the employer can begin the assessment, all the parties at the enterprise must formally agree on a procedure for assessment which is consistent with the procedure outlined in the Implementation Guide, including an appeals procedure.

There are four issues to be addressed:

- suitability;
- evidence of competency;
- the question of who makes the decision on competency; and
- the appeals process.

The assessment procedure must be suitable for the enterprise's size, structure and needs.

There must be agreement by all parties involved on what constitutes evidence of competency.

One form of evidence is obviously the possession of a relevant recognised qualification.

Another form is the employee's demonstration of his/her ability to meet the Performance Criteria specified in the Competency Units and to apply them in the workplace. The demonstration could be physical, verbal or in writing (such as a test of knowledge) or a combination of these.

Other forms of evidence could include:

- statements from peers that the skill is consistently applied in the workplace;
- statements from the employee's supervisor, team leader or trainer;
- indirect evidence such as the production of a total service or product which meets the enterprise's standard operating procedures or specifications; or
- a combination of these.

It is recommended that objective evidence and procedures which are clear and defined are used.

There are several ways in which decisions can be made within the enterprise, including:

- An assessment panel or body established specifically to carry out assessment. This panel could be a subcommittee of the training committee or the consultative committee.
- An internal "expert" or nominee selected to carry out the assessment of specific skills relevant to their area of expertise. This could be a supervisor, team leader, manager or other employee already competent in the Units being assessed.
- An external "expert" or nominee selected for their specific skills in a particular area. It could be someone from another company or an

enterprise similar to who has recognised skills in a relevant area: someone from TAFE or another registered provider of training; or a person nominated by the Manufacturing Engineering and Related Services Industry Training Advisory Body.

- Peer assessment. This is similar to a panel assessment, but the panel is made up solely of peers - that is, other workers from the enterprise. The employer will need to agree on the skills required by the people on such a panel (Oldmeadow 1997:57).

The decision on who makes these decisions should be made through the consultative process.

Assessment will not always involve a formal assessment or test of skills. An example would be when an employee already has a relevant qualification, or where both management and employee representatives agree that a skill is being adequately performed in the workplace.

The assessment process needs to have the confidence of both the employer and employee at the enterprise level during the transition stage to a permanent and universally accepted industry assessment system.

To ensure this:

- Either party can call for advice and assistance on this issue at any time during the implementation of Competency Standards at the enterprise. Annexure 6 contains a list of sources of external advice. Although it is highly desirable for the parties to agree to seek advice, it is not mandatory to agree. The advice could cover such issues as the composition of assessment panels, whether the correct Competency Units have been selected, appeal processes at the enterprise level, and whether they are appropriate qualified assessors where these are required, and so on.
- During the transition stage, a "qualified" assessor is one who has completed an accredited assessor's course or its formal equivalent, as well as a training course on the Competency Standards approved by the parties. In addition, the assessor must be a person who has been

approved by the MERSITAB, MTIA, MTFU or ACM. A central register of workplace assessors is maintained by the MERSITAB.

- Either the assessor must also be competent in the Unit or Units being assessed; or, as an alternative, the employer should adopt arrangements at the enterprise that guarantee the participation of technically qualified personnel in the assessment process.
- In deciding the method of assessment to be adopted at the enterprise, both management and employee representatives have the right to call for a qualified assessor from outside the enterprise. When there is a clear justification for this request and it is not designed simply to delay the process, a qualified assessor must be used if one of the parties has requested it. However, if the employer can demonstrate that employee requests will result in excessive costs then attempts should be made to resolve this issue at the enterprise level prior to any assessment being carried out. If these attempts are unsuccessful then the issue should be referred to the parties at national level for resolution. The parties must then consult about selecting an appropriate qualified assessor. This ability to involve an external qualified assessor is critical in ensuring the confidence of all parties in the early stages of implementing the Competency Standards. There should be no cost to employees for assessments.
- Qualified assessors will have the authority to query Units selected by enterprises if they feel that, based on their knowledge of the Competency Standards, inappropriate Units have been selected.
- The Board of Reference is available to resolve disputes over any of these matters (Oldmeadow, 1997:58).

An appeals process needs to be included as part of the overall assessment procedure. The assessment procedure that the employer chooses should include the steps to be taken if the results of the initial assessment of skills are unclear or indeterminate or are challenged.

The appeals process sets the steps that are available to both the employer and the employee if the results of the assessment are unsatisfactory to either of them. (Oldmeadow, 1997)

It is recommended that the assessment procedure is carried out in three separate steps.

1. Select the Competency Units.

Use the structured process to select the appropriate Competency Units relevant to the skill requirements of the positions in the enterprise.

2. Determine assessment criteria.

For each selected Competency Unit where assessment is required, determine how the employer will assess the performance. Ensure that wherever possible assessment is done by directly observing an employee's skill and comparing it with the Performance Criteria in a realistic work setting.

3. Determine responsibility.

Determine who will be responsible for carrying out the assessment. Ideally, this should be a staged process. The following stages are recommended:

- Internal assessment: Appoint individual assessors or an internal assessment panel made up of people who between them possess an understanding of the relevant skills and who the parties agree are competent to carry out the assessment.
- Internal appeals process: Select appropriate internal or external experts who can be called upon if the outcome of the internal assessment is questioned by the employee or employer.
- Board of Reference: If after the internal appeals process the outcome is still questioned by the employee or the employer, the Australian Industrial Relations Commission can be called upon to convene the Board of Reference (Oldmeadow, 1997 59).

The assessment procedure should be agreed before the assessment takes place, so that everyone is aware of how the process will be carried out and what options are open to them if either the assessment procedure itself or its outcomes are called into question. (Oldmeadow, 1997)

2.4.3.7 Five Themes for the Next Generation

In the “The Next Generation Report” (chaired by Kaye Schofield 2001) five themes recur throughout the report of the TAFE NSW product processes and policies. These are outlined from the Overview of the Report.

The first of these was the need for the product system to support TAFE’s vision to become a catalyst for regional renewal and economic progress, equitably shared. As different communities, economies, industries, enterprises, occupations and learners respond in different ways to economic and social pressures, a “one-size-fits-all” model of training product is no longer viable. Product diversity, innovation and flexibility at a local level will be necessary.

The second was the *changing contest* for vocational learning. New and shifting customer needs and expectations are evident everywhere. Change in the structure of industry is affecting product content and product mix. New technologies are impacting on the range of teaching and learning products and also on the way learning can be facilitated and managed. Competition is becoming ever more intensive. Shifts in the availability of resources are apparent. Change in government policy and regulations continue to impact strongly on all training organisations, including TAFE NSW.

Any training organisation that fails to regularly adjust its strategy, systems and processes to changing circumstances will not have a secure future and those that continue with approaches tailored to outdated modes of operation will suffer most.

The third theme was *quality*. In a world where products and services are merging, a new teaching and learning model is taking shape. In this new model quality is less dependent on standardised products and centrally determined policies and more dependent on the quality of teaching, learning and assessment

of services actually delivered to customers. Teacher knowledge, skill and understanding and their perceptions of the different contexts in which they now work have become even more central to vocational learning and fundamentally affect its success. It is not that products don't matter - just that teaching and learning processes and outcomes now matter more than ever before.

The fourth theme was *value*. Conceiving the TAFE product system not as a collection of documents, resources, policies, committees, guidelines, procedures and cost centres but as an integrated value chain has allowed the Review to better identify where change is required and most likely to add value. Within this product value chain, there are four primary activities: teaching, learning and assessment of resources; professional development; teaching, learning and assessment; and student support. Together they provide end-to-end delivery of services. These activities are interdependent. The way any one of them is performed affects the efficiency and effectiveness of the others. Innovation and responsiveness are created in the tension between the pull exerted on the one hand by customers and stakeholders and the push exerted on the other hand by product research, design and development processes. With this concept of the product consideration must be given to the linkages these have downstream with professional development and teaching, learning and assessment.

Finally, the fifth theme was *the change process* itself. The review has chosen an approach to change based on building links, networks and relationships that allow creativity and adaptability to emerge, and on weeding out those blocking processes that are often found in functionally-split bureaucracies. It has not advocated for long-term product planning because this forces organisations to

make wild guesses about what customers might want in the future. It has not advocated for significant structural change because this can yield its own dysfunctions. Rather, their focus has been on helping TAFE NSW to evolve and adapt continuously to new circumstances.

The TAFE NSW product system represents a substantial investment that is large and complex. The complexity is a consequence of many factors. The size, diversity and distributed nature of TAFE NSW, combined with efforts to manage multiple structured changes and often competing with demands from national, state and local levels, from individual and enterprise customers, and from industry, community and government stakeholders make some degree of complexity inevitable. It is not so much the existence of complexity that is important but how efficient and effectively this complexity is managed.

The Report found that despite the best endeavours of many dedicated people and ongoing efforts to improve the systems and processes of product research and development, the value of the current investment in product is not being fully realised. The main findings of the Report are:

- the current system has many strengths;
- one size does not fit all;
- there is no shared understanding of the constraints and opportunities offered by Training Package specifications;
- risks associated with assessment are not widely appreciated or managed;
- investment in the professional development of teachers is inadequate;
- the current approach to e-learning products has served its purpose;

- management processes are inefficient and lack strategic focus;
- professional knowledge is neither captured nor shared;
- research responsibilities are fragmented and rigorous evaluation is limited; and
- the Course Information System is no longer an enabling technology (Schofield, Labrett, Gonczi, Alexander, and Adermann 2001: 4).

The Report believes that the product system has now reached its limits in terms of both efficiency and effectiveness. It has captured many of the benefits of product quality and now there is the opportunity to capture the potential service delivery benefits.

The Report makes a small number of carefully targeted recommendations designed to capture these potential service delivery benefits. These need to be considered within a larger context of the strategic intent of the changes proposed by the Report.

Previous generations of curricula have given TAFE NSW a unique and powerful position in the market for quality vocational education and training. The emphasis on consistency across the State has yielded strong brand recognition in NSW, nationally and internationally. However, the changing nature of demand for vocational learning and the changing internal and external context make a migration to the next stage essential if the competitive advantage gained so far is to continue.

The strategic intent of TAFE NSW should be to create a third generation curriculum model which helps TAFE achieve its vision of becoming a catalyst for regional renewal and economic and social progress across NSW. This model, if

implemented, must allow TAFE NSW not only to anticipate and respond quickly to change but also to facilitate it. It must permit and encourage diversity but must also assure both the quality of delivery and of the TAFE NSW credential.

Five broad directions for change underpin the strategic intent:

- from Division/Institute-centric to teacher/student-centric;
- from product focused to service focused;
- from standardised products to consistency of outcomes;
- from organisational silos to collaboration and learning; and
- from control/compliance to risk management. (Schofield, Labrett Gonczi, Alexander and Adermann, 2001:5)

The product value chain has provided a useful framework for the recommendations. The report makes recommendations to improve two critical components in the value chain: quality teaching and learning; and consistent assessment outcomes. The Report then recommends modifying and refocusing some of the links, notably by changing product development processes based on risk and volume and by moving to a focused developer strategic for e-learning. The Report identifies the adjustments needed in the support system to achieve these strategic shifts and also identify the structural implications arising from the recommendations. Finally the Report recommends a small transition team to steer the change to the third generation curriculum model.

The Report expected the changes to take twelve months to implement and perhaps another two years to bed down.

The Report also stated that the TAFE product system must reinvent itself.

It must:

- build on its successes and travel to a new level of performance;
- offer more diverse products and services;
- be more attuned to current and potential customers needs;
- be based on a more complete understanding of the market it is in and where its comparative advantage lies;
- be more attentive to vision and strategy than day-to-day operational imperatives;
- use research and evaluation more astutely;
- direct resources to those areas that add greater value for customers, communities and regions;
- foster innovation and develop the capability of its people to develop, use and evaluate products to best effect;
- trust and build on the professionalism of its teachers; and
- let go of some things and hold tight to others but base this choice on value rather than custom and practice. (Schofield, Labrett, Goncz,ⁱ Alexander and Adermann, 2001:6-7)

The Report stated that if TAFE NSW was to become a catalyst for regional renewal and economic and social progress, it would need new products and new capabilities for more fluid and unpredictable times.

2.4.4 Lifelong Learning: The Future of Public Education in NSW Report

A proposal was put forward for discussion in June 2003 by the Board for consideration for the further improvement of the standard of public education in NSW.

The Department of Education and Training (DET) is perceived by some to be a large bureaucracy that is remote from schools and TAFE Institutes. The

proposed changes would enable the organization to focus better its resources on its core responsibility: supporting the delivery of quality education.

The proposal involved:

- streamlining the organisation;
- developing stronger links between schools and TAFE, without diminishing their strong separate identities;
- creating ten regions across the State;
- more effectively supporting teachers; and
- strengthening the focus towards on-line learning (DET 2003:4).

Streamlining of the organisational structures was considered necessary to reduce the costly duplications across the Department. It was aimed at achieving a better co-ordinated and more efficient use of resources now available across schools and TAFE, such as in the area of corporate services.

The process of developing stronger links between schools and TAFE began in 1997. Building on that, this proposal would bring about a single public education system from early childhood to training for employment and beyond – allowing schools and TAFE to share better teaching expertise and resources but importantly, preserving the specialised services each delivers so successfully.

The ten regions were created broadly aligned with the geographical boundaries of other key State Government service providers. The new regions, unlike those that have previously operated, would be free of many onerous administrative functions – allowing a sharp focus on supporting education delivery. The offices would also have more authority than existing district offices to make important

decisions that affect local schools, TAFE Institutes and communities – decisions that have often previously been made by head office.

School and TAFE teachers – along with their support staff – would also benefit from extended access to on-line teaching and learning resources, using and further developing methodology that already exists within TAFE. Over time, teachers would gain greater on-line access to information about the latest developments in their field and to materials for immediate use by their students.

In August 2003 the revised proposal was published based on the 5000 responses that the Board received during the consultation period.

2.4.4.1 Summary of issues raised in feedback

- Maintaining a separate identity for TAFE NSW;
- The need to maintain centrally the support for teaching and learning currently available through the TAFE Divisions and the Professional Support and Curriculum Directorate;
- The proposed regional boundaries and their impact on schools, TAFE campuses and their communities;
- The location of regional offices and education support centres and the potential impact on rural and regional communities;
- The implications for school support and district office staff of the proposed regional structure;
- Accountability and reporting relationships including those for principals, chief education officers, school education directors, and TAFE institute directors;
- The implications of the proposal to close the Southern Sydney Institute and to manage the delivery part of Open Training and education Network (OTEN) as an arm of the Western Sydney Institute;

- A perception of increased layers of bureaucracy in proposed regions;
- The implications of eight regions on school sport;
- The Registered Training Organisation (RTO) status of schools and TAFE Colleges;
- The maintenance of commercial arrangements and memoranda of understanding;
- Support for Adult and Community Education;
- The possibility of streamlining the operations of the Board of Adult and Community Education, Board of Vocational Education and Training and the Vocational Education and Training Accreditation Board; and
- Co-ordination of State-wide programs such as TAFE childcare services, library services and student affairs (DET 2003 Overview : 2).

The revised model was developed in the context of the feedback provided.

The four portfolio areas of the Department were to be reorganised to improve support for schools and institutes. In addition, a corporate communications directorate was to be established to improve support for the communication and marketing needs of the Department.

The proposed main areas of the Department are:

- Teaching and Learning: Regions, State wide policy areas;
- TAFE and Community Education;
- Strategic Planning and Regulation;
- Corporate Services;
- Corporate Communications; and
- Office of the Director-General (DET 2003 Overview: 3).

2.4.4.2 Main Features

A major feature of the model is the grouping of schools into ten regions that coincide with TAFE institute boundaries. Each school region will be headed by a Regional Director and each TAFE institute by an Institute Director. Within school regions there are smaller groups of schools each supported by an Education Support Centre. There will be 78 Education Support Centres across the State. Each will be headed by a School Education Director. It should be noted that the Southern Sydney Institute and Open Training and Educational Network (OTEN) have been absorbed into the ten institutes as proposed in June 2004. Regional Directors and TAFE Institute Directors have separate accountability and reporting arrangements and are co-located to TAFE institutes where possible. There are service level arrangements between these directors to ensure closer working relationships between schools and TAFE.

2.4.4.3 Teaching and Learning

The Teaching and Learning Portfolio was assigned responsibility for a range of State wide policies and co-ordination services. These include curriculum support, Aboriginal education and equity, disability services, student welfare and school security, VET in schools, professional learning, professional practice, and educational measurement. Each Regional Director was assigned a State wide responsibility for policy co-ordination in one or more of these areas. This ensures policy development and practice are effectively linked to ensure policy decisions and advice reflecting on experience.

2.4.4.4 TAFE and Community Education

The deputy Director-General of TAFE and Community Education had the responsibility for TAFE NSW Institutes, Adult and Community Education (ACE), the National Art School and the Adult Migrant English Service (AMES).

2.4.4.5 TAFE Services

TAFE educational services are provided through ten institutes: four in metropolitan Sydney and six in rural and regional NSW. Southern Sydney Institute was to be integrated into Sydney Institute and the South-Western Sydney Institute; St George and Sutherland Colleges were to become part of the Sydney Institute; and Bankstown, Lidcomb and Padstow Colleges were to join the South-Western Sydney Institute. The educational delivery function of OTEN was to maintain its brand name with RTO status. It is expected to operate as a State wide service from the Strathfield site and report to the On-line Learning Directorate in the Strategic Planning Regulation area.

2.4.4.6 State wide TAFE service and support

The existing seven TAFE Divisions are to be reorganised into four TAFE Industry Curriculum Centres and one TAFE Access and General Education Curriculum Centre. Each will be responsible to an Institute Director.

2.4.4.7 Community Education

State wide support for Adult and Community (ACE), Adult Migrant English Services (AMES) and the National Art School has been brought under the portfolio.

2.4.4.8 Strategic Planning and Regulation

Strategic Planning and regulation support the education and training by helping to shape the policy and strategic environment and by fostering improvements and innovation.

2.4.4.9 Corporate Services

The aim of the Corporate Services Strategy is to deliver improved services to schools and TAFE by sharing resources across both sectors. This division places greater emphasis on delivering functions such as IT support, human resources, asset management and OHS at a level to improve support for schools and TAFE Institutes.

2.4.4.10 Corporate Communications

This division is responsible for incorporating the Public Affairs and TAFE Marketing Directorates into a Corporate Communications Directorate. The Directorate is developing strategies to promote public education and assist schools and TAFE colleges to communicate their successes and their educational programs to the wider community. The Corporate Communications Directorate is

also responsible for media relations, marketing, stake holder management and communications services.

2.4.4.11 Office of the Director-General

The office of the Director-General has reporting arrangements which include the Audit Directorate and the Executive Support Directorate, to improve the performance of systems and work practices, while being responsible for internal audits and corruption prevention.

Under this office an announcement was made to introduce a large new fee structure for TAFE NSW commencing in 2004 which saw the trade student pay over \$300 per year to enrol a the trade course and some advance diplomas costing over \$1000 per year. In essence, the existing system of public education was reshaped to create an organisation more keenly focused on front-line education, more integrated to deliver “whole of life” education, and more responsive to the needs of communities and local businesses (DET 2003 Overview: 3-7).

2.4.5 Growth of apprenticeships in Australia

The following statistics were extracted from Department of Employment and Industrial Relations (1986), National Centre for Vocational Education Research (NCVER 1998), NCVER (2000a), NCVER (2000b) and unpublished data and explain the apprenticeship numbers a growth in Australia 1973-2000.

The Apprenticeships in the modern era, 1973-1976, grew rapidly from just over 116,000 in 1973 to almost 135,000 by 1976 despite increasing costs due to the global impact of rising oil prices on the Australian economy at the time.

Apprenticeships grew strongly over a five-year period from just over 123,000 in 1977 to reach almost 150,000 by 1982. Again there was a positive response by employers to the introduction of an enhanced comprehensive national employer incentive scheme in 1977.

In 1984, increasing concerns about persisting unemployment and the stagnation in apprenticeships around 130,000 led the government to establish a national inquiry into labour market programs. The apprenticeship numbers increased significantly from the mid-to-late 1980's in response to a rapidly growing Australian economy. Apprenticeship numbers grew from under 130,000 in 1985 to reach an all-time Australian record of 161,000 in 1990.

The recession in the Australian economy in the early 1990's had an enormous impact on apprenticeship numbers. The numbers dropped from 161,000 in 1990 to just over 120,000 three years later.

Apprenticeship and traineeship numbers increased in the mid 1990's and this has been the most significant period of growth ever witnessed in the history of the system in Australia. Total numbers have grown from just over 131,000 in 1994 to over 275,000 in 2000 - a doubling of numbers in only six years (NCVER, 2000: 5).

2.4.5.1 Australian apprenticeships in an international context

The growth of apprenticeships, traineeships and new apprenticeships has been so rapid in the 1998 to 2000 era that some 2.1% of Australia's working population was employed in the new apprenticeships training area.

Australia now rates fourth in the world, just behind Switzerland 3.4%, Germany 3% and Austria 2.2%, in terms of the coverage of the workforce by an apprenticeship system. Australia's 2.1% ranks well ahead of countries like Finland 1.1%, Norway 1.1%, the Netherlands 1.1%, Denmark 0.9%, France 0.8%, the United Kingdom 0.6% and the United States of America 0.2%. The percentages represent the working-age population (15-64 years) in apprenticeships.

Australia is a world leader in terms of its coverage of adult apprentices. The dual systems of Switzerland, Germany and Austria all focus only on young people (Robinson, 2001: 54).

2.4.5.2 Broadening the occupational base of Australian apprenticeships

Apprenticeships were traditionally focused on skilled trades, which amounted to 14% of all jobs in Australia. The study shows that, by 1990, 93% of all apprenticeships and traineeships were still in the trade areas, with traineeships in the clerical and sales occupations just starting to make an impact in the system.

The impact of a broadening of the occupational base really began to be felt by 1997 prior to the introduction of new apprenticeships. The trades had dropped to 72.8% of the total. Robinson (2001) explains that, contrary to popular belief, diversification has been achieved at the expense of apprenticeship opportunities in the skilled trades. Apprenticeships and traineeships across all occupational groups have grown strongly since the mid-1990s, some from a relatively low base. Skilled trades' apprenticeships have grown from 120,000 in 1995 to almost 140,000 in 2000. Robinson (2001) goes on to explain that far from being a problem as is often supposed, the broadening of the occupational base of new apprenticeships

has been both desirable and necessary. New apprenticeships are more in line with the structure of the labour market than ever before (Robinson, 2001: 67).

2.4.5.3 Changes in the level of qualifications of apprenticeships, traineeships and new apprenticeships

Traditionally the apprenticeship system was focused wholly on trade certificate or equivalent qualifications. Traineeships initially introduced the equivalent of Australian Qualifications Framework (AQF) Certificate I and II of the system, with an extension of the system to the equivalent of AQF Certificate IV's and diplomas in the early 1990's. Clearly the extension of the apprenticeship system to cover all levels of vocational qualifications means by definition that Certificate III's are no longer 100% of the system. The numbers in Certificate III contracts in training grew by over 90,000 places since 1995 to reach an all-time record of 208,000 new apprenticeships in Certificate III programs by 2000 (Robinson, 2001: 72).

2.4.5.4 Opening up apprenticeships to all ages

Robinson (2001) explains that the biggest myth about recent changes to the apprenticeship system in Australia is that opportunities for young people are diminishing. Until the decision to remove all age restrictions to apprenticeships and traineeships was taken in 1992, all places went to young people. By 1995, people aged 25 years or more took up 7% of all apprenticeships and traineeships. Today almost one-third of new apprentices are aged 25 years or over. Opening up the system to older people was crucial. The effect of the rapidly ageing population

means that the young can no longer be considered the sole source of entry-level to new skilled occupations in the labour market (Robinson, 2001: 88-89).

2.4.5.5 Changing characteristics of apprentices

The study shows that growth of female apprentices, trainees and new apprentices in 1995 reached 16.5%, following the rollout of traineeships beyond the traditional trades. There has been a rapid rise in female participation since then, with female participation reaching 31% by 2000.

There has also been a dramatic increase in indigenous apprentices and trainees in Australia since the mid-1990's. The number has risen from 1100 in 1995 to 5100 in 2000 and is proportional to the total number, which has grown from 0.8% in 1995 to 1.9% in 2000. Some 7% of all new apprentices by 2000 reported that they were from a non-English-speaking background while the number of people with disabilities in the apprenticeship system has risen from 1000 in 1995 to 5600 by 2000.

2.4.5.6 Completion and attrition rates in apprenticeships and traineeships

The issue of non-completion and attrition in apprenticeships and traineeships is the most misunderstood aspect of the whole system, with the prevailing view that attrition is relatively high and getting worse. However, Robinson's (2001) study gives details that this is not the case. The growth in the absolute numbers of recorded completions has reached unprecedented levels in recent years. Completion numbers have more than doubled since 1995, rising from 32,900 in 1995 to 73,700 by 2000. Robinson (2001) goes on to state: "The

employment retention outcomes after completion of an apprenticeship, traineeship or new apprenticeship are excellent and over 20% of those with an apprenticeship or other skilled vocational qualifications are self-employed.”

2.4.5.7 Future directions: expanding new apprenticeships

The findings from the Robinson’s report on *Australian Apprentices: Facts, Fiction and Future (2000)* as outlined in the *Australian apprenticeships: research at a glance (2000)* suggest a number of ways in which the Australian new apprenticeship system might be expanded in the future:

- There is potential to expand the system to at least 400,000 new apprenticeships in the medium to long term;
- Associate professional occupations are identified as having the most potential for expansion of new apprenticeships.
- Clerical, sales and service occupations cover nearly 32% of all jobs in Australia. This is an area where potential for more expansion exists.
- Raising participation in new apprenticeships in capital cities is now needed, particularly for those who live in the lower socio-economic suburbs of our cities.
- More attention needs to be paid to theory underpinning vocational knowledge in many new apprenticeships which are in jobs that require higher-order skills.
- Considerably more emphasis will be required on the generic or employability skills in apprenticeship training. (Robinson 2001: 14-15)

This study has had an impact and is interrelated to the pre-apprenticeship system. The fact that the implementation of the training packages through the new apprenticeship scheme has an on-the-job component of competencies that have to

be assessed, will create problems for the pre-apprenticeship system. The other factor that emerges is the increased growth of the broadened occupations of the new apprenticeship system, which is likely to see a lot of prospective pre-apprenticeship students going into the new apprenticeship training system.

2.4.5.8 New Apprenticeships

New Apprenticeships as explained in the study (Robinson 2001), were introduced in Williams' *The New Apprenticeship: consider the possibilities Memorandum*. This publication remains current but needs to be read taking into account the repeal of the old Act and the proclamation of the new Act (Williams, 1998: 1) to establish a single integrated system of employment and training that incorporated what was formally a separate apprenticeship and traineeship system.

The late 1970's and early 1980's saw an increase in the number of apprentices employed in the Metal Fabrication and Welding industry in the Hunter Region but by the mid 1980's the industry was in decline. The Scott Report (1990) was the catalyst for change in the vocational education sector in New South Wales. The year 1991 saw the introduction of Competency Based Training (CBT) into the NSW Metal Industry, and this had an immediate impact on the apprenticeship system.

2.4.5.9 Skilling Australia's Workforce Act (Act No 149 of 2005)

In 1998 the Federal Government provided over \$200 million over four years to support the vocational education in schools, while Australian Technical

Colleges provided \$80 million over four years for Australian Student Traineeship Foundation to help school students learn skills relevant to the workforce. The Federal Government also provided \$16 million to Group Training Companies in 1998/9 to expand opportunities for small and medium sized enterprises to employ apprentices and trainees and \$30 million in loan guarantees for Group Training Companies to further assist them to increase the number of apprentices and Traineeships (Crosby 1998).

During this time TAFE in Australia had little or no increases to the operating funds and their funding arrangements were a step towards the Australian Government introducing the Skilling Australia's Workforce in 2005 to ensure the workforce and young people were properly skilled to meet the plan for job growth and the skill shortage that was occurring. (Cosby, 1998)

Skilling Australia's Workforce Act 2005 repealed the Australian National Training Authority Act 1992 and the Vocational Education and Training Act 1992 and thereby brought about the abolition of the Australian National Training Authority (ANTA) and then existing funding arrangements for Commonwealth grants to the States and Territories for vocational education and training (VET). It provided transitional arrangements for the transfer of functions from ANTA to the Department of Education and Science and Training, including the transfer of assets, liabilities and records. The Bill was linked to the Skilling Australia's Workforce Bill (Kempner, 2005) leading to the enactment of the Skilling Australia's Workforce Act of 2005.

2.5 Workplace Training and Assessment

Research confirms that the “focus in teaching and learning should be on the individual’s active construction of knowledge” (Stevenson 1994). The essential role of vocational education is “to facilitate construction of knowledge through experiential, contextual, and social methods in real-world environments” (Lynch 1997). In view of the fact that the focus is on the learner, vocational education should be conceptualised as a learning process rather than a teaching process (Stevenson 1994).

The vocational teacher’s role is not to set tasks, but to organize experiences that allow learners to develop their own knowledge and understanding. Using the methods of cognitive apprenticeship, the teacher is a coach who provides guidance that gradually decreases as learners become more proficient, and who models, mediates, diagnoses, and scaffolds. The learning environment should reproduce the key aspects of communities of practice authentic sequenced in complexity, multiple experiences and examples of knowledge application, access to experts, and a social context in which learners collaborate on knowledge construction (Kerka 1998).

However, issues relating to learning and assessment within apprenticeships have not received the same degree of attention. Little attention has been paid to what actually happens to apprentices and how their experiences affect their training. The most recent Australian studies have included Wilson and Englund (1994), Smith (1998) and Harris et al (1998). The question of quality in apprenticeships has also been only minor and of recent interest (WADOT 1998;

Schofield 2000; Smith 2000). Yet such issues relating to learning and assessment go to the very heart of the quality of Vocational Education and Training (VET) for apprentices as well as the ability of the system to deliver outcomes relating to promoting lifelong learning (Robinson 2001: 28-29).

2.6 Competency Based Training in Australia

The Carmichael Report (1992) outlined a staged strategy for meeting Australia's training needs into the new millennium.

The Employment and Skills Formation Council (ESFC) recommended and the National Training Board implemented the competency based Australian Vocational Certificate Training System. The focus of a CBT system was based on outcomes, the attainment and demonstration of specific knowledge skills and applications by individual, rather than on inputs, such as time served. The key areas of competence targeted were generic competencies which under-pin the acquisition of vocational and occupational-specific competencies.

Competency based education is perceived by some as the answer, and by others as the wrong answer, for the improvement of education and training for the complex contemporary world (Harris, 1995). Popular in the United States of America in the 1970's with the performance-based vocational teacher movement, competency approaches were riding a new wave in the 1990's. They were the basis of the National Vocational Qualifications (NVQs) system in England and Wales (introduced in 1986); New Zealand's National Qualifications Framework; the competency standards endorsed by Australia's National Training Board (NTB) and the Secretary's Commission of Achieving Necessary Skills (SCANS); and the National Skills Standards initiative in the United States of America. Competency standards are propelled by a strong political impetus as the way to prepare the workforce for the competitive global economy (Kerka 1998). At the same time, a

growing number of critics argue that the approach is conceptually confused, empirically flawed, and inadequate for the needs of a learning society (Chappell 1996; Ecclestone 1997; Hyland 1994). Much of the debate was taking place in Britain and Australia, where there has been time to examine the impact of this approach.

2.7 Metal Fabrication and Welding (Heavy) in NSW

The Metal Fabrication and Welding (Heavy) craft history stems back to Roman times, when craftsmen forged weapons from bronze over a type of forged heat. This craft transformed over the centuries into the Blacksmith craft and during the industrial changes, at the turn of the twentieth century, new craftsmen were required to form, shape and join steel products. Among the new products, which emerged were boilers that were used to drive the heavy industry and the new transportation vehicles, including steam trains. From this industry a new craft was established - that of Boilermaking. The trade was dominant in the heavy industrial cities in Australia. The training was mainly carried out on the job with the tradesman handing down skills and knowledge over a 5-7 year period depending on whether the tradesman thought whether the trainee was skilled enough to be a tradesperson. With the introduction of apprenticeship training and changes in attitudes, off-the-job training was established (McIntyce, 2006)

In the early 1950's day release was introduced with one day a week for training off-the-job for apprentices. This training was carried out over a four year period at a Technical Education College. The time span for an apprenticeship then was five years. This situation changed in 1972 when the time period for apprenticeships was reduced to four years with an off-the-job component of three

years which is still current today. Changes to the vocational training in the Boilermaking trade did not occur until the late 1970's which was after the Kangan Report (1974), which changed the format for the delivery of the trades' curriculum. The recommendations in the report saw the lifting of the age restriction that at the time, stated that no person over the age of 21 could start an apprenticeship, and advocated the introduction of multi-skill training in the apprenticeship area.

In the early 1960's a change in technology was introduced to the trade. This was a joining method whereby the Manual Metal Arc Welding (MMAW) process replaced the riveting process. In the next three decades to follow such processes as Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW) and Flux Core Welding (FCW) were introduced to the trade and are widely used in production and fabrication in the trade areas of Australia. The mid to late 1980's saw a boom in the heavy industry in Australia and the trade underwent a name change, becoming Metal Fabrication and Welding to describe the type of work that craftsmen were performing.

As previously outlined in 2.4.2 an inquiry into the Labour Market Training Programs by the Federal Government produced the Kirby Report (1984). The recommendations from this report that had an impact on the MF&W (Heavy) trade were recommendations 18, 22 and 79. These recommendations heralded the introduction of the Australian Traineeship System (ATS) in 1985. This system was to train people more quickly and to meet the demands of industry. Traineeships were mainly for twelve months duration with an off-the-job training component of two days a week.

The Scott Report that was handed down in 1990 had a profound impact on the structure of TAFE NSW and the MF&W (Heavy) trade sections. This report was in response to the NSW State Government's recognition of the emerging demand for all kinds of educational training. While it was widely recognised that TAFE had a vitally important role to play in the State's economic well being, it was also at a crossroads for several reasons:

- The Metal Industry's demands on post-compulsory education and training had grown enormously, and are likely to continue to grow.
- Virtually all growth industries at that time were knowledge based, and new processes and techniques required constant retraining and new training.

The Metal Industry demands were increasingly becoming customised in character, requiring new kinds of courses and forms of delivery to meet new technology. This was not simply a logistical challenge - it required a shift in managerial mind-set to meet the more competitive environments in the marketplace. Technical and vocational education had become a fast-growth business. In some areas of the Metal Industry private providers were able to make inroads into the traditional training market, even though they charged commercial fees in the areas where TAFE's courses were basically free.

For the trade this change brought about a new structure for apprenticeship training. The introduction of an Institute Training model in NSW saw 22 institutes formed across the State but after two years, basically due to the cost factor, the 22 institutes were converged into eleven institutes. These eleven institutes comprised three faculty and eight federation models. Coupled with the

introduction of CBT at this time, the trade was going through a major change in the way apprentices were to be trained.

The Finn Report (1991) advocated the convergence of general and vocational education with both individual and industry needs focusing in that direction. Internationally, there was an increasing realisation that the most successful forms of work organisations were those which encouraged people to be multi-skilled, creative and adaptable. At the same time schools were broadening their programs and curriculum to offer greater access to vocational education for an increasing proportion of young people staying on past Year 10. There was also a related process of convergence between the concepts of work and education. Increasingly, as regular updating of skills and knowledge became essential to maintaining and enhancing productivity in the workplace, the concepts of working and learning would converge.

To serve their clients' needs, both school and TAFE have changed:

- Schools have become more concerned with issues of employability and provision of broad vocational education; and
- TAFE had recognised that initial vocational courses must increasingly be concerned with competencies that are more general than those which, for example, characterised the traditional craft-based apprenticeship (Finn, 1991: 1).

In industry, all parties have taken a more active role in the development and support of on-going training, which was integrated with employment.

The Carmichael Report (1992) introduced CBT into the Australian Vocational Certificate Training System. The focus of a CBT system was on outcomes, the attainment and demonstration of specified knowledge, skills and

application by an individual, rather than on inputs, such as time served. Education and training pathways in the system provided training in the key areas of competence as well as vocational competencies. All pathways provided recognition of prior learning, and articulation and credit transfer to higher levels of competence. This changed the direction and ways that the MF&W (Heavy) trade course was delivered (Carmichael, 1992: v-vi)

The competency standards that the National Training Board (NTB) ratified were the mechanism through which a CBT system could operate to ensure that vocational education and training could be delivered to meet the needs of industry.

The ESFC proposed that apprenticeships and traineeships should merge into the new Australian Vocational Training System, which would provide a flexible range of fully articulated, substantially work based, vocational certificate training pathways.

At this time a pilot program of CBT in Metal Fabrication and Welding (MF&W) was being conducted at Orange to ascertain the validity of the concept in regard to the MF&W trade training in NSW. CBT was fully introduced to MF&W trade training in 1993. This meant that an apprentice had to complete successfully an equivalent of twenty four modules whereas before the apprentice sat for a formal exam at the end of three years of training.

In 1995 the Australian Qualification Framework (AQF) was established. This meant that an apprentice's qualification was now recognised across Australia and the New Apprenticeship System was set up in 1998, combining apprenticeships and traineeships into a single integrated system. User choice was introduced to enable a choice of RTO's.

The start of the new millennium saw the metal trades in NSW slow down with world economics and this change dictated the industry's direction and training. In the training area CBT was now fully implemented and each year, minor correction was made to the product being delivered. The delivery mode had not changed and where the apprentice was deemed to be competent meant that the apprentice successfully completed that module.

The enrolling MF&W apprentices of 2000 were to be greeted with a change to their TAFE training whereby they had to have a training plan signed by them, their employer and the RTO. This training plan laid out the structure for the next four years of the apprentice's training obligations. This plan not only required the apprentice to complete successfully twenty four modules that are thirty six hours in duration for each module but required an on-the-job assessment of the apprentice's competency by the employer. (Appendix B: i, ii.). A combination of modules successfully completed and on-the-job assessment component, through a manual log book or electronic log book, allowed the apprentice to complete successfully ninety six points and their Trade Course. (Appendix B: iii)

In "The Next Generation Report" (chaired by Kaye Schofield 2001) five themes recur throughout the report of the TAFE NSW product processes and policies that affected and had an impact on the MF&W (Heavy) course and operation of the teaching sections (Schofield, Labrett Gonczi, Alexander and Adermann, 2001:4).

The first of these was the need for the product system to support TAFE's vision to become a catalyst for regional renewal and economic progress, equitably

shared. As different communities, economies, industries, enterprises, occupations and learners respond in different ways to economic and social pressures, a “one-size-fits-all” model of training product is no longer viable. Product diversity, innovation and flexibility at a local level were necessary.

The second was the changing context for vocational learning. New and shifting customer needs and expectations were evident everywhere. Change in the structure of industry was affecting product content and product mix. New technologies were impacting on the range of teaching and learning products and also on the way learning was to be facilitated and managed. Competition was becoming ever more intensive. Shifts in the availability of resources were apparent. Change in government policy and regulations continued to impact strongly on all training organisations, including TAFE NSW.

The third theme was quality. In a world where products and services were merging, a new teaching and learning model was taking shape. In this new model quality was less dependent on standardised products and centrally determined policies and more dependent on the quality of teaching, learning and assessment services actually delivered to customers. Teacher knowledge, skill and understanding and their perceptions of the different contexts in which they now work was becoming even more central to vocational learning and fundamentally affecting its success. It was not that products did not matter; just that teaching and learning processes and outcomes became more important than ever before.

The fourth theme was value. Conceiving the TAFE product system not as a collection of documents, resources, policies, committees, guidelines, procedures and cost centres, but as an integrated value chain, was allowing better

understanding and opportunity to identify where change was required and most likely to add value.

Finally, the fifth was the change process itself. Since the early 1990s rapid change had occurred in the TAFE NSW with the introduction of CBT and the implementation of the Scott Report (1990). The fifth theme recommended more rapid change in the direction of flexible and e-learning. Flexible learning and e-learning has been part of the MF&W modes of delivery since 1995 but has proved to be high in cost to operate compared to the conventional modes of delivery. E-learning has been used in isolated areas of NSW but has had limited success due to the hands-on nature of the trade (Schofield et al. 2001:5).

In 2003 the NSW Department of Education and Training (DET) put forward a report *Lifelong Learning: The Future of Public Education in NSW*. This report was designed to change the structure of the administration system within TAFE NSW from an institute based system to a centralised system basically reversing the Scott Report (1990) recommendations. These changes, on economic grounds, are likely to have a flow on effect to the delivery of the educational product with less support and a decline in financial support for educational delivery in the classroom. The focus of this report was the economical down sizing of Public Education and TAFE NSW which has had an impact on the courses and students who enrolled in the MF&W (Heavy) trade course.

2.8 Current Trends in Apprenticeship Training

In the past decade in Australia there have been significant changes in the development of apprenticeships as outlined in 2.4.2. The abolition of age

restrictions for entry into an apprenticeship and the belated introduction of traineeships in the early to mid 1990's are two developments that have impacted on the system. The (AVCTS) was established on 21 July 1992 and this included CBT, RPL, AQF and the NFROT. The newly formed National Training Authority (ANTA) was directed to play a key role in implementing the new system at that time.

The AVCTS was designed to be a comprehensive system of training involving:

- industry participation in development and provision of training;
- quality training to national standards;
- achievements and recognition of competencies, however achieved;
- many different training providers;
- a national framework of vocational qualifications; and
- provision for those with various disadvantages.

In November 1994, the Ministerial Council on Employment, Education, Training and Youth Affairs (MCEETYA) agreed to support the transfer of both apprenticeships and traineeships to AVCTS by December 1996 (Ray 2001).

The Howard Government in 1996 initiated the overhaul of the apprenticeship system in Australia by introducing "New Apprenticeships" under the *New Apprenticeship: consider the possibilities Memorandum*. This publication remains current but needs to be read taking into account the repeal of the old Act and the proclamation of the new Act (Williams, 1998: 1). This saw the combination of apprenticeships and traineeships under one umbrella entitled "New

Apprenticeships” and extended the occupational coverage of apprenticeship-style training. The New Apprenticeship system introduced new features, such as training packages and user choice of RTO providers. Training packages were combinations of the training agreement (in place of indentures), training plans, competencies to be attained, assessment guidelines and the method of assessment.

The legislative approach used by the States and Territories for the administration of apprenticeships and traineeships depended largely on the age of the legislation (Ray, 1998: 15). However, distinctions between trades’ apprentices (blue-collar trades) and non-trade trainees continued to be made.

The New Apprenticeship system initiated a growth trend that resulted in a very large increase in the number of apprentices and trainees in non-trade occupations. It also led to a substantial increase in the amount of training undertaken outside of TAFE, including wholly on-the-job training (Ray 2001). The original apprenticeships in Australia were undertaken fully on-the-job. Ray (2001) reported that throughout the last half of the twentieth century “the provision of formal training (typically for one day per week for three years) became universal and on-the-job apprentice training virtually disappeared” (Ray 2001: 33).

Fully on-the-job training re-emerged under National Employment and Training Taskforce (NETTFORCE) arrangements introduced by the Federal Labour Government in 1994 and 1995. This gave employers the capacity to provide training entirely on-the-job under a contract of training if they wished. This development ignited debate about the relative worth of on and off-the-job training

in both traineeships and apprenticeships and the appropriate balance between the two (Robinson 2001).

Controversy about fully on-the-job training continued. In its report, *Aspiring to excellence*, the Senate Employment, Workplace Relations, Small Business and Education Reference Committee (2000) notes that the term “on-the-job training” is often confused with “workplace training”. The committee’s report goes on to note that many employer groups in their submissions strongly supported on-the-job training and expected to see it increase.

With the introduction of the MF&W (Heavy) course (6059) in 1999 for the apprentices who were in place by 2002, a three year trade course with an on-the-job component (30% end result) has not impacted on the trade as such but in the years to come these changes are likely to greatly affect how and when training take place.

2.8.1 Bridging the skills divide 2003

On the 6 November 2003 the Employment, Workplace Relations and Education References Committee of the Senate (Upper House of Parliament) tabled the report *Bridging the skills divide*, chaired by George Campbell (2003). The title, *Bridging the skills divide*, sums up the main messages of the report. The report goes on to state that employers, unions and educators agree that Australia is currently facing a serious skills shortage, which is set to worsen over the next decade (Campbell 2003: xxv). The report found that, apart from the well-known and persistent skills shortages in the health and education sectors, there are many skills shortages, which are not properly recognised (Campbell 2003: 7). Many are

in the skilled trades and in occupations at associate professional levels. In fact, numbers in training in the metal trades, engineering and manufacturing sectors have fallen disproportionately since 1996, according to NCVER. Shortages in the metal trades, engineering and manufacturing, and electrical have become endemic during the last five to ten years. This indicates a serious erosion of the skills base in areas of strategic and economic significance, which continues unabated despite the restructuring of the training system. Because skills development in skills shortage areas has not been a policy focus, now there are too few people with the required levels of skills and knowledge to fill the available positions across regions, occupations and industries. Far too many industries have sacrificed investment in the recruitment and training of skilled people for the sake of short-term cost saving. With this in mind, the committee's majority concluded that Australia needs a new and focused policy on skills formation. Of the 52 recommendations made by the committee many of the recommendations relate to the training needs of the traditional trades, skilled vocations, young people and employment.

More fundamentally, the committee came to the view that current reliance on the market and employer demand with some targeted innovation initiatives, is not an adequate basis for skills formation policy. Academic and other experts pointed out that the current competitive business environment and policy setting create a disincentive for many employers to invest in skills formation and training incentives under the New Apprenticeship system (Campbell 2003: 7).

The report recommended that, as a priority, New Apprenticeship incentives should be made available for traineeships at certificate level 5 and above, and that

for skilled trades and higher level traineeship the bulk of the payment should be made on commencement of the training contract, contingent on compliance with a negotiated individual training plan. This should go a long way to assist industry offsetting costs of taking on apprentices in the traditional trades in the early stages of training (Campbell 2003: 79).

2.9 Summary

This chapter presented a review of literature related to the study. Emphasis was placed on the evolution of apprenticeship training in Australia through such reports as the Kangan (1974), Kirby (1984), Scott (1990), Finn (1991), Carmichael (1992) and the Schofield Report (2001). It also discussed the apprenticeship, traineeship and New Apprenticeship system in Australia.

In 1997 Commissioner Justine Oldmeadow handed down a variation to the Workplace Relations Act 1996 which inserted the Competency Standards Implementation Guide Oldmeadow (1997).

Finally, consideration was given to the training for the trades in Australia, overseas research studies in the apprenticeship training area, and how these have impacted on the MF&W (Heavy) apprenticeship training in NSW.

The following chapter will discuss the methodology, the research design instrument development, locations and participants taking part in the study.

Chapter Three

Research Methodology and Design

3.1 Introduction

The main purpose of this study was to ascertain whether there has been an improvement in the knowledge base of the apprentices who were completing the MF&W (Heavy) trade courses 6059 and 3449 conducted by the TAFE NSW when compared to the old MF&W trade course 7792 which did not have the on-the-job component in the course structure. The study attempted to identify, clarify and record the past developments and future directions of the course in providing the training to meet the industry requirements. The study provides a basis for the implementation of strategies for improving the delivery of training and providing direction for future research.

This chapter presents the research methodology and sample, as well as the research design, development of data gathering instruments, data collection procedures and the analysis of quantitative and qualitative data.

3.2 Research Methodology and Design

Data were collected using structured questions in the form of an exit test given to stage 3 apprentices completing their MF&W (Heavy) trade course in TAFE NSW. Hoinville and Jowell (1989: 2) explain the three factors in forming a

survey: the purpose of the inquiry; the population at which it should focus; and the resources that are available. These factors were considered when designing the exit test for the stage three MF&W apprentices in NSW and the phone interviews conducted with the MF&W teaching staff in TAFE NSW.

Bryman's (1988: 53) statement that “Getting in, getting on, getting out and getting back” process was particularly useful when organising the exit test for the stage three MF&W apprentices in NSW between 2001-2004 in the study. The strategies outlined in obtaining approvals and access to organisations for carrying out research studies aided the approval of the studies by the human research ethics committee of the University of Newcastle.

The sample population comprised the apprentices who completed the MF&W (Heavy) course numbers 6059 and 3449 of the ten institutes of TAFE NSW (see copy in Appendix A). The sample comprised 229 stage three MF&W (Heavy) apprentices in 2004 across NSW TAFE. This sample was bench marked against a sample of similar tests carried out in 2001 at the Hunter Institute of TAFE course number 7792 which is the MF&W (Heavy) trade course as shown in Table 5.5.

The Engineering Fabrication Certificate III (Heavy) Trade Course 7792 (refer appendix B.1) was the last of the third fine tuning exercise, since the introduction of Competency Based Training in 1991. This course met the trade's needs at that time and was to be the final adjustment for an extended period but this was not to be with the introduction in later years of on-the-job training and abandonment of modules for competency tasks.

The course structure of 7792 was a mixture of theory, drawing, welding and fabrication modules which at the successful completion of the course rewarded the apprentice with a trade certificate. The apprentice with this qualification then served another year on the job completing his/her obligation to the company and received a craft person's certificate enabling that person to work in the industry as a tradesperson.

The course structure that the exit test questions were obtained from had compulsory modules, elective compulsory modules and elective modules see appendix B.

3.2.1. Stage 1 of the course modules

The OH&S module in the course covered the safe working principles associated with the Metal Fabrication and Welding industry and included a first aid segment in which the apprentices were taught CPR techniques and where to apply the technique.

Production and Interpretation of Engineering Sketching module in the course covered the necessary skill of freehand sketching of articles that have to be fabricated and welded associated with metal industry.

Welding and Thermal Cutting module in the course covered the many different welding applications associated with the trade and was intended to introduce the apprentice to these methods such as MMAW, GMAW, Oxy Welding, Oxy Cutting, Braze Welding, Brazing and Gouging.

Hand and Power Tools module in the course covered skills associated with the use of many hand held tools such as dividers, scribes, trammels, centre

punches, plate squares, correct use of hammering and the use of power tools in the trade.

Fabrication Techniques 1 module in the course covered the introduction to metal fabrication of material 3mm and above. This involved forming, cutting, bending and shaping of low carbon steel.

Engineering Drawing and Interpretation 1 module in the course covered the interpretation of engineering drawings and techniques used to draw such drawing to Australian Standard Code - AS 1100.

Manual Metal Arc Welding 1 module in the course covered the explanation and demonstrated use of rutile electrodes (E4112/4113) in flat, horizontal and vertical positions on plate, flat bar and sectional steel sections.

Gas Metal Arc Welding 1 module in the course covered the GMAW techniques, explanation and demonstrated use of solid wire in the flat, horizontal and vertical positions on plate, flat bar and sectional steel sections.

Structural Fabrication 1 module in the course covered the techniques used when working with structural steel channel such as splicing mitre cuts, assembling channels sections to specifications and manufacturing and fabricating column sections.

3.2.2. Stage 2 of the course modules

Gas Metal Arc Welding 2 module in the course covered more advanced GMAW techniques, explanation and demonstrated use of solid wire and flux core welding in the flat, horizontal, vertical and overhead positions on plate, flat bar and sectional steel sections.

Material Science module in the course covered testing of materials such as bend test, macros and break tests that had been welded. This included coverage of the apprentices understanding of the different properties of materials associated with the welded products in the trade area.

Computing in Engineering module in the course covered basic computer skills in operating programs such as Excel spread sheets, Word and Fast Cam.

Manual Metal Arc Welding 2 module in the course covered a more advanced explanation and demonstrated use of rutile electrodes in flat, horizontal, vertical and overhead positions on plate, flat bar and sectional steel sections

Fabrication Drawing 1 module in the course covered the advance techniques associated with engineering and interpretation of detailed blue print drawings.

Gas Tungsten Arc Welding 1 module in the course covered the explanation and demonstrated use of GTAW processes in flat, horizontal and vertical positions on aluminium, stainless steel and low carbon steel plate.

Structural Fabrication 2 module in the course covered the marking off, bending, rolling, cutting and shaping of pipe structures.

Structural Fabrication 3 module in the course covered laying-out of building sites, cambers, levelling of footing for building sites and the fabrication and assembly of portal frames simulating large building/roofing projects.

3.2.3. Stage 3 of the course modules

Advance Thermal Cutting and Gouging module in the course covered the different thermal cutting methods used in the trade such as magnetic profile

cutting, photo profile cutting and straight line cutting. This included design and manufacture of low carbon steel templates for the magnetic profile and drawing templates for the photo profile.

Thermal Cutting and Associated Processes module in the course covered the different cutting processes associated with cutting non-ferrous materials such as stainless steel and aluminium. These processes included plasma cutting, air arc gouging and high pressure thermal gouging.

Manual Metal Arc Welding 3 module in the course covered a more advanced explanation and demonstrated use of low hydrogen electrodes (E4816) in flat, horizontal, vertical and overhead positions on plate, flat bar and sectional steel sections.

Parallel Line Development module in the course covered drawing developments and templates of cylindrical and triangular sections associated with heavy fabrication trade.

Cylindrical/Rectangular Fabrication module in the course covered the marking off and fabrication of cylindrical and rectangular shaped jobs, such as lobster backs, branch pipes and rectangular hoppers.

Radial Line Development module in the course covered drawing developments and templates of conical sections associated with heavy fabrication trade such as frustum of a right cone, oblique cones and truncated cones.

Conical Fabrication module in the course covered the marking off and fabrication of frustum, truncated cones and frustum and truncated oblique cones jobs.

Triangulation Line Development module in the course covered drawing developments and templates of triangular hoppers and transition pieces such as square to round and round to round transition pieces associated with heavy fabrication trade.

Transition Fabrications module in the course covered the marking off and fabrication of transition pieces and rectangular shaped jobs, such as square to round, rectangular to round, round to round and rectangular hoppers.

In 2001 the Metal Fabrication and Welding (Heavy) Course changed to incorporated off-the-job assessment which meant that the employer had to take a role in the training of their apprentice by assessing the apprentice's skills to competency standards. This course was Engineering Fabrication Certificate III (Heavy) Trade Course 3449 (refer appendix B table 2). Although this course did not differ from 7792 (refer appendix B table 1) in the modules offered there was the inclusion of the off-the-job competencies.

In stage 1 of the course the employer was not asked to assess the apprentice on competencies but in September of the following year the employer was sent out a workplace record book per apprentice which contained competencies that had to be signed off by the employer. Refer appendix B&C.

Once these competencies and modules were successfully completed and the apprentice completed four years of on-the-job training he/she was awarded a trade craftsman certificate enabling him/her to work in the industry as a tradesperson.

A letter setting out full details of the project, including the purpose and specific objectives (Appendix I) was sent to the Director General (DG) for TAFE NSW seeking the department's approval to undertake the research. After the

approval was obtained from the DG, letters (Appendix I) were sent out to each of the eleven TAFE NSW Institute Directors seeking approval for the inclusion of their institutes in the research project. On receiving such approval from the Institute Directors, letters (Appendix I) were sent out to each Faculty Director of Manufacturing and Engineering Divisions in each TAFE NSW Institute seeking approval to include them in the research project. After such approval was received from the Faculty Directors, letters (Appendix I) were sent to the 21 sections involved in the teaching of the stage three MF&W (Heavy) trade course. After approval was obtained from the Head/Senior Head Teachers of the sections, a package containing the details and procedures of conducting the exit test was sent out to each of the sections in October 2002. The package contained a letter on how to administer the exit test (Appendix D); a course outline sheet (Appendix B&C); a student information sheet (Appendix H); and a copy of the exit test (Appendix M).

When the exit tests were completed, the test papers were returned to the researcher for marking. The results were sent out to those students who requested to have their results. The section results were sent back to the sections without identifying students by February 2003. This test was for the purpose of the study and did not have any bearing on the apprentice's course outcome. Results were correlated and independent T-tests were computed to determine if there were any significant differences between the results using SPSS for presentation in the research document.

Phone interviews with the MF&W (Heavy) Head Teachers and Teachers in NSW were conducted in 2005. Descriptive surveys provide governments,

manufactures, economists and local authorities with information necessary for planning and action. Usually, the purpose of such surveys is fact finding and descriptive – although the data collected is also often used to make predictions, for instance by comparing the results of similar surveys at different times and identifying the trends. (Oppenheim, 1992: 12).

The most obvious advantage of conducting structured interviews over the telephone is the low cost factor. It has been estimated that face-to-face interviews take about one third of the interviewer's time in conducting interviews, whereas the remainder of their time is taken up by travel and by locating respondents. The results of a set of telephone interviews are usually available in a much shorter time. Despite some misgivings, numbers declining to participate are actually lower, perhaps because of the advantage of “interviewer invisibility” to some respondents (Oppenheim, 1992: 97-98).

The structure of the phone interview was in conformity with the times and procedures advocated by Oppenheim (1992: 101). The interview with structured questions to the negotiated text was particularly useful when structuring the questions for the telephone interviews of the MF&W teaching staff in TAFE NSW (Denzin & Lincoln 2000: 645-672).

The sample included 102 Teachers and Head Teachers, covering 17 TAFE campuses from nine TAFE Institutes in NSW. The interview comprised of six general information questions and eleven trade information questions. Results were analysed using SPSS for presentation in the research document.

Cohen, Manion and Morrison (2000: 245-265) state that questionnaires, (2000: 267-292) and tests (2000:317-335) are particularly useful when designing and formulating the structure of an exit test and phone interviews in the studies.

3.3 Research Sample

The research covered 17 campuses across nine institutes of TAFE NSW which were teaching the MF&W (Heavy) Trade Course. The capacity of each class was 12 students. This equated to a sum total of 204 students who could have sat the exit test in 2004. The students who attempted the exit test in 2004 totalled 95, which equated to 46% of the population. The sample was representative of the population in that rural and city campuses were included in both. However, we do not know to what extent the range of ability of the students were in the sample. This study has three components - one is the Hunter Institute of TAFE in 2001 – 2004, the second is NSW TAFE 2004 and the third being the interviews with MF&W (Heavy) teachers in TAFE NSW.

In 2005 a sample population of 102 Head Teachers and Teachers in MF&W (Heavy) trade across 17 campuses in nine institutes of TAFE NSW were invited to take part in phone interviews. The number of Head teachers and teachers who participated in the phone interviews totalled 89, which equated to 87% of the population.

3.4 Exit Test Design

3.4.1 Structure of the Test

The exit test was made up of four parts. These parts contained multiple choice questions, short answer questions, calculative and development questions. The exit test was designed from the format of the MF&W (Heavy) stage three examination between 1980-1990 and covered the subject matter that a stage three apprentice was expected to know at this stage of his/her training in the trade area.

First, this exit test was discussed and distributed amongst the Hunter Institute of TAFE MF&W teaching staff for their comments and suggestions. It was then piloted at the Cessnock Campus in 2001.

All the questions used were taken from the modules taught to the apprentices. This means that the participants have attempted the questions through an end of the module test or review questions used in the modules. It should also be noted that the participants have completed Parallel Line, Conical and Triangulation developments and Fabrication modules in their final year.

The exit test received 94 responses and the results were calculated and recorded as percentages.

3.4.2 Exit Test Layout (refer appendix M)

The title page explained the purpose for the study, the purpose for which the exit test was to be used, time allowed and what could be used in the process of doing the test.

The second page explained that the test was voluntary and outlined the structure of the test.

The exit test was divided into four sections and explained in detail.(refer appendix N). Section A - Comprised 60 Multiple Choice Questions. Question 1 to 5 of the exit test covered the topic of NBB01 Occupational Health and Safety (OH&S) 7793T. Question 6 to 15 of the exit test covered the topic of NF 13 Thermal Cutting and Associated Processes (TC&AP) and incorporates NBB09 Welding and Thermal Cutting (W&TC). Question 16 to 32 of the exit test covered the topics of Manual Metal Arc Welding (MMAW) processes NF01, NF05 and NF10. Question 33 to 50 of the exit test covered the topics of Gas Metal Arc Welding (GMAW) processes NF02, NF07 and NF14. Question 51 to 55 of the exit test covered the topic of NF03 Gas Tungsten Arc Welding process (GTAW). Question 55 to 60 of the exit test covered the topic of NF33 Structural 1 in the Metal Fabrication and Welding industry.

Section B – Comprising 5 Short Answer Questions

Questions 1 and 2 were valued at 5 marks each. Question 3 was valued at 4 marks Questions 4 and 5 were valued at 2 marks each. All these questions in section B derived from topics in NF33, 34 and 35 Structural units.

Section C - Comprising 6 Calculative Questions

Question 1 was valued at 4 marks. Questions 2, 3 and 5 were valued at 1 mark. Question 4 was valued at 2 marks All questions in section C derived from topics NF45, NF46, NF47 Development units.

Section D - Comprising 3 Development Sketching Questions

Question 1 was valued at 3 marks. Question 2 and 3 were valued at 4 marks each. All questions in section C derived from topics NF45, NF46, NF47 Development units.

3.5 Phone Interview Design

The phone interview schedule comprised 2 sections (refer appendix E)

3.5.1 Section 1 General information.

This section of the interview dealt with gender, location, length of service, full-time part-time employment and qualification.

3.5.2 Section 2 Trade Course Information

This part of the interview comprised of question relating the trade course.

3.6 The Research Questions

The following key research questions were raised as part of the empirical comparative study of the test scores:

- 1 Was there an improvement in the exit knowledge of the apprentices who completed between 2001 and 2004 and those who completed the trade course stage three at TAFE NSW, after the introduction of new courses 6059 and 3449?
- 2 What were the differences, if any, in the knowledge base of MF&W (Heavy) apprentices between the TAFE NSW institutes in 2004?
- 3 What were the differences in the results of the exit tests undertaken between 2001 and 2004 and what were the differences between the old course 7792 and the new courses 6059 and 3449 at the Institute 1?
- 4 In the opinion of the teachers did the changes implemented in new courses 6059 and 3449 improve the knowledge base of the apprentices who were completing the stage three of the course in the MF&W (Heavy) sector?

- 5 In the opinion of the teachers does the current MF&W (Heavy) course meet industry needs and if not what components of the courses need improvements?
- 6 Which is the preferred teaching delivery technique to be used by MF&W (Heavy) teachers in TAFE NSW?
- 7 In the opinion of the teachers to what extent do employers take on-the-job training of the apprentices as an important component of the course?

The data for the exit tests was statistically analysed using SPSS independent T-tests and the phone interviews were descriptively analysed (refer chapter 5).

3.7 The Theoretical Framework for the Study

The framework for this study was based on a combination of two theoretical concepts: (1) Workplace Learning and Assessment; and (2) Competency Based Training in the Vocational Education and Training Area.

One of the key areas in vocational education for the Australian Government is apprenticeships and traineeships that are aimed at increasing the quality and quantity of entry-level training. This area has seen considerable changes and debate during the implementation of training reforms over the last decade. Issues relating to participation rates, industrial relations and wage policies all have received significant attention (Australian Education Council Review Committee 1991; DEET, 1991; Kemp, 1996; Lundberg, 1997).

3.7.1 Workplace Training and Assessment

In the opinion of Stevenson “focus in teaching and learner should be on the individual’s active construction of knowledge” (Stevenson, 1994: 29).

"Contemporary work-based learning is grounded in teaching and learning research emanating from the cognitive sciences, psychology, and pedagogy. Consistent with research from these various disciplines, work-based learning blends into an integrated curriculum the mental and tactile, theoretical and applied, and academic and vocational. This blending appears for most students most of the time to result in increased retention of knowledge, deeper understanding of subject matter, and the ability to apply (i.e., transfer) knowledge and skills in ill-structured environments."(Lynch, 2000: 19)

Because the focus is on the learner, "vocational practice needs to be conceptualised as a learning process rather than a teaching process". (Billett, 1994: 64).The vocational teacher’s role is not to set tasks, but to organize experiences that allow learners to develop their own knowledge and understanding. Using the methods of cognitive apprenticeship, the teacher is a coach who provides guidance that gradually decreases as learners become more proficient, and who models, mediates, diagnoses, and scaffolds. The learning environment should reproduce the key aspects of communities of practices and authentic sequences in complexity, multiple experiences and examples of knowledge application, access to experts, and a social context in which learners collaborate on knowledge construction (Kerka, 1997).

However, issues relating to learning and assessment within apprenticeships have not received the same degree of attention. Little attention has been paid to what actually happens to apprentices and how their experiences affect their training. The most recent Australian studies have included Wilson and Englund (1994); Smith (1998); and Harris, Willis, Simons, and Underwood (1998). The question of quality in apprenticeships has also been only minor and of recent interest (WADOT, 1998; Schofield, 2000; Smith, 2000). Yet such issues relating to learning and assessment go to the very heart of the quality of Vocational Education and Training (VET) for apprentices as well as the ability of the system to deliver outcomes relating to promoting lifelong learning (Robinson 2001: 28-29).

3.7.2. Competency Based Training

The Carmichael Report (1992) outlined a staged strategy for meeting Australia's training needs into the new millennium.

The Employment and Skills Formation Council (ESFC) recommended and the National Training Board implemented the competency based Australian Vocational Certificate Training System. The focus of a competency based training (CBT) system was based on outcomes, the attainment and demonstration of specific knowledge, skills and applications by individuals, rather than inputs, such as time served. The key areas of competence targeted were generic competencies which under-pin the acquisition of vocational and occupational-specific competencies.

3.8 Summary

This chapter presented the research methodology, design and the sample populations followed by the explanations of the exit test and phone interview design. The procedures were then outlined and this was followed by an explanation of the data analysis techniques and the theoretical framework for the study.

The following chapter reviews the analysis of data collected from the Institutes of TAFE in 2001 and 2004, data from the phone interviews in 2005 and an evaluation of data results.

Chapter Four

Analysis of Data from the Exit Test Conducted 2001-2004 and Phone Interviews with Metal Fabrication and Welding (Heavy) TAFE NSW Teachers 2005

4.1 Introduction

This chapter presents an analysis of data from the exit tests carried out in 2001 and 2004 with stage three apprentices completing the Metal Fabrication and Welding (Heavy) Trade Course in TAFE NSW and phone interviews with teachers in the Metal Fabrication and Welding (Heavy) TAFE NSW. The chapter is divided into six sections.

The first section provides details of the terminology and the abbreviations that are used throughout the chapter. The second section presents data on the exit test results in Institute 1 of TAFE NSW in 2001. The data presented in tables and illustrated by charts. The third section presents data on the exit test results in the eleven institutes of TAFE NSW in 2004. The data presented in tables and illustrated by charts. A comparison of results was required because of a change in course structure. This statistical analysis for the exit test was carried out by using cross tabulation and t-tests in SPSS (Coakes & Steed 2001).

The fourth section presents data relating to the phone interviews of MF&W (Heavy) Teachers 2005 in TAFE NSW. It also involved the Metal

Fabrication and Welding (Heavy) teaching experience, location, gender and qualifications. Section five details the results of statistical analysis for the information collected from the phone interviews using cross tabulation tests in SPSS (Coakes & Steed 2001). The final section provides a summary of the results of the study.

4.2 Abbreviations and Terminologies

Throughout this chapter the following abbreviations and terminologies are used:

OH&S	Occupational Health and Safety
TC&AP	Thermal Cutting and Associated Processes
MMAW	Manual Metal Arc Welding
GMAW	Gas Metal Arc Welding
GTAW	Gas Tungsten Arc Welding
OAW	Oxy-acetylene Welding
SAW	Submerged Arc Welding
FCW	Flux Core Welding
Structural	Rolled steel sections used in the Metal Fabrication Industry
Weld Positions	Four welding positions used in the Welding Industry
Struct Calcs	Metal Fabrication and Welding trade calculations used in the structural component of the course
Struct Fab	Structural fabrication
Cylind/Rec	Cylindrical Rectangular fabrication
Conical	Conical fabrication

Transition	Transition fabrication
Fab Drw & Interp	Fabrication Drawing and Interpretation
CNC	Computer Numerically Control
CAD	Computer Aided Drawing

4.3 Exit Test Data of Institute 1 of TAFE 2001

Institute 1 of TAFE NSW is one of the ten institutes that took part in the study. The institute has sixteen campuses with six of the campuses offering Metal Fabrication and Welding (Heavy) (refer Appendix A). Only five of these campuses were used in this study because one campus uses flexible delivery and the course structure did not line up at the time as shown in Table 4.1. All five campuses had response rates of at least 80%.

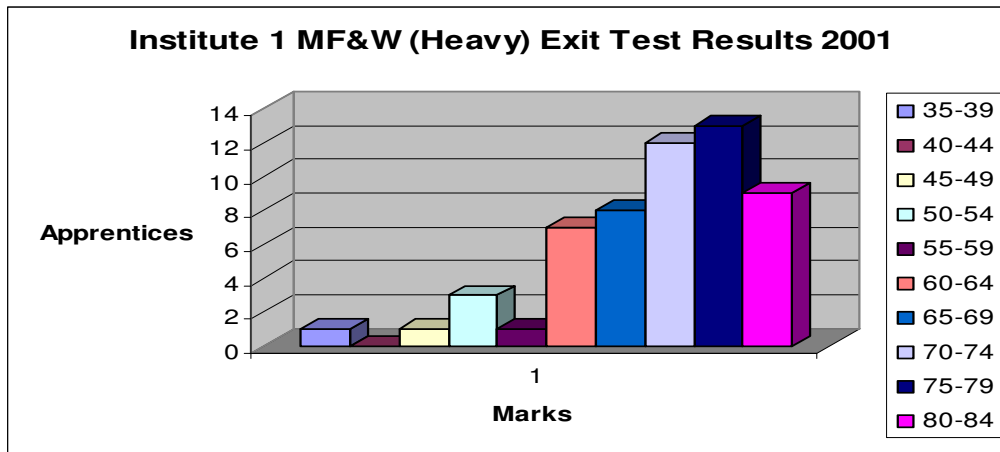
Table 4.1 Apprentice Response Rate Institute 1 of TAFE 2001

Campus	1	2	3	4	5	Total
Exit Test	15	11	11	8	11	56
Enrolled	16	12	12	12	12	64

The response rate for the exit test at these five campuses was 92% and the mean mark achieved by the apprentices was 69.7% which is just below the competency standard mark for all the modules taught in this trade (70%) as shown in Table 4.2.

The collected marks had a range of 38 to 84. Only 20% of the apprentices achieved 70% or more marks with 9% achieving 80% and above, as shown in Figure 4.1. For more detailed information by campuses refer to Appendix J.

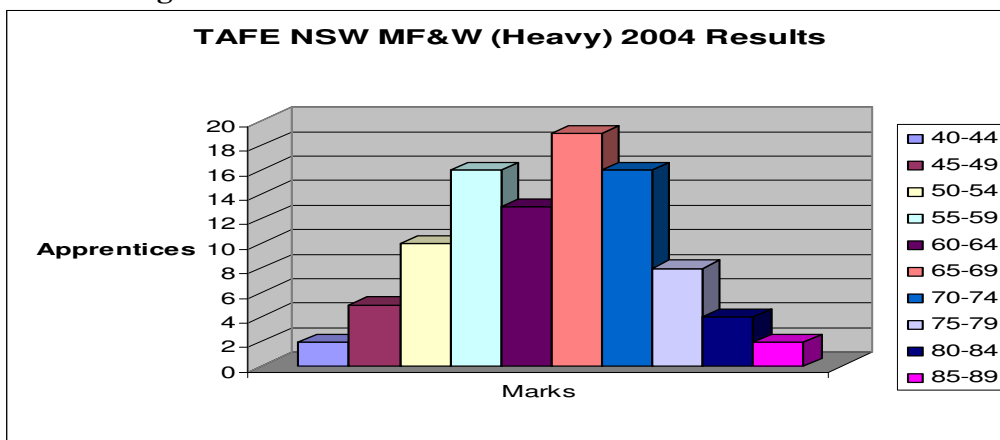
Figure 4.1 Institute 1 MF&W (Heavy) Exit Test Results 2001



4.4 Exit Test Data of TAFE NSW 2004

Of the ten institutes in TAFE NSW (Appendix A), five institutes were involved in the study. Eleven campuses of those institutes of TAFE took part in the study. The response rate for apprentices completing the exit test over these eleven campuses was 43% TAFE NSW in 2004 - refer to Figure 4.2. The mean score achieved by the apprentices in 2004 was 64.5% which is below the 70% percentage required by the competency levels of the modules taught; with a range of 42 to 88 marks. For more detailed data on campuses refer to Appendix K.

Figure 4.2 Exit Test Results of TAFE NSW Institutes 2004



4.5 The Different Sections of the Exit Test Results 2001

Table 4.2 Institute 1 of TAFE NSW Exit Test Results 2001

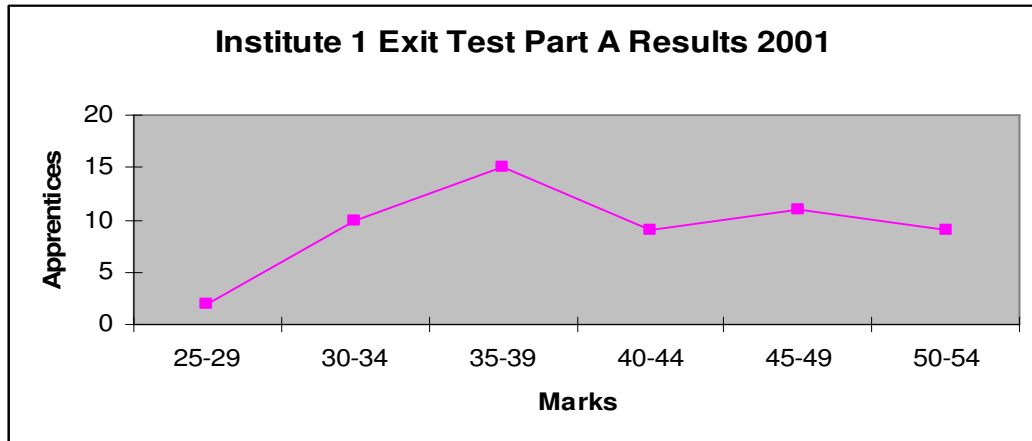
	Institute	Campuses	Part A	Part B	Part C	Part D	Total
	1	1	35.7	16.4	7.9	3.9	64%
		2	38.3	13.6	9.0	5.7	67%
		3	51.0	16.5	8.4	1.2	77%
		4	43.6	17.4	8.1	1.8	71%
		5	38.0	17.0	8.1	6.9	70%
Max	1	5	60.0	18.0	11.0	11.0	100
Mean	1	5	41.3	16.2	8.3	3.9	70%

The exit test was divided into four sections: Part A contained 60 multiple choice questions; Part B was made up of five short answer questions; Part C contained six calculative questions; and Part D was made up of three developmental questions.

The questions were taken from review questions and exam questions from modules that had been taught over the past three years. The apprentices had attempted each of these questions at least once during that time.

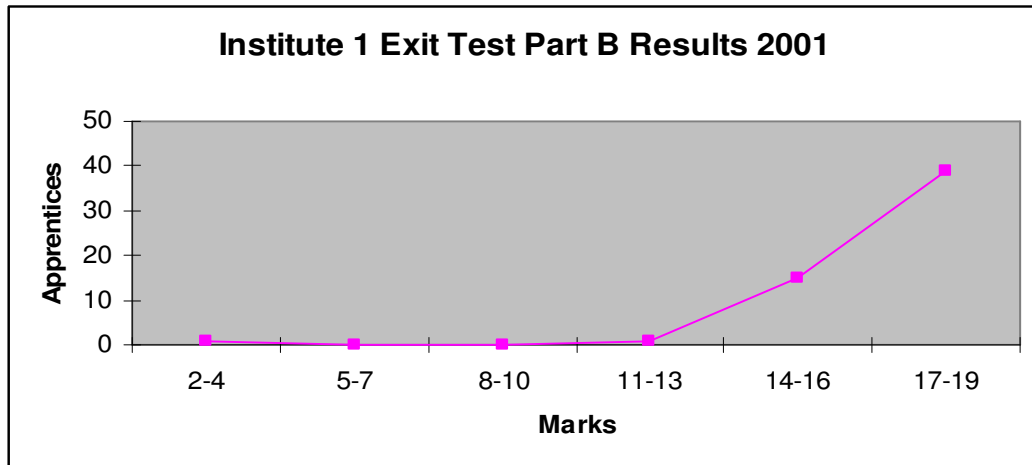
Part A. The 60 multiple-choice questions covered all modules taught during the past three years when the apprentices attended Institute 1 of TAFE MF&W (Heavy) Trade course 2001. Out of 92% apprentices that responded 48% failed to reach the required 70% pass mark as shown in Figure 4.3.

Figure 4.3 Institute 1 of TAFE Exit Test Part A Results 2001



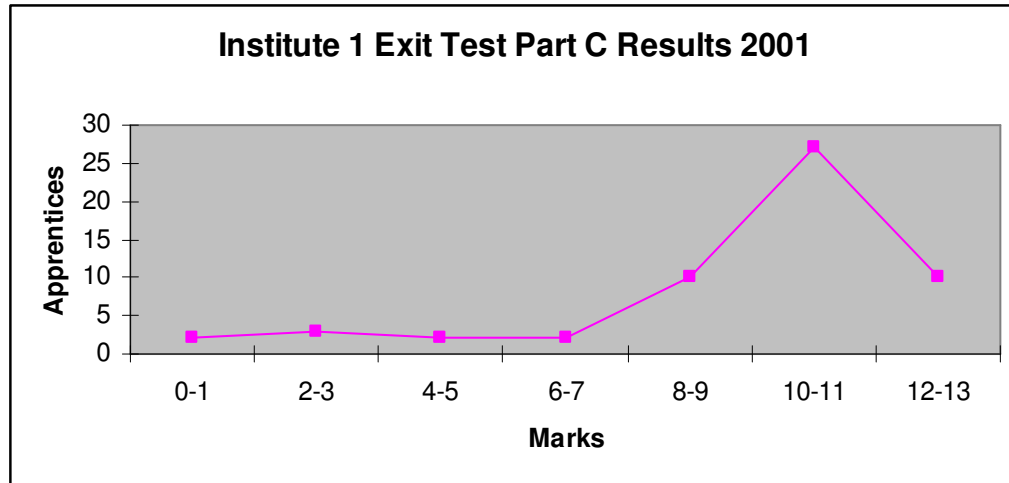
Part B. The five short answer questions were based on a Manual Metal Arc Welding (MMAW) diagram, a Gas Tungsten Arc Welding (GTAW) diagram, a Weld position diagram, a rolled steel section diagram and drawing symbols. Ninety two percent of respondents achieved more than the pass mark of 70%. The distribution of scores are indicated in Figure 4.4.

Figure 4.4 Institute 1 of TAFE Exit Test Part B Results 2001



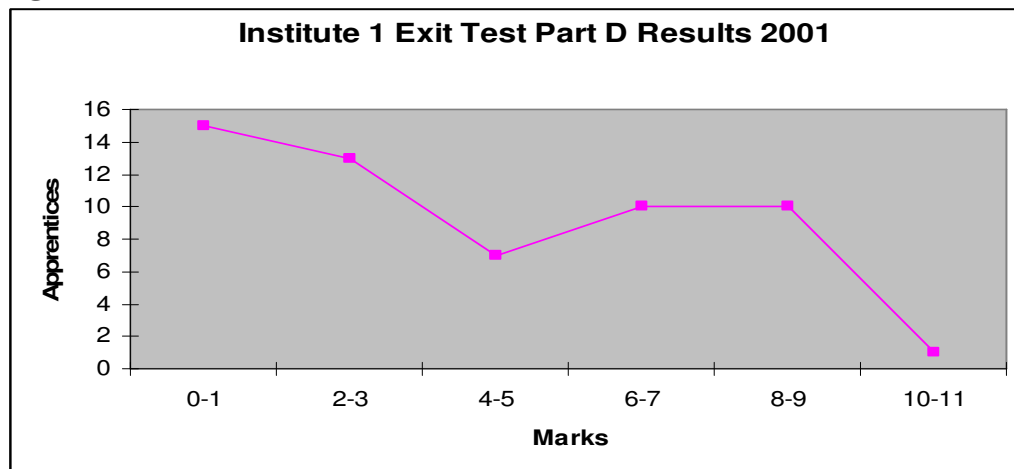
Part C. This section contained six calculative questions. Seventy seven per cent of the respondents reached the required pass mark of 70% or more. The distribution of score are shown in Figure 4.5.

Figure 4.5 Institute 1 of TAFE Part C Exit Test Results 2001



Part D. The development section had three developmental questions for the apprentices to draw. These were: one parallel line development; one radial line development and one triangulation development drawing. Only 20% of respondents successfully achieved 70% or more marks as indicated in Figure 4.6.

Figure 4.6 Institute 1 of TAFE Exit Test Part D Results 2001



Of the five campuses that took part in the exit test, three were urban and two were city campuses.

4.6 The Different Sections of the Exit Test Results 2004

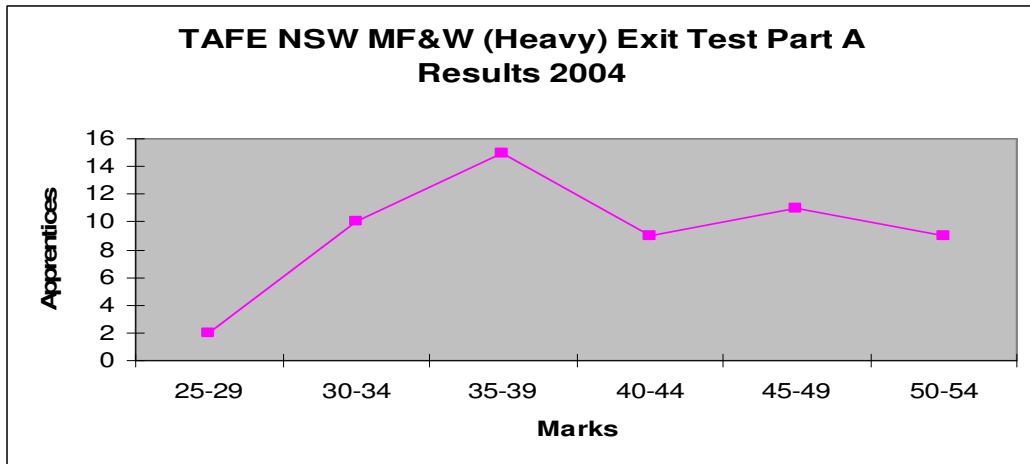
Table 4.3 Exit Test Results 2004

Institute	Campuses	Part A	Part B	Part C	Part D	Total
1	1	36	16.6	6.6	5.4	65%
	2	35.3	16.3	7.3	4.5	63%
	4	38.0	16.2	7.0	4.8	66%
	5	34.6	15.8	7.2	4.8	62%
2	7	38.9	16.8	9.5	3.1	68%
3	8	46.9	16.7	8.0	7.3	79%
	9	35.9	16.2	7.2	6.7	66%
4	10	34.9	14.8	5.8	2.8	58%
5	11	31.6	15	5.6	0.8	53%

Max	5	9	60.0	18.0	11.0	11.0	100
Mean	5	9	37	16	7.1	4.5	65%

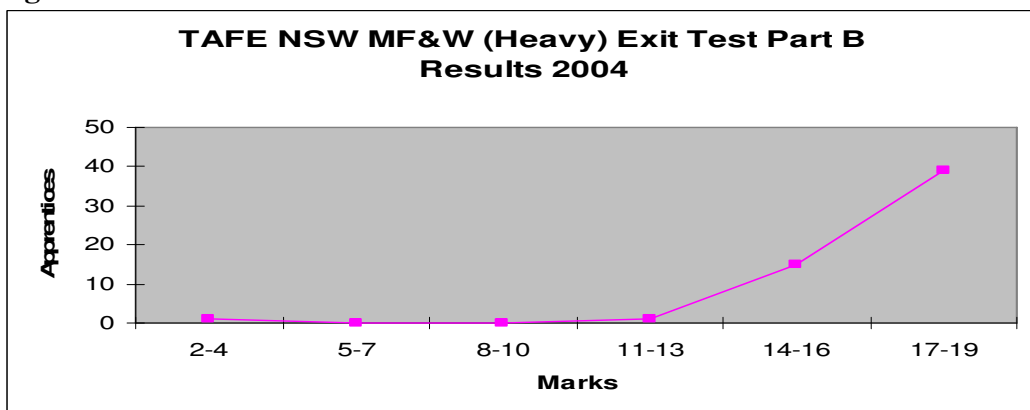
Part A. The 60 multiple-choice questions covered all modules taught during the past three years that the apprentices attended in the TAFE MF&W (Heavy) Trade course 2004. Of the apprentices that responded, 78% failed to reach the required pass mark of 70% while 11% obtained above 80% as shown in Figure 4.7

Figure 4.7 Exit Test Part A Results 2004



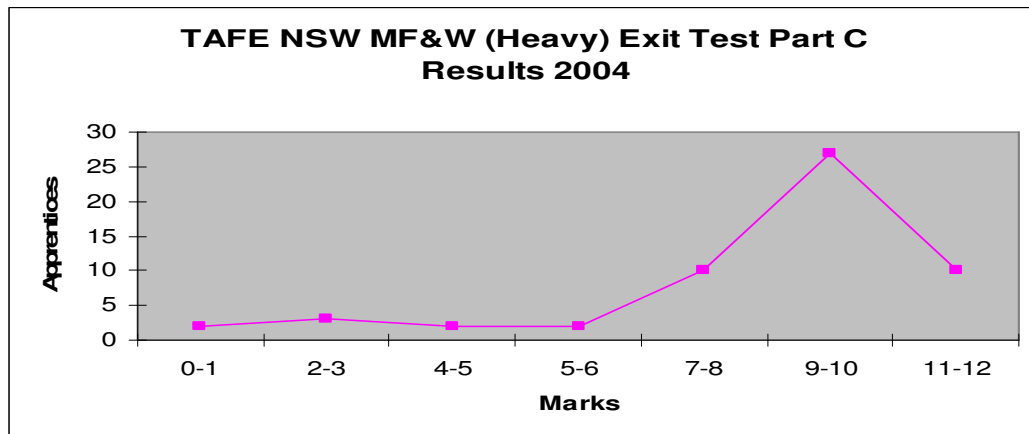
Part B. The five short answer questions were based on a Manual Metal Arc Welding (MMAW) diagram, a Gas Tungsten Arc Welding (GTAW) diagram, a Weld position diagram, a rolled steel section diagram and drawing symbols. Ninety seven per cent of respondents achieved more than 70% pass mark and 52% of these apprentices achieved above 90% as indicated in Figure 4.8.

Figure 4.8 Exit Test Part B Results 2004



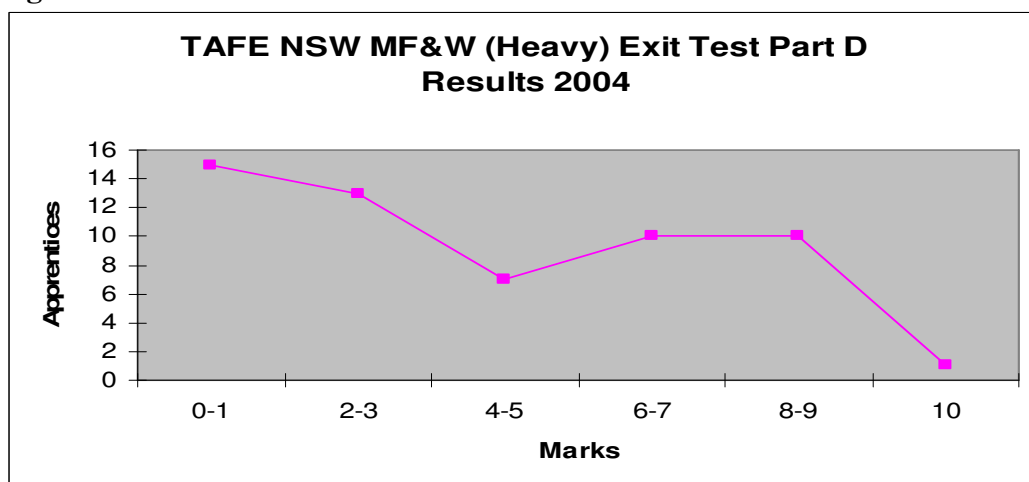
Part C. This section contained six calculative questions. Thirty nine per cent of respondents reached the required pass mark of 70% or more as shown in Figure 4.9.

Figure 4.9 Exit Test Part C Results 2004



Part D. The development section had three developmental questions for the apprentices to draw. These were: one parallel line development; one radial line development and one triangulation development drawing. Only 30% of respondents successfully achieved 70% or more marks as indicated in Figure 4.10.

Figure 4.10 Exit Test Part D Results 2004



Figures 4.7 to 4.10 highlight the tabular summary of 2004 when compared to Figure 4.3 to 4.3 of 2001 reflects a drop 5.2% in marks due mainly to the introduction of the on-the-job assessment change to the course structures.

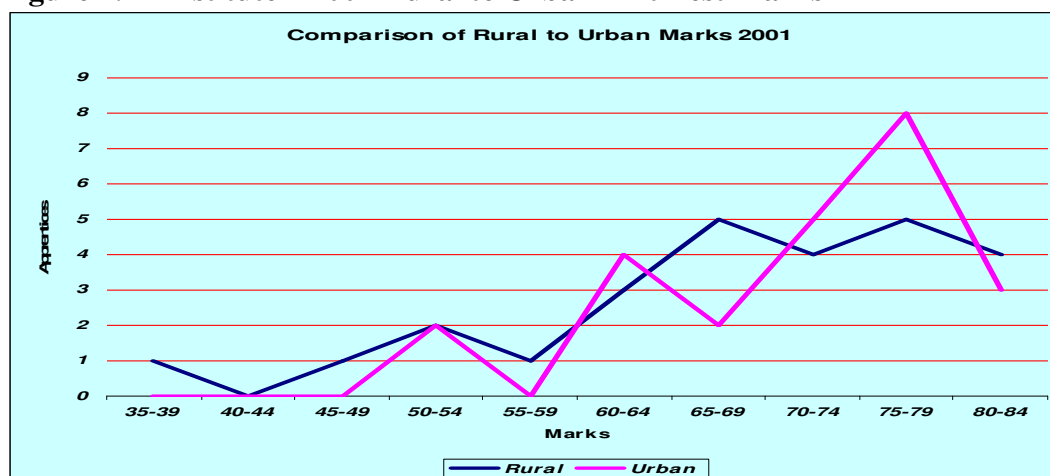
4.7 Exit Test Data of the Institute 1 Rural and Urban TAFE NSW Campuses 2001

Table 4.4 represents Institute 1 TAFE Campuses that are in the rural and urban areas of TAFE NSW 2001, to see if there were differences because of location (*six did not participate*). The rural campuses had a mean score of 64.6 and a range of 38-84 marks and the urban campuses a mean score of 69.1 and a range of 51 to 83. Table 4.13 and Figure 4.11 show that 50% of the rural apprentices obtained the pass mark while 70% of urban apprentices also passed the exit test. For more details about individual campuses refer to Appendix J and K.

Table 4.4 Rural and Urban Campuses Exit Test Results 2001

Marks	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rural	1	0	1	2	1	3	5	4	5	4
Urban	0	0	0	2	0	4	2	5	8	3

Figure 4.11 Institute 1 2001 Rural to Urban Exit Test Marks

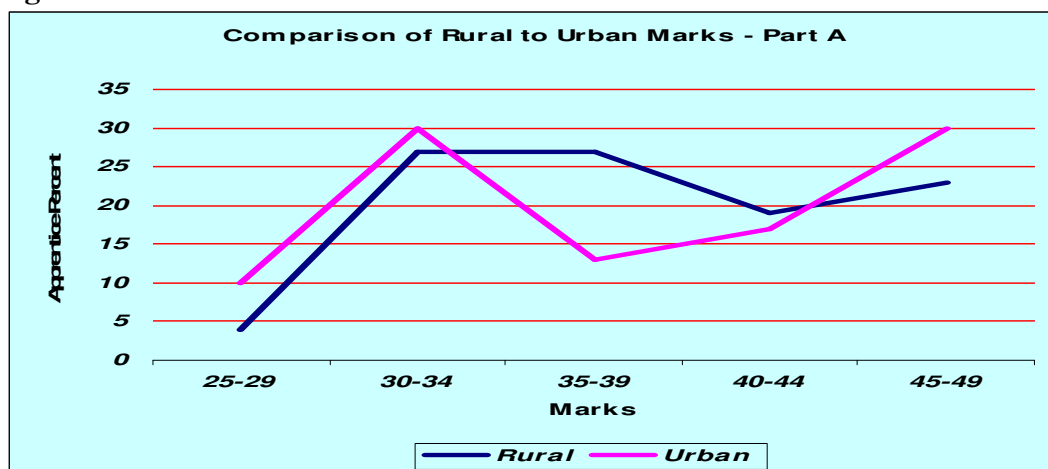


The following data differences are tested for significance in chapter 5.

Part A Multiple Choice Questions

This section of the exit test had a maximum of 60 marks. The mark ranged from 27 to 48 marks for apprentice from rural areas, compared to a range of 29 to 49 marks for urban apprentices. The rural mean was 38.5 marks compared to 38.3 for urban marks - a very small difference of 0.2 marks as shown in Figure 4.12

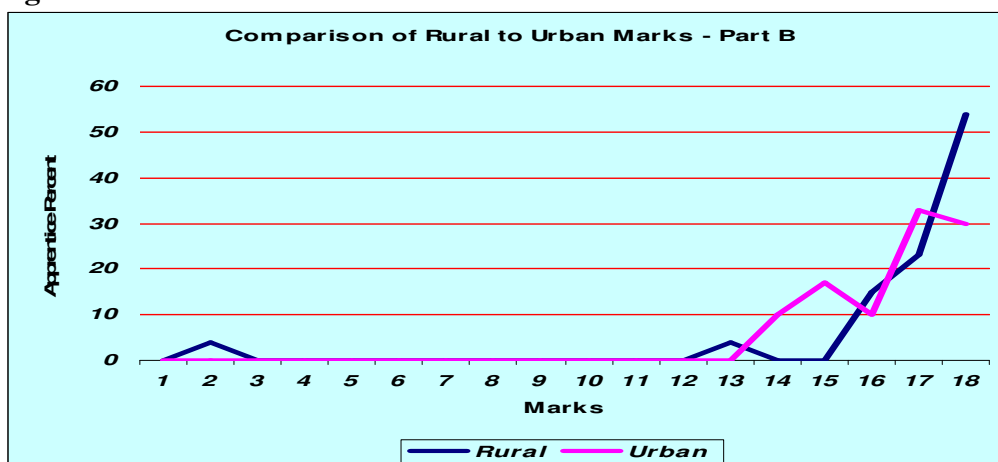
Figure 4.12 Institute 1 2001 Rural to Urban Marks –Part A



Part B Short Answer Questions

This section of the exit test had a maximum of 18 marks. The rural range was 2 to 18 marks compared to the urban range of 13 to 18. The mean rural mark was 16.7 whereas the urban mark was 16. The difference was only 0.7 marks as shown in Figure 4.13.

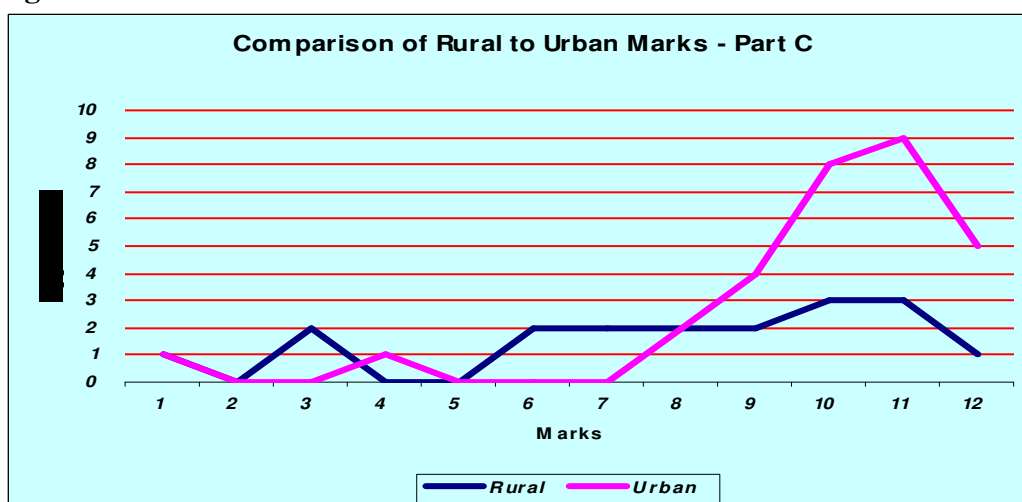
Figure 4.13 Institute 1 2001 Rural to Urban Marks – Part B



Part C Calculations Questions

This section of the exit test had a maximum of 11 marks. The rural and urban marks had a range of 0 to 11 marks. The mean mark was 8 for the rural areas and 8.9 marks for the urban areas. The difference was 0.9 marks as shown in Figure 4.14.

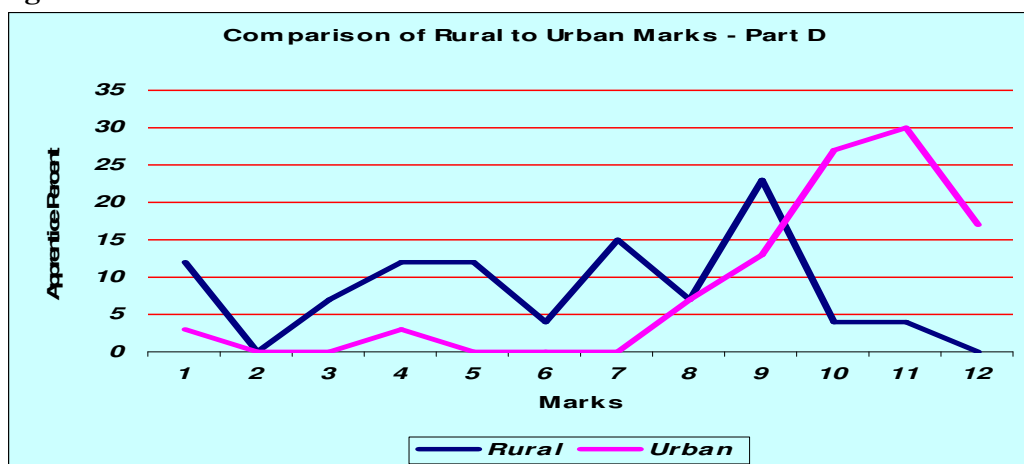
Figure 4.14 Institute 1 2001 Rural to Urban Marks – Part C



Part D Development Questions

In this section of the exit test the maximum mark was 11. The rural range was 0 to 10 compared to the urban range of 0-9 marks. The rural mean mark was 5.19 marks compared to the urban mark of 3. The difference was 2.19 marks as shown in Figure 4.15.

Figure 4.15 Institute 1 2001 Rural to Urban Marks – Part D



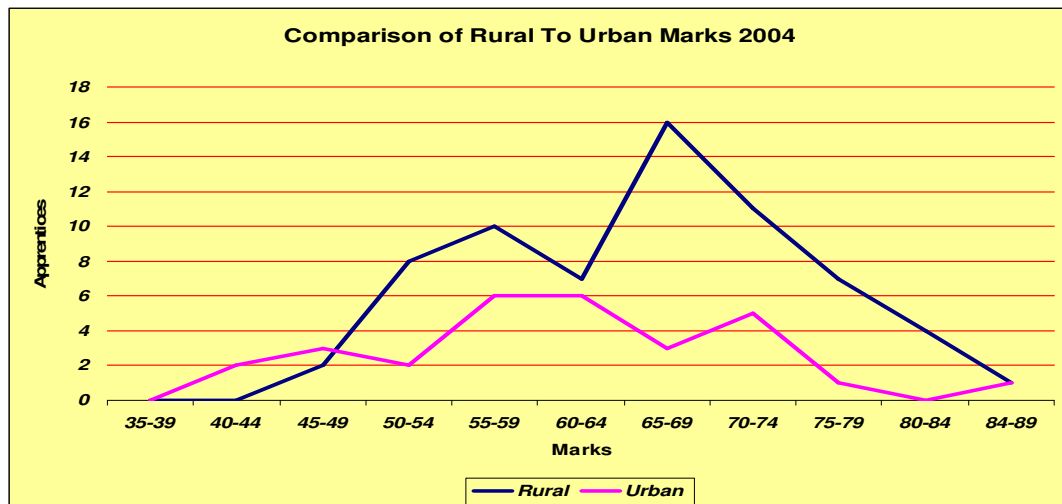
4.8 Exit Test Data of Rural and Urban TAFE NSW Campuses 2004

Table 4.5 represents TAFE campuses that are in the rural and urban areas of TAFE NSW 2004. The rural campuses had a mean score of 64.7 with a range of 45 to 86 marks compared to the urban's mean of 61.9 and a range of 40-89. The difference of 2.8 marks between the means was not a large difference as illustrated in Figure 4.16. For more detailed information relating to the individual campuses refer to Appendices J and K.

Table 4.5 Rural and Urban Campuses Exit Test Results 2004

Marks	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89
Rural	0	0	2	8	10	7	16	11	7	4	1
Urban	0	2	3	2	6	6	3	5	1	0	1

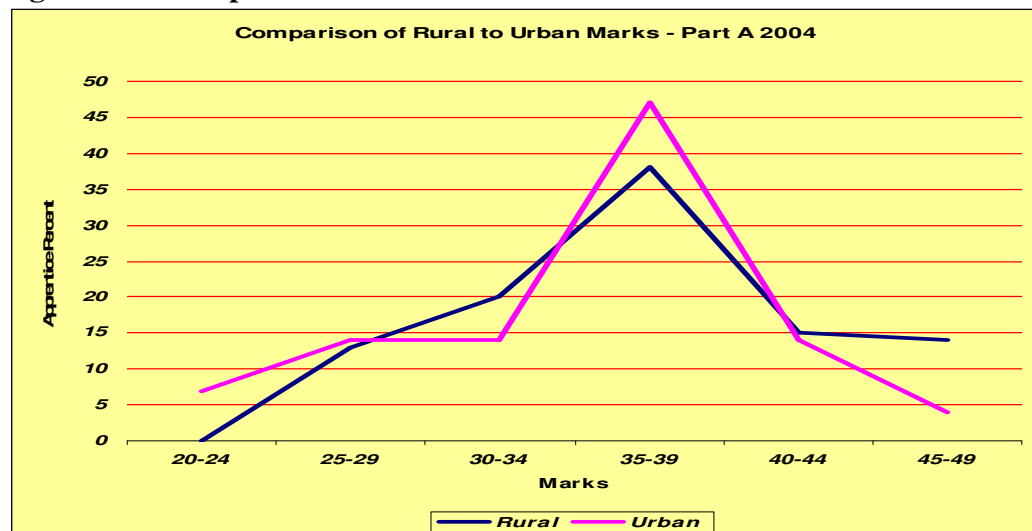
**Figure 4.16 Comparison of Rural and Urban Campuses
Exit Test Results 2004**



Part A Multiple Choice Questions

This section was assigned a maximum of 60 marks. The rural range was 25 to 46 with a mean of 36 marks whereas the urban marks ranged from 22 to 49 with a mean of 35.1 marks. The difference was 1.1 marks in the means as illustrated in Figure 4.17.

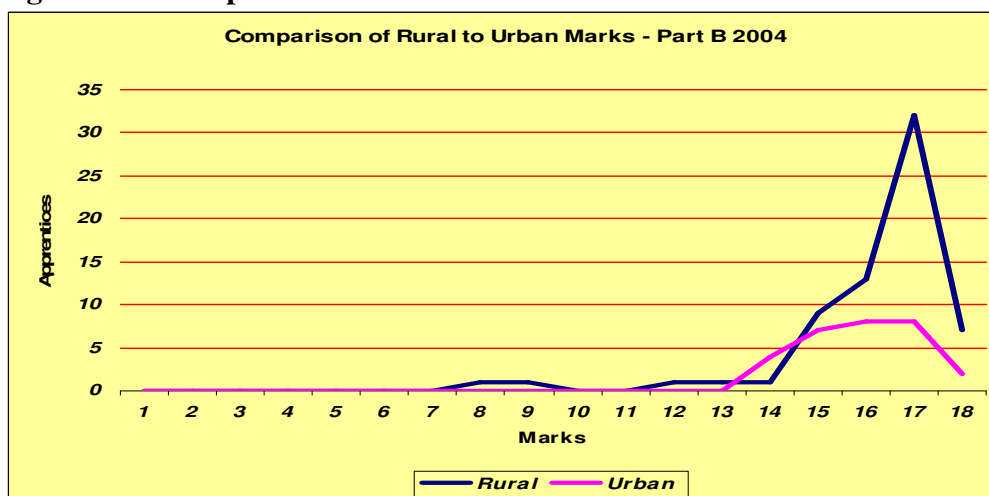
Figure 4.17 Comparison of Rural to Urban Marks – Part A 2004



Part B Short Answer Questions

This section has a maximum of 18 marks. The rural range was 8 to 18 with a mean of 16.2 marks whereas the urban range was 14 to 18 and a mean of 15.9 marks. The difference was 0.3 marks in the means as illustrated in Figure 4.18.

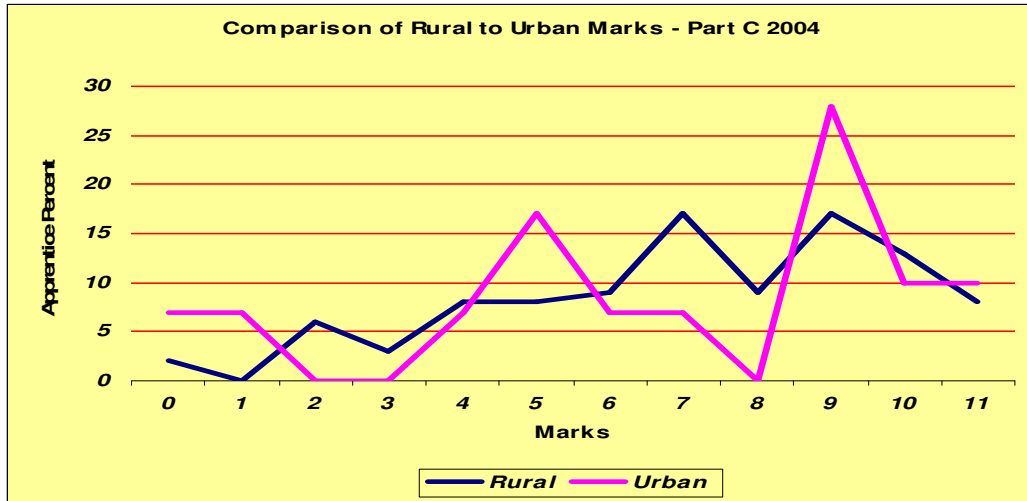
Figure 4.18 Comparison of Rural to Urban Marks – Part B 2004



Part C Calculation Questions

This section had a maximum of 11 marks. The rural range was 0 to 11 and a mean of 7.2 marks whereas the urban range was 0 to 11 and a mean of 6.8 marks. The difference was 0.5 marks as illustrated in Figure 4.19.

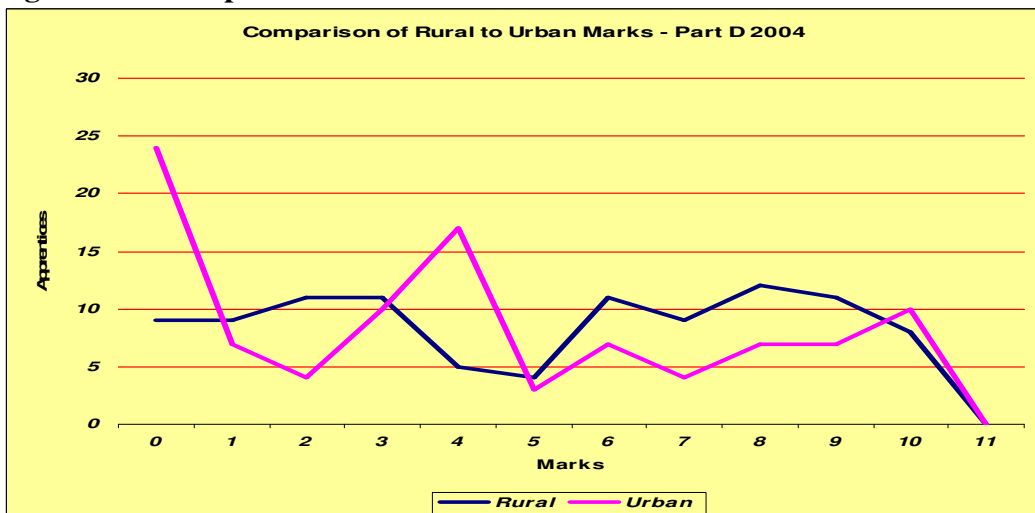
Figure 4.19 Comparison of Rural to Urban Marks – Part C 2004



Part D Development Questions

This section has a maximum of 11 marks. The rural range was 0 to 10 and a mean of 5 marks whereas the urban range was 0 to 10 and a mean of 4.2 marks. The difference was 0.8 marks as illustrated in Figure 4.20.

Figure 4.20 Comparison of Rural to Urban Marks – Part D 2004

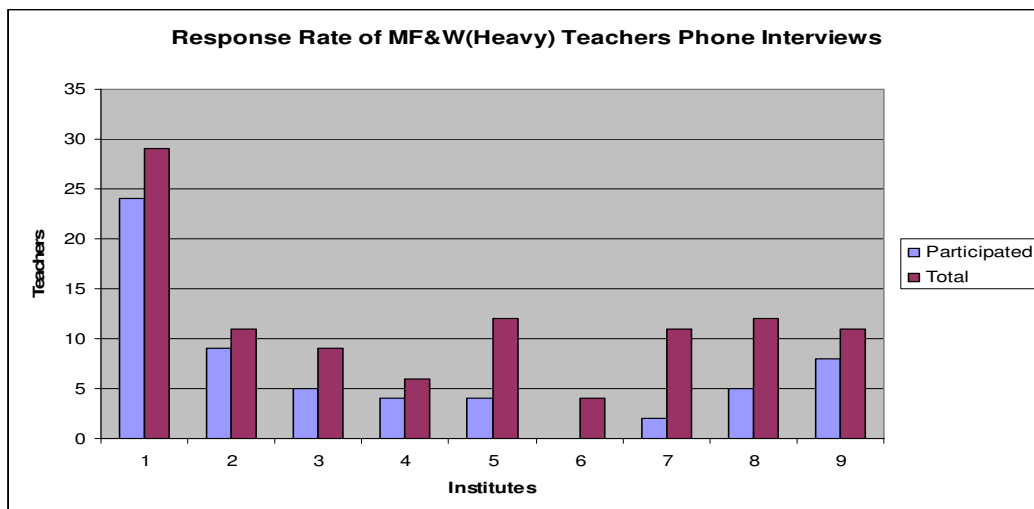


There was a difference in the means of 2.8 marks in favour of rural areas of TAFE NSW which across the spectrum was not significant.

4.9 Phone Interviews of TAFE NSW MF&W (Heavy) Teachers 2005 Section 1.

Out of a total of 10 TAFE NSW Institutes, the Metal Fabrication and Welding (Heavy) teachers, two did not participate in the phone interviews. One institute did not offer this trade course while the other institute had only one campus that offered Metal Fabrication and Welding (Heavy) and that campus had not participated in the study. Of the eight TAFE NSW institutes which had 24 campuses that offered Metal Fabrication and Welding (Heavy) Trade Course agreed to participate in the interviews - seventeen from the rural areas and seven from the urban areas. Of those institutes that participated, 61 out of 105 teachers agreed to participate in the interviews (Figure 4.21). Of the 24 Metal Fabrication and Welding (Heavy) sections that participated in the interviews 60 were males while there was only one female. Of these male teachers 57 were employed on a full time bases while the other three were employed part time.

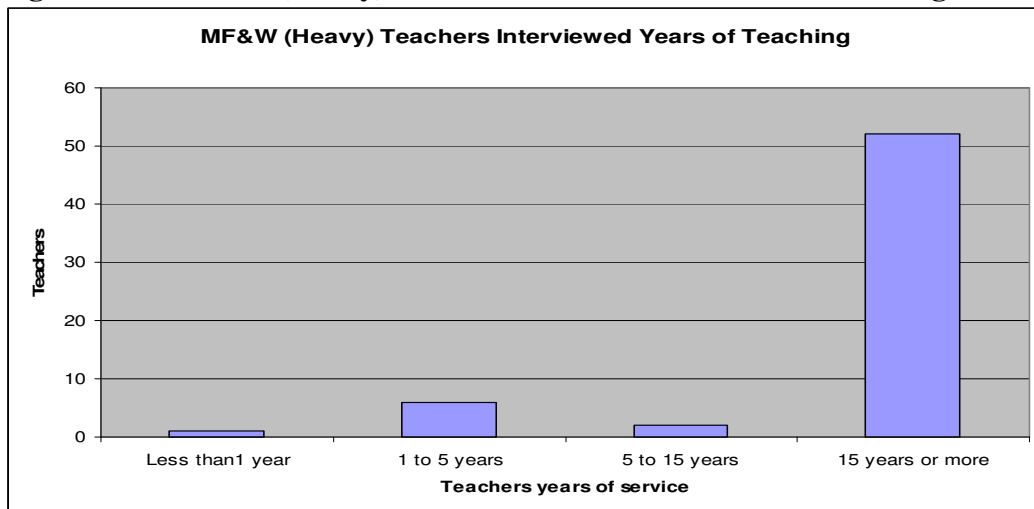
Figure 4.21 Response Rate of MF&W (Heavy) Teachers Phone Interviews



4.9.1 Length of Teaching Service of MF&W (Heavy) Teachers Interviewed

In the next five years over half of the Metal Fabrication and Welding (Heavy) teaching staff will be eligible for retirement and this is reflected in the following statistics. Of the teachers interviewed one teacher had less than one year teaching experience; six teachers had one to five years experience and two teachers had 5 to 15 years experience. The remaining 52 teachers had more than 15 years of experience. Thus more than 85% interviewed had 15 or more years of experience showing a highly experienced workforce. This highlights the ageing workforce in TAFE NSW as shown in Figure 4.22.

Figure 4.22 MF&W (Heavy) Teachers Interviewed Years of Teaching

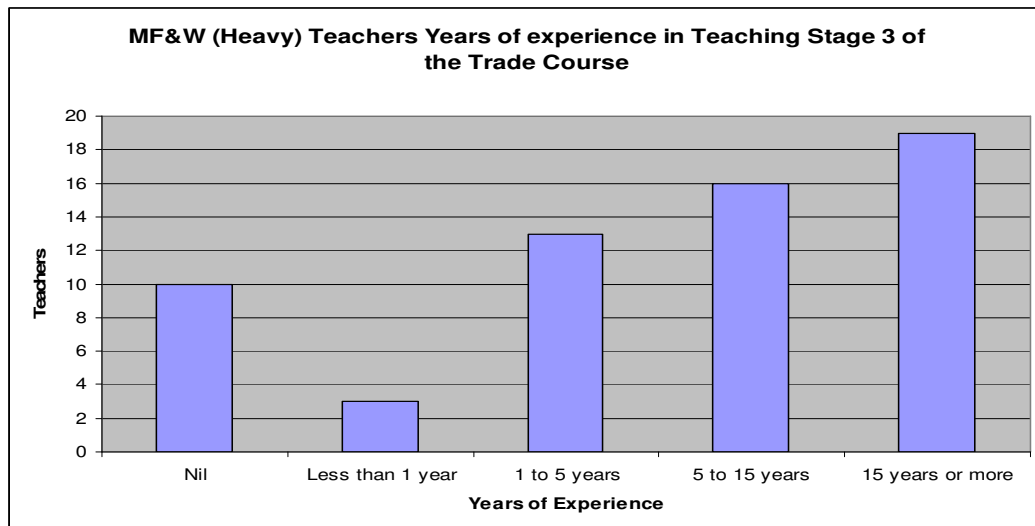


4.9.2 Experience of Teaching Stage 3 MF&W (Heavy) Trade Course

Of the teachers interviewed ten had not taught stage 3 of the trade course; three had taught the relevant trade course for less than 1 year and 13 had taught the course for 1 to 5 years. Sixteen had taught the course for 5 to 15 years while nineteen had taught the course for more than 15 years. These results indicate that

the majority of teachers have had a vast amount of experience when teaching stage three of the trade course- as shown in Figure 4.23.

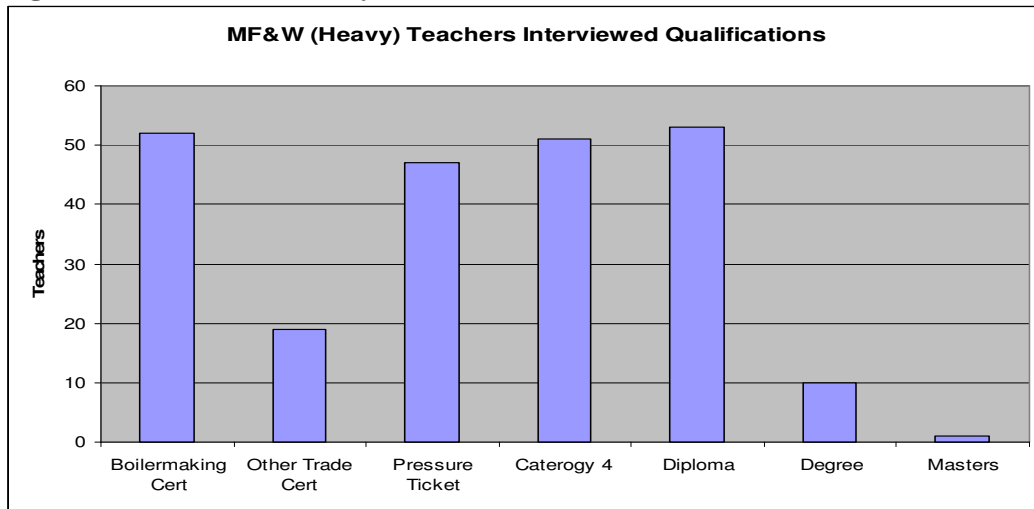
Figure 4.23 MF&W (Heavy) Teachers Years of Experience in Teaching Stage 3 of the Trade Course



4.9.3 Qualification of Teachers Interviewed

Of the teachers interviewed 52 held a Boilermaking Trade Certificate; nineteen held another Trade Certificate; 47 held one or more Pressure Welding Certificates; 51 had a category 4 Workplace Certificate; 33 held a Teaching Diploma; 10 held a University Degree; and one teacher interviewed held a Masters Degree. More than half the teacher interviewed had more than two qualification. The results indicate that the MF&W teachers in NSW are highly qualified in their discipline area - as shown in the Figure 4.24.

Figure 4.24 MF&W (Heavy) Teachers Interviewed Qualifications



4.9.4 Phone Interview Section 2 Responses

This section shows the opinions of Metal Fabrication and Welding (Heavy) teachers TAFE NSW in relation to phone interviews carried out in 2005.

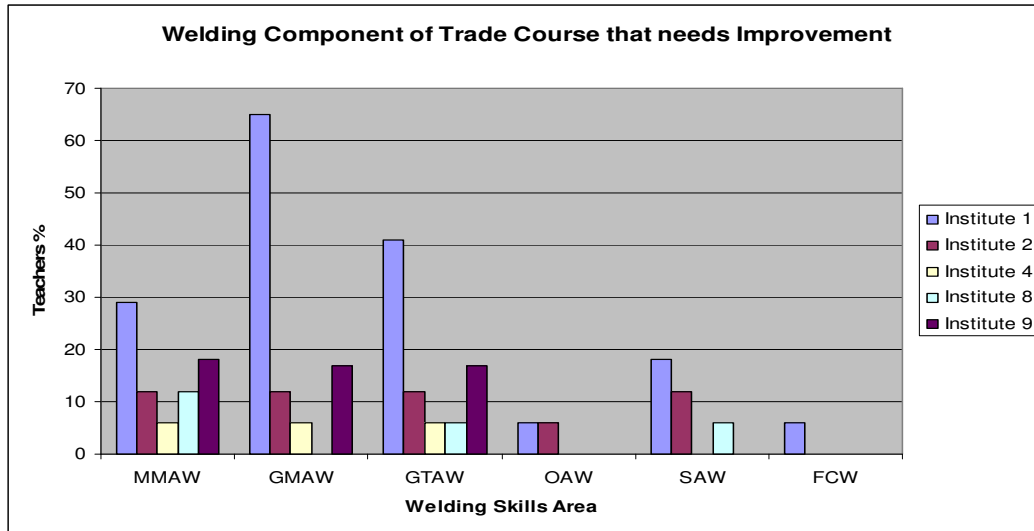
4.9.5 Has the Trade Course Met Industry Needs?

Of the teachers interviewed 59% indicated that overall the current trade course does not meet industry needs. When asked about the Welding component of the course, 64% of the teachers who responded felt that it met industry needs and 61% felt that the Fabrication component does not meet those needs.

4.9.6 Has the Welding and Fabrication Components of the Course Met Industry Needs?

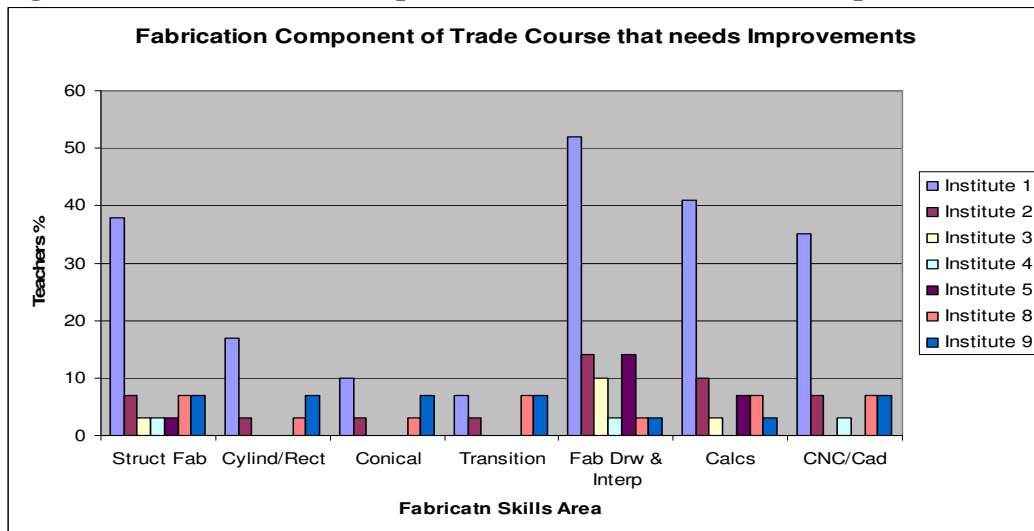
For the Welding component of the course, 36% of those who responded felt that this area could be improved particularly in the Gas Metal Arc Welding (GMAW) - see Figure 4.25. In the Fabrication area 38%.33% and 31% have respectively indicated that Drawing and Interpretation, Structural Fabrication and Fabrication Calculations need to be expanded in the trade course. see Figure 4.26.

Figure 4.25 Welding Component of Trade Course needs Improvement



MMAW – Manual Metal Arc Welding, GMAW – Gas Metal Arc Welding, GTAW – Gas Tungsten Arc Welding, OAW Oxy-Acetylene Welding, SAW – Submerge Arc Welding, and FCW – Flux Core Welding

Figure 4.26 Fabrication Component of Trade Course needs Improvement



Struct Fab - Structural fabrication, Cyland/Rect - Cylindrical Rectangular fabrication, Conical - Conical fabrication, Transition - Transition fabrication, Fab Drw & Interp - Fabrication Drawing and Interpretation, CNC.-.Computer Numerically Control, and CAD - Computer Aided Drawing

4.9.7 Have the changes to the Course had an Impact on the Tuition Delivery Techniques?

In 1991 Competency Based Training was introduced into the NSW Vocational Educational system and this involved the Metal Fabrication and Welding (Heavy) section. The change embraced an alternate delivery system - that of modules and how it was to be delivered. Amongst the teachers interviewed 87%, indicated that the changes had an impact on tuition delivery techniques; 79% preferred the lock-step method rather than the CBT method of delivering lessons. More importantly 92% believed that there had not been an improvement in apprentices' outcomes from the change.

4.9.8 Improvements in Knowledge and Skills

Eighty seven per cent of teacher's interviewed indicated that since 2001 knowledge and skill level had not improved because of changes to the Metal Fabrication and Welding (Heavy) trade course (on-the-job assessment).

The following are the comments gathered from teacher's interviewed from different institutes in the study.

Institute 1 includes rural and urban campuses. The general consensus of the teachers indicated that the majority of employers are concerned with dollars in business. This created a more 'tick and flick' (where the employer just signs-off the apprentices without actually evaluating whether she/he has the competency) assessment without any real evidence of skills acquired by the trade apprentice or any real understanding of the trade knowledge needed. Employers in most cases are yet to embrace the concept. On the positive side it allows the teachers more contact with employers and therefore more feedback.

Institute 2, encompasses rural campuses. The teachers indicated that the employers and apprentices had little or no interest in the processes and they lacked motivation.

Institute 3 also encompasses rural campuses. The teachers expressed concerns about the ‘tick and flick’ mentality of the employers in the region.

The teachers of Institute 4, which also comprises of rural campuses indicated that skill levels had not changed and that apprentices were only interested in passing rather than in excelling in what they do.

The teachers in Institute 5 comprising of urban campuses, expressed concerns that the employers were not committed to the process.

The teachers in Institute 7 encompassing urban campuses, did not make any comment on this topic.

The teachers in Institute 8 encompassing rural campuses, indicated that this change had narrowed the skills training and trade knowledge of the apprentices.

The teachers in Institute 9 encompassing rural and urban campuses have stated that there were no follow-up assessments of under-pinning knowledge of the apprentices while the employers in general were not committed to the process.

Institute 6 and 10 did not have any comment.

4.9.9 Does the Location of Training Affect Learning Outcomes?

The teachers were undecided on whether it was beneficial to be trained in the rural or the urban area. The teachers indicated that there was better work ethics and willingness to learn from rural apprentices compared to urban apprentices. The teachers expressed concern about the lack of resources and equipment that country campuses were working with compared to the urban campuses.

4.9.10 Was there an Increase or Decline in Student Numbers?

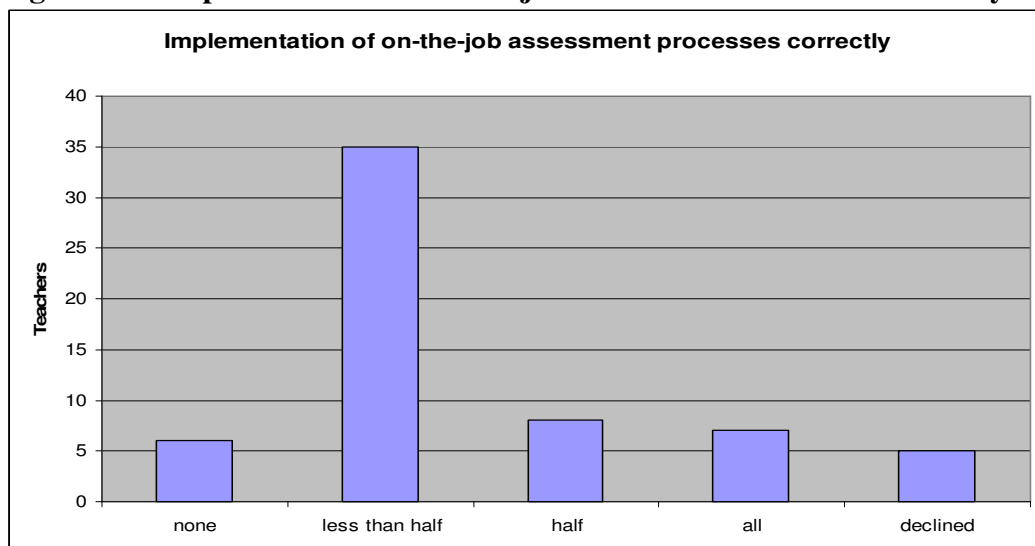
In 2005 there was an increase in apprenticeships in the MF&W (Heavy) trade due to the skills shortage. This has come about because of a lack of forward

planning from industry and government bodies, a shift of political attitude and policy since the skills shortage was common knowledge in 1999 while 80% of teachers in this study also have indicated this fact.

4.9.11 Is the On-the-job Assessment Process being Correctly Implemented by Employers?

Of the Metal Fabrication and Welding (Heavy) teachers who were interviewed, 57% indicated that less than half the employers implemented an on-the-job assessment process correctly. Of the teachers interviewed 77% expressed an opinion that employers did not take the on-the-job assessment seriously and that employers are forced to do the on-the-job assessments and ‘tick and flick’ without any real conviction. Most businesses are so busy that they have no time to focus on the training, leading to just processing the documentation to expedite the apprentice’s qualification. Therefore they did not see it as their role to train as shown in Figure 4.27.

Figure 4.27 Implementation of on-the-job Assessment Processes Correctly



4.10 Summary

This chapter provided an analysis of the data and results of the study. An analysis of exit test results of the campuses that took part in the study within the institutes of TAFE NSW 2001-2004 was presented using tables and figures. Also provided was data and results of the interviews carried out with Metal Fabrication and Welding (Heavy) Teachers in TAFE NSW in 2005. The response rate for the interviews was indicated and in section one the gender balance was explained, employment status, teaching location and qualifications were shown using graphs. In section two, opinions were expressed regarding current industry needs in the welding and fabrication training areas of the trade; the impact of tuition techniques; the extent of improvement if any, with the introduction of changes to the processes and the apprentice's knowledge and skills. The issue of whether it was beneficial to be trained in the rural or urban areas; and the employer implementation of on-the-job assessment were also presented. The following chapter presents the analysis and evaluation of the results from the exit tests of stage three Metal Fabrication and Welding (Heavy) Apprentices TAFE NSW 2001-2004 and phone interviews of Metal Fabrication and Welding (Heavy) teachers TAFE NSW 2005.

Chapter Five

Analysis of Results, Exit Tests and Phone Interviews TAFE NSW 2001-2005

5.1 Introduction

This chapter presents an analysis of data and the results of the study. The chapter is divided into four sections.

The first section provides details of the terminology and the abbreviations that are used throughout the chapter. The second section presents the data collected in relation to the exit test carried out 2001-2004 of the M F & W (Heavy) stage 3 apprentices in NSW. The third section presents data, in table form, on the phone interviews carried out in 2005 with the teachers of Metal Fabrication and Welding (Heavy) in NSW. Statistical analysis for both exit test and interview responses was carried out by using cross tabulation tests in SPSS (Coakes & Steed 2001). The fourth and final section provides a summary of the results of the study.

5.2 Exit Test

This section of the chapter is described by tabular form the comparison of all exit test results 2001-2004; a comparison of exit test result for **Institute 1** to other Institutes in 2004. It also presents a break down of the sections of exit test results in 2001 and 2004 and a comparison of urban to rural exit test results in 2001 and 2004. For information relating to the exit test format refer to Appendix L.

5.2.1 Comparison of all Exit Test Results in 2001 and 2004 (2-tailed T-test)

Table 5.1 indicates the results for all Institutes from the exits tests 2001 and 2004 and a break down of data for the separate sections of the test.

As shown in Table 5.1, Parts A and C and the total score were significantly different between 2001 and 2004, and in each case the mean scores were higher in 2001. There was no significant difference in mean scores for Parts B and D of the exit test between 2001 and 2004.

In the case of Part B, the short answer section, the performance was uniformly high, the mean representing about 90% of marks for this section. In the case of Part D, the developmental section, the performance was low, the mean representing about 40% of marks available.

The results from Table 5.1 indicate that there has been in specific areas and overall a decline in the exit knowledge of stage 3 MF&W (Heavy) apprentices who undertook the exit test in 2004 compared to 2001.

Table 5.1 A Comparison of all Exit Test Results in 2001 with 2004

Test Part	Year	Mean	Standard Deviation	T	P Less than 0.05
A	2001	40.7	7.23	3.606	Significant
	2004	36.6	6.01		
B	2001	16.6	2.37	1.539	Not Significant
	2004	16.1	1.63		
C	2001	8.5	2.72	2.887	Significant
	2004	7.1	2.90		
D	2001	4.0	3.13	1.309	Not Significant
	2004	4.7	3.34		
Total	2001	70.0	10.10	3.237	Significant
	2004	65.0	10.20		

5.2.2 A Comparison of Exit Test Results in Institute 1. 2001 and 2004 (2-tailed T-test)

Table 5.2 indicates the results for Institute 1 from the exits tests 2001 and 2004 and a break down of data for the separate sections of the test.

As shown in Table 5.2, Institute 1 Parts A,C and the total test score were significantly different in 2001 and 2004, and in each case the mean scores were higher in 2001.

In the case of Part B, the short answer section, the performance was uniformly high, representing about 90% of marks for this section. In the case of Part D, the developmental section, the performance was low, representing about 40% of marks available, similar to what is shown in Table 5.1 (5.2.1)

The results in Table 5.2 (5.3.2) show that Institute 1's were similar to those throughout NSW. Students in 2001 managed the pass mark of 70% but fell below this mean mark by about 5 marks in 2004, indicating a decline in performances over that period of time.

**Table 5.2 A Comparison of the Exit Test Results in Institute 1.
2001 with 2004**

Test Part	Year	Mean	Standard Deviation	T	P Less than 0.05
A	2001	40.7	7.23	3.820	Significant
	2004	36.0	5.36		
B	2001	16.6	2.37	0.822	Not Significant
	2004	16.3	1.46		
C	2001	8.5	2.72	2.945	Significant
	2004	7.0	2.64		
D	2001	4.0	3.13	1.348	Not Significant
	2004	4.9	3.41		
Total	2001	70.0	10.08	3.187	Significant
	2004	64.5	9.17		

5.2.3 A Comparison of Exit Test Results between Institutes 1 and other Institutes in TAFE NSW 2004 (2-tailed T-test)

As shown in Table 5.3, there were no significant differences in 2004 results between Institute 1 and other institutes of NSW. This reflects the common standard across the Metal Fabrication and Welding Trade training system.

Table 5.3 A Comparison of Exit Test Results between Institute 1 with other Institutes in TAFE NSW 2004

Test Part	Institute	Mean	Standard Deviation	T	P Less than 0.05
A	Other	37.2	6.64	0.462	Not Significant
	Hunter	37.8	8.11		
B	Other	15.9	1.79	0.110	Not Significant
	Hunter	16.0	3.23		
C	Other	7.3	3.18	0.312	Not Significant
	Hunter	7.1	3.24		
D	Other	4.6	3.30	0.414	Not Significant
	Hunter	4.4	3.24		
Total	Other	65.0	11.23	0.162	Not Significant
	Hunter	65.3	13.47		

5.2.4 A Comparison of Groups in Part A of Exit Test Results in 2001 with 2004 (2-tailed T-test)

As shown in Table 5.4, section A the multiple choice part of the exit test is illustrated with OH&S, GTAW and Structural having a significant difference between 2001 and 2004. In each case the mean scores were higher in 2001. There was no significant difference for TC&AP, MMAW and GMAW in the exit tests in 2001 and 2004.

In the case of OH&S section, the score was (about 80%) and GTAW (about 98%) indicating uniformly high performance whereas in the Structural section of the exit tests it was about 60% of the marks in 2001.

Table 5.4 A Comparison of Groups in Part A of Exit Test Results in 2001 with 2004

Module Groups	Year	Mean	Standard Deviation	T	P Less than 0.05
OH&S	2001	4.1	0.91	3.775	Significant
	2004	3.5	1.13		
TC&AP	2001	5.3	2.00	2.670	Not Significant
	2004	4.5	1.67		
MMAW	2001	10.4	2.67	2.790	Not Significant
	2004	9.2	2.64		
GMAW	2001	13.1	2.45	2.200	Not Significant
	2004	12.3	2.44		
GTAW	2001	4.9	0.52	2.730	Significant
	2004	4.5	0.78		
Structural	2001	3.1	0.98	2.312	Significant
	2004	2.6	1.34		

5.2.5 A Comparison of Groups in Part B of Exit Test Results in 2001 with 2004 (2-tailed T-test)

As shown in Table 5.5, section B of the exit test MMAW Diagram short answer questions had a significant difference in 2001 and 2004. In this case the mean score was higher in 2004. There was no significant difference for GTAW Diagram, Weld positions, Structural section and Engineering drawing short answer questions of the exit tests in 2001 with those of 2004.

For this section of the exit test - the short answer section - student performance had a uniformly high success rate, representing about 90% of marks assigned for this section.

Table 5.5 A Comparison of Groups in Part B of Exit Test Results in 2001 with 2004

Group	Year	Mean	Standard Deviation	T	P Less than 0.05
MMAW Diagram	2001	4.5	1.08	1.583	Significant
	2004	4.8	0.74		
GTAW Diagram	2001	4.8	0.79	5.042	Not Significant
	2004	4.1	0.76		
Weld Positions	2001	3.9	0.54	1.520	Not Significant
	2004	3.9	0.48		
Structural Sections	2001	3.1	1.34	0.794	Not Significant
	2004	3.0	1.32		
Engineering Drawings	2001	3.8	0.63	0.827	Not Significant
	2004	3.9	0.50		

5.2.6 A Comparison of Groups in Part C of Exit Test Results in 2001 with 2004 (2-tailed T-test)

As shown in Table 5.6 in section C of the exit test, the structural calculative questions on mass, slant height and the hypotenuse sections had a significant difference between 2001 and 2004, and in each case the mean scores were higher in 2001 except for slant height where the means were even. There was no significant difference for the structural calculative questions on rolled steel, apex height and cylindrical dimensions of the exit test between 2001 and 2004.

In the case of the calculative mass and hypotenuse questions, the performance was uniformly high, representing about 80% of marks for this section. In the case of the slant height question, the performance was low, representing only about 30% of marks assigned.

**Table 5.6 A Comparison of Groups in Part C of Exit Test Results
in 2001 with 2004**

Group	Year	Mean	Standard Deviation	T	P Less than 0.05
Struct Calcs Rolled Steel Sections	2001	3.6	1.25	2.589	Not Significant
	2004	3.0	1.54		
Struct Calcs Mass	2001	0.8	0.44	2.901	Significant
	2004	0.5	0.50		
Struct Calcs Apex Height	2001	0.8	0.43	0.426	Not Significant
	2004	0.7	0.44		
Struct Calcs Slant Height	2001	1.0	0.79	0.028	Significant
	2004	1.0	0.90		
Struct Calcs Hypotenuse	2001	0.8	0.40	4.329	Significant
	2004	0.5	0.50		
Cylindrical Dimensions	2001	1.4	0.75	0.006	Not Significant
	2004	1.4	0.68		

**5.2.7 A Comparison of Groups in Part D of the Exit Test Results in 2001
with 2004 (2-tailed T-test)**

As shown in Table 5.7 in section D of the exit test, the radial line development question had a significant difference between 2001 and 2004, and in this case the mean scores were even. There was no significant difference for the cylindrical and triangulation development questions of the exit test between 2001 and 2004.

Table 5.7 A Comparison of Groups in Part D of the Exit Test Results in 2001 with 2004

Group	Year	Mean	Standard Deviation	T	P Less than 0.05
Cylindrical Development	2001	1.5	1.28	0.171	Not Significant
	2004	1.5	1.37		
Radial Line Development	2001	1.5	1.30	0.066	Significant
	2004	1.5	1.48		
Triangulation Development	2001	1.1	1.26	2.764	Not Significant
	2004	1.7	1.40		

5.2.8 A Comparison of the Urban and the Rural Exit Test Results in 2001 with 2004

As shown in Table 5.8 there were no significant differences in Parts A, B, C and D of the urban results for apprentices completing the exit test in 2001 and 2004.

In the case of Parts A, B, and C of the urban mean marks, the performance was higher in 2001 than 2004 with Part D 2001 being lower than the 2004 marks.

Part A, there was a significant difference between the rural apprentices in 2001 and 2004, and in this case the mean score was higher in 2001. There was no significant difference for Parts B, C and D of the rural mean scores of the exit test in 2001 and 2004.

In the case of Part A, the multiple choice section, the performance was uniformly high, representing about 70% of marks for this section in 2001 compared to 2004.

**Table 5.8 A Comparison of Urban to Rural Exit Test Results
in 2001 with 2004**

Part	Location	Year	Mean	Standard Deviation	T	P Less than 0.05
A	Urban	2001	38.4	5.28	1.888	Not Significant
		2004	35.1	6.51		
	Rural	2001	42.0	7.84	3.497	Significant
		2004	37.2	5.71		
B	Urban	2001	16.6	1.34	1.948	Not Significant
		2004	15.9	1.18		
	Rural	2001	16.6	2.77	0.785	Not Significant
		2004	16.2	1.79		
C	Urban	2001	8.6	2.83	2.080	Not Significant
		2004	6.8	3.36		
	Rural	2001	8.4	2.70	2.077	Not Significant
		2004	7.2	2.70		
D	Urban	2001	4.1	3.24	0.260	Not Significant
		2004	4.3	3.54		
	Rural	2001	4.0	3.12	1.423	Not Significant
		2004	4.9	3.26		

5.2.9 A Comparison of the Urban in Part A of the Exit Test Results in 2001 with 2004

As shown in Table 5.9, section A of the urban apprentices completing the exit test GTAW and Structural multiple choice question sections had a significant

difference in 2001 compared to 2004, and in each case the mean scores were higher in 2001. There was no significant difference for OH&S, TC&AP, MMAW and GMAW of the exit test between 2001 and 2004.

In the case of GTAW and structural sections the performance was moderately high in 2001 compared to 2004.

Table 5.9 A Comparison of Urban in Part A of the Exit Test Results in 2001 with 2004

Module Groups	Year	Mean	Standard Deviation	T	P Less than 0.05
OH&S	2001	3.8	1.03	2.327	Not Significant
	2004	3.0	1.31		
TC&AP	2001	4.6	1.50	0.519	Not Significant
	2004	4.8	1.79		
MMAW	2001	9.9	2.16	1.687	Not Significant
	2004	8.8	2.46		
GMAW	2001	12.6	2.19	1.251	Not Significant
	2004	11.7	2.81		
GTAW	2001	4.8	0.54	1.739	Significant
	2004	4.5	0.74		
Structural	2001	3.0	0.88	1.919	Significant
	2004	2.3	1.39		

5.2.10 A Comparison of the Rural in Part A of the Exit Test Results in 2001 with 2004

As shown in Table 5.10, section A of the rural apprentices completing the exit test TC&AP and GTAW multiple choice question sections had a significant difference between 2001 and 2004, and in each case the mean scores were higher

in 2001. There was no significant difference in OH&S, MMAW, GMAW and Structural sections of the exit test in 2001 and 2004.

In the case of GTAW and structural sections, the performance was moderately higher in 2001 compared to 2004. Across the urban and rural results there were higher results recorded 2001 than in 2004.

Table 5.10 A Comparison of the Rural in Part A of the Exit Test Results in 2001 with 2004

Group	Year	Mean	Standard Deviation	T	P Less than 0.05
OH&S	2001	4.3	0.80	3.289	Not Significant
	2004	3.7	0.98		
TC&AP	2001	5.6	2.14	3.592	Significant
	2004	4.3	1.60		
MMAW	2001	10.7	2.89	2.308	Not Significant
	2004	9.4	2.72		
GMAW	2001	13.4	2.56	1.692	Not Significant
	2004	12.5	2.23		
GTAW	2001	4.9	0.52	2.152	Significant
	2004	4.6	0.81		
Structural	2001	3.1	1.03	1.667	Not Significant
	2004	2.7	1.33		

5.2.11 A Comparison of the Urban in Part B of the Exit Test Results in 2001 with 2004

As shown in Table 5.11, there was no significant difference for the urban means of Part B for any of the sections of the exit test between 2001 and 2004.

Table 5.11 A Comparison of Urban in Part B of the Exit Test Results in 2001 with 2004

Group	Year	Mean	Standard Deviation	T	P Less than 0.05
MMAW Diagram	2001	4.6	1.02	0.713	Not Significant
	2004	4.8	0.51		
GTAW Diagram	2001	4.8	0.50	5.041	Not Significant
	2004	4.1	0.49		
Weld Positions	2001	4.0	0.00	*	
	2004	4.0	0.00		
Structural Sections	2001	2.8	1.40	0.659	Not Significant
	2004	2.5	1.41		
Engineering Drawings	2001	4.0	0.23	0.181	Not Significant
	2004	3.9	0.37		

** As there was no variance in the welding position section, no T-Test could be performed.*

5.2.12 A Comparison of the Rural in Part B of the Exit Test Results in 2001 with 2004

As shown in Table 5.12, rural Section B of the exit test MMAW Diagram short answer questions had a significant difference between 2001 and 2004, and in this case the mean score was higher in 2004. There was no significant difference for GTAW Diagram, Weld positions, Structural section and Engineering drawing short answer questions of the exit test between 2001 and 2004.

In both the urban and rural results for Part B there were similar outcomes across 2001 to 2004.

Table 5.12 A Comparison of the Rural in Part B of the Exit Test Results in 2001 with 2004

Group	Year	Mean	Standard Deviation	T	P Less than 0.05
MMAW Diagram	2001	4.5	1.12	1.544	Significant
	2004	4.8	0.82		
GTAW Diagram	2001	4.7	0.91	3.349	Not Significant
	2004	4.1	0.86		
Weld Positions	2001	3.9	0.66	0.102	Not Significant
	2004	3.9	0.57		
Structural Sections	2001	3.3	1.29	0.615	Not Significant
	2004	3.1	1.25		
Engineering Drawings	2001	3.8	0.75	0.892	Not Significant
	2004	3.9	0.55		

5.2.13 A Comparison of the Urban in Part C of the Exit Test Results in 2001 with 2004

As shown in Table 5.13, urban's Section C of the exit test the structural calculative question on mass had a significant difference between 2001 and 2004, and in this case the mean scores were higher in 2001. There was no significant difference for the structural calculative questions on rolled steel, apex height, slant height, hypotenuse and cylindrical dimensions of the exit test between 2001 and 2004.

Table 5.13 A Comparison of the Urban in Part C of the Exit Test Results in 2001 with 2004

Group	Year	Mean	Standard Deviation	T	P Less than 0.05
Struct Calcs Rolled Steel Sections	2001	3.6	1.26	1.220	Not Significant
	2004	3.1	1.62		
Struct Calcs Mass	2001	0.8	0.42	1.940	Significant
	2004	0.5	0.51		
Struct Calcs Apex Height	2001	0.8	0.38	0.979	Not Significant
	2004	0.7	0.46		
Struct Calcs Slant Height	2001	1.4	0.83	1.168	Not Significant
	2004	1.1	0.92		
Struct Calcs Hypotenuse	2001	0.7	0.45	3.143	Not Significant
	2004	0.3	0.47		
Cylindrical Dimensions	2001	1.3	0.81	0.409	Not Significant
	2004	1.2	0.66		

5.2.14 A Comparison of the Rural in Part C of the Exit Test Results in 2001 with 2004

As shown in Table 5.14, rural's Section C of the exit test, the structural calculative questions on mass, slant height and the hypotenuse sections had a significant difference in 2001 compared to 2004, and in each case the mean scores were higher in 2001 except for slant height where the means were lower. There was no significant difference for the structural calculative questions on rolled steel, apex height and cylindrical dimensions of the exit test between 2001 and 2004.

In the case of the calculative mass and hypotenuse questions, the performance was uniformly high, representing about 70% of marks for this section.

The results for urban to rural Part C of the exit test were higher in 2001 with the exception of rural results in the slant height calculative questions which were lower and the apex height calculative question which were even.

Table 5.14 A Comparison of the Rural in Part C of the Exit Test Results in 2001 with 2004

Group	Year	Mean	Standard Deviation	T	P Less than 0.05
Struct Calcs Rolled Steel Sections	2001	3.5	1.26	2.264	Not Significant
	2004	2.9	1.52		
Struct Calcs Mass	2001	0.7	0.45	2.153	Significant
	2004	0.5	0.50		
Struct Calcs Apex Height	2001	0.7	0.45	0.138	Not Significant
	2004	0.7	0.44		
Struct Calcs Slant Height	2001	0.9	0.71	0.871	Significant
	2004	1.0	0.90		
Struct Calcs Hypotenuse	2001	0.8	0.37	3.248	Significant
	2004	0.5	0.50		
Cylindrical Dimensions	2001	1.4	0.73	0.233	Not Significant
	2004	1.4	0.68		

5.2.15 A Comparison of the Urban Part D of the Exit Test Results in 2001 with 2004

As shown in Table 5.15, urban's Section D of the exit test, there were no significant differences for the cylindrical, radial line and triangulation development questions of the exit test between 2001 and 2004.

Table 5.15 A Comparison of the Urban Part D of the Exit Test Results in 2001 with 2004

Group	Year	Mean	Standard Deviation	T	P Less than 0.05
Cylindrical Development	2001	1.5	1.35	0.175	Not Significant
	2004	1.2	1.35		
Radial Line Development	2001	1.3	1.28	0.148	Not Significant
	2004	1.2	1.29		
Triangulation Development	2001	1.3	1.41	1.089	Not Significant
	2004	1.8	1.73		

5.2.16 A Comparison of the Rural Part D of the Exit Test Results in 2001 with 2004

As shown in Table 5.16, rural's Section D of the exit test, the radial line development results had a significant difference between 2001 and 2004, and in this case the mean scores were higher in 2004. There was no significant difference for the cylindrical and triangulation development questions of the exit test between 2001 and 2004.

In urban to rural Part D, the results were poor considering the subject being examined had been taught in the year previous to the exam and should have been fresh in the apprentices' minds.

Table 5.16 A Comparison of the Rural Part D of the Exit Test Results in 2001 with 2004

Group	Year	Mean	Standard Deviation	T	P Less than 0.05
Cylindrical Development	2001	1.4	1.26	0.695	Not Significant
	2004	1.6	1.37		
Radial Line Development	2001	1.6	1.30	0.100	Significant
	2004	1.7	1.54		
Triangulation Development	2001	1.0	1.19	2.729	Not Significant
	2004	1.7	1.25		

5.3 Phone Interviews Descriptive Analysis

5.3.1 Section 1

Of those MF&W (Heavy) Teachers who could have taken part in the interviews, 58% of those responded were males. The teachers had extensive trade teaching experience particularly in stage 3 of the trade course and held qualifications above the normal qualification required.

5.3.2 Section 2

Of the MF&W (Heavy) Teachers interviewed, 59% indicated that the course did not meet industry needs. The teachers expressed the opinion that the welding component was reasonable in its outcomes but felt that the fabrication part of the course lacked substance in the drawing interpretation, calculations and the computer aided drawing components of the course.

The teachers preferred the old method of teaching - lock-step delivery over competency based training method. There have been a number of changes to teaching packages in recent years which the teachers had accommodated.

However, they were clearly of the opinion that the previous method of lock-step was superior to competency based training method. They overwhelmingly indicated that the CBT method had not improved the learning outcomes of apprentices.

From the results of the interviews it would appear that on-the-job assessment of the apprentice's training was in large measure, ineffective due to the reluctance of the employers to participate in the system. The teachers felt that this was due mainly to the fact that employers saw their role as providing employment and it was TAFE's role to provide the training leading to a 'tick and flick' (whereby the apprentices is given a pass for the competency without completing it) attitude towards doing the assessments.

A large majority of teachers indicated that the changes that occurred to the course created no improvement in the knowledge base of the apprentices and further more explained that in their opinion it had a de-skilling effect on the trade.

5.4 Summary

This chapter provided an analysis of the data and results of the study. The terminology and abbreviations that were used throughout the chapter were defined. Statistical analyses of the results for the study were presented. The following chapter presents the summary, conclusions and recommendations of the study.

Chapter Six

Summary, Conclusions and Recommendations

6.1 Introduction

This research was conducted to find whether there has been an improvement in the knowledge base of the apprentices who were completing the MF&W (Heavy) trade courses conducted by the TAFE NSW in 2004 when compared to the old MF&W trade course in 2001 which did not have the off-the-job component in the course structure. This study provides a basis for the implementation of strategies for improving the delivery of training and providing direction for future research. First, the chapter focuses on the purpose and objectives of the study and then summarizes the findings of the study. Secondly, it presents conclusions relating to the study and the final section of the chapter puts forward recommendations based on the results of the study.

6.2 Purpose and Objectives of the Study

The main purpose of this study was to ascertain whether there has been an improvement in the knowledge base of the apprentices who were completing the MF&W (Heavy) trade courses 6059 and 3449 conducted by the TAFE NSW when compared to the old MF&W trade course 7792. The study attempted to identify, clarify and record the past developments and future directions of the courses in

providing the training to meet the industry requirements. It also considered the impact of the rapid changes that have occurred within the industry such as the closure of BHP Newcastle in 1999; the economic rationalisation of some companies; and the introduction of new heavy industries. The study, by means of stage 3 MF&W (Heavy) apprentices exit tests results and MF&W (Heavy) NSW teachers interviews, has shown that the implemented changes to the course have not had the desired results in regard to what is being taught, the delivery method used or the commitment of employers to embrace the changes. The study provides a basis for the implementation of strategies for improving the delivery of training, better communication about changes and providing direction for future research.

The specific objectives of the study were to:

1. Identify whether there has been an improvement in the knowledge of the apprentices who completed the MF&W (Heavy) course stage three as a result of the introduction of changes to the course.
2. Identify whether there were any substantial differences in the knowledge base of the apprentices graduating from different TAFE Institutes in NSW in the MF&W (Heavy), trade area.
3. Ascertain from the results of the exit tests undertaken from 2001 to 2004, whether there has been a difference between the old course 7792, and new courses 6059 & 3449 at the Hunter Institute of TAFE and the other institutes in NSW.
4. Evaluate whether the changes introduced to course 7792 were necessary to improve the knowledge base of the apprentices.

A further set of objectives was set to identify the opinions of Metal Fabrication and Welding (Heavy) Teachers of NSW. These were to:

5. Examine whether the current course meets industry needs and if not what improvements are needed.
6. Ascertain which teaching delivery technique is preferred as the one more effective.
7. Ascertain whether the employers consider on-the-job training of apprentices as an important component of the current course.

6.3 Summary of the Findings

From the information gathered from the exit tests and phone interviews the following findings are presented:

- There was a significant difference in the total ten scores between 2001 and 2004 which indicated a decline in standards. In Parts A and C of the test the mean scores were lower in 2004 than in 2001. There was no significant difference for Parts B and D of the exit test between 2001 and 2004. In the case of Part B, the short answer section, the performance was uniformly high, representing about 90% of marks for this section. In the case of Part D, the developmental section, the performance was low, representing about 40% of marks available
- In Institute 1 in Parts A and B the total test scores were significantly different in 2001 when compared to 2004. In Parts A and B the mean scores were higher in 2001 indicating that there was a decline in standards to 2004. In the case of Part B, the short answer section, the performance was uniformly high,

representing about 90% of marks for this section. In the case of Part D, the developmental section, the performance was low compared to other sections in the exit test results.

- A comparison of the results for Institute 1 to the rest of TAFE NSW results showed that 69.7% students in 2001 managed the pass mark of 70% but fell below this mean mark by about 5 marks in 2004, indicating a decline over that period of time.
- There were no significant differences in 2004 between Institute 1's results and other institutes of NSW. This reflects a common standard across the Metal Fabrication and Welding Trade training system in that period.

6.3.1 The Sections of the Exit Test Results

Part A of the exit test OH&S, GTAW and Structural multiple choice question sections had a significant difference between 2001 and 2004. In each case the mean scores were higher in 2001. There was no significant difference for TC&AP, MMAW and GMAW of the exit test between 2001 and 2004. In the case of the OH&S (about 80%) and GTAW (about 98%) of the sections the performance was uniformly high whereas the Structural section was about 60% of the marks available in 2001.

Part B of the exit test MMAW Diagram short answer questions had a significant difference in 2001 compared to 2004. In this case the mean score was higher in 2004. There was no significant difference for GTAW Diagram, Weld positions, Structural section and Engineering drawing short answer questions of the exit test between 2001 and 2004. In this section of the exit test, the short

answer section, students' performance had a uniformly high success rate, representing about 90% of marks for this section.

Part C of the exit test, the structural calculative questions on mass, slant height and the hypotenuse sections, had a significant difference between 2001 and 2004. In each case the mean scores were higher in 2001 except for slant height where the means were even. There was no significant difference for the structural calculative questions on rolled steel, apex height and cylindrical dimensions of the exit test between 2001 and 2004. In the case of the calculative mass and hypotenuse questions, the performance was uniformly high, representing about 80% of marks for this section. In the case of the slant height question, the performance was low, representing about 30% of marks available.

Part D of the exit test, the radial line development question, had a significant difference between 2001 and 2004, and in this case the mean scores were even. There was no significant difference for the cylindrical and triangulation development questions of the exit test between 2001 and 2004.

6.3.2 Urban and Rural Results

There was no significant difference for Parts A, B, C and D of the results of apprentices completing the exit test from urban areas between 2001 and 2004. In the case of Parts A, B, and C of the urban mean marks the performance was higher in 2001 than 2004 with Part D 2001 being lower than the 2004 marks available.

In the rural results, Part A of the rural apprentices had a significant difference in 2001 when compared to 2004. In this case the mean score was higher

in 2001. There was no significant difference for Parts B, C and D of the rural mean scores of the exit test between 2001 and 2004. In the case of Part A, the multiple choice section, the performance was uniformly high, representing about 70% of marks for this section in 2001 compared to 2004.

6.3.3 Sections of Exit Test of the Urban to Rural Results

The urban apprentices who were completing the part A of the exit test GTAW and Structural multiple choice question sections had a significant difference between 2001 and 2004, and in each case the mean scores were higher in 2001. There was no significant difference for OH&S, TC&AP, MMAW and GMAW of the exit test between 2001 and 2004. In the case of GTAW and structural sections the performance was moderately high in 2001 compared to 2004.

In Part A of the rural apprentices completing the exit test, TC&AP and GTAW multiple choice question sections had a significant difference between 2001 and 2004, and in each case the mean scores were higher in 2001. There was no significant difference for OH&S, MMAW, GMAW and Structural sections of the exit test between 2001 and 2004. In the case of GTAW and structural sections the performance was moderately higher in 2001 compared to 2004. Across the urban and rural results there were higher results recorded in 2001 than in 2004.

There was no significant difference for the urban means of Part B for any of the sections of the exit test between 2001 and 2004.

Part B of the rural results of the exit test MMAW Diagram short answer questions had a significant difference between 2001 and 2004, and in this case the

mean score was higher in 2004. There was no significant difference for GTAW Diagram, Weld positions, Structural section and Engineering drawing short answer questions of the exit test between 2001 and 2004.

In both the urban and rural results for Part B there were similar outcomes across 2001 and 2004.

In Part C of the urban results of the exit test the structural calculative question on mass had a significant difference between 2001 and 2004, and in this case the mean scores were higher in 2001. There was no significant difference for the structural calculative questions on rolled steel, apex height, slant height, hypotenuse and cylindrical dimensions of the exit test between 2001 and 2004.

The rural's Part C of the exit test, the structural calculative questions on mass, slant height and the hypotenuse sections, had a significant difference in 2001 compared to 2004. In each case the mean scores were higher in 2001, except for slant height where the means were lower. There was no significant difference for the structural calculative questions on rolled steel, apex height and cylindrical dimensions of the exit test between 2001 and 2004.

In Part C of the urban and rural results, the calculative mass and hypotenuse questions, the performance was uniformly high, representing about 70% of marks for this section. The results were higher in 2001 with the exception of rural results in the slant height calculative questions where the mean was lower and apex height calculative question where the mean was even.

In the urban areas, in respect of the Part D of the exit test, there were no significant differences for the cylindrical, radial line and triangulation development questions of the exit test in 2001 compared to 2004.

In rural's Part D of the exit test, the radial line development results had a significant difference between 2001 and 2004. In this case the mean scores were higher in 2004. There was no significant difference for the cylindrical and triangulation development questions of the exit test between 2001 and 2004.

In Part D of the urban to rural results, the results were poor considering the subject being examined had been taught in the year previous to the test and should have been fresh in the apprentices' minds.

6.3.4 Teacher's Response to Change

From those teachers interviewed 84% had more than 15 years of experience in teaching in the trade course with a majority of them experiencing the added experience of teaching stage 3 of the course. The teachers involved in the study held qualification far exceeding the require level of qualification needed to teach in this area of TAFE NSW.

When asked the 59% of teacher's felt that the course did not meet industry needs and that the welding component was reasonable in its outcomes but felt that the fabrication part of the course lacked substance in the drawing interpretation, calculations and the computer aided drawing components of the course.

When it came to teaching methods the teachers preferred the old method of teaching - lock-step delivery over competency based training method - and overwhelmingly indicated that the CBT method had not improved the learning outcomes of the apprentices due to lack of under pinning knowledge.

The on-the-job assessment of the apprentice's training was in largely ineffective due to the reluctant attitude of the employers to participate in the system. The teachers felt that this was due mainly to the fact that employers saw their role as providing employment and TAFE's role as providing the training.

A majority of teachers interviewed indicated that the changes that occurred to the course created no improvement in the knowledge base of apprentice. Furthermore they explained that in their opinion it had a de-skilling effect on the trade and was affecting the overall trade standard in industry.

6.4 Conclusions

A number of conclusions can be drawn from the study:

A comparison of the data collected from the stage III Metal Fabrication and Welding (Heavy) apprentices who completed the exit tests in 2001 with those who completed the exit tests in 2004 at TAFE NSW, showed that the mean scores of the apprentices in exit knowledge have declined. When the Institute 1's results for 2001 and 2004 are compared, the same pattern has occurred, whereby it is shown that there was a decline in exit knowledge in 2004. In the opinion of the TAFE teachers the employers did not understand, embrace or even favour the change.

There were no significant differences between the results of different NSW Institutes in 2004. This would indicate that the level of material taught on-the-job and off-the-job did not differ across the State.

When the MF&W (Heavy) Teachers in NSW were interviewed, a majority indicated that the course did not meet the industry needs. The teachers expressed the opinion that the welding component was reasonable in its outcomes but felt that the fabrication part of the course lacked substance in the drawing interpretation, trade calculations and the computer aided drawing components of the course.

The teachers interviewed preferred the old method of teaching - lock-step delivery over competency based training method - and overwhelmingly indicated that the CBT method had not improved the learning outcomes of apprentices since the changes that occurred in 1991. The findings indicate that on-the-job assessment of the apprentice's training was largely ineffective due to the reluctant attitude of the employers to participate in the system. The teachers felt that this was due mainly to the fact that employers saw their role as providing employment and it was the TAFE's role to provide the training so there was a 'tick and flick' (where the employer just signs-off the apprentices without actually evaluating whether she/he has the competency) attitude towards doing the assessments.

A large majority of those interviewed indicated that the changes to the trade course that occurred from 2001 to 2004 created no improvement in the knowledge base of the apprentices. Furthermore they explained that in their opinion it had a de-skilling effect on the trade.

6.5 Recommendations

The following recommendations are made based on the findings of this study:

- There should be better communication and involvement between the employers and the organisation implementing the changes to the courses at all levels.
- More structured drawing interpretation material should be included in the trade course and computer aid drafting techniques should also be incorporated with the changes.
- Calculations relating to the trade should be integrated through training package competencies to enhance existing trade calculations.
- The engineering drawing subject should be compulsory in NSW High Schools for year 9 and 10 students intending to undertake a trade course.
- The methods used to deliver the educational subject matter in the vocational education and training area should be reviewed.

- With the introduction of a new training package to the MF&W (Heavy) trade course in 2007 there should be further research undertaken to evaluate the impact of the changes on the trade course.

6.6 In conclusion

The Metal Fabrication and Welding (Heavy) training has come a long way since the Federation in 1901, with minor but important changes occurring up till the 1990's. With the global market becoming a major factor in the manufacturing industry in Australia rapid changes had to occur to keep pace with the market.

Perhaps we have got it right (or not) but research needs to continue to evaluate the changes and impacts on the trade courses for the future of the industry and its training needs.

Bibliography

Australian Industrial Workplace Relations Act 1996, Australian Government of Australia, Commonwealth Printer, Canberra.

www.austlii.edu.au/au/legis/cth/consol_act/wra1996220/index.html

Beattie, A., (1968). *The apprenticeship system in New South Wales: A Report by the Commission to the Minister for Labour and Industry*. Industrial relations Commission of New South Wales, New South Wales Printers, Sydney.

Ball, S. J., (1994). *Education Reform: a Critical and Post-structural Approach*, Buckingham: Open University Press.

Billett, S., (1993). *Learning is working when working is learning: A guide to learning in the workplace*, Centre for skill Formation Research and Development, Griffith University, Brisbane.

Billett., S., (1994). *Cognition at Work: The Development of Vocational Expertise*; in Stevenson, Leabrook, Australia, NCVER

Boud, D. and Solomon, N., (2001). *Work-based Learning: a new higher education?* Buckingham: Society for Research into Higher Education, Open University Press.

Bryman, A., (1988). *Doing Research in Organizations*, Routledge Inc, New York.

Bunderministerium fur Bildung und Forschung., (1969) *The Vocational Act 2003. Berufsbildungsbericht 2003, Report of vocational education and training*, viewed 21 June 2006, <http://www.berufbildungsbericht.info/_htdocs/bbb/2002teil1_kapite15.htm>

Campbell, G., (2003). Employment, Workplace Relations and Education References Committee Chaired by Campbell, G., *Bridging the skill divide*, Canberra, Senate Printing Unit, Department of the Senate, Parliament House.
http://wopared.parl.net/Senate/committee/eet_ctte/completed_inquires/2001-04/skills/report/report.pdf

Carmichael, L., (1992). *Employment and Skills Formation Council: The Australian Vocational Certificate Training System*, AGPS, Canberra

Candy, P. and Matthews, J., (1998). 'Fusing learning and work: changing conceptions of workplace learning', in *Current issues and new agendas in workplace learning*, ed. Baud, D., Adelaide, NCVER.

Chappel, C., (1996). 'Quality & Competency Based Education and Training'. In *The Literacy Equation*, pp71-79. Red Hill, Australia: Queensland Council for Adult Literacy.

Chappell, C., (2003). *Researching Vocational Education and Training: where to from here?* Journal of Vocational Education and Training Vol.55, No.1.,

Cobb, J. A., (1993). *A Technical Education: A History of the State of Technical Education in NSW to 1949*. Unpublished Manuscript.

Cohen, L., Manion, L. and Morrison, K., (2000). *Research Methods in Education*, Routledge/Falmer, London, UK.

Cosby, L., (1998), *Skilling Australia for Jobs*, Liberal Party of Australia, Barton, ACT,
http://www.liberal.org.au/documents/1998_election/apprentice/apprentice.html

DET (Department of Education and Training) (2003), *Lifelong learning: The Future of Public Education in NSW* Report, DET, Sydney.

DET (Department of Education and Training) (2003), Overview of Revised Proposal, *Lifelong learning: The Future of Public Education in NSW* Report, DET, Sydney.

DEET (Department of Employment, Education and Training) (1991). *A new structured entry-level training system for Australia*, Canberra, AGPS.

Denzin, N. Z. and Lincoln, Y. S., (2000). *Handbook of Qualitative Research*, Sage Publications Inc London, UK.

Doherty, J., (1998). *Globalisation: Implications for vocational education and training* [Professional development activity sheet]. Retrieved September 6, 2001, from:

www.curriculum.edu.au/vertis/eninfo/profess/workunit/activity/act1_1.htm

Ecclestone, K., (1997). 'Energising or Enervating?' in *Journal of Vocational Education and Training*, 49, no. 1 (pp 65-79 EJ 507 496).

Finn Report, (1991) Australian Education Council review Committee (chair: B. Finn 1991). *Young people's participation in post compulsory education and training*, (3 vols), Canberra, AGPs, July (Finn Report).

Garrick, J., (1998). *Informal Learning in the Workplace: unmasking human resource development*. New York: Routledge.

Gunning, D., (1993). 'Lessons Learned in Scottish Competence Based System', in W.C. Hall (Ed), *What Future for Educational Education and Training*, Adelaide: NCVER.

Grubb, W.N., (1996). The 'New Vocationalism' in the United States: returning to John Dewey, *Educational Philosophy and Theory*, 28, pp 1-23

Harris, R., Willis, P., Simons, M. and Underwood, F., (1998). *Learning the job. Juggling the message in on-and off-job training*, Adelaide, NCVER.

Harris, R., Guthie, H., Hobart, B. and Lundberg, D., (1995). *Competency-Based Education and Training: Between a Rock and a Whirlpool*. South Melbourne, Macmillan Education Australia.

Herr, E. L., (2000). *Collaboration, partnership, policy, and practice in career development*. The Career Development Quarterly, U.S.

Hobart. B., (1999). *Globalisation and its impact on VET: Review of research*. Adelaide: NCVER.

Hoinville, G. and Jowell ,R., (1989). *Survey Research Practice*, Gower Publishing Company Ltd, Gower House Aldershot, England.

Hyland , T., (1994). *Competence, Education and NVQs: Dissenting Perspectives*. New York, Cassell.

Imel, S., (2001). *Career Development of the Free Agent Worker*, ERIC Digest No 228.

Kemp, D., (1996). 'A modern apprenticeship and training system', address to MTIA National Personnel and Industrial relations Conference. Canberra, Hyatt Hotel, 2nd May 1996.

Kempner, C.,(2005). *Skilling Australia's Workforce (Repeal and Transitional Provisions) ACT 2005*. Department of Parliamentary Services, Parliament of Australia, ACT.

[http://www.comlaw.gov.au/ComLaw/Legislation/Act1.nsf/0/6087A371F48D468BCA25706D001258EB/\\$file/107-2005.pdf](http://www.comlaw.gov.au/ComLaw/Legislation/Act1.nsf/0/6087A371F48D468BCA25706D001258EB/$file/107-2005.pdf)

Kerka, S., (1998). *Competency-Based Education and Training*,
<http://www.ericacve.org/docs/cbetmr.htm>

Kerka, S., (2001). *Nontraditional Employment and Training Trends & Issues*, Alert No 30 ERIC.

Kirby Report (1984). *Report of the Committee of Inquiry into Labour Market Programs*, AGPS, Canberra.

Lundberg, D., (1997). *Entry level training*, Adelaide, NCVER.

Lynch, R. L., (2000). *High School and Technical Education for the first Decade of the 21st Century*, Journal of Vocational Education Research, (Vol.25: 19) Columbus, OH.

Marginson, S., (2000). *The Changing Nature and Organisation of Work and the Implications for Vocational Education and Training*, Adelaide, NCVER.

Marsick, V.J. and Watkins, K.E., (1990). *Informal and Incidental Learning in the Workplace*.

London: Routledge.

McIntyre, D., (2006). *Making and remaking the boilermaker at Newcastle Steelworks*.

www.industrysearch.com.au/features/viewrecord.aspx?ID=388

Metal Industry Award 1984 – Part 1, Australian Government of Australia, ODN C No. 02568 of 1984 Print F8925 – MOO39, Commonwealth Printer, Canberra.

www.wagenet.gov.au/Wagenet/Search/view.asp?docid=151100&query=&page=63&quickview=Y

Ministry of Education and Training (MEST) (1995). *Major Reforms in Training Systems in Five Countries Education Skills and Training*, Province of British Columbia, Canada.

Misko, J., (2005), *Vocational education and training in Australia, the United Kingdom and Germany*, NCVER, Adelaide.

NCVER. (2000). *Australian apprenticeship: research at a glance*. NCVER , Adelaide. www.ncver.edu.au/apprentices.htm.

O'Connor, R., (1993). 'Reform of Tertiary Education: The New Zealand Experience', in W.C. Hall (Ed), *What Future for Vocational Education and Training*, Adelaide: NCVER.

Occupational, Health and Safety Act 2000 No 40. New South Wales State Government, Sydney.

www.workcover.nsw.gov.au/LawAndPolicy/Acts/ohsact.htm

Oldmeadow, J., (1997). *Competency Standards Implementation Guide*, Australian Industrial Relations Commission Workplace Relations Act 1996, s.113 application for Variation MOO39V187V Print N1676, Australian Government, Commonwealth Printer, Canberra.

www.e-airc.gov.au/files/c20025237/LHMOVattachment8.DOC

Oppenheim, A. N., (1992). *Questionnaire Design, Interviewing and Attitude Measurement*, Printer Publishers, London, UK.

Papadopoulos, G., (1996). *Education 1960-1990: the OECD Perspective*. Paris: OECD.

Pollard, A., Purvis, J. & Walford, G., (1988). *Education Training and the New Vocationalism*, Buckingham: Open University Press.

Ray, J., (1998). *Apprenticeship and Traineeships - Overcoming obstacles to school-based arrangements*, A report for the Department of Employment, Education, Training and Youth Affairs, Canberra.

Ray, J. (1998). *Apprenticeship and Traineeship - Overcoming obstacles to school-based arrangements*. A Report from the Department of Employment, Education, Training and Youth Affairs, Canberra.

Ray, J., (2001). *Apprenticeship in Australia: An historical snapshot*, Adelaide, NCVER.

Ray, J., (2001). *Apprenticeship in Australia: A concise history*, in Smart. N., (2001), Research readings, Adelaide, NCVER.

Robinson, C., (2001). *Australian Apprenticeships: Facts Fiction and Future*, Adelaide, NCVER.

Rojewski, J. W., (2003). *Globalization and the Internationalization of Research on Career and Technical Education*. U.S., Journal of Vocational Education Research 28(1) pp 3-13 2003.

Schofield, K., (2000). Delivering quality. *Report of the independent review of the quality of training in Victoria's apprenticeship and training system*, [http:// www.otfe.vic.gov.au/publ/qualityreview/index.htm](http://www.otfe.vic.gov.au/publ/qualityreview/index.htm)

Schofield, K., (2001). Next Generation. *Report of a Review of Product Research and Development Processes and Policies in TAFE NSW*. Commissioned by NSW Department of Education and Training, Sydney.

Schofield, C., Labrett, I., Gonczi, A., Alexander, S., and Adermann, M., (2001). Summary of Next Generation. *Report of a Review of Product Research and Development Processes and Policies in TAFE NSW*. Commissioned by NSW Department of Education and Training, Sydney.

Scott, B.W., (1990). *TAFE's Commission for the 1990's: Restructuring Vocational, Basic and Vocational Education in NSW*. Management Review: New South Wales Education Portfolio, Sydney, Southwood Press.

Seagraves, L. and Osborne, M., (1997). 'Participants in a work-based programme: Small and Medium enterprises and their employers, in *Good thinking Good Practice Research perspective a learning and work*, Centre for Learning and Work Research, Griffith University, Brisbane.

Senate Employment, Workplace Relations, Small Business and Education Reference Committee Report 2000. *Aspiring to excellence: Report into the quality of vocational education and training in Australia*, Commonwealth of Australia, Canberra.

Senge, P.M., (1994). *The Fifth Discipline Field Book; Strategies and Tools for Building a Learning Organisation*. Toronto: Currency Doubleday.

Smart, N., (2001). *Research Reading*, Adelaide, NCVER.

Smith, E., (1998). *Making sense of training reform and competency-based training*, Wentworth Falls, Social Science Press.

Smith, L., (2000). *Issues impacting on the quality of assessment in vocational education and training in Queensland*, DETIR, Brisbane.

Strickland, A., Simons, M., Harris, R., Robertson, I. and Harford, M., (2001). *On- and off-job approaches to learning and assessment in apprenticeships and traineeships*, in Smart, N., (2001), *Research Readings*, Adelaide, NCVER.

Stevenson, J., (1994). *Cognition at Work: The Development of Vocational Expertise*; Senate Employment, Workplace Relations, Small Business and Education Reference Committee Report 2000. *Aspiring to excellence: Report into the quality of vocational education and training in Australia*, Commonwealth of Australia, Canberra.

WADOT (Western Australian Department of Training), (1998). *New Apprenticeships. Making it work*, WADOT, Perth.

Webster, E., Dockery, M., Bainger, T. and Kelly, R., (2001). *On- and off-job approaches to learning and assessment in apprenticeships and traineeships*, in Smart, N., (2001), Research Readings, Adelaide, NCVER.

Williams, H., (1998). New Apprenticeship: consider the possibilities Memorandum.

<http://www.apsc.gov.au/publications98/apprenticeships.htm>

Wilson, B. and Engelhand, M., (1994). *Young people in full-time work: Issues affecting apprentices*, Youth Research Centre, University of Melbourne, Melbourne.

Wonacott, M., (1992). 'Apprenticeship and the future of workforce', ERIC digest no.124, ERIC Clearinghouse on Adult, Career and Vocational Education, Columbus, OH.

Zeszotarski, P., (2001). *Issues in global education initiatives in community colleges*. U.S., Community College Review, 29(1), 65-77.

Appendix “A”

TAFE New South Wales Geographical Boundaries

Figure A.1 Technical and Further Education - New South Wales (TAFE NSW)

Geographical Boundaries

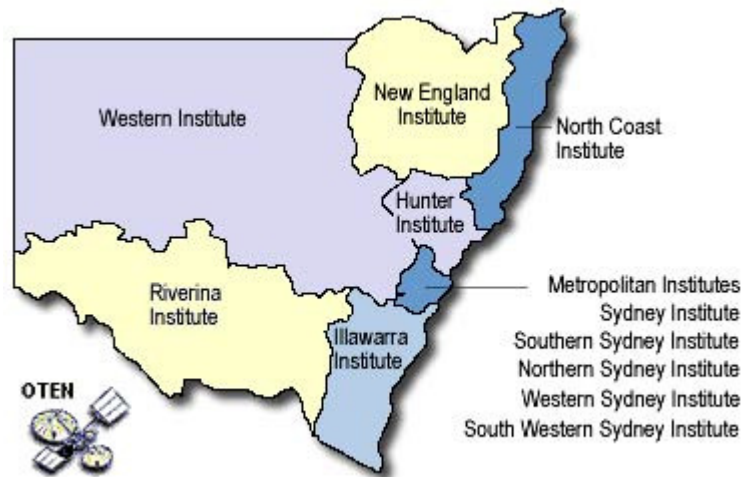


Figure A.2. Hunter Institute of TAFE



Figure A.3. New England Institute



Figure A.4. North Coast Institute



Figure A.5. Riverina Institute

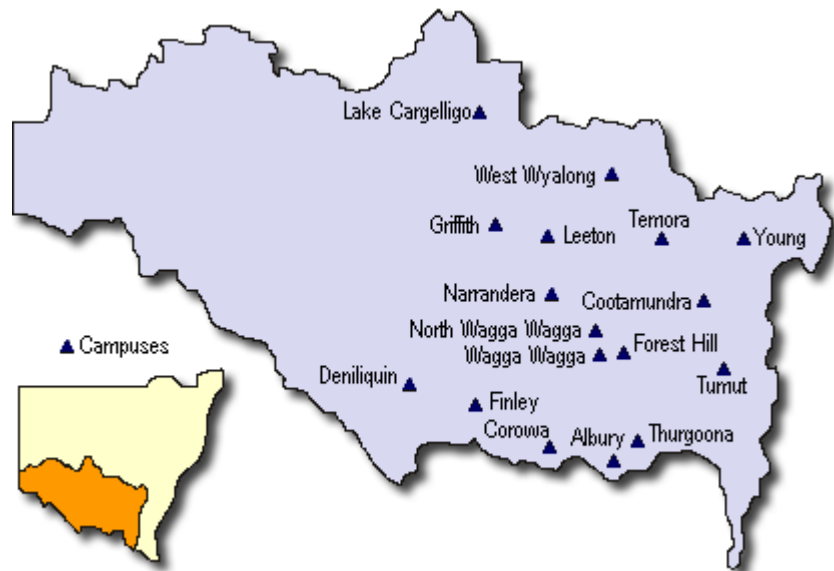


Figure A.6. Metropolitan Institute – South Western Sydney



Figure A.7. Metropolitan Institute – Western Sydney



Figure A.8. Western Institute



Figure A.9. Illawarra Institute

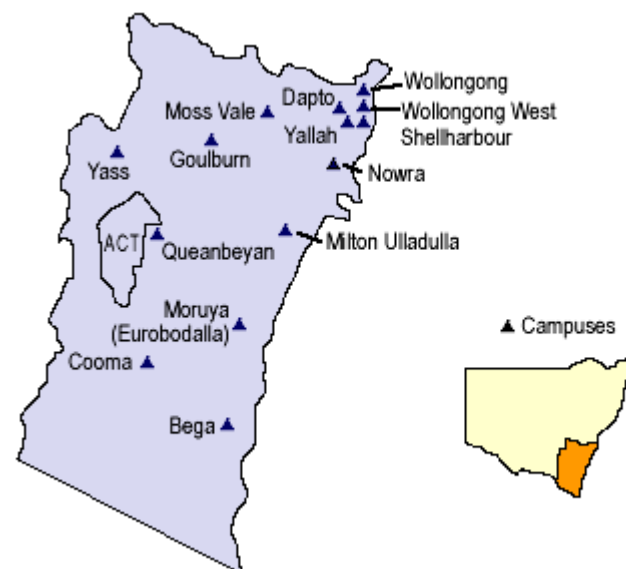


Figure A.10 Metropolitan Institute – Northern Sydney



Figure A.11. Metropolitan Institute – Southern Sydney



Appendix ‘B’

**Institute 1 of TAFE
Metal Fabrication and Welding (Heavy)
Course Plans 7792 & 3449**

Table B .1. Fabrication Engineering Certificate 3 (Heavy Fabrication Trade) Training Plan Course Number 7792 (2001) Institute 1 of TAFE NSW

Stage 1		Semester 1		Stage 1	Semester 2
OH&S NBB02 7793T 6059DN 1.2F Apply principles of OH&S	Prod &Interpt. Eng. Sketches MEC075 7786AP 9.1A-6059AD Drw & Interp Sketch	Hand Tools MEC072 7786AL 18.1A-6059AE Use hand Tools	Power Tools MEC073 7786AM 18.2A-6059AF Use Power/hand Held operations	Eng.Drawing Interpretation 1 MEC076 7786An 9.2A-6059AC Interp technical Drawings	GMAW 1 NF02 8267D 5.17A-6059T weld using GMAW process
Welding and Thermal Cutting NBB09 8267J 5.7A-6059Z Manual heating thermal cutting and gouging		Fabrication Techniques 1 NBB10 8264K 5.5A-6059Y Carry out mechanical cutting		MMAW 1 NF01 8267C 5.15A-6059R Weld using MMAW process	Structural 1 Nf33 8268L 12.7A-6059BP Mark off/out structural fabrication and shapes
Stage 2		Semester 1		Stage 2	Semester 2
GMAW 2 NF07 8267J 5.18A-6059U Perform advanced welding using GMAW		Computing in Engineering NBB04 8264D 2.9c10 Perform computer operations		Fabrication drawing Interpretation 1 NF91 7761U 5.11A-6059P Assemble fabricated components	Structural 2 NF34 8268M 12.7A-6059BP
Material NF15 8267AS	Science	MMAW 2 NF05 8267G 5.16A-6059S Perform Advanced weld using MMAW		GTAW 1 NF03 8267E 5.19A-6059V Weld using GTAW process	Structural 3 NF35 8268N 5.11A-6059P Assemble fabricated components
Stage 3		Semester 1		Stage 3	Semester 2
Advanced Thermal Cutting &Gouging MEC070 7786X 5.8A-6059AA Advan. Thermal Cut & Gouge & Shape	TC&AP NF13 8267AR 5.9A-6059AT Automated Thermal cutting	Parallel Line Development NF47 8269A 5.37A-6059X Geometric Development		Radial Line Development NF46 8268Z 5.37A-6059X Geometric Development	Triangulation Development NF45 8268Y 5.37-6059X Geometric Development
MMAW 3 NF06 8267H 5.16A Perform Advanced welding using MMAW		Cylindrical/Rectangular Fabrication MEC062 7786P 5.10A-6059N Undertake fabrication forming & Shaping		Conical Fabrication MEC064 7786R 5.10A-6059N Undertake Fabrication Forming & Shaping	Transition Fabrication MEC063 7786Q 5.10A-6059N Undertake Fabrication Forming & Shaping

Table B.02. Fabrication Engineering Certificate III (Heavy Fabrication Trade) Training Plan - Course Number 3449 (2004) Institute 1 of TAFE NSW

Stage 1		Semester 1	Stage 1	Semester 2
OH&S NBB02 7793T	Prod &Interpt. Eng. Sketches MEC075 7786AP 9.1A-6059AD Drw & Interp	Engineering Drawing 1 Interpretation MEC076AN 7786AN 9.2A - 6059AC Interpretation Technical Drawing	MMAW 1 NF01 8267C 5.15A-6059R Weld using MMAW Process	GMAW 1 NF02 8267D 5.17A-6059T weld using GMAW process
Welding and Thermal Cutting NBB09 8267J 5.7A-6059Z Manual heating thermal cutting and gouging		Fabrication Techniques 1 NBB10 8264K 5.5A-6059Y Carry out mechanical cutting	Structural 1 NF33 8268L 12.7A-6059BP Mark off/out structural fabrication and shapes	Fabrication Techniques 2 8267W 12.7A-6059BP Mark off/out structural fabrications
Stage 2		Semester 1	Stage 2	Semester 2
Fabrication Drawing 1 NF91 7761U 5.11A-6059P Assemble fabrication components		Fabrication calculation 1 7786AV 2.8C10-6059DT Perform Computations	Material Science NF15 8267AS	GMAW 2 NF07 8267J 5.18A-6059U Perform advance welding usingGMAW
MMAW 2 NF05 8267G 5.16A- Perform advanced welding using MMAW		GTAW 1 NF03 8267E 5.19A-6059V Weld using GTAW process	Structural 2 NF34 8268M 12.7A-6059BP Mark off/out structural fabrications	Structural 3 NF35 8268N 5.11A-6059P Assemble fabricated components
Stage 3		Semester 1	Stage 3	Semester 2
Advanced Thermal Cutting &Gouging MEC070 7786X 5.8A-6059AA Advan. Thermal Cut & Gouge & Shape	TC&AP NF13 8267AR 5.9A-6059AT Automated Thermal cutting	Parallel LineDevelopment NF47 8269A 5.37A-6059X GeometricDevelopment	Radial Line Development NF46 8268Z 5.37A-6059X Geometric Development	Triangulation Development NF45 8268Y 5.37-6059X Geometric Development
MMAW 3 NF06 8267H 5.16A Perform advanced welding using MMAW		Cylindrical/Rectangular Fabrication MEC062 7786P 5.10A-6059N Undertake fabrication forming & Shaping	Conical Fabrication MEC064 7786R 5.10A-6059N Undertake Fabrication Forming & shaping	Transition Fabrication MEC063 7786Q 5.10A-6059N Undertake Fabrication Forming & Shaping

Appendix ‘C’

**Institute 1 of TAFE NSW
Metal Fabrication and Welding (Heavy)
Training Plan 3449**

Table C.1. Training Plan Certificate 3 Fabrication Course 3449

	Competency Units	C.S.U.s prefix is (MeM)	NSW Subject Number	TAFE Module Name	NSW Subject Number	Workplace Record Name	NSW Module Number
Compulsory							
	Undertake Wkpl Comm	1.1F	6059A			Workplace Comm.	6059DR
	Apply OH&S	1.2F	6059B	Occupational Health & Safety	7793T	OH&S	6059DN
	Apply Quality Procedures	1.3F	6059C			App. Qual. Procedure	6059DA
	Undertake Routine task	1.4F	6059D			Under. Routine Task	6059DB
Core							
	Apply Quality Procedures	2.1c12A	6059E			Apply Qual. System	6059DQ
	Organise/Analyse Info.	2.2C11A	6059F			Organise Analyse Info.	6059DS
	Operate in Team Environ.	2.3C11B	6059G			Operate Team Environ.	6059DC
	Assist on the Job Train	2.4C11A	6059AY			Assit in Job Train	6059DW
	Meas. Graduated Devices	2.5C11A	6059H			Meas. Grad. Device	6059ED
	Plan an Activity	2.6C10A	6059J			Plan an Activity	6059DU
	Perf. Computation Basic	2.7C10A	6059K			Perform. Comp. Basic	6059DV
	Perf. Computations	2.8C10A	6059L			Perform. Computation	6059DT
	Perf. Computer Oper.	2.9C10A	6059M			Perform Computer	6059DX
20							

Elective

S T A G E 1	2	Manual heat cut/gouge	5.7AB	6059Z	Welding & Thermal Cutting	8264J	Manual Thermal Cutting	8264JJ
	2	Draw & Interpret. Sketch	9.1AD	6059AD	Produce & Interpret. Eng. Sketch	7786AP		
	4	Interpret Tech.Drw	9.2AA	6059AC	Eng. Drawing 1.	7786AN		
	2	Mechanical Cutting	5.5AA	6059Y	Fabrication Techniques 1.	8264K	Mechanical Cutting	8264KK
	2	Routine MMAW Welding	5.12AB	6059HE	MMAW 1.	8267C		
	4	MMAW Weld Processes	5.15AB	6059R			MMAW Welding	8267CC
	2	Use Hand Tools	18.1AB	6059AE	Fabrication Techniques 2.	8267W		
	2	Use Power Tools	18.2AA	6059AF	Fabrication Techniques 2.	8267W		
	2	Routine GMAW Welding	5.50AA	4247BD	GMAW 1.	8267D		
	4	GMAW Weld Process	5.17AB	6059T			GMAW Welding	8267CC
	4	Mark/out Structural	12.7AA	6059BP	Structural 1.	8268L	Mark Off fabrication	6059NB

S T A G E 2	4	Adv. MMAW Weld	5.16AB	6059S	MMAW 2	8267G	Adv. MMAW Welding	6059KE
	4	Flux Core Arc Weld	5.47AB	4247BB	GMAW 2	8267J	Adv. GMAW Welding	6059KE
					Material Science	8267AS		
	4	Perf. Maths Computation	2.13C5A	6059AL	Fabrication Calculations	7786AV		
	2	Routine GTAW Welding	5.49AA	3441AG	GTAW 1	8267E		
	4	GTAW Weld Process	5.19AB	6059V			GTAW Welding	8267CC
	8	Assemble Fab. Compon.	5.11AB	6059P	Structural 2	8268M	Assemble Fab. Comp.	7761UU
					Fabrication Drawing 1.	7761U		
	4	Repair/Modify Fab.	5.36A	6059AK	Structural 3	8268N	Repair/Modify Fabrication	8269JJ

S T A G E 3	2	Advanced Manual Cut	5.8AB	6059AA	Adv. Manual Cut & Gouge	7786X	Advanced Manual Cutting	6059FK
	2	Auto. Thermal Cutting	.9AB	6059AB	Thermal Cut & Associate Process	8267AR	Auto Thermal Cutting	8267AT
					MMAW 3	8267H		
	8	Fab. Form. Bend	5.10AA	6059N	Cylind/Rectangle Fab.	7786P	Form Fab. Comp.	7786PP
	6	Geometric Development	5.37AA	6059X	Parallel Line Develop.	8269A	Geometric Develop	9269YY
			5.37AA	6059X	Radial Line Develop.	8268Z		
		Fab. Form. Bend	5.10AA	6059N	Conical Fabrication	7786R		
			5.10AA		Transition Fabrication	7786Q		
			5.37AA	6059X	Triangulation Develop.	8268Y		

98 Total Points

Stage 1 of the course modules.

The OH&S module in the course covered the safe working principles associated with the Metal Fabrication and Welding industry and included a first aid segment in which the apprentices were taught CPR techniques and where to apply the technique.

Production and Interpretation of Engineering Sketching module in the course covered the necessary skill of freehand sketching of articles that have to be fabricated and welded associated with metal industry.

Welding and Thermal Cutting module in the course covered the many different welding applications associated with the trade and was intended to introduce the apprentice to these methods such as MMAW, GMAW, Oxy Welding, Oxy Cutting, Braze Welding, Brazing and Gouging.

Hand and Power Tools module in the course covered skills associated with the use of many hand held tools such as dividers, scribes, trammels, centre punches, plate squares, correct use of hammering and the use of power tools in the trade.

Fabrication Techniques 1 module in the course covered the introduction to metal fabrication of material 3mm and above. This involved forming, cutting, bending and shaping of low carbon steel.

Engineering Drawing and Interpretation 1 module in the course covered the interpretation of engineering drawings and techniques used to draw such drawing to Australian Standard Code - AS 1100.

Manual Metal Arc Welding 1 module in the course covered the explanation and demonstrated use of rutile electrodes (E4112/4113) in flat, horizontal and vertical positions on plate, flat bar and sectional steel sections.

Gas Metal Arc Welding 1 module in the course covered the GMAW techniques, explanation and demonstrated use of solid wire in the flat, horizontal and vertical positions on plate, flat bar and sectional steel sections.

Structural Fabrication 1 module in the course covered the techniques used when working with structural steel channel such as splicing mitre cuts, assembling channels sections to specifications and manufacturing and fabricating column sections.

Stage 2 of the course modules .

Gas Metal Arc Welding 2 module in the course covered more advanced GMAW techniques, explanation and demonstrated use of solid wire and flux core welding in the flat, horizontal, vertical and overhead positions on plate, flat bar and sectional steel sections.

Material Science module in the course covered testing of materials such as bend test, macros and break tests that had been welded. This included coverage of the apprentices understanding of the different properties of materials associated with the welded products in the trade area.

Computing in Engineering module in the course covered basic computer skills in operating programs such as Excel spread sheets, Word and Fast Cam.

Manual Metal Arc Welding 2 module in the course covered a more advanced explanation and demonstrated use of rutile electrodes in flat, horizontal, vertical and overhead positions on plate, flat bar and sectional steel sections

Fabrication Drawing 1 module in the course covered the advance techniques associated with engineering and interpretation of detailed blue print drawings.

Gas Tungsten Arc Welding 1 module in the course covered the explanation and demonstrated use of GTAW processes in flat, horizontal and vertical positions on aluminium, stainless steel and low carbon steel plate.

Structural Fabrication 2 module in the course covered the marking off, bending, rolling, cutting and shaping of pipe structures.

Structural Fabrication 3 module in the course covered laying-out of building sites, cambers, levelling of footing for building sites and the fabrication and assembly of portal frames simulating large building/roofing projects.

Stage 3 of the course modules.

Advance Thermal Cutting and Gouging module in the course covered the different thermal cutting methods used in the trade such as magnetic profile cutting, photo profile cutting and straight line cutting. This included design and manufacture of low carbon steel templates for the magnetic profile and drawing templates for the photo profile.

Thermal Cutting and Associated Processes module in the course covered the different cutting processes associated with cutting non-ferrous materials such

as stainless steel and aluminium. These processes included plasma cutting, air arc gouging and high pressure thermal gouging.

Manual Metal Arc Welding 3 module in the course covered a more advanced explanation and demonstrated use of low hydrogen electrodes (E4816) in flat, horizontal, vertical and overhead positions on plate, flat bar and sectional steel sections.

Parallel Line Development module in the course covered drawing developments and templates of cylindrical and triangular sections associated with heavy fabrication trade.

Cylindrical/Rectangular Fabrication module in the course covered the marking off and fabrication of cylindrical and rectangular shaped jobs, such as lobster backs, branch pipes and rectangular hoppers.

Radial Line Development module in the course covered drawing developments and templates of conical sections associated with heavy fabrication trade such as frustum of a right cone, oblique cones and truncated cones.

Conical Fabrication module in the course covered the marking off and fabrication of frustum, truncated cones and frustum and truncated oblique cones jobs.

Triangulation Line Development module in the course covered drawing developments and templates of triangular hoppers and transition pieces such as square to round and round to round transition pieces associated with heavy fabrication trade.

Transition Fabrications module in the course covered the marking off and fabrication of transition pieces and rectangular shaped jobs, such as square to round, rectangular to round, round to round and rectangular hoppers.

In 2001 the Metal Fabrication and Welding (Heavy) Course changed to incorporated off-the-job assessment which meant that the employer had to take a role in the training of their apprentice by assessing the apprentice's skills to competency standards. This course was Engineering Fabrication Certificate III (Heavy) Trade Course 3449. Although this course did not differ from 7792 in the modules offered there was the inclusion of the off-the-job competencies.

In stage 1 of the course the employer was not asked to assess the apprentice on competencies but in September of the following year the employer was sent out a workplace record book per apprentice which contained competencies that had to be signed off by the employer. These competencies were to be organised by the successful completion of the following units:

As described in tables B.2 & C1

Competencies used in the Trade Courses

1.3F Apply Quality Procedures.

- Taking responsibility for own quality.
- Meeting customer requirements.
- Applying "right first time" principles.
- Quality system procedures are followed.
- Work conforms to specifications.

1.4F Plan to Undertake a Routine Task.

- Instructions, specifications and requirements are provided and understood.
- Task outcomes are identified.

- The task and associated planning activities are carried out under supervision.
- The plan may or may not be documented.
- Sequence of activities required to be completed is identified in the plan.
- Outcomes are identified and compared with task instructions, specifications and requirements.

2.1C12A Apply Quality Systems.

- Ensures conformance to specifications.
- Defects detected and reported according to standard operating procedure.
- Performance of operation or quality of product or service to ensure customer satisfaction monitored.
- Process improvement procedures participated in.
- Participates in the improvement of internal/external customer/supplier relationships.

2.5C11 Measure with Graduated devices.

- Work is undertaken autonomously or as part of a team.
- Measurements undertaken may include using verniers, feeler gauges, micrometers, dial indicators and similar graduated devices.
- Selection of appropriate device or equipment to achieve required outcomes.
- Correct measuring techniques are used.
- Measurements undertaken may include length, squareness, flatness, angle or roundness.
- Measurements may include metric and imperial measurement.

2.9C10A Perform Computer Operations.

- Understanding the principles of computers.
- Application of computers in the workplace correctly identified.
- Correct program/application selected.
- Required information identified and retrieved.
- Entry of data into computer hardware.

5.5A Carry Out Mechanical Cutting.

- Determining job requirements.
- Includes the operations of sawing, shearing, cropping and holing.
- Includes both ferrous and non-ferrous metals.
- Setting up of mechanical cutting and holing machines.

- Operating machines including guillotines, croppers, cold saws, band saws, radial drills, punch and shears.
- Checking material for conformance to specifications.

5.7A Manual Heating, Thermal Cutting and Gouging.

- Work is undertaken autonomously or as part of a team.
- Cutting and heating may be applied to material of various thickness and types including ferrous and non-ferrous.
- Methods used may include oxyacetylene, plasma, carbon arc etc.
- The appropriate cutting process and procedure for material are selected.
- All safety procedures are observed.
- Equipment start up procedures is followed correctly to standard operating procedures.
- Equipment adjustments are made correctly.
- Appropriate cutting allowances are made and materials used in most economical way.
- Defects are recognised and corrected.
- Materials are heated, cut or gouged to specification, shape and size to workplace standards.

12.7A Mark-off Structural Fabrications and Shapes.

- Marking out general fabrications and shapes.
- Tasks may be performed in the workshop or on site.
- Marking out is undertaken using appropriate tools and equipment.
- Marking out techniques may apply to a range of materials and shapes.
- Equipment used may include tapes, rules, dividers, squares etc.
- Specifications and work requirements are determined and understood.
- Marking out is carried out to specifications or standard operating procedures.
- Templates are produced to specifications.
- Appropriate development and/or measurement sequence is chosen and applied.
- Relevant standards/codes and symbols are interpreted.
- Materials are correctly identified and quantities estimated from drawings.

In September, in the third year of the apprenticeship at TAFE a workplace record book (per apprentice) which contained the competencies that had to be signed off by the employer was sent out.

These competencies comprised the following units:

5.8A Advanced Thermal Cutting.

- Work is carried out following standard operating procedures.
- Items are cut, shaped or gouged in a variety of methods which may include oxyacetylene, plasma, oxy hydrogen.
- Appropriate cutting process and procedure for material are selected.
- Equipment is correctly selected and assembled.
- Correct equipment settings and consumables are selected.
- All safety procedures are observed.
- Equipment start up procedures is followed correctly to standard operating procedures.
- Material is cut to specification (shape, size, surface finish).
- Cutting defects are recognised and corrective action taken.

5.9A Automated Thermal Cutting.

- Involves the use of single or multi-head cutting machines.
- Powder marking and magnetic, photoelectric tracing devices or numerical control (NC) machines may be used.
- Material is set up correctly including stack cutting and nesting to minimise waste.
- The process cutting requirements are determined from specifications.
- The machine is set up safely to specifications using standard operating procedures.
- Correct NC programs (if applicable) are selected and loaded to standard operating procedures.
- Machine data are established.
- Where required the cutting medium is ignited following standard operating procedures.
- Machine is started using correct sequence and procedure.
- Powder marking and other tracing devices are used as required.
- Correct shutdown procedure is followed.

5.11A Assemble Fabricated Components.

- Work is undertaken using either plate, pipe, sections or sheet.
- Typical applications are transitions, pipework, structural fabrications, ductwork, general jobbing work or pressure vessels.
- Alignment and levelling may be carried out using straight edges, spirit levels, line levels, squares etc.

- The use of jigs and fixtures may be used in accordance with workshop practice.
- Distortion techniques are correctly applied.
- All components are checked against drawing and material lists.
- Materials and/or fabricated components are correctly positioned.
- Datum lines are correctly determined if necessary.
- Assembled components are checked for position including squareness, level and alignment to specification.
- Fixing/joining techniques are applied to standard operating procedures.

5.15A Welding MMAW.

- Work is carried out on a range of material for heavy and light fabrication.
- Weld quality is to meet AS 1554 general purpose or equivalent (single pass).
- Materials may include carbon steel or stainless steel etc.
- Welding requirements are identified from specifications and/or drawings.
- Material is correctly prepared and assembled/aligned to specifications.
- Welding machine and electrodes/consumables are identified against pre-determined welding procedures and specifications.
- Welding equipment is assembled and set up safely and correctly in accordance with standard operating procedures.
- Distortion prevention measures are identified.
- Appropriate action is taken to minimise and rectify distortion.
- Welds are deposited correctly in flat, horizontal and vertical position to specifications.
- Weld joints are cleaned to specification and visually inspected.
- Weld defects are identified and defects removed using correct and appropriate techniques.

5.17A Welding GMAW.

- Work is carried out on a range of material for heavy and light fabrication.
- Weld quality is to meet AS 1554 general purpose or equivalent (single pass).
- Materials may include carbon steel or stainless steel etc.
- Welding requirements are identified from specifications and/or drawings.
- Material is correctly prepared and assembled/aligned to specifications.

- Welding machine and electrodes/consumables are identified against pre-determined welding procedures and specifications.
- Welding equipment is assembled and set up safely and correctly in accordance with standard operating procedures.
- Distortion prevention measures are identified.
- Appropriate action is taken to minimise and rectify distortion.
- Welds are deposited correctly in flat, horizontal and vertical position to specifications.
- Weld joints are cleaned to specification and visually inspected.
- Weld defects are identified and defects removed using correct and appropriate techniques

5.19A Welding GTAW.

- Work is carried out on a range of material for heavy and light fabrication.
- Weld quality is to meet AS 1554 general purpose or equivalent (single pass).
- Materials may include carbon steel or stainless steel etc.
- Welding requirements are identified from specifications and/or drawings.
- Material is correctly prepared and assembled/aligned to specifications.
- Welding machine and electrodes/consumables are identified against pre-determined welding procedures and specifications.
- Welding equipment is assembled and set up safely and correctly in accordance with standard operating procedures.
- Distortion prevention measures are identified.
- Appropriate action is taken to minimise and rectify distortion.
- Welds are deposited correctly in flat, horizontal and vertical position to specifications.
- Weld joints are cleaned to specification and visually inspected.
- Weld defects are identified and defects removed using correct and appropriate techniques

1.1F Workplace Communication.

- Communicates information about tasks, processes, events or skills.
- Takes part in group discussion to achieve appropriate work outcomes.
- Represents views of group to others.

1.2F Work Environment OH&S.

- Unit applies to safe working practices as applied to all metal and engineering workplaces.
- Work is carried out safely and in accordance with company policy, procedures and legislative requirements.
- Housekeeping is undertaken in accordance with company procedures.
- Workplace activities are carried out in a safe manner.
- Appropriate personal Protective Equipment (PPE) is worn for the task.
- All equipment and safety devices are used according to legislative and company procedures.
- Safety signs/symbols are identified and followed.
- All manual handling is carried out in accordance with legal requirements and company procedures.
- Emergency equipment is able to be identified and appropriate use demonstrated.
- Workplace hazards are identified and reported to appropriate person.

2.3C11 Operate in a work based team.

- Unit applies to skills necessary for participation in small work team environments.
- The role and scope of the team is identified from available information.
- Job or work instructions are obtained in accordance with workplace procedures.
- All relevant drawings, specifications, standards etc. are obtained in accordance with workplace procedures.
- The role and responsibility of all team members is identified.
- Reporting relationships within teams and the organization are identified.
- The individual contributes to the team's work planning procedures.
- Effective communication is used with team members to contribute to team activities.
- Effective contributions are made to complement team activities and objectives based on skills.
- Follows agreed reporting lines in accordance with standard operating procedures.

2.4C11 Assist in on-the-job training.

- This unit applies where an employee assists in the provision of on-the-job training while undertaking his/her own duties.
- Objectives of training and role are identified and understood in consultation with team leaders.
- Training is conducted using suitable methods eg. demonstration.
- Trainee progress is monitored and appropriate feedback is provided.

2.9C10A Perform Computer Operations.

- Principles of computer are understood.
- Application of computers in the workplace is correctly identified.
- Correct program/application is selected.
- Required information is identified and retrieved.
- Entry of data into a computer.
- Data is printed using computer hardware.

5.10A Forming Fabricated Components.

- Forming, shaping and bending operations are conducted on either plate, structural sections, tube or sheet.
- A range of shapes may be formed including cylinders, cones, pipework, hoppers, ductwork, angles, square to round transitions, Lobster backs and tubular shapes, including handrails.
- Materials may include ferrous and non-ferrous metals.
- A variety of tools and equipment may be used including presses, shapers, benders or rolls.
- The most appropriate tools and equipment are selected.
- Equipment is correctly set up and adjusted for operation.
- Allowances for shrinkage, thickness, inside/outside measurements are correctly made.
- Machine is safely started up and shut down to standard operating procedures.
- Material and safety guards are correctly positioned in/on the machine.
- Equipment is correctly operated and adjusted.
- The final shape of the object is checked for compliance to specification.

5.16A Advanced MMAW.

- Work is carried out using a range of materials for general fabrication purposes.
- Welding is to conform to AS 1554 Structural Purpose.
- Welds would be fillet and butt weld in the flat, horizontal, vertical and overhead position.
- Appropriate welding machine settings and welding consumables are selected.
- Welding equipment is prepared correctly and safely according to standard operating procedures.
- Instructions, symbols and specifications are interpreted correctly including weld size, location and reinforcement etc. and in accordance with a procedure sheet if available.
- Weld joints are visually inspected against specifications.
- Defects are removed with minimum loss of sound metal using correct techniques.
- Weld records are maintained in accordance with specifications.

5.18A Advanced GMAW.

- Work is carried out using a range of materials for general fabrication purposes.
- Welding is to conform to AS 1554 Structural Purpose.
- Welds would be fillet and butt weld in the flat, horizontal, vertical and overhead position.
- Appropriate welding machine settings and welding consumables are selected.
- Welding equipment is prepared correctly and safely according to standard operating procedures.
- Instructions, symbols and specifications are interpreted correctly including weld size, location and reinforcement etc. and in accordance with a procedure sheet if available.
- Weld joints are visually inspected against specifications.
- Defects are removed with minimum loss of sound metal using correct techniques.
- Weld records are maintained in accordance with specifications.

5.20A Advanced GTAW.

- Work is carried out using a range of materials for general fabrication purposes.
- Welding is to conform to AS 1554 Structural Purpose.

- Welds would be fillet and butt weld in the flat, horizontal, vertical and overhead position.
- Appropriate welding machine settings and welding consumables are selected.
- Welding equipment is prepared correctly and safely according to standard operating procedures.
- Instructions, symbols and specifications are interpreted correctly including weld size, location and reinforcement etc. and in accordance with a procedure sheet if available.
- Weld joints are visually inspected against specifications.
- Defects are removed with minimum loss of sound metal using correct techniques.
- Weld records are maintained in accordance with specifications.

5.36A Repair/Replace/Modify Fabrications.

- Integrated levels of skill in fabrication and maintenance.
- Work is undertaken autonomously or as part of a team.
- Work may be carried out in a workshop or on-site.
- Drawings and specifications are interpreted and understood.
- Utilizes welding, fabrication techniques, tools, equipment and procedures on a variety of materials.
- May involve the simple marking out of materials, setting up and operation of a variety of welding and cutting equipment.
- Materials for repair/replacement are cut, formed or shaped to specifications using appropriate fabrication techniques.

5.37A Geometric Development.

- Unit applies to marking out of general fabrications using geometric development.
- Marking out is undertaken using appropriate tools, equipment, templates and patterns.
- Job instructions and specifications are determined and understood and necessary calculations are performed correctly.
- Development is carried out to specifications and using appropriate techniques.
- Datum points are correctly established and marked.
- Appropriate template material is chosen if required.
- Templates are produced to specifications.
- Parallel line, radial line and triangulation development methods are chosen and applied.
- Relevant standards/codes and symbols are interpreted and applied to materials and processes.

Once these competencies and modules were successfully completed and the apprentice completed four years of on-the-job training he/she was awarded a trade craftsman certificate enabling him/her to work in the industry as a tradesperson.

Appendix “D”

Administration Sheets for Phone Interview of Teaching Staff

Ross Lidbury
PhD Candidate of the University of Newcastle
Teacher of Metal Fabrication & Welding
Cessnock TAFE NSW 2325
Phone (02)-4993-0422
E-mail: ross.lidbury@tafensw.edu.au

David Gamage,
Associate Professor and Director
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The University of Newcastle
Callaghan, NSW 2308
Phone: (02)-4921-5914.
Email: David.Gamage@newcastle.edu.au

30th June 2005

Snr/Head Teacher
Newcastle Campus
Hunter Institute of TAFE

Dear

**A Comparative Study of Metal Fabrication and Welding (Heavy) Trade Course
in TAFE NSW between 2001-2004.**

I am a Teacher at Cessnock TAFE who is undertaking a comparative study on the old trade course 7792 in Metal Fabrication and Welding and the new course 3449 as a part of my PhD program. Since 1990, a number of changes have been implemented in the training programs and training processes with little or no research to establish whether the changes have been of any benefit to the trade training in the Metal Fabrication and Welding (Heavy) area. The results from the questionnaire will enhance the results from the exit test carried out between 2001-2004. This questionnaire when completed by each staff member by phone interview together with the statistical data from the exit tests will enable us to determine whether there has been an increase or decline in the knowledge bases of the students resulting from the changes effected. It is presumed that this research study would help future planning towards the enhancement of training in Metal Fabrication and Welding (Heavy) trade program. A/Prof. David Gamage and Prof. Sid Burke of the School of Education, the University of Newcastle, are supervising the project.

We would like to emphasise that your Section's participation is purely voluntary. The information that would be obtained will remain anonymous. The data collected will be used for research purposes enabling the completion of my thesis. The completed documentation will be stored at Mr Lidbury's office at Cessnock TAFE in a locked cupboard until the documents are destroyed when the project is completed.

Could you acknowledge by e-mail your acceptance for your section to take part in this phone interview and what day and time would be convenient to contact you?

Your approval to include your Section in the research sample is greatly appreciated, as this is a study, which is directly relevant to the Metal Fabrication and Welding (Heavy) Trade area.

If you need more information or clarification, please contact me (Lidbury) on phone (02)-4993-0422 or by E-mail. Your support and co-operation in this project is very much appreciated.

Yours sincerely,

(Ross Lidbury)

(A/Prof. David Gamage)

NB If you have any complaints concerning the manner in which this research project is conducted, they may be directed to me or if an independent person is preferred, to the University's Human Ethics Officer, Research Branch, The University of Newcastle, Callaghan, NSW 2308 (Phone (02)-4921-6333)

Ross Lidbury
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30th June 2005

Metal Fabrication and Welding Teacher Section
Newcastle Campus
Hunter Institute of TAFE

Dear

**A Comparative Study of Metal Fabrication and Welding (Heavy) Trade Course
in TAFE NSW between 2001-2004.**

I am a Teacher at Cessnock TAFE who is undertaking a comparative study on the old trade course 7792 in Metal Fabrication and Welding and the new course 3449 as a part of my PhD program. Since 1990, a number of changes have been implemented in the training programs and training processes with little or no research to establish whether the changes have been of any benefit to the trade training in the Metal Fabrication and Welding (Heavy) area.

I am seeking your participation in a phone interview which will enable a better understanding of exiting statistical data collected in the exit tests undertaken by stage 3 students of Metal Fabrication and Welding (Heavy) apprentices carried out between 2001-2004. Your participation and the data nominally collected will help determine whether there has been an increase or decline in the knowledge bases of the students resulting from the changes. It is presumed that this research study would help future planning towards the enhancement of training in Metal Fabrication and Welding (Heavy) trade program. Professor David Gamage and Prof. Sid Burke of the School of Education, the University of Newcastle, are supervising the project.

We would like to emphasise that your participation is purely voluntary. The information that would be obtained will remain anonymous. The data collected will be used for research purposes only enabling the completion of my thesis. The completed documentation will be stored at Mr Lidbury's office at Cessnock TAFE in a locked cupboard until the documents are destroyed when the project is completed.

Could you e-mail me your approval to take part in the phone interview , and date and time to contact you. Your approval to participate in the research sample is greatly appreciated, as this is a study, which is directly relevant to the Metal Fabrication and Welding (Heavy) Trade area.

If you need more information or clarifications please contact me (Lidbury) on phone (02)-4993-0422 or by E-mail. Your support and co-operation in this project is very much appreciated.

Yours sincerely,

(Ross Lidbury)

(A/Prof. David Gamage)

NB If you have any complaints concerning the manner in which this research project is conducted, they may be directed to me or if an independent person is preferred, to the University's Human Ethics Officer, Research Branch, The University of Newcastle, Callaghan, NSW 2308 (Phone (02)-4921-6333)

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Appendix “E”

Phone Interview Question Sheet

Phone Interview Design

The phone interview schedule comprised 2 sections (refer appendix E)

Section 1 General information - Question Explanations.

Question 1

This question was designed to identify the different genders associated with the teaching in the Metal Fabrication and Welding Trade Course in TAFE NSW.

Question 2

This question was designed to establish the type of employment status, whether part-time or full-time, for teachers of the Metal Fabrication and Welding Trade Course in TAFE NSW.

Question 3

This question was designed to identify the length of teaching service and experience of the Metal Fabrication and Welding Trade Course teachers in TAFE NSW.

Question 4

This question was designed to establish where the respondents of the phone interviews were located within TAFE NSW.

Question 5

This question was designed to recognize the experience in teaching MF&W (Heavy) stage 3 of the MF&W teaching staff in TAFE NSW.

Question 6

This question was designed to establish the respondent's qualifications in relationship to their teaching position.

Section 2 Trade Course Information – Question Explanations**Question 7**

This question was designed to gauge the respondent's opinion on whether the current industrial needs were being met by the course.

Question 8

This question was designed to ascertain, in the opinion of the respondent, whether the welding component of the course met the industry needs.

Question 9

This question was designed to ascertain, in the opinion of the respondent, whether the fabrication component of the course met the industry needs.

Question 10

This question was designed to gather information about the changes to the course and what the teachers thought of those changes.

Question 11

This question was designed to find out which method of tuition was considered to be most effective by MF&W teachers in TAFE NSW.

Question 12

This question was designed to enquire about the impact of the introduction of Competency Based Training (CBT) into the MF&W teaching sector of TAFE NSW and whether in their opinion it had been successful.

Question 13

This question was designed to gauge the opinions of the MF&W Teachers about on-the-job training component in the trade.

Question 14

This question was designed to find out if location had an influence on training quality.

Question 15

This question was designed to establish the student population increases and decreases across the trade training areas of TAFE NSW.

Question 16

This question was designed to find out, in the opinion of the teaching staff, whether the on-the-job component implementation was being carried out correctly.

Question 17

This question was designed to ascertain the opinion of the teaching staff about the employer attitudes to on-the-job component.

New South Wales
Technical and Further Education
Metal Fabrication and Welding (Heavy)
Teachers' Phone Interview

General Information: This questionnaire consists of two sections and all questions will relate to the Metal Fabrication and Welding (Heavy) Trade training course that is conducted in the NSW TAFE System.

Please tick in appropriate bracket

Section 1. General Information

1. Gender? Male () Female ()
2. Employment status: Part Time () Years ()
Full Time () Years ()
3. How long have you been teaching MF&W (Heavy) in TAFE?
Less than One Year of service ()
One to Five Years of service ()
Five to fifteen Years of service ()
More than Fifteen years Service ()
4. Is your Campus located in the: City () Country ()
5. How long have you taught Stage 3 MF&W (Heavy) Trade Course?
Have not taught stage three. ()
Less than One Year ()
One to Five Years ()
Five to fifteen Years ()
More than Fifteen years ()

6. What qualifications (out of the following) do you currently hold?

- | | |
|--------------------------------------------|-----|
| Boilermaking Trade Certificate | () |
| Other Trade Certificate/s | () |
| Post Trade Certificate/s | () |
| Pressure Welding Ticket/s | () |
| Category 4 Work Place Assessor Certificate | () |
| Diploma in Teaching | () |
| Degree | () |
| Masters Degree | () |
| PhD/Doctorate | () |

Section 2 Trade Course Information

7. In your opinion does the trade course meet the current industrial needs?

Yes () No ()

8. Does the welding component of the course meet industry needs?

Yes () No ()

If **NO** what welding application needs more input:

- | | |
|------|-----|
| MMAW | () |
| GMAW | () |
| GTAW | () |
| OAW | () |
| SAW | () |

9. Does the Fabrication component of the course meet industry needs?

Yes () No ()

If **NO** what fabrication area needs more input:

Structural Fabrication ()

Cylindrical/Rectangular Fabrication ()

Conical Fabrication ()

Transition Fabrication ()

Fabrication Print Reading and Interpretation ()

Comments.....

.....

10 In your opinion has the changes to the Metal Fabrication and Welding (Heavy) Trade Course had an impact on your tuition delivery techniques?

Yes () No ()

11. Which method of tuition would you prefer to deliver your lessons with?

Lock – Step (Pre 1991) ()

Competency Based Training (Post 1991) ()

12. Do you believe since the introduction of Competency Based Training into the Metal Fabrication & Welding (Heavy) Trade area there has been an improvement in the apprentices?

Yes () No ()

If **YES**. What improvements?

.....

.....

Skills
Trade Knowledge

13 In your opinion have the changes to the Metal Fabrication & Welding (Heavy) Trade course in NSW since 2001 (off-the-job assessment) improved the trade knowledge and skills of the students?

Yes () NO ()

If **YES**.

How?.....

.....

Skills

Trade Knowledge

14. Will it affect the apprentice's outcome in the Metal Fabrication & Welding (Heavy) Trade Course? if he/she is trained in the country?

Yes () No ()

If **YES**. Why

.....

.....

15 In your opinion is the MF&W(Heavy) trade course in decline in student numbers compared to 2001?

Yes () No ()

If **YES**. What are the contributing factors:

.....

.....

16. Is the employer implementing on-the-job assessment processes correctly. How many?

None () Less than Half () Half () More than Half () All ()

17. What is your opinion as to whether the employer takes on-the-job assessment seriously?

Comment

.....

.....

NB If you have any complaints concerning the manner in which this research project is conducted, they may be directed to me or if an independent person is preferred, to the University's Human Research Ethics Officer, Research Branch, The University of Newcastle, Callaghan,

Appendix “F”

Phone Interview Data

MF&W (Heavy) Teachers Phone Interviews Results 2005

1. Participation in phone survey of MF&W (Heavy) teachers across NSW.

Institute	1	2	3	4	5	6	7	8	9
Teachers	24	9	5	4	4	0	2	5	8
%	39.3	14.8	8.2	6.6	6.6	0	3.3	8.2	13.1

2. Years experience of teaching Stage 3 MF&W (Heavy) Trade students.

Nil	10	16.4%
Less than 1 year	4	6.6%
1 to 5 years	12	19.7%
5 to 15 years	16	26.25
More than 15 years	19	31.1%

3. Teachers Qualifications

Boilermaking Trade Qualification	83.6%
Other Trade Qualifications	31.1%
Post Trade Qualifications	65.5%
Pressure Welding Tickets	78.7%
Category 4 Workplace Assessor	83.6%
Diploma in Teaching	85.2%
Teaching Degree	16.4%
Masters	1.6%
PhD	0%

4. MF&W (Heavy) Employment Status

Full Time	87.9%
Part Time	4.5%

5. Years of service with TAFE NSW

Less than 1 year	1.6%
1 to 5 years	9.8%
5 to 15 years	4.9%
More than 15 years	83.6%

6. Location of Teaching staff in NSW

Country	73.8%
City	26.2%

7. MF&W (Heavy) Trade Course meeting industry needs

	Yes	NO
Industry Needs	41 %	59 %
Welding component	63.9 %	36.1 %
Fabrication component	37.7 %	60.7 %

8. Impact to teaching style by changing of the curriculum (CBT)

Yes	No
80.3 %	18 %

9. Preferred Tuition Technique

CBT	Lock-step
18 %	78.7 %

10 CBT Techniques has improved the learning situation of apprentices in trade?

Yes	No
4.9 %	93.4 %

11. Apprentices are better trained in the country?

Yes	No
44.3 %	49.2 %

12. Has there been a decline in MF&W (Heavy) trade apprentices?

Yes	No
21.3 %	75.4 %

13. Is the on-the-job assessment component of the training effective?

Yes	No
4.9 %	86.9 %

14. Does the employer take part in on-the-job assessment?

None	11.5%
Less than Half	57.4%
Half	14.8%
All	11.5%

15. Does the employer take on-the-job assessment seriously?

Yes	No
14.8%	77%

Appendix “G”

Administration Sheet for Exit Test

Administering the Exit Test

The exit test is voluntary by the students.

Before the test

- Look though exit test, if questions pertain to a module not taught indicate such information on module check list sheet in red.
- Complete module check list sheet.
- Photocopy test papers for the number students sitting for test.
- Front and back please easier to post back and mark.
- Explain to students a week before test that they will require their calculators and drawing equipment for the test.

At start of test

Explain the reason for the exit test. It is also outlined in the student information sheet.

- Give student information sheet. Allow time to read.
- Start test. Time allowed 2 hours.
- At the completion of the test collect papers and put in with module check list sheet and post back to below address.

Thank you for your co-operation. The summary results will arrive about April/May next year, for more information do not hesitate to contact me.

Ross Lidbury
Cessnock Campus TAFE
P.O. 366
Cessnock NSW 2325

Appendix “H”

Student Information Sheet on Exit Test

Student Information Sheet on Exit Test

Since 1990, a number of changes have been implemented in the training programs and processes with little or no research to establish whether the changes have been of any benefit to the trade training in the Metal Fabrication and Welding (Heavy) area. The results from the exit test which is to be conducted today will compare the results with those of the bench mark test conducted by the Hunter Institute of TAFE in 2001. This will enable us to determine whether there has been an increase or decline in the knowledge bases of the students resulting from the changes effected.

In this context, the exit test has been designed to gain information for research purposes which will help future planning towards the enhancement of training for Metal Fabrication and Welding (Heavy) apprentices.

The Exit Test is purely a voluntary one and you are free to decide whether you want to participate or not. It does not have any bearing on your course outcomes or training. If you do decide to sit, you are not required to write your name on the paper and thus confidentiality and your privacy are assured.

When undertaking the exit test attempt all questions within the time allocated. Summary results for your group will be returned to your teacher in April/May of the following year. However, no individual results will be available.

If there are any questions about the test please do not hesitate to ask your teacher and if he/she are unable to answer the question please contact me on the number below.

We hereby invite you to participate in this exit test. Your participation in this study is much appreciated as it is likely to help improve the future training of apprentices in the Metal Fabrication and Training (Heavy) trade area.

Ross Lidbury
Teacher of Metal Fabrication and Welding.
Cessnock NSW
Ph 02 49930422

A/Prof. David Gamage
Project Supervisor
The University of Newcastle

NB If you have any complaints concerning the manner in which this research project is conducted, they may be directed to me or if an independent person is preferred, to the University's Human Research Ethics Officer, Research Branch, The University of Newcastle, Callaghan, NSW 2308 (Phone (02)-4921-6333).

Appendix ‘T’

**Letter to the TAFE Institute Directors, Faculty Director and Senior/Head
Teachers of Engineering and Manufacturing Areas in NSW**

Ross Lidbury
PhD Candidate of The University of Newcastle
Teacher of Metal Fabrication & Welding
Cessnock TAFE NSW 2325
Phone (02)-4993-0422
E-mail: ross.lidbury@tafensw.edu.au

David Gamage, PhD
Associate Professor and Director
MLMED Program, School of Education
The University of Newcastle
Callaghan, NSW 2308
Phone: (02)-4921-5914.
Email: David.Gamage@newcastle.edu.au

30th June 2003

The Director
Hunter Institute of TAFE

Dear Gaye Hart

**A Comparative study of the Metal Fabrication and Welding (Heavy) Trade Course
in TAFE NSW between 2001-2004.**

I am a Teacher at Cessnock TAFE undertaking a PhD study at The University of Newcastle, who wishes to conduct a comparative research study involving all Metal Fabrication and Welding sections conducting trade course 3449 in NSW. Since 1990, a number of changes have been implemented in the training programs and training processes with little or no research to establish whether the changes have been of any benefit to the trade training in the Metal Fabrication and Welding (Heavy) area. The results from the proposed exit test will compare the results with those of the bench mark test conducted by the Hunter Institute of TAFE in 2001. This will enable us to determine whether there has been an increase or decline in the knowledge bases of the students resulting from the changes effected. It is presumed that this research study would help future planning towards the enhancement of training in Metal Fabrication and Welding (Heavy) trade program. I propose to collect data by means of an exit test. The test contains both structured and open questions, calculation and drawing questions. The test is in four parts: PART A of the test consists of 60 multiple-choice questions; Part B 5 short answer questions; Part C 6 calculation questions and Part D 3 development questions.

In this context, we hereby apply for your permission to conduct the above research in the Institute. The following documents as required by you are attached:

- 1 One copy of the research proposal;
- 2 Research instrument (Exit Test - one copy);
- 3 Student information sheet
- 4 The University Ethics Committee Approval (one copy).
- 5 Department of Education and Training Approval (one copy)

An early approval to proceed with this research would be appreciated.

Yours sincerely,

Ross Lidbury
PhD candidate of The University of Newcastle

A/Prof. David Gamage
PhD Supervisor

Ross Lidbury
PhD Candidate of The University of Newcastle
Teacher of Metal Fabrication & Welding
Cessnock TAFE NSW 2325
Phone (02)-4993-0422
E-mail: ross.lidbury@tafensw.edu.au

David Gamage,
Associate Professor and Director
MLMED Program, School of Education
The University of Newcastle
Callaghan, NSW 2308
Phone: (02)-4921-5914.
Email: David.Gamage@newcastle.edu.au

30th June 2003

The Director
Faculty of Engineering and Manufacturing
Hunter Institute of TAFE

Dear Keith Horan

**A Comparative Study of Metal Fabrication and Welding (Heavy) Trade Course
in TAFE NSW between 2001-2004**

I am a Teacher of MF&W at Cessnock TAFE who is undertaking a comparative study on the old trade course 7792 in Metal Fabrication and Welding and the new course 3449 as a part of my PhD program. Since 1990, a number of changes have been implemented in the training programs and training processes with little or no research to establish whether the changes have been of any benefit to the trade training in the Metal Fabrication and Welding (Heavy) area. The results from the proposed exit test will compare the results with those of the bench mark test conducted by the Hunter Institute of TAFE in 2001. This will enable us to determine whether there has been an increase or decline in the knowledge bases of the students resulting from the changes effected. It is presumed that this research study would help future planning towards the enhancement of training in Metal Fabrication and Welding (Heavy) trade program. Prof. David Gamage of the Faculty of Education, the University of Newcastle, is supervising the project.

We are seeking your approval to undertake this study in your Faculty. A copy of the approval of the Institute Director is attached for your reference.

We would like to emphasise that your Faculty's participation is purely voluntary. The information that would be obtained will remain anonymous. The data collected will be used for research purposes enabling the completion of my thesis. The completed exit test records will be stored at Mr Lidbury's office at Cessnock TAFE in locked cupboard until the documents are destroyed when the project is completed. Once the papers are marked, feedback will be provided to the classroom teacher around April/May in the following year.

If you grant permission, please sign the 'Consent Form' on page 2 and return to the above address.

Your approval to include your Faculty in the research sample is greatly appreciated, as this is a study, which is directly relevant to the Metal Fabrication and Welding (Heavy) Trade area.

If you need more information or clarifications, please contact me (Lidbury) on phone (02)-4993-0422 or by E-mail. Your support and co-operation in this project is very much appreciated.

Yours Sincerely,

(Ross Lidbury)

(A/Prof. David Gamage)

NB If you have any complaints concerning the manner in which this research project is conducted,
they may be directed to me or if an independent person is preferred, to the University's Human
Ethics Officer, Research Branch, The University of Newcastle, Callaghan, NSW 2308 (Phone (02)-
4921-6333)

Ross Lidbury
PhD Candidate of the University of Newcastle
Teacher of Metal Fabrication & Welding
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David Gamage,
Associate Professor and Director
MLMED Program, School of Education
The University of Newcastle
Callaghan, NSW 2308
Phone: (02)-4921-5914.
Email: David.Gamage@newcastle.edu.au

30th June 2003

Snr/Head Teacher
Newcastle Campus
Hunter Institute of TAFE

Dear David Thompson

**A Comparative Study of Metal Fabrication and Welding (Heavy) Trade Course
in TAFE NSW between 2001-2004.**

I am a Teacher at Cessnock TAFE who is undertaking a comparative study on the old trade course 7792 in Metal Fabrication and Welding and the new course 3449 as a part of my PhD program. Since 1990, a number of changes have been implemented in the training programs and training processes with little or no research to establish whether the changes have been of any benefit to the trade training in the Metal Fabrication and Welding (Heavy) area. The results from the proposed exit test will compare the results with those of the bench mark test conducted by the Hunter Institute of TAFE in 2001. This will enable us to determine whether there has been an increase or decline in the knowledge bases of the students resulting from the changes effected. It is presumed that this research study would help future planning towards the enhancement of training in Metal Fabrication and Welding (Heavy) trade program. Prof. David Gamage of the Faculty of Education, the University of Newcastle, is supervising the project..

We would like to emphasise that your Section's participation is purely voluntary. The information that would be obtained will remain anonymous. The data collected will be used for research purposes enabling the completion of my thesis. The completed exit test records will be stored at Mr Lidbury's office at Cessnock TAFE in locked cupboard until the documents are destroyed when the project is completed. Once the papers are marked, feedback will be provided to the classroom teacher around April/May in the following year.

If you grant permission, please sign the 'Consent Form' on page 2 and return to the above address.

Your approval to include your Section in the research sample is greatly appreciated, as this is a study, which is directly relevant to the Metal Fabrication and Welding (Heavy) Trade area.

If you need more information or clarifications, please contact me (Lidbury) on phone (02)-4993-0422 or by E-mail. Your support and co-operation in this project is very much appreciated.

Yours Sincerely,

(Ross Lidbury)

(A/Prof. David Gamage)

NB If you have any complaints concerning the manner in which this research project is conducted,
they may be directed to me or if an independent person is preferred, to the University's Human
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4921-6333)

Appendix “J”

Exit Test Data 2001

Exit Test Data of Institute 1 of Campuses 2001

Five of a possible six campuses of the Hunter Institute of TAFE took part in the study in 2001.

From Table J1 Campus 1 response rate was 93.75% and had a mean of 63.87%. This was 6.13 marks below a pass mark although 6 of 13 apprentices achieved 70 or more marks. The campus had a range of marks 38-80 as illustrated in Figure J1. This campus is situated in rural area of the institute providing training to Maitland, Cessnock, Tomago and the upper Hunter Valley areas of the industry.

Part A multiple choice questions from Table J2 show more than half the marks were clustered between 30-39 as illustrated in Figure J2.

Part B short answer questions as indicated in Table J3 has a majority of marks clustered between 16-18 as shown in Figure J3.

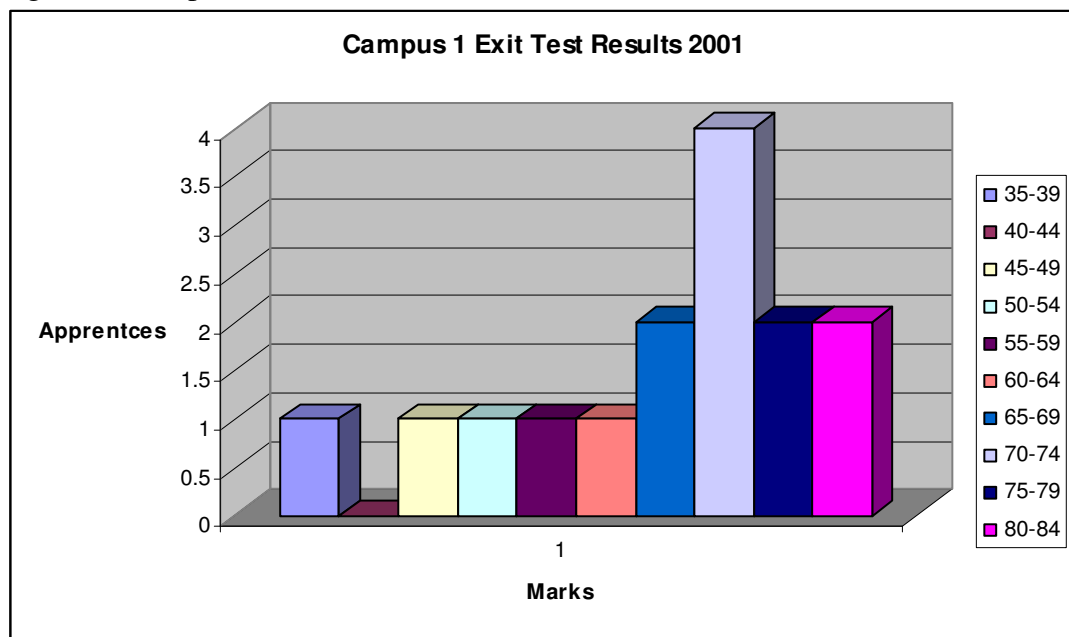
Part C calculation questions had more than half the marks between 7-11 as illustrated in Figure J4 and Table J4.

Part D development question as shown in Table J5 clustered between 3-6 marks as illustrated in Figure J5.

Table J1. Campus 1 Results 2001

Marks	38	40	45	50	53	59	60	61	67	68	70	73	78	80	84
Apprentices	1	0	1	0	1	1	0	1	1	1	3	1	2	1	1

Figure J1 Campus 1 Exit Test Results 2001



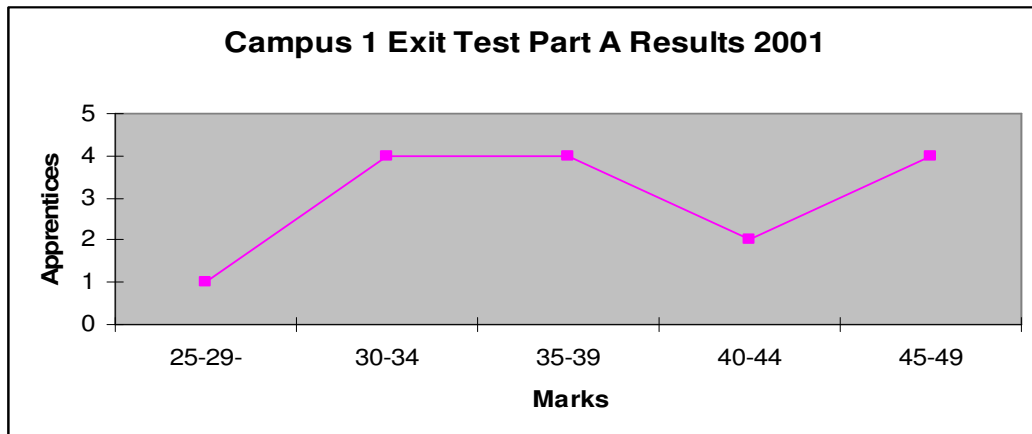
Part A Multiple Choice Questions

Table J2 Range 27-48 (Max 60 marks) Mean 35.67 Apprentice Numbers 15.

Table J2 Campus 1 Part A Results

Marks	27	31	34	36	37	38	39	40	42	45	47	48
Apprentices	1	3	1	1	1	1	1	1	1	2	1	1

Figure J2 Campus 1 Exit Test Part A Results 2001



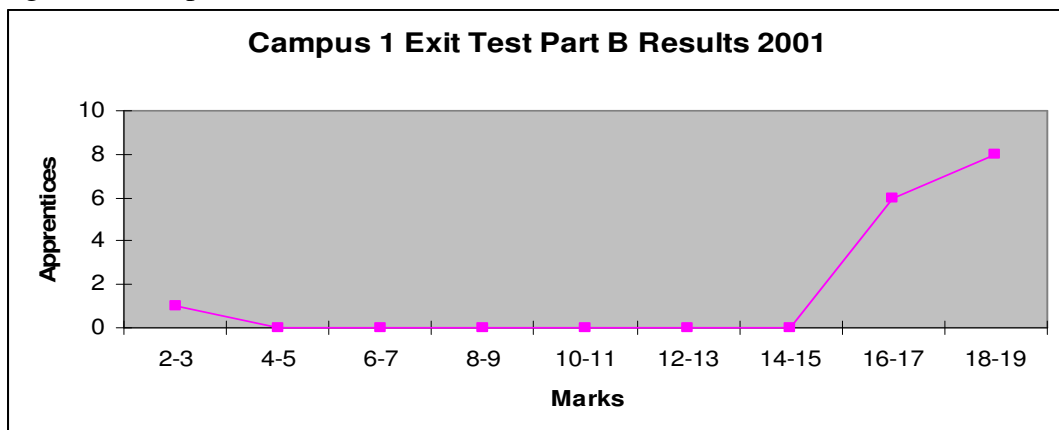
Part B Short Answer Questions

Table J3 Range 2-18 (Max 18 marks) Mean 16.4 Apprentice Numbers 15.

Table J3 Campus 1 Part B Results

Marks	2	16	17	18
Apprentices	1	2	4	8

Figure J3 Campus 1 Exit Test Part B Results 2001



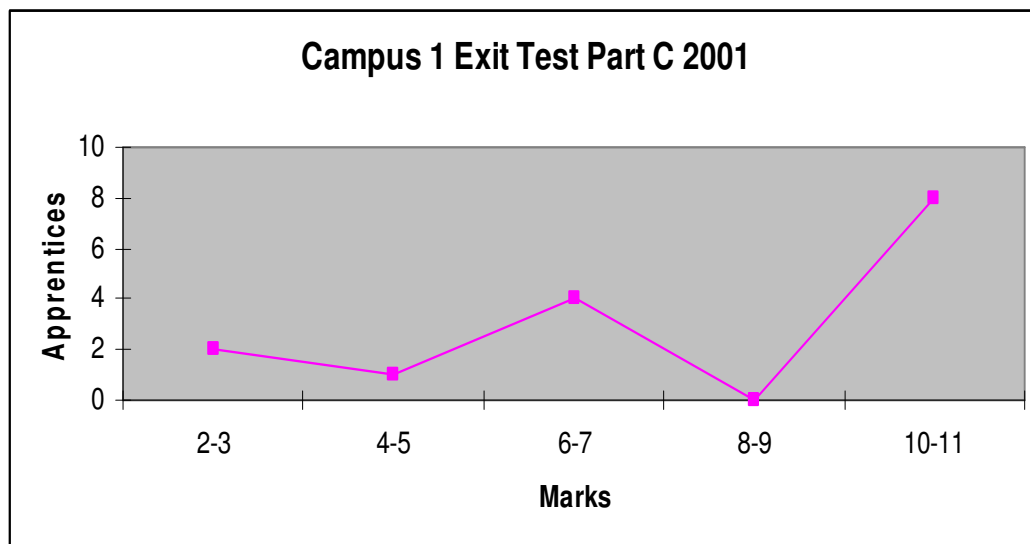
Part C Calculations Questions

Table J4. Range 2-11 (Max 11 marks) Mean 7.9 Apprentice Numbers 15. .

Table J4 Campus 1 Part C Results

Marks	2	5	6	7	10	11
Apprentices	2	1	2	2	4	4

Figure J4 Campus 1 Exit Test Part C 2001



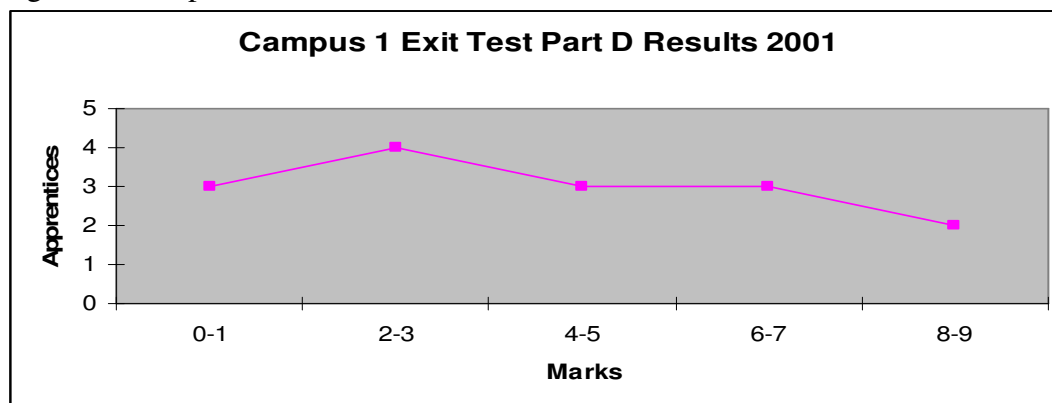
Part D Development Questions

Table J5 Range 0-8 (Max 11 marks) Mean 3.9 Apprentice Number 15.

Table J5 Campus 1 Part D Results

Marks	0	2	3	4	5	6	7	8
Apprentices	3	1	3	2	1	2	1	2

Figure J5 Campus 1 Exit Test Part D 2001



From Table J6 Campus 2 response rate was 91.67% and had a mean of 66.6%. This was 3.4 marks below a pass mark although 6 of 11 apprentices achieved 70 or more marks. The campus had a range of marks 52-83 as illustrated in Figure J6. This campus is situated in the urban area of the Institute providing training to the Belmont, Glendale and West part of Lake Macquarie areas of the industry.

Part A multiple choice questions from Table J7 show more than half the marks were clustered between 35-42 marks as illustrated in Figure J7.

Part B short answer questions as indicated in Table J8 show the marks were evenly spread between 14-18 marks as shown in Figure J8.

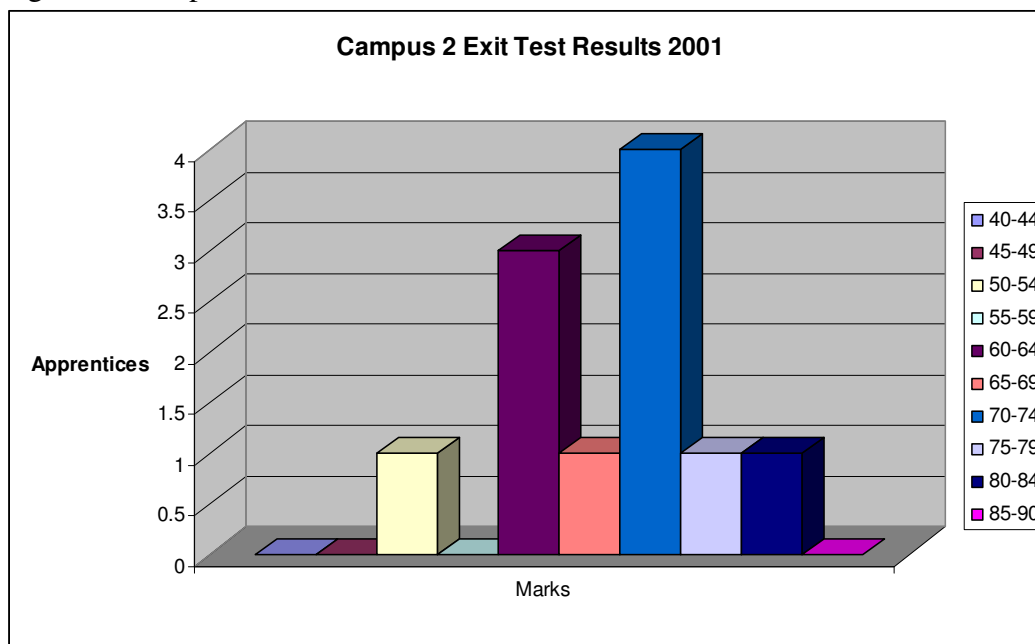
Part C calculation questions had more than half the marks between 9-11 marks as illustrated in Figure J9 and Table J9.

Part D development question as shown in Table J10 was evenly spaced between 2-9 marks as illustrated in Figure J10.

Table J6. Campus 2 Results 2001

Marks	52	63	64	68	70	72	73	74	75	83
Apprentices	1	1	2	1	1	1	1	1	1	1

Figure J6 Campus 2 Exit Test Results 2001



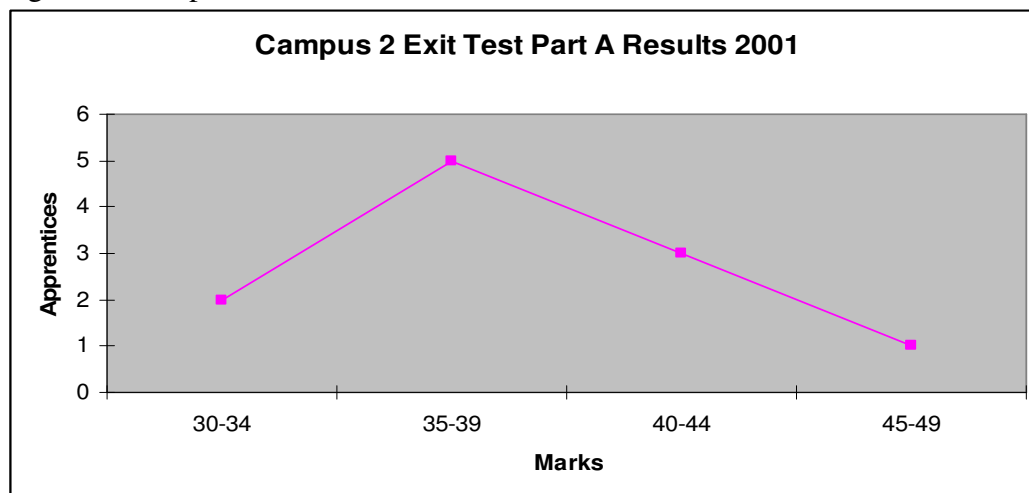
Part A Multiple Choice Questions

Range 32-46 (Max 60 marks) Mean 38.3 Apprentice Numbers 11

Table J7 Campus 2 Part A Results

Marks	32	33	35	36	37	39	42	46
Apprentices	1	1	1	1	2	1	3	1

Figure J7 Campus 13 Exit Test Part A Results 2001



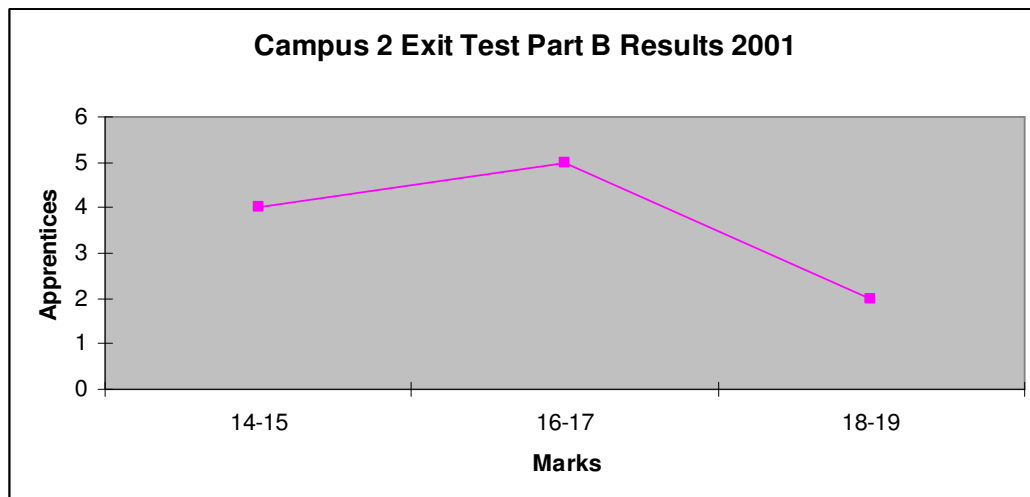
Part B Short Answer Questions

Range 14-18 (Max 18 marks) Mean 13.6 Apprentice Numbers 11

Table J8 Campus 2 Part B Results

Marks	14	15	16	17	18
Apprentices	2	2	2	3	2

Figure J8 Campus 2 Exit Test Part B Results 2001



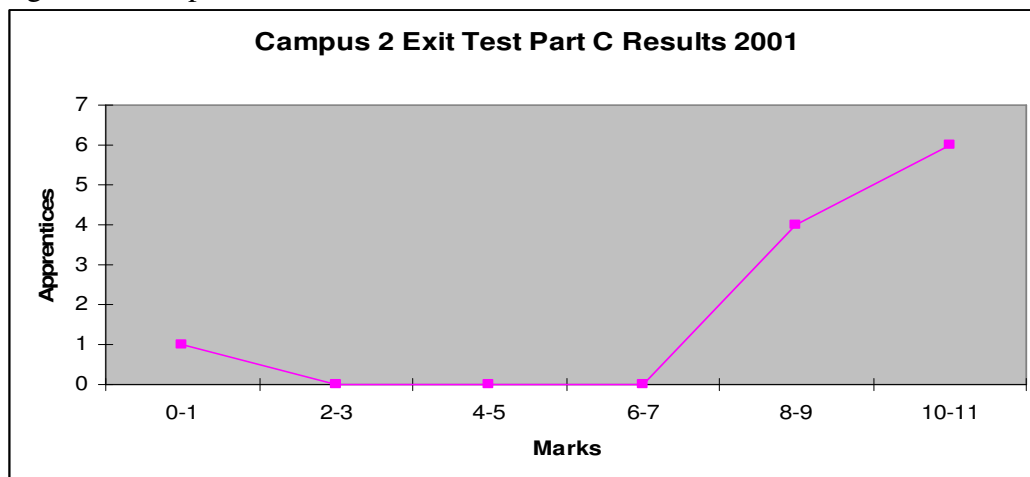
Part C Calculations Questions

Range 0-11 (Max 11 marks) Mean 9 Apprentice Numbers 11

Table J9 Campus 2 Part C Results

Marks	0	8	9	10	11
Apprentices	1	1	3	2	4

Figure J9 Campus 2 Exit Test Part C 2001



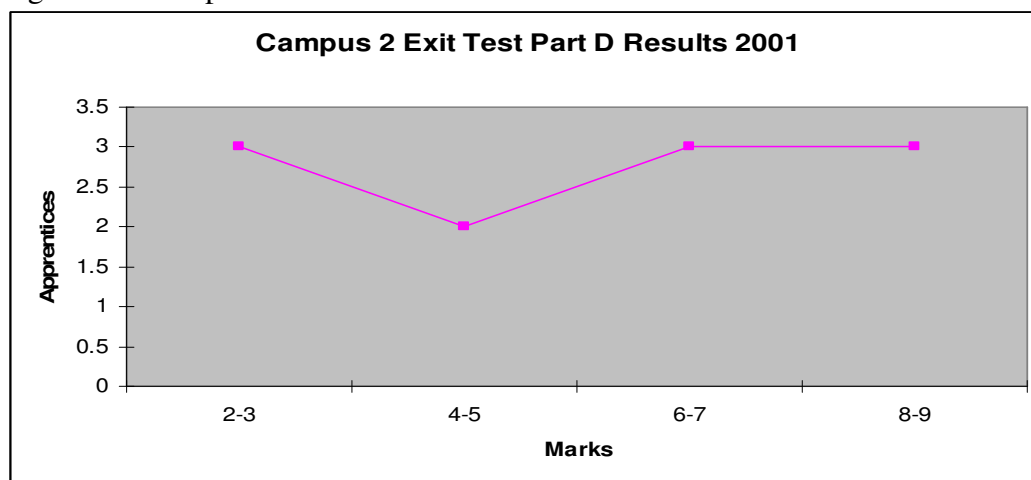
Part D Development Questions

Range 2-9 (Max 11 marks) Mean 5.7 Apprentice Number 11

Table J10 Campus 2 Part D Results

Marks	2	3	5	6	7	9
Apprentices	2	1	2	2	1	3

Figure J10 Campus 2 Exit Test Part D Results 2001



From Table J11 Campus 3 response rate was 91.67% and had a mean of 77.06%. These were all above a pass mark with 3 of 11 apprentices achieving 80 or more marks. The campus had a range of marks 74-82 as illustrated in Figure J11. This campus is situated in the urban area of the Institute providing training to the Central Coast and the Northern parts of Sydney areas of the industry.

Part A multiple choice questions from Table J12 show more than half the marks were clustered between 51-53 marks as illustrated in Figure J12.

Part B short answer questions as indicated in table J13 had the marks clustered between 15-18 marks as shown in Figure J13.

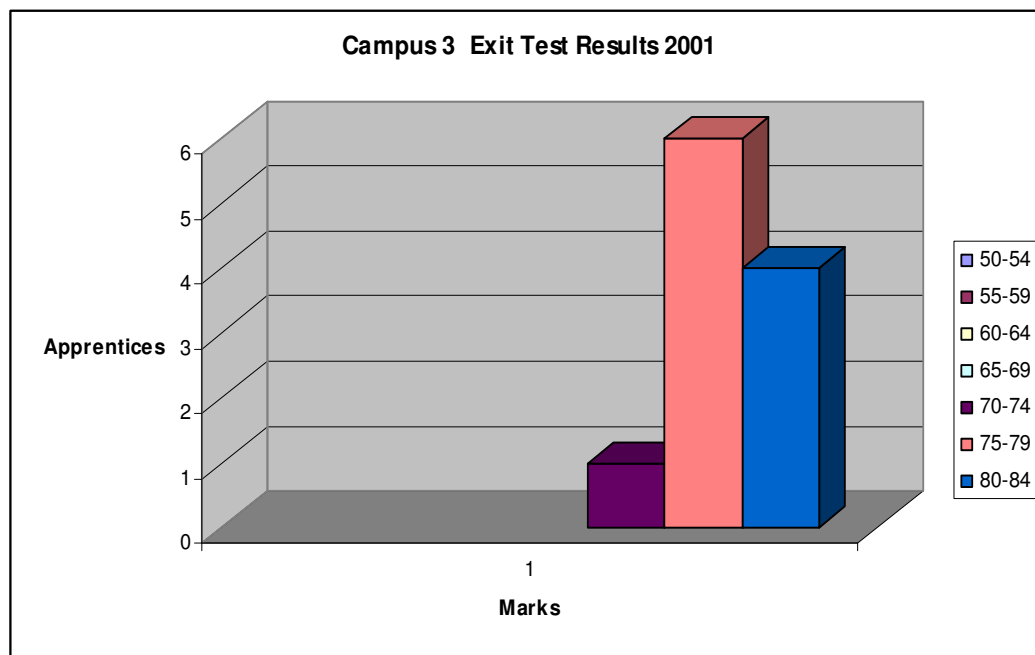
Part C calculation questions had more than half the marks between 9-10 marks as illustrated in Figure J14 and Table J14.

Part D development question as shown in Table J15 had the marks clustered between 0-3 as illustrated in Figure J15.

Table J11. Campus 3 Results 2001

Marks	74	75	76	77	78	79	80	81	82
Apprentices	1	0	1	2	3	1	2	0	1

Figure J11 Campus 3 Exit Test Results 2001



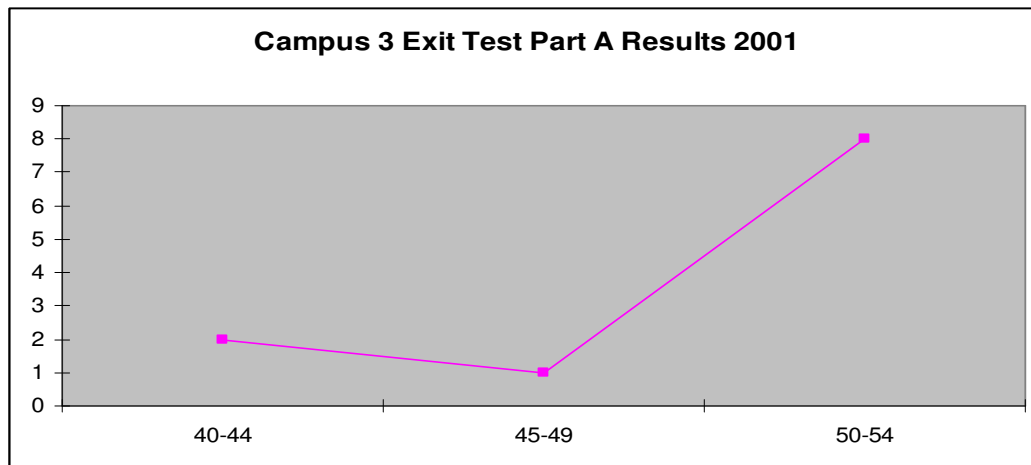
Part A Multiple Choice Questions

Range 49-53 (Max 60 marks) Mean 51 Apprentice Numbers 11

Table J12 Campus 3 Part A Results

Marks	49	50	51	52	53
Apprentices	2	1	2	5	1

Figure J12 Campus 3 Exit Test Part A Results 2001



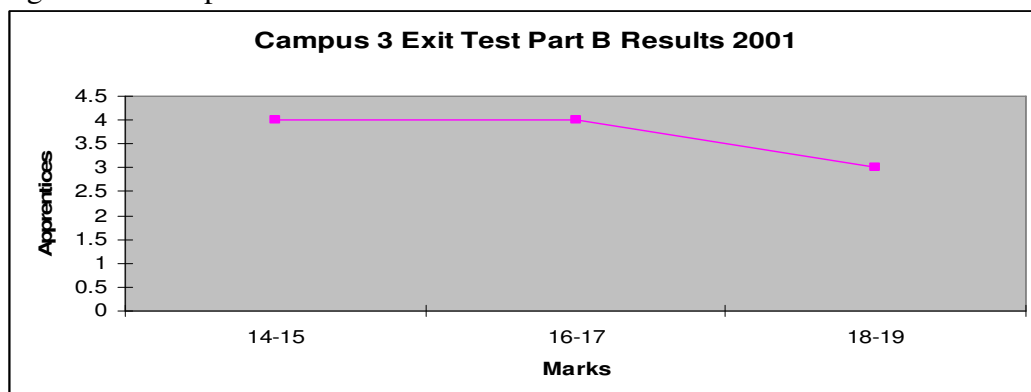
Part B Short Answer Questions

Range 14-18 (Max 18 marks) Mean 16.5 Apprentice Numbers 11

Table J13 Campus 3 Part B Results

Marks	14	15	17	18
Apprentices	1	3	4	3

Figure J13 Campus 3 Exit Test Part B Results 2001



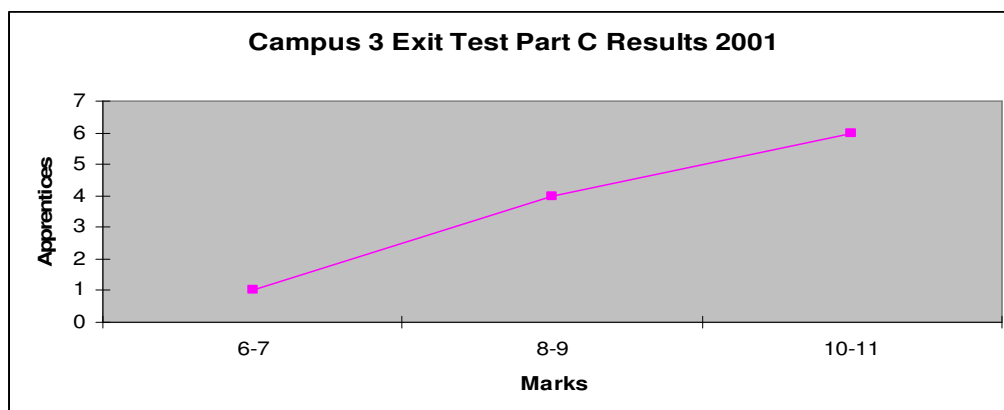
Part C Calculations Questions

Range 7-10 (Max 11 marks) Mean 8.36 Apprentice Numbers 11

Table J14 Campus 3 Part C Results

Marks	7	8	9	10
Apprentices	1	1	3	6

Figure J14 Campus 3 Exit Test Part C Results 2001



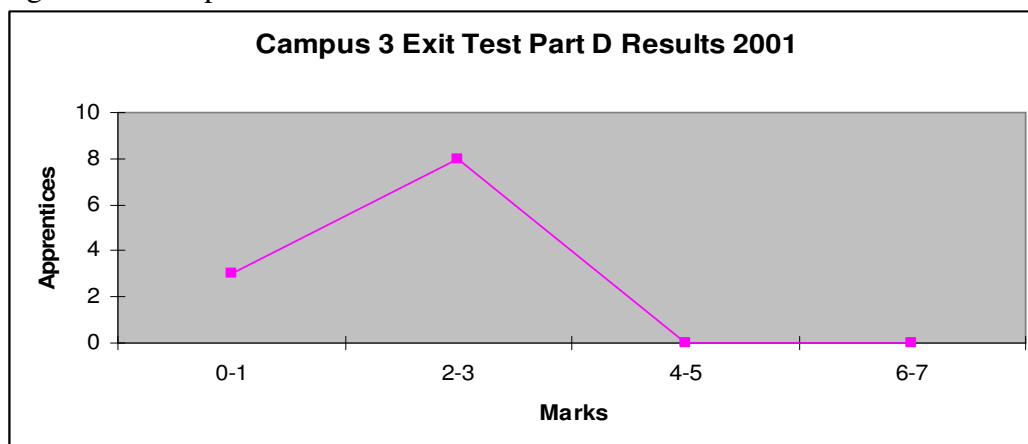
Part D Development Questions

Range 0-3 (Max 11 marks) Mean 1.2 Apprentice Number 11

Table J15. Campus 3 Part D Results

Marks	0	1	2	3
Apprentices	3	4	3	1

Figure J15 Campus 3 Exit Test Part D Results 2001



From Table J16 Campus 4 response rate was 80% and had a mean of 70.9%. These were three below the pass mark with 4 of 8 apprentices achieving 70 or more marks. The campus had a range of marks 51-83 as illustrated in Figure J16. This campus is situated in the urban area of the Institute providing training to the Newcastle area of the industry.

Part A multiple choice questions from Table J17 show an even spread of marks between 31-48 as illustrated in Figure J17.

Part B short answer questions as indicated in table J18 had the marks clustered between 17-18 as shown in Figure J18.

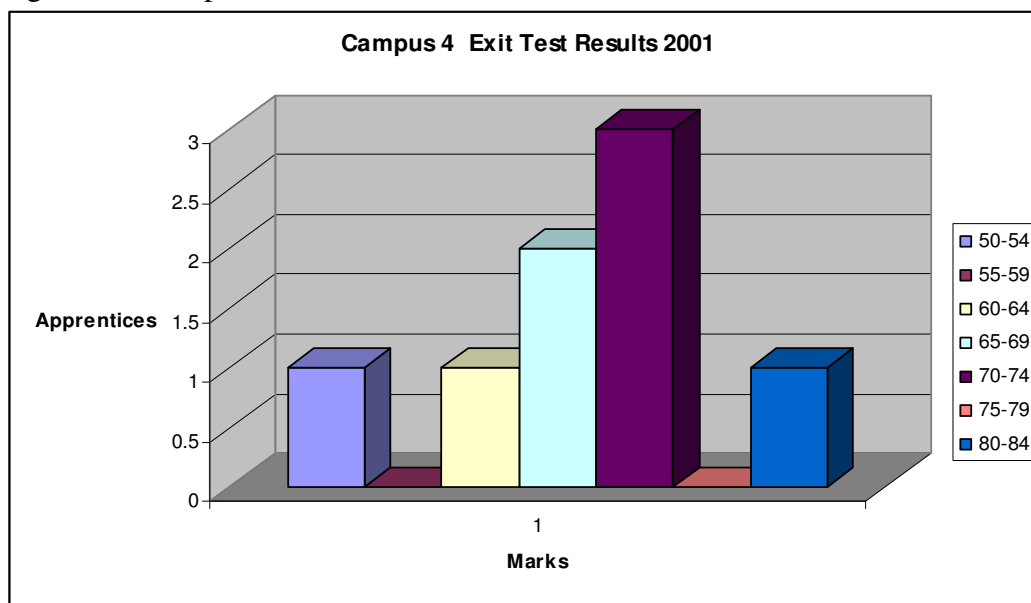
Part C calculations question had half the marks between 8-9 as illustrated in Figure J19 and Table J19.

Part D development question as shown in Table J20 half did not receive any marks as illustrated in Figure J20.

Table J16. Campus 4 Results 2001

Marks	51	60	62	65	66	70	71	80	83
Apprentices	1	0	1	1	1	2	1	0	1

Figure J16 Campus 4 Exit Test Results 2001



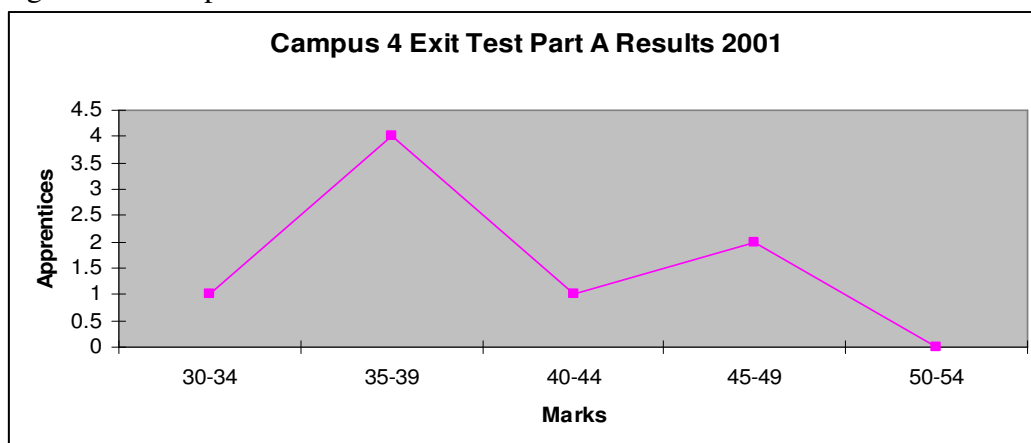
Part A Multiple Choice Questions

Range 31-48 (Max 60 marks) Mean 43.6 Apprentice Numbers 8

Table J17 Campus 4 Part A Results

Marks	31	37	38	39	42	45	48
Apprentices	1	1	2	1	1	1	1

Figure J17 Campus 4 Exit Test Part A Results 2001



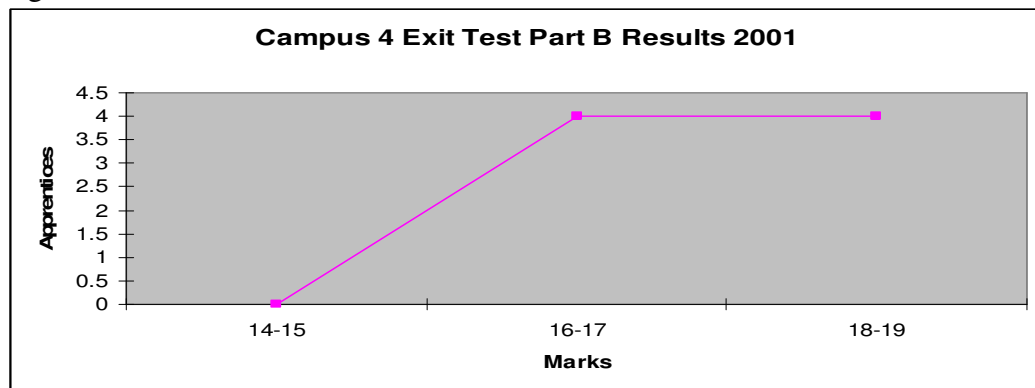
Part B Short Answer Questions

Range 16-18 (Max 18 marks) Mean 17.4 Apprentice Numbers 8

Table J18 Campus 4 Part B Results

Marks	16	17	18
Apprentices	1	3	4

Figure J18 Exit Test Part B Results 2001



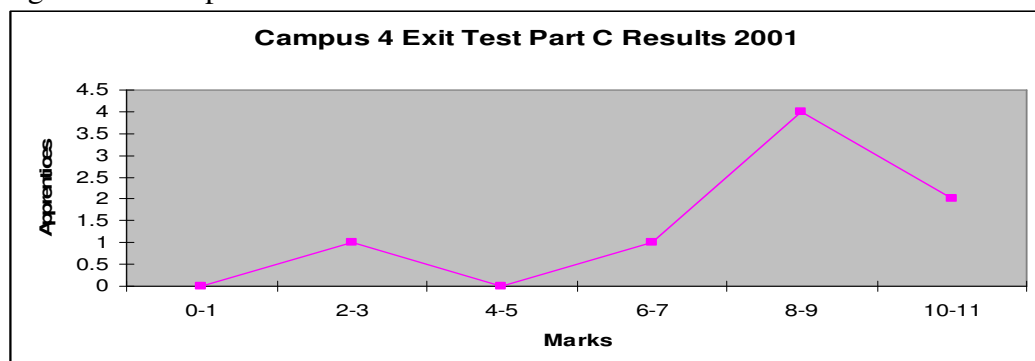
Part C Calculations Questions

Range 3-11 (Max 11 marks) Mean 8.1 Apprentice Numbers 8

Table J19 Campus 4 Part C Results

Marks	3	7	8	9	10	11
Apprentices	1	1	2	2	1	1

Figure J19 Campus 4 Exit Test Part C Results 2001



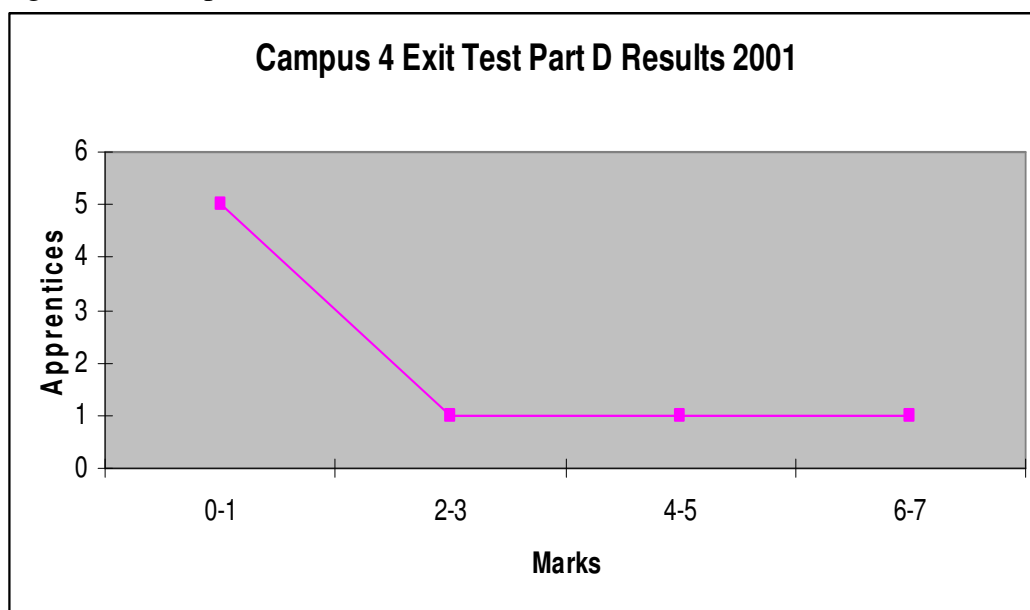
Part D Development Questions

Range 0-7(Max 11 marks) Mean 1.8 Apprentice Number 8

Table J20 Campus 4 Part D Results

Marks	0	1	2	4	7
Apprentices	4	1	1	1	1

Figure J20 Campus 4 Exit Test Part D Results 2001



From Table J21 Campus 5 response rate was 91.67% and had a mean of 70%. This was level with the pass mark with 5 of 11 apprentices achieving 70 or more marks. The campus had a range of marks 50-84 as illustrated in Figure J21. This campus is situated in the rural area of the Institute providing training to the Upper Hunter Valley of the industry.

Part A multiple choice questions from Table J22 shows a cluster of marks between 30-41 as illustrated in Figure J22.

Part B short answer questions as indicated in Table J23 show the marks peak at 18 with more than half the total at this mark as shown in Figure J23.

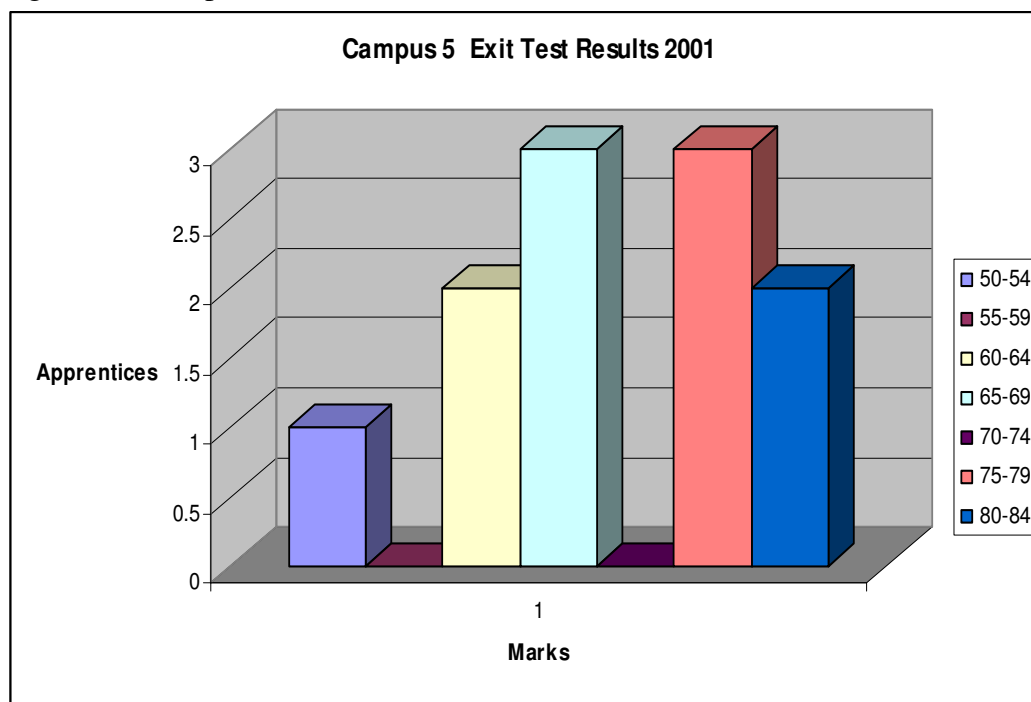
Part C calculations question had a cluster of marks between 6-8 as illustrated in Figure J24 and Table J24.

Part D development question as shown in Table J25 had majority of marks clustered between 6-8 as illustrated in Figure J25.

Table J21. Campus 5 Results 2001

Marks	50	60	64	65	66	69	70	75	76	77	80	84
Apprentices	1	0	2	1	1	1	0	1	1	1	1	1

Figure J21 Campus 5 Exit Test Results 2001



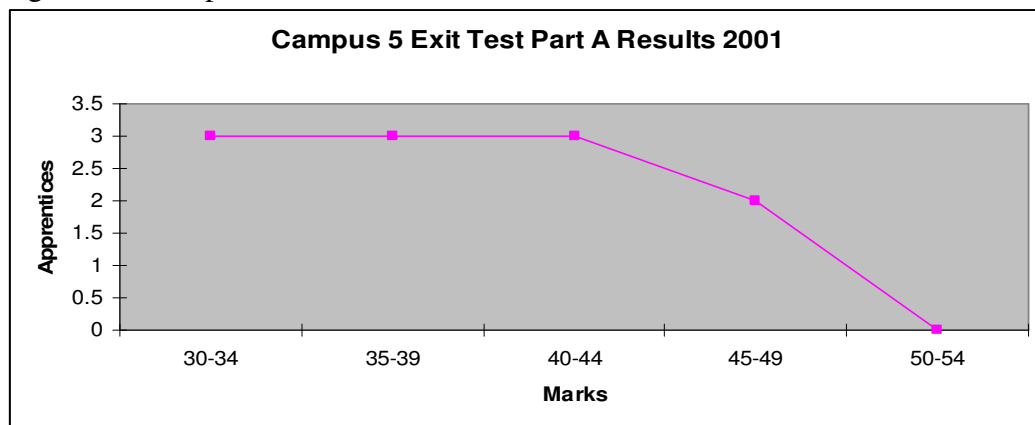
Part A Multiple Choice Questions

Range 31-46 (Max 60 marks) Mean 38 Apprentice Numbers 11

Table J22 Campus 5 Part A Results

Marks	31	32	33	35	38	41	45	46
Apprentices	1	1	1	2	1	3	1	1

Figure J22 Campus 5 Exit Test Part A Results 2001



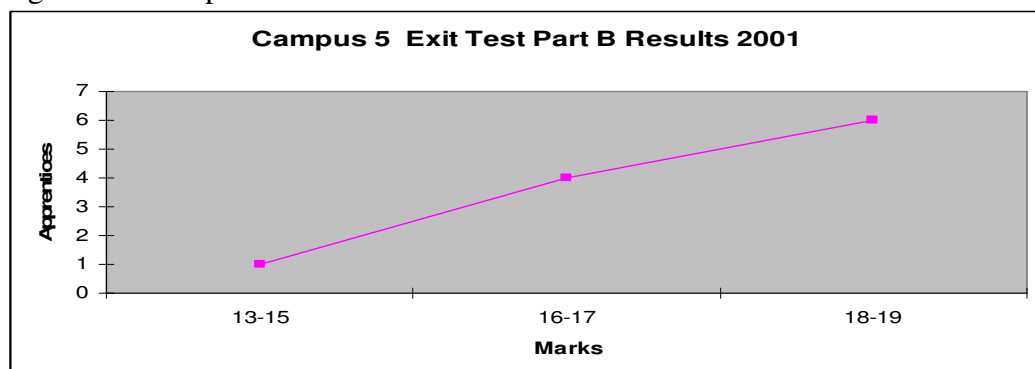
Part B Short Answer Questions

Range 13-18 (Max 18 marks) Mean 17 Apprentice Numbers 11

Table J23 Campus 5 Part B Results

Marks	13	16	17	18
Apprentices	1	2	2	6

Figure J23 Campus 5 Exit Test Part B Results 2001



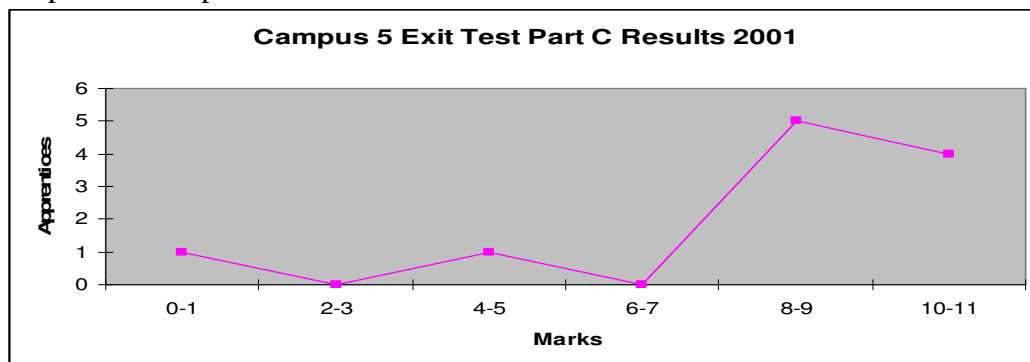
Part C Calculations Questions

Range 0-11 (Max 11 marks) Mean 8.1 Apprentice Numbers 11

Table J24 Campus 5 Part C Results

Marks	0	5	8	9	10	11
Apprentices	1	1	2	3	3	1

Graph J24 Campus 5 Exit Test Part C Results 2001



Part D Development Questions

Range 2-10 (Max 11 marks) Mean 6.9 Apprentice Number 11

Table J25 Campus 5 Part D Results

Marks	2	4	6	7	8	9	10
Apprentices	1	1	2	1	4	1	1

Graph J25 Campus 5 Exit Test Part D Results 2001

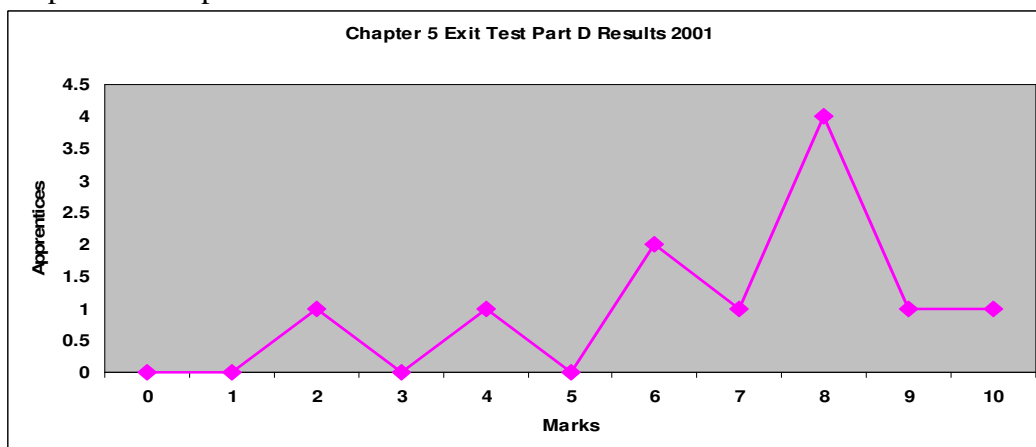


Table J26. Institute 1 of TAFE MF&W (Heavy) Exit Test Results 2001
(six did not participate)

Marks	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Apprentices	1	0	1	3	1	7	8	12	13	9

Table J27 Institute 1 of TAFE Exit Test Part A Results 2001

Marks	25-29	30-34	35-39	40-44	45-49	50-54
Apprentices	2	10	15	9	11	9

Table J28 Institute 1 of TAFE Exit Test Part B Results 2001

Marks	2-4	5-7	8-10	11-13	14-16	17-19
Apprentices	1	0	0	1	15	39

Table J29 Institute 1 of TAFE Exit Test Part C Results 2001

Marks	0-1	2-3	4-5	6-7	8-9	10-11	12-13
Apprentices	2	3	2	2	10	27	10

Table J30 Institute 1 of TAFE Exit Test Part D Results 2001

Marks	0-1	2-3	4-5	6-7	8-9	10
Apprentices	15	13	7	10	10	1

Table J31 Rural and Urban Campuses Marks Part A 2001

Marks	25-29	30-34	35-39	40-44	45-49
Rural	1	7	7	5	6
Urban	3	9	4	5	9

Table J32 Rural and Urban Campuses Marks Part B 2001

Marks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Rural	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	4	6	14
Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	2	10	9

Table J33 Rural and Urban Campuses Marks Part C 2001

Marks	0	1	2	3	4	5	6	7	8	9	10	11
Rural	1	0	2	0	0	2	2	2	2	3	3	1
Urban	1	0	0	1	0	0	0	2	4	8	9	5

Table J34 Rural and Urban Campuses Marks Part D 2001

Marks	0	1	2	3	4	5	6	7	8	9	10	11
Rural	3	0	2	3	3	1	4	2	6	1	1	0
Urban	1	0	0	1	0	0	0	2	4	8	9	5

Appendix “K”

Exit Test Data 2004

Exit Test Data of TAFE NSW Campuses 2004

From Table K1 Campus 1 combined groups response rate was 95% and had a mean of 64.6% with a range of marks 50-80 as illustrated in Figure K1. This campus is situated in a rural area of the NSW providing training to the upper and lower Hunter region of the NSW.

Part A multiple choice questions from Table K10 shows a cluster of marks between 26-41 and had a mean mark of 34.1 as illustrated in Figure K10.

Part B short answer questions as indicated in Table K11 show the marks peak at 17 with more than half the total at this mark as shown in Figure K11.

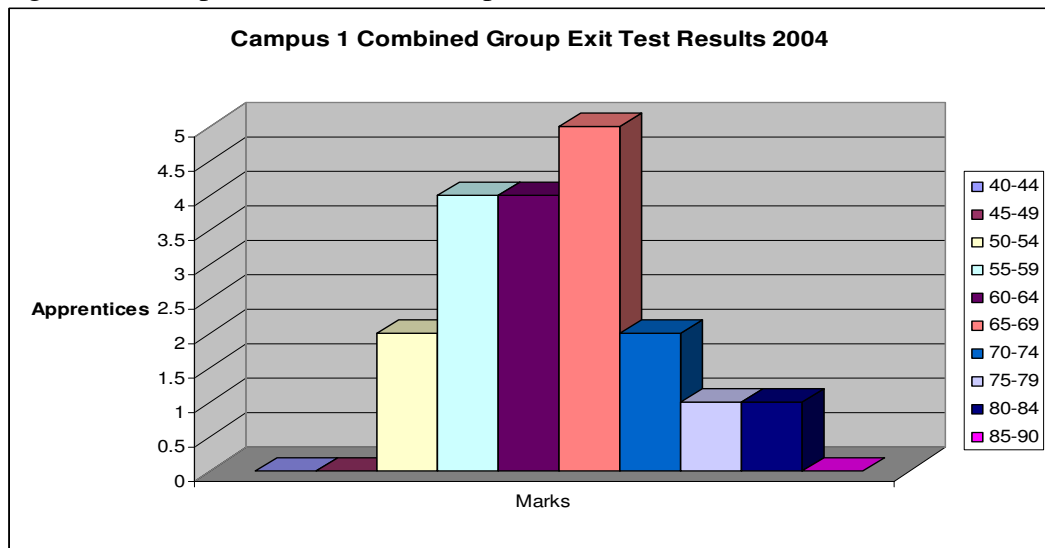
Part C calculation questions had an even distribution across the marks as illustrated in Figure K 12 and Table K12.

Part D development question as shown in Table K13 had marks spread between 6-10 bracket marks as illustrated in Figure K13.

Table K1 Campus 1 Combined Groups Exit Test Results 2004

Marks	50	53	55	57	59	62	63	64	65	67	68	71	74	78	80
Apprentices	1	1	1	1	2	2	1	1	1	3	1	1	1	1	1

Figure K1 Campus 1 Combined Group Exit Test Results 2004



Campus 1 Group 1

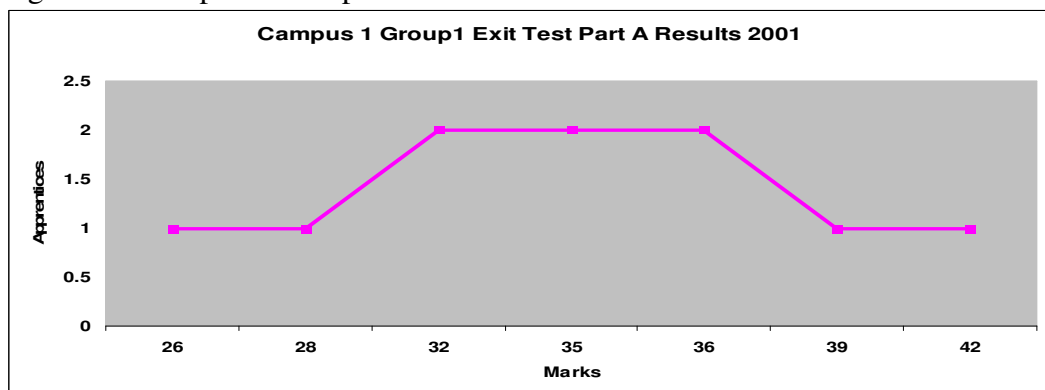
Part A Multiple Choice Questions

Range 26-41 (Max 60 marks) Mean 34.1 Apprentice Numbers 10

Table K2 Campus 1 Group 1Part A Results

Marks	26	28	32	35	36	39	42
Apprentices	1	1	2	2	2	1	1

Figure K2 Campus 1 Group 1 Exit Test Part A Results 2004



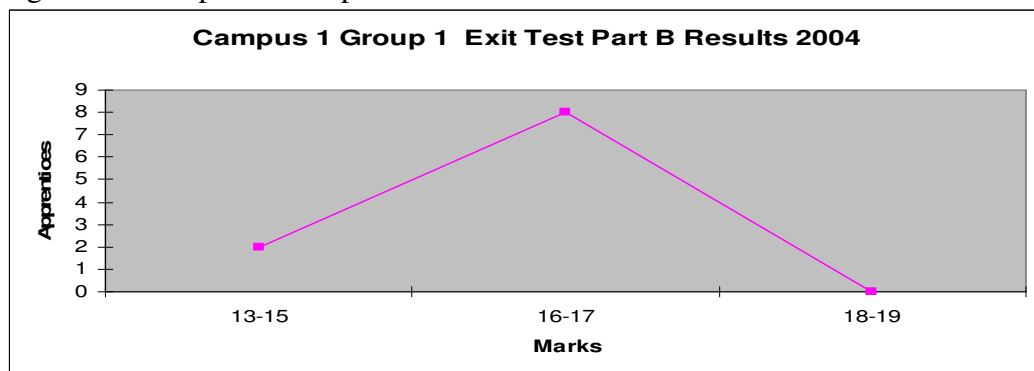
Part B Short Answer Questions

Range 15-17 (Max 18 marks) Mean 16.5 Apprentice Numbers 10

Table K3 Campus 1 Group 1 Part B Results

Marks	15	16	17
Apprentices	2	1	7

Figure K3 Campus 1 Group 1 Exit Test Part B Results 2004



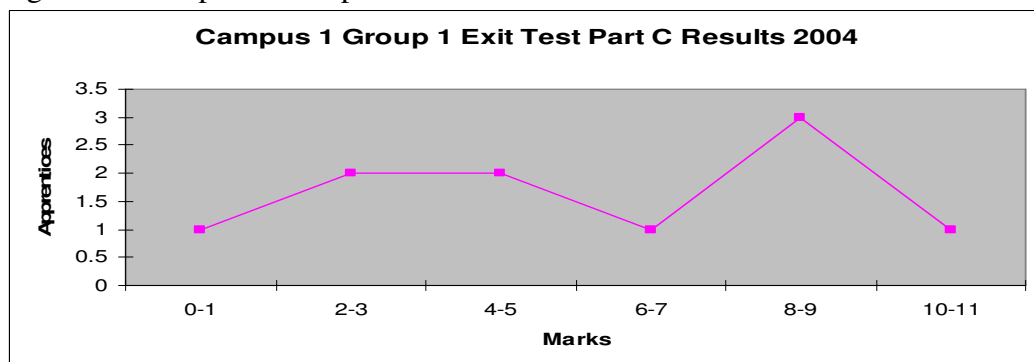
Part C Calculation Questions

Range 0-10 (Max 11 marks) Mean 5.7 Apprentice Numbers 10

Table K4 Campus 1 Group 1 Part C Results

Marks	0	2	5	7	8	9	10
Apprentices	1	2	2	1	1	2	1

Figure K4 Campus 1 Group 1 Exit Test Part C Results 2004



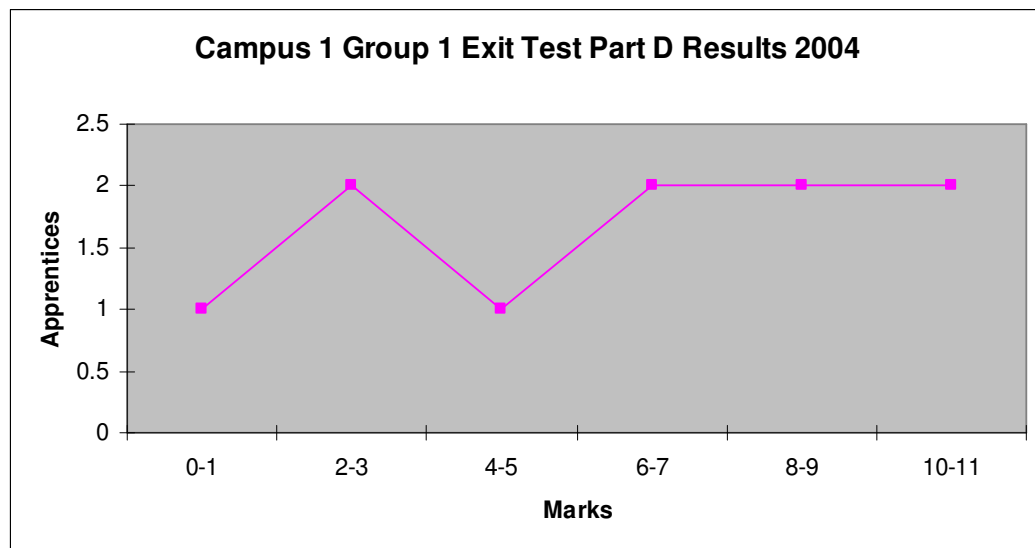
Part D Development Questions

Range 0-10 (Max 11 marks) Mean 5.9 Apprentice Number 10

Table K5 Campus 1 Group 1 Part D Results

Marks	0	3	4	6	7	8	10
Apprentices	1	2	1	1	1	2	2

Figure K5 Campus 1 Group 1 Exit Test Part D Results 2004



Campus 1 Group 2

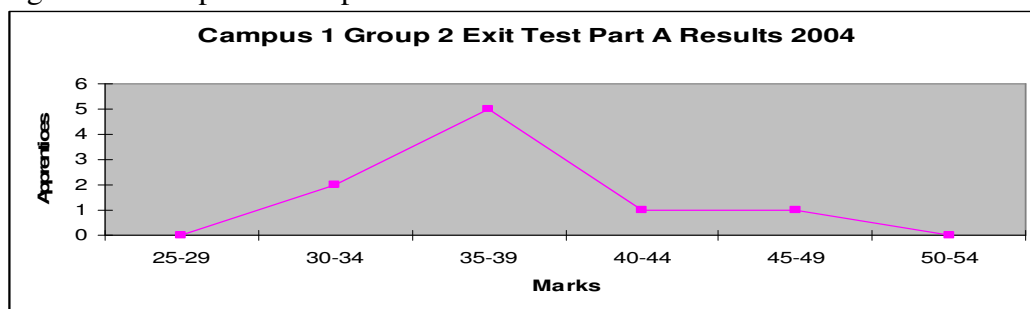
Part A Multiple Choice Questions

Range 33-46 (Max 60 marks) Mean 38.1 Apprentice Numbers 9

Table K6 Campus 1 Group 2 Part A Results

Marks	33	34	36	37	38	39	44	46
Apprentices	1	1	2	1	1	1	1	1

Figure K6 Campus 1 Group 2 Exit Test Part A Results 2004



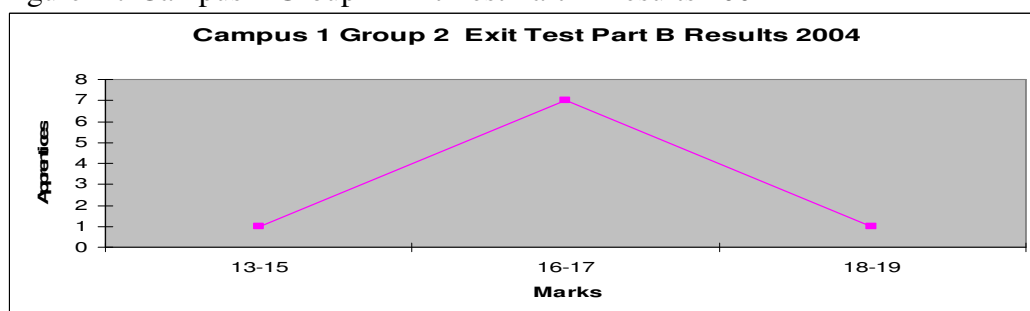
Part B Short Answer Questions

Range 14-18 (Max 18 marks) Mean 16.7 Apprentice Numbers 9

Table K7 Campus 1 Group 2 Part B Results

Marks	14	16	17	18
Apprentices	1	1	6	1

Figure K7 Campus 1 Group 2 Exit Test Part B Results 2004



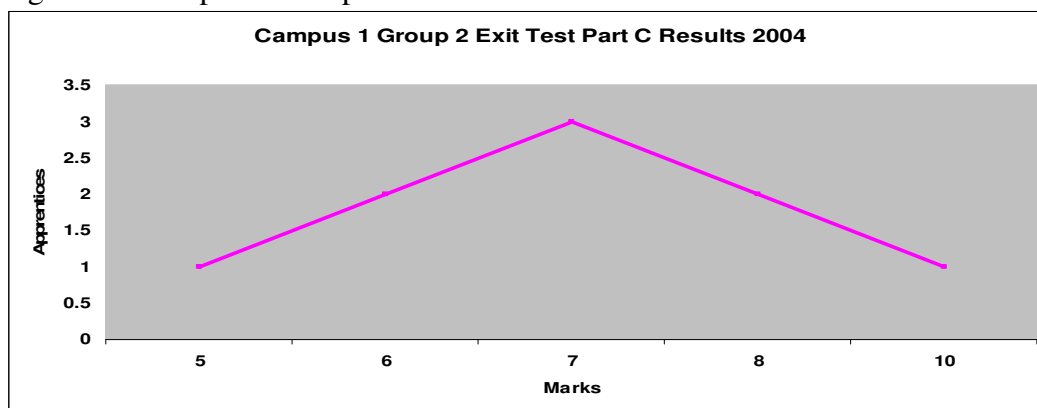
Part C Calculations Questions

Range 5-10 (Max 11 marks) Mean 7.1 Apprentice Numbers 9. 2 students did not attempt section

Table K8 Campus 1 Group 2 Part C Results

Marks	5	6	7	8	10
Apprentices	1	2	3	2	1

Figure K8 Campus 1 Group 2 Exit Test Part C Results 2004



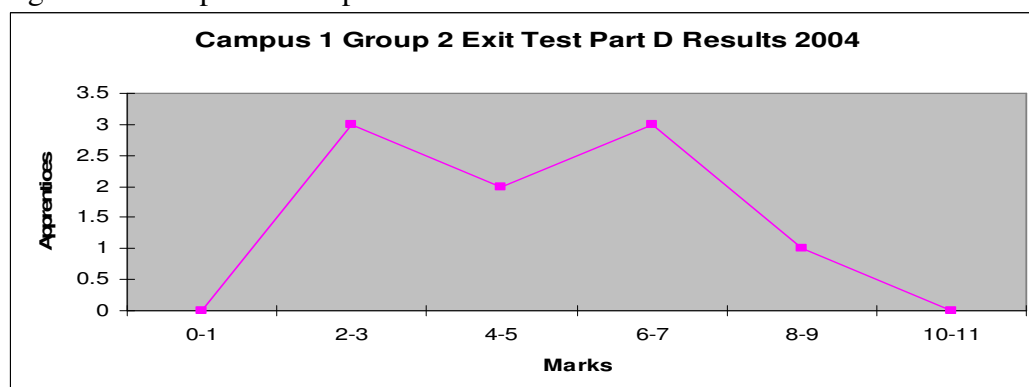
Part D Development Questions

Range 2-8 (Max 11 marks) Mean 4.9 Apprentice Number 9

Table K9 Campus 1 Group 2 Part D Results

Marks	2	3	4	5	6	7	8
Apprentices	1	2	1	1	2	1	1

Figure K9 Campus 1 Group 2 Exit Test Part D Results 2004



Campus 1 Combined Groups

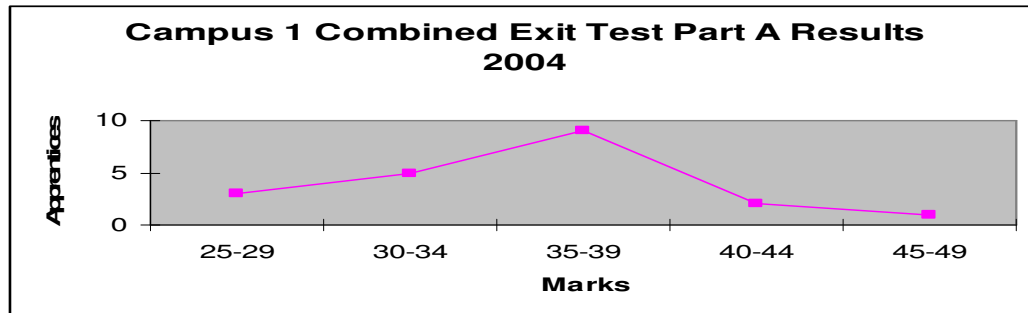
Part A Multiple Choice Questions

Range 26-46 (Max 60 marks) Mean 36 Apprentice Numbers 19

Table K10 Campus 1 Combined Group Part A Results

Marks	26	28	32	33	34	35	36	37	38	39	42	44	46
Apprentices	1	2	1	1	2	4	1	1	2	1	1	1	1

Figure K10 Campus 1 Combined Exit Test Part A Results 2004



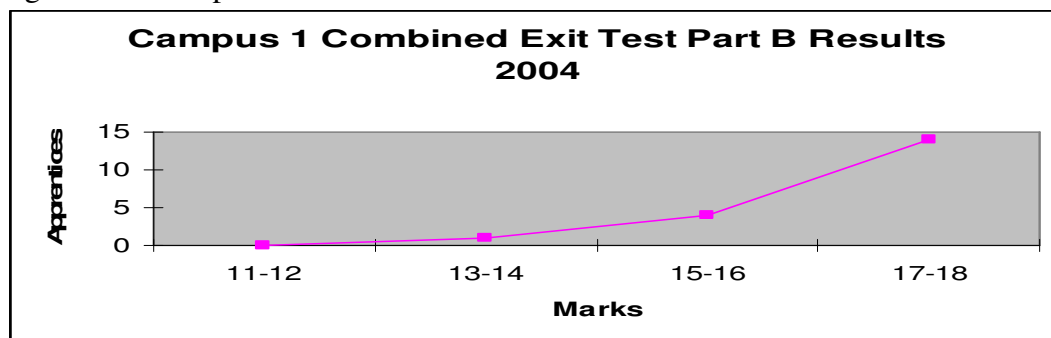
Part B Short Answer Questions

Range 14-18 (Max 18 marks) Mean 16.6 Apprentice Numbers 19

Table K11 Campus 1 Combined Group Part B Results

Marks	14	15	16	17	18
Apprentices	1	2	2	13	1

Figure K11 Campus 1 Combined Exit Test Part B Results 2004



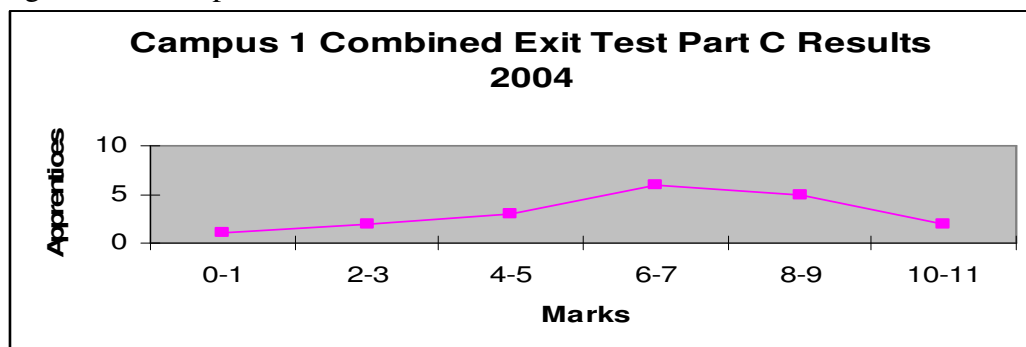
Part C Calculations Questions

Range 0-10 (Max 11 marks) Mean 6.6 Apprentice Numbers 19

Table K12 Campus 1 Combined Group Part C Results

Marks	0	2	5	6	7	8	9	10
Apprentices	1	2	3	2	4	3	2	2

Figure K12 Campus 1 Combined Exit Test Part C Results 2004



Part D Development Questions

Range 0-10 (Max 11 marks) Mean 5.4 Apprentice Number 19

Table K13 Campus 1 Combined Group Part D Results

Marks	0	2	3	4	5	6	7	8	10
Apprentices	1	1	4	2	1	3	2	3	2

Figure K13 Campus 1 Combined Exit Test Part D Results 2004

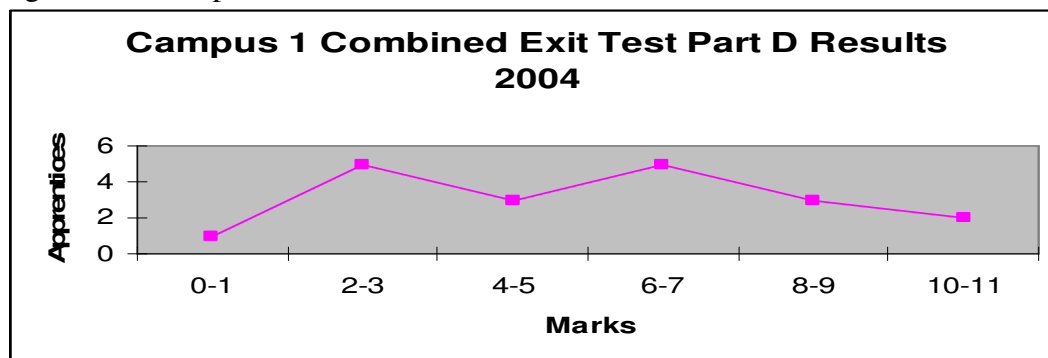


Table K14 indicates Campus 2 results with a response rate of 100% and with a mean of 63.4 with a range of 47-88 as illustrated in Figure K14. This campus is an urban campus, which provides training to southern lakes area of Newcastle.

Part A multiple choice questions from Table K15 shows a range of marks between 24-49 and with a mean mark of 35.3 as illustrated in Figure K15.

Part B short answer questions as indicated in Table K16 show the marks peak at 16-17 with more than half the total at these marks as shown in Figure K16.

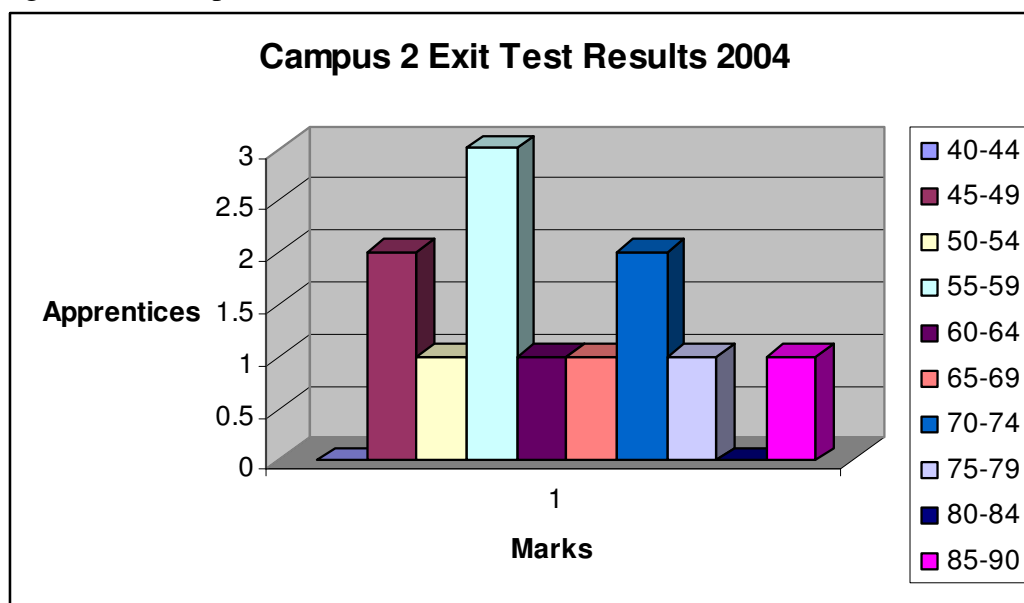
Part C calculations question had an even distribution across the marks as illustrated in Figure K17 and Table K17.

Part D development question as shown in Table K18 had marks spread between ranges evenly as illustrated in Figure K18.

Table K14 Campus 2 Exit Test Results 2004

Marks	47	48	51	55	58	59	63	66	73	74	78	88
Apprentices	1	1	1	1	1	1	1	1	1	1	1	1

Figure K14 Campus 2 Exit Test Results 2004



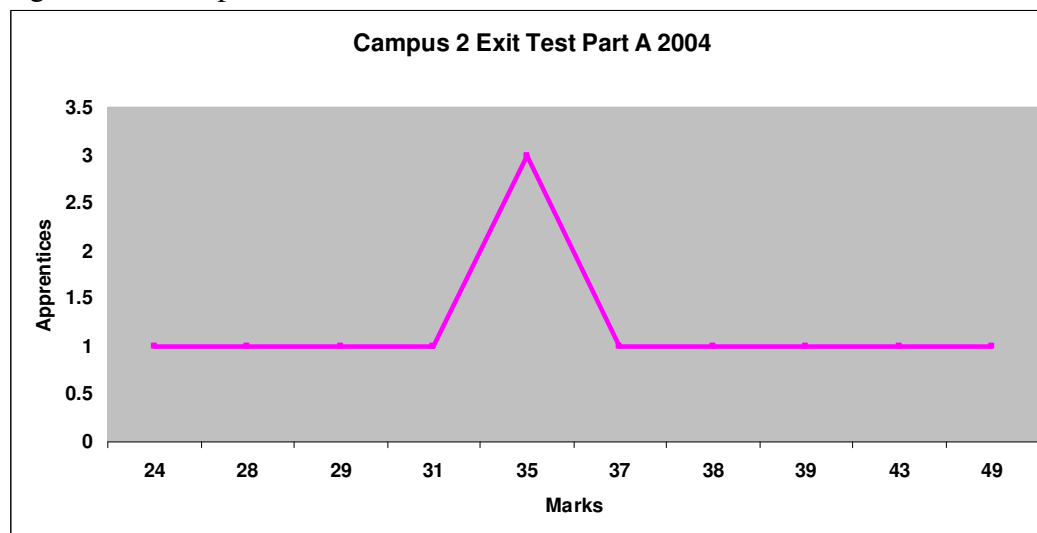
Part A Multiple Choice Questions

Range 24-49 (Max 60 marks) Mean 35.3 Apprentice Numbers 12

Table K15 Campus 2 Part A Results

Marks	24	28	29	31	35	37	38	39	43	49
Apprentices	1	1	1	1	3	1	1	1	1	1

Figure K15 Campus 2 Exit Test Part A Results 2004



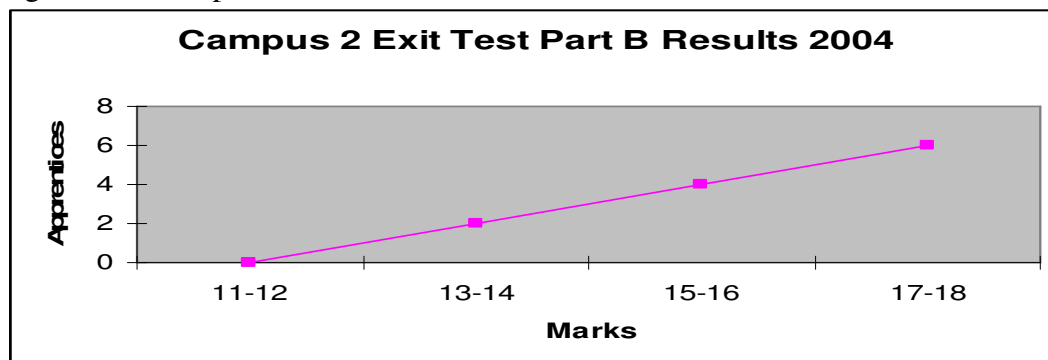
Part B Short Answer Questions

Range 14-18 (Max 18 marks) Mean 16.3 Apprentice Numbers 12

Table K16 Campus 2 Part B Results

Marks	14	15	16	17	18
Apprentices	2	1	3	4	2

Figure K16 Campus 2 Exit Test Part B Results 2004



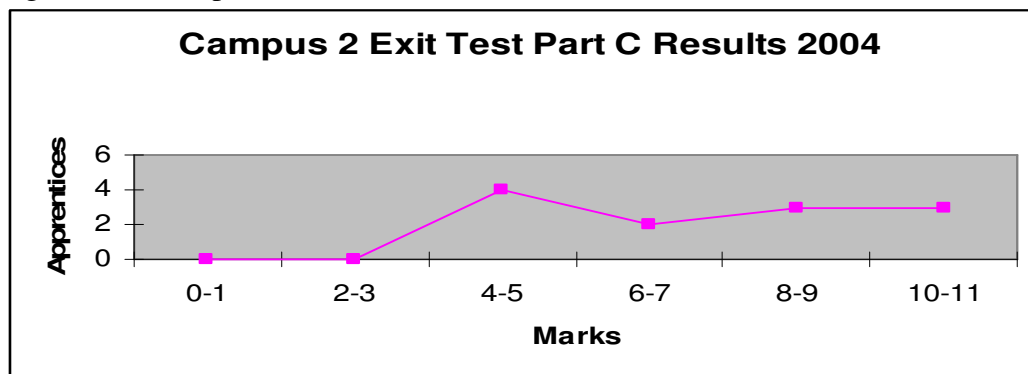
Part C Calculations Questions

Range 4-11 (Max 11 marks) Mean 7.3 Apprentice Numbers 12

Table K17 Campus 2 Part C Results

Marks	4	5	6	9	10	11
Apprentices	2	2	2	3	2	1

Figure K17 Campus 2 Exit Test Part C Results 2004



Part D Development Questions

Range 0-10 (Max 11 marks) Mean 4.5 Apprentice Number 12

Table K18 Campus 2 Part D Results

Marks	0	1	2	3	4	5	9	10
Apprentices	3	1	1	1	1	1	1	3

Figure K18 Campus 2 Exit Test Part D Results 2004

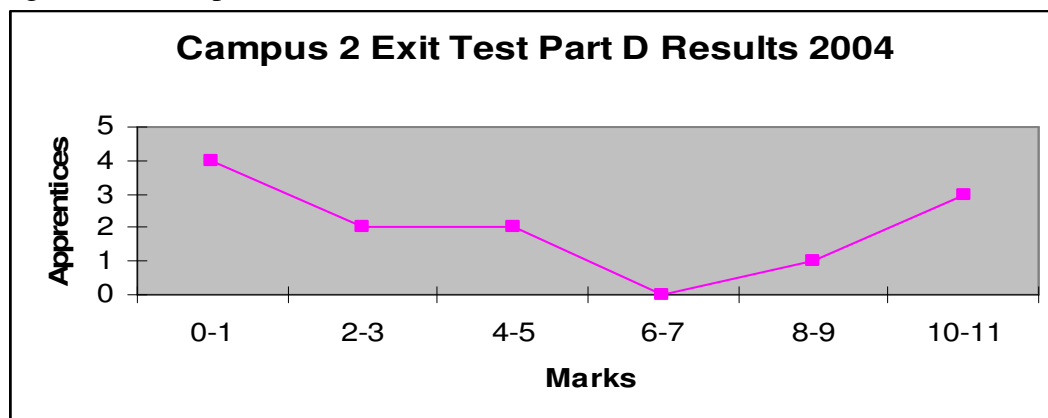


Table K19 indicates the response rate of 90% and the mean was 66 with a range of marks 59-74 as illustrated in Figure K19. Campus 4 is an urban campus, which provides training to the Newcastle and surrounding industrial areas.

Part A multiple choice questions from Table K20 shows a range of marks between 30-44 and with a mean mark of 38 as illustrated in Figure K20.

Part B short answer questions as indicated in Table K21 show the marks peak at 16-17 with more than half the total at these marks as shown in Figure K21.

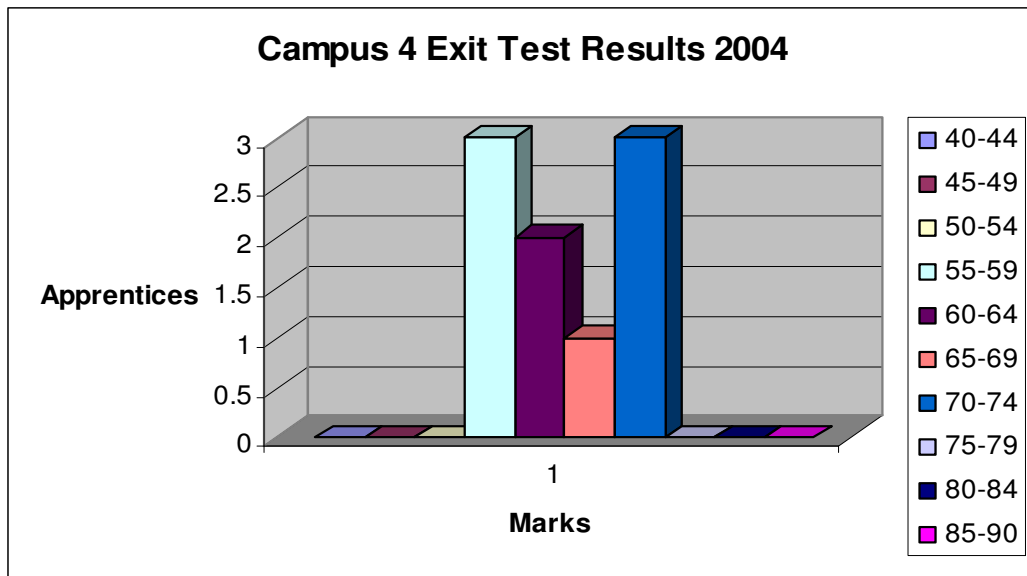
Part C calculations question marks clustered at the 5-9 range as illustrated in Figure K22 and Table K22.

Part D development question as shown in Table K23 show marks peaked at the 6-7 mark bracket as illustrated in Figure K23.

Table K19 Campus 4 Exit Test Results 2004

Marks	59	64	68	73	74
Apprentices	3	2	1	1	2

Figure K19 Campus 4 Exit Test Results 2004



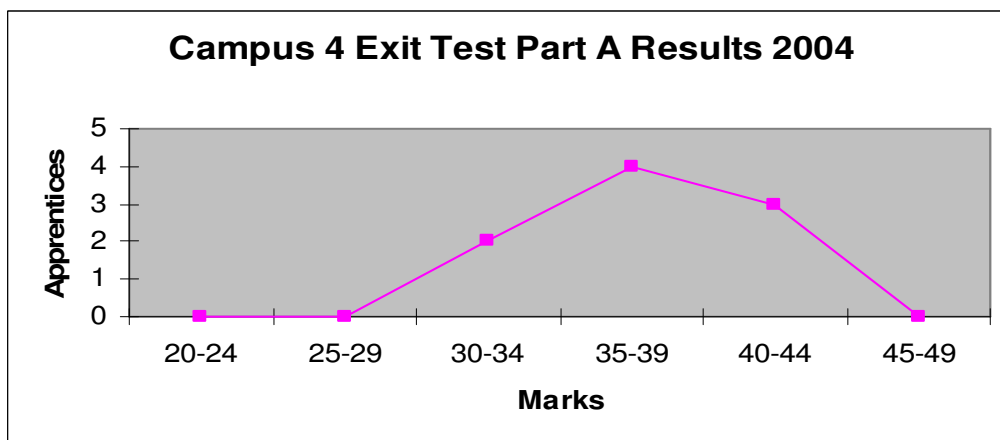
Part A Multiple Choice Questions

Range 30-44 (Max 60 marks) Mean 38 Apprentice Numbers 9

Table K20 Campus 4 Part A Results

Marks	30	32	36	38	39	44
Apprentices	1	1	2	1	1	3

Figure K20 Campus 4 Exit Test Part A Results 2004



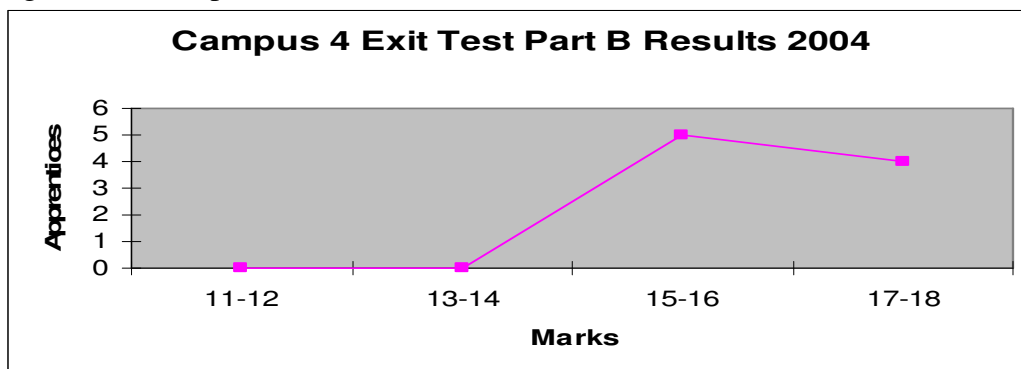
Part B Short Answer Questions

Range 15-17 (Max 18 marks) Mean 16.2 Apprentice Numbers 9

Table K21 Campus 4 Part B Results

Marks	15	16	17
Apprentices	2	3	4

Figure K21 Campus 4 Exit Test Part B Results 2004



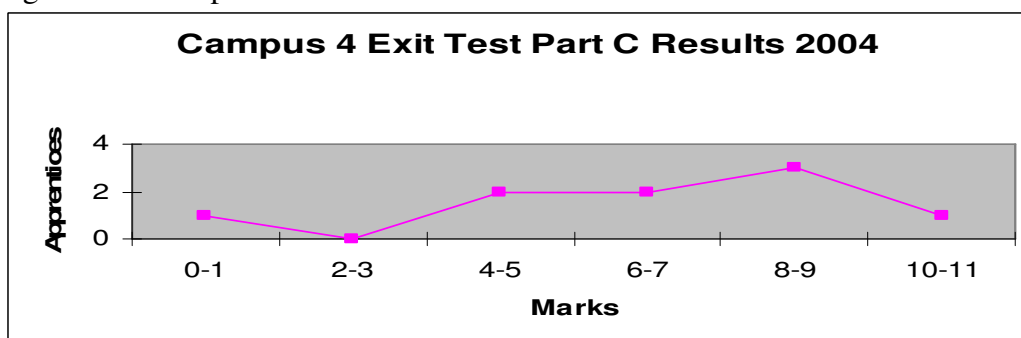
Part C Calculations Questions

Range 1-11 (Max 11 marks) Mean 7 Apprentice Numbers 9

Table K22 Campus 4 Part C Results

Marks	1	5	7	9	11
Apprentices	1	2	2	3	1

Figure K22 Campus 4 Exit Test Part C Results 2004



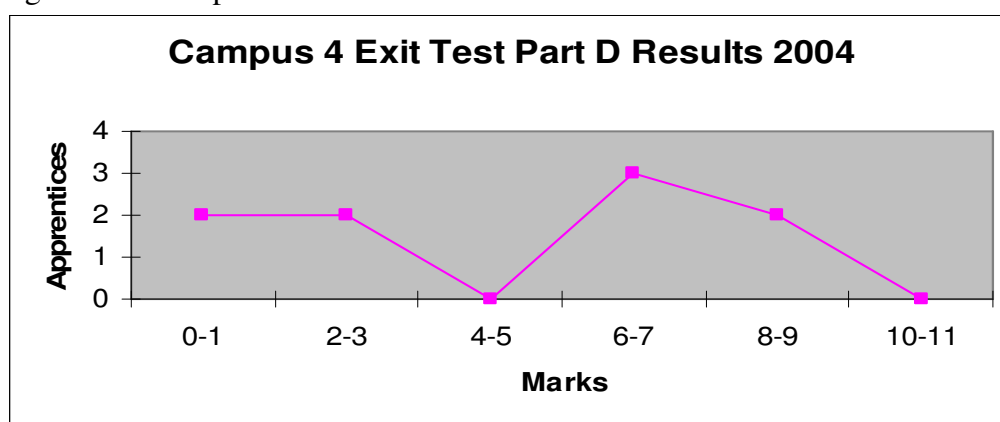
Part D Development Questions

Range 0-9 (Max 11 marks) Mean 4.8 Apprentice Number 9

Table K23 Campus 4 Part D Results

Marks	0	1	3	6	7	8	9
Apprentices	1	1	2	2	1	1	1

Figure K23 Campus 4 Exit Test Part D Results 2004



Campus 5 is situated in a rural area and provides training to the upper Hunter Valley industries. The response rate for this campus was 75% with mean of 62.4% and a range of 45-75 as shown in Table K24 and illustrated in Figure K24.

Part A multiple choice questions from Table K25 show a cluster of marks between 35-39 with a mean mark of 34.6 as illustrated in Figure K25.

Part B short answer questions as indicated in Table K26 show the marks peak at 17 with more than half the total at these marks as shown in Figure K26.

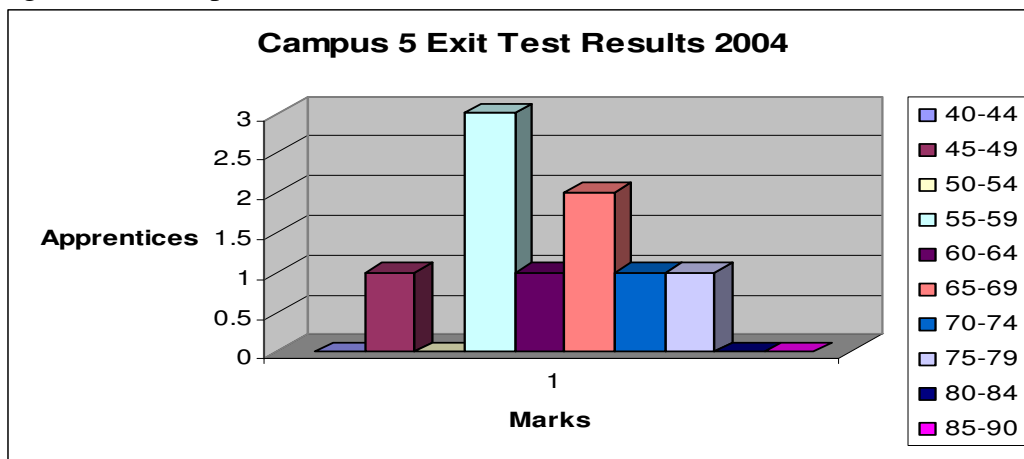
Part C calculations question marks clustered at the 4-9 range as illustrated in Figure K27 and Table K27.

Part D development question as shown in Table K28 had marks peaked at the 6-10 mark bracket as illustrated in Figure K28.

Table K24 Campus 5 Exit Test Results 2004

Marks	45	57	58	59	60	66	73	75
Apprentices	1	1	1	1	1	2	1	1

Figure K24 Campus 5 Exit Test Results 2004



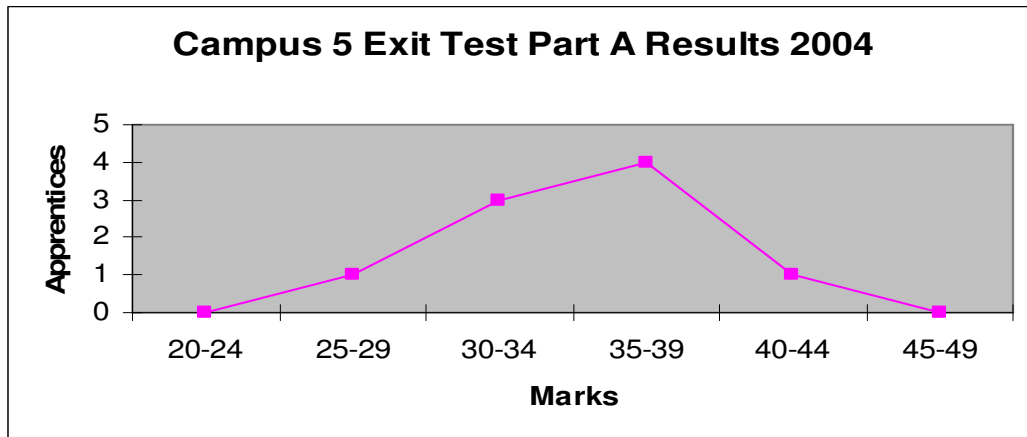
Part A Multiple Choice Questions

Range 26-41 (Max 60 marks) Mean 34.6 Apprentice Numbers 9

Table K25 Campus 5 Part A Results

Marks	26	31	34	35	37	38	39	41
Apprentices	1	1	2	1	1	1	1	1

Figure K25 Campus 5 Exit Test Part A Results 2004



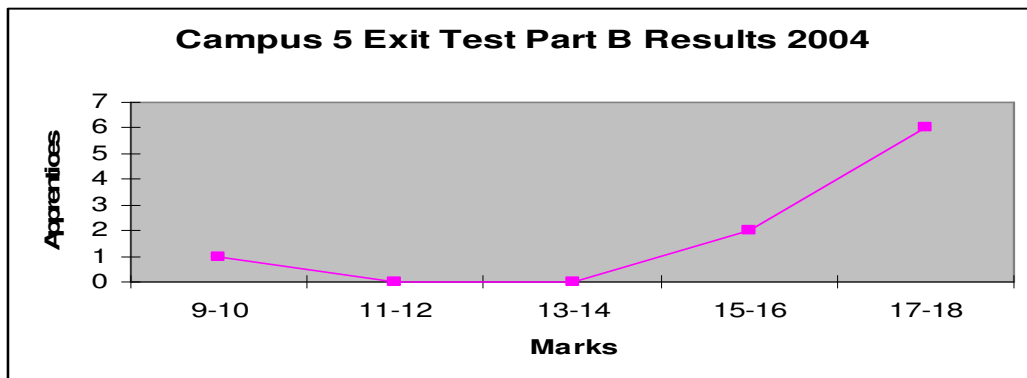
Part B Short Answer Questions

Range 9-17 (Max 18 marks) Mean 15.8 Apprentice Numbers 9

Table K26 Campus 5 Part B Results

Marks	9	15	16	17
Apprentices	1	1	1	6

Figure K26 Campus 5 Exit Test Part B Results 2004



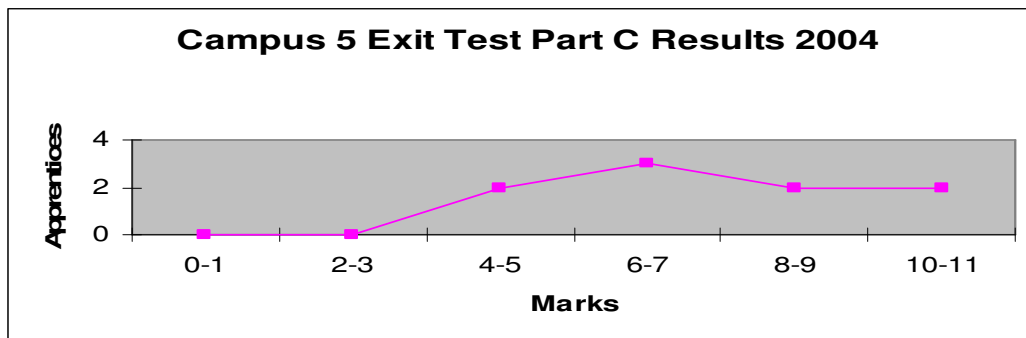
Part C Calculations Questions

Range 4-11 (Max 11 marks) Mean 7.2 Apprentice Numbers 9

Table K27 Campus 5 Part C Results

Marks	4	6	7	8	9	10	11
Apprentices	2	2	1	1	1	1	1

Figure K27 Campus 5 Exit Test Part C Results 2004



Part D Development Questions

Range 0-10 (Max 11 marks) Mean 4.8 Apprentice Number 9

Table K28 Campus 5 Part D Results

Marks	0	1	2	6	7	10
Apprentices	2	1	1	1	2	2

Figure K28 Campus 5 Exit Test Part D Results 2004

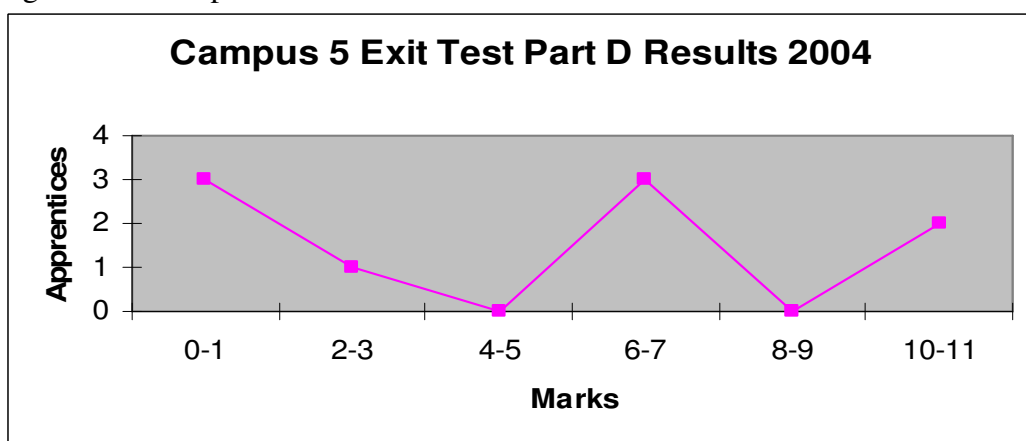


Table K29 indicates Campus 7 which had a response rate of 67.5% with the mean mark of 68.3% and a range of 60-75 marks as illustrated in Figure K29. This campus is a rural campus and is situated in the New England area.

Part A multiple choice questions from Table K30 show a cluster of marks between 35-39 marks with a mean mark of 38.9 as illustrated in Figure K30.

Part B short answer questions as indicated in Table K31 show the marks peak at 16-17 with more than half the total at these marks as shown in Figure K31.

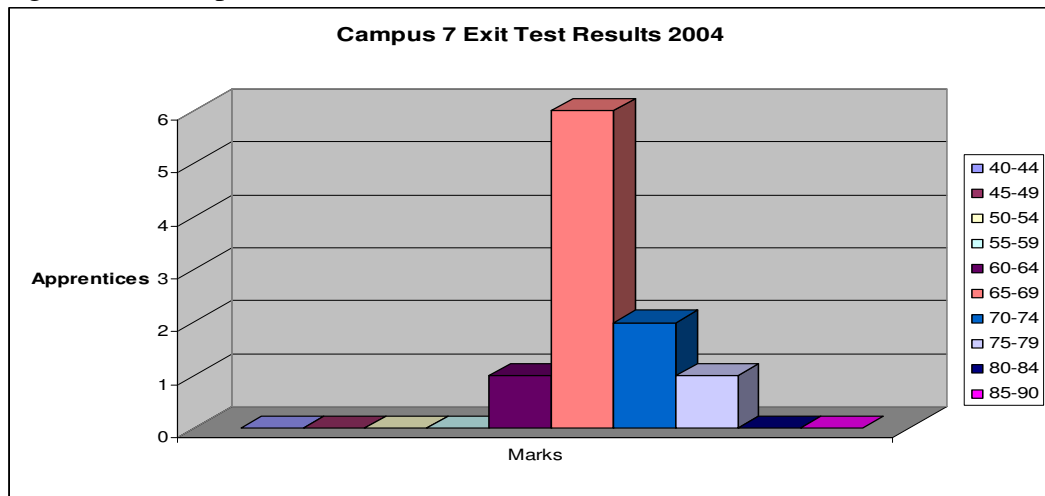
Part C calculations question marks clustered at the 9-11 range as illustrated in Figure K32 and Table K32.

Part D development question as shown in Table K33 show marks cluster at 1-4 bracket as illustrated in Figure K33.

Table K29 Campus 7 Exit Test Results 2004

Marks	60	65	66	67	68	73	75
Apprentices	1	1	1	1	3	2	1

Figure K29 Campus 7 Exit Test Results 2004



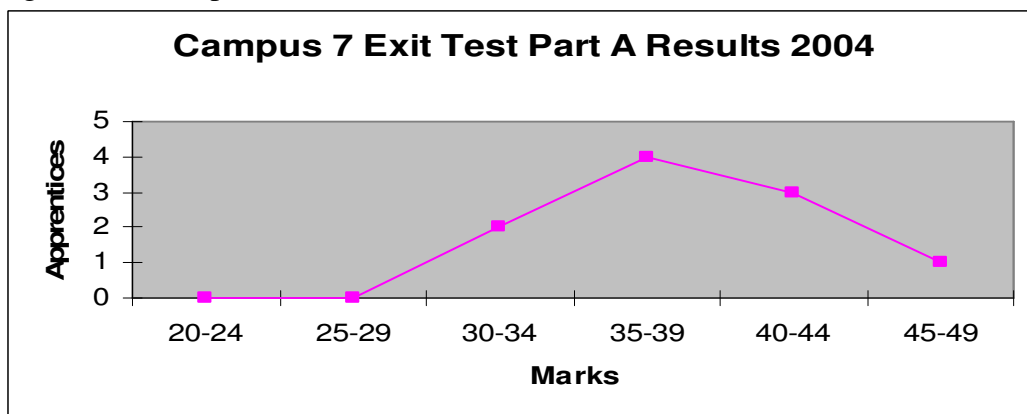
Part A Multiple Choice Questions

Range 34-45 (Max 60 marks) Mean 38.9 Apprentice Numbers 10

Table K30 Campus 7 Part A Results

Marks	34	37	38	39	40	42	45
Apprentices	2	1	2	1	1	2	1

Figure K30 Campus 7 Exit Test Part A Results 2004



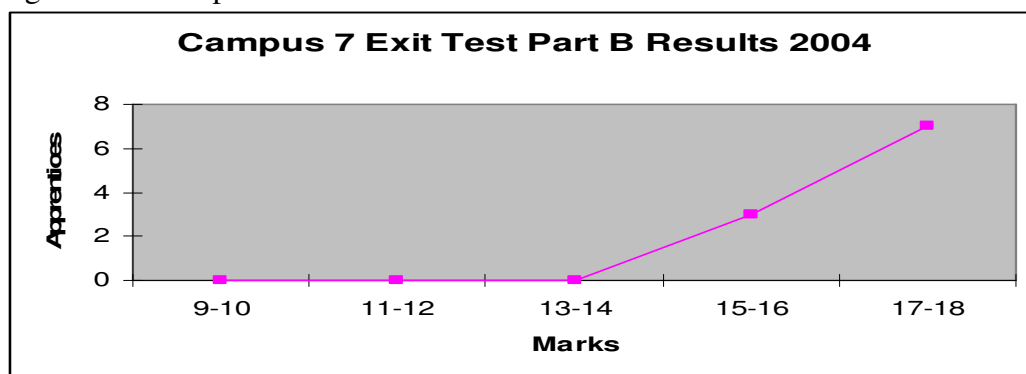
Part B Short Answer Questions

Range 15-18 (Max 18 marks) Mean 16.8 Apprentice Numbers 10

Table K31 Campus 7 Part B Results

Marks	15	16	17	18
Apprentices	1	2	5	2

Figure K31 Campus 7 Exit Test Part B Results 2004



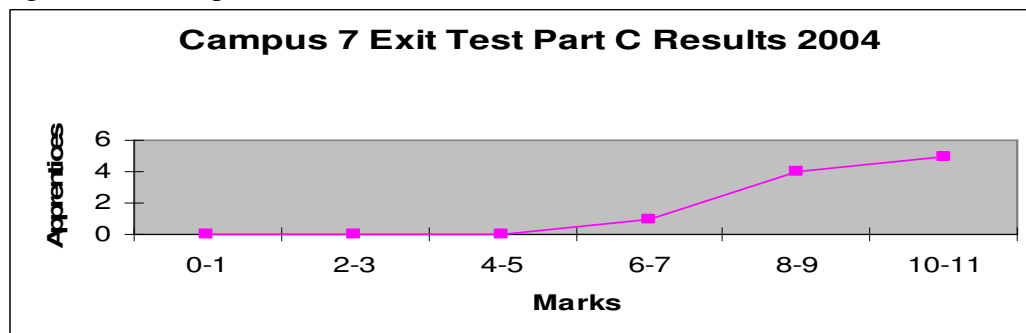
Part C Calculations Questions

Range 7-11 (Max 11 marks) Mean 9.5 Apprentice Numbers 10

Table K32 Campus 7 Part C Results

Marks	7	9	10	11
Apprentices	1	4	3	2

Figure K32 Campus 7 Exit Test Part C Results 2004



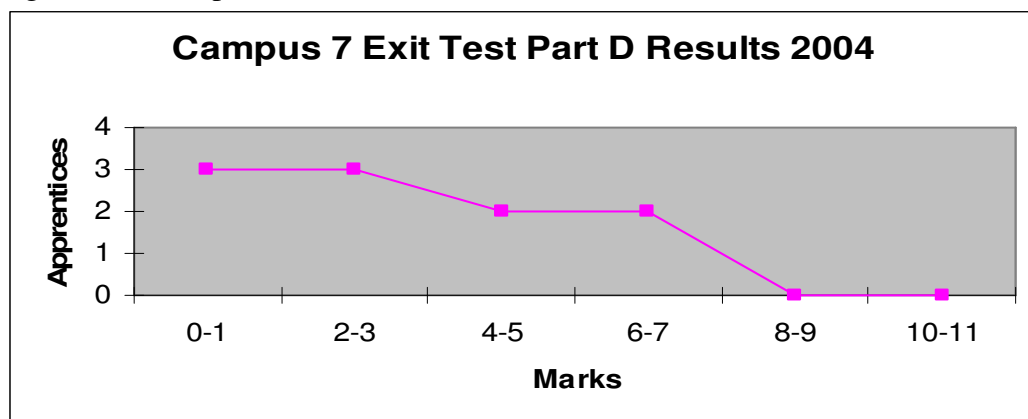
Part D Development Questions

Range 1-7 (Max 11 marks) Mean 3.1 Apprentice Number 10

Table K33 Campus 7 Part D Results

Marks	1	2	3	4	6	7
Apprentices	3	2	1	2	1	1

Figure K33 Campus 7 Exit Test Part D Results 2004



Campus 8 is a rural campus and is located in the mid north coast of NSW. The response rate was 70% with a mean mark of 78.9% and a range of 74-86 as shown in Table K34 and illustrated in Figure K34.

Part A multiple choice questions from Table K35 show a cluster of marks between 45-49 marks with a mean mark of 46.9 as illustrated in Figure K35.

Part B short answer questions as indicated in Table K36 show the marks peak at 16-18 with more than half of the marks at this range as shown in Figure K36.

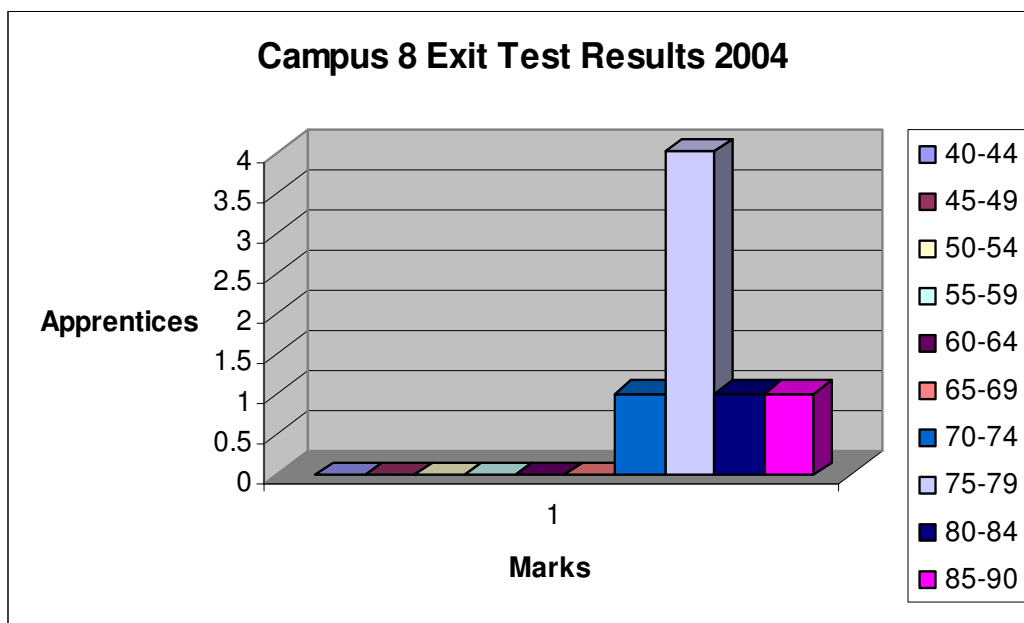
Part C calculations question marks clustered at the 10-11 range as illustrated in Figure K37 and Table K37.

Part D development question as shown in Table K38 show marks cluster at 8-10 bracket as illustrated in Figure K38.

Table K34 Campus 8 Exit Test Results 2004

Marks	74	76	78	81	86
Apprentices	1	2	2	1	1

Figure K34 Campus 8 Exit Test results 2004



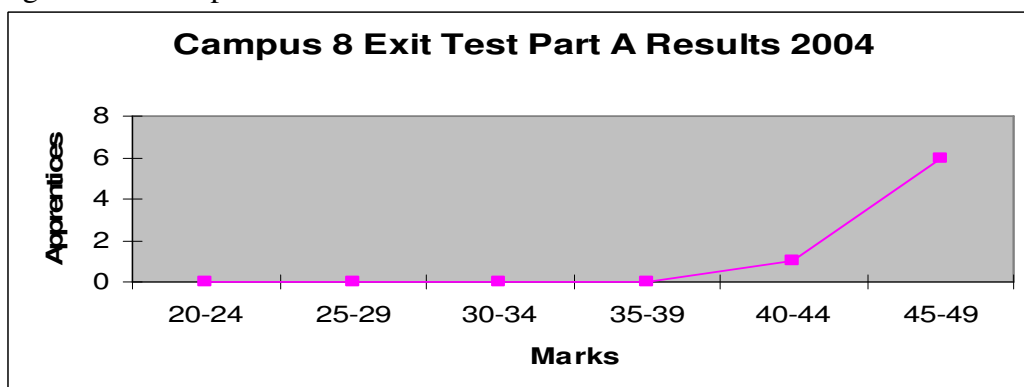
Part A Multiple Choice Questions

Range 44-49 (Max 60 marks) Mean 46.9 Apprentice Numbers 7

Table K35 Campus 8 Part A Results

Marks	44	45	46	47	48	49
Apprentices	1	1	2	1	1	1

Figure K35 Campus 8 Exit Test Part A Results 2004



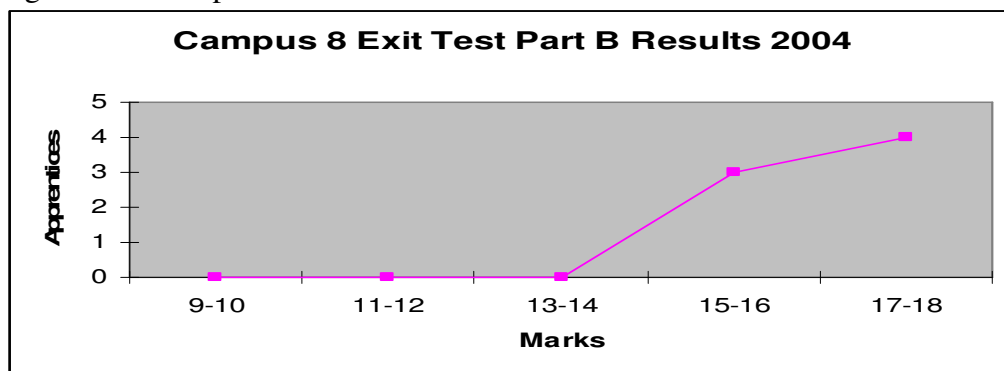
Part B Short Answer Questions

Range 16-18 (Max 18 marks) Mean 16.7 Apprentice Numbers 7

Table K36 Campus 8 Part B Results

Marks	16	17	18
Apprentices	3	3	1

Figure K36 Campus 8 Exit Test Part B Results 2004



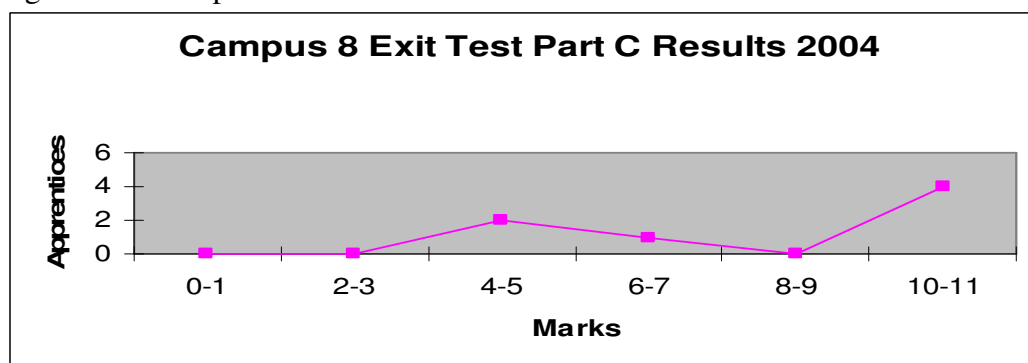
Part C Calculations Questions

Range 4-11 (Max 11 marks) Mean 8 Apprentice Numbers 7

Table K37 Campus 8 Part C Results

Marks	4	7	10	11
Apprentices	2	1	3	1

Figure K37 Campus 8 Exit Test Part C Results 2004



Part D Development Questions

Range 3-10 (Max 11 marks) Mean 7.3 Apprentice Number 7

Table K38 Campus 8 Part D Results

Marks	3	6	8	9	10
Apprentices	1	2	1	2	1

Figure K38 Campus 8 Exit Test Part D Results 2004

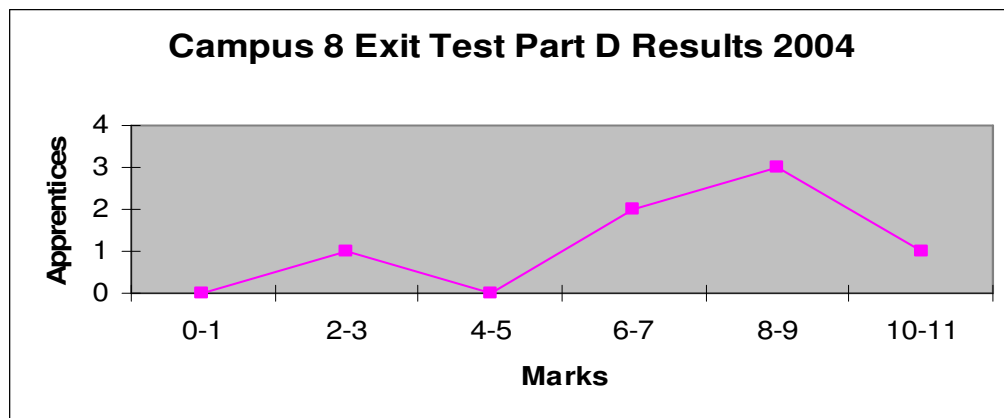


Table K39 represents Campus 9 which is a rural campus located in the far North Coast of NSW. The response rate was 100% with a mean of 66% and a range of 50-83 as illustrated in Figure K39.

Part A multiple choice questions from Table K40 show a cluster of marks between 36-40 marks with a mean mark of 35.9 as illustrated in Figure K40.

Part B short answer questions as indicated in Table K41 show the marks peak at 16-17 with more than half of the marks at this range as shown in Figure K41.

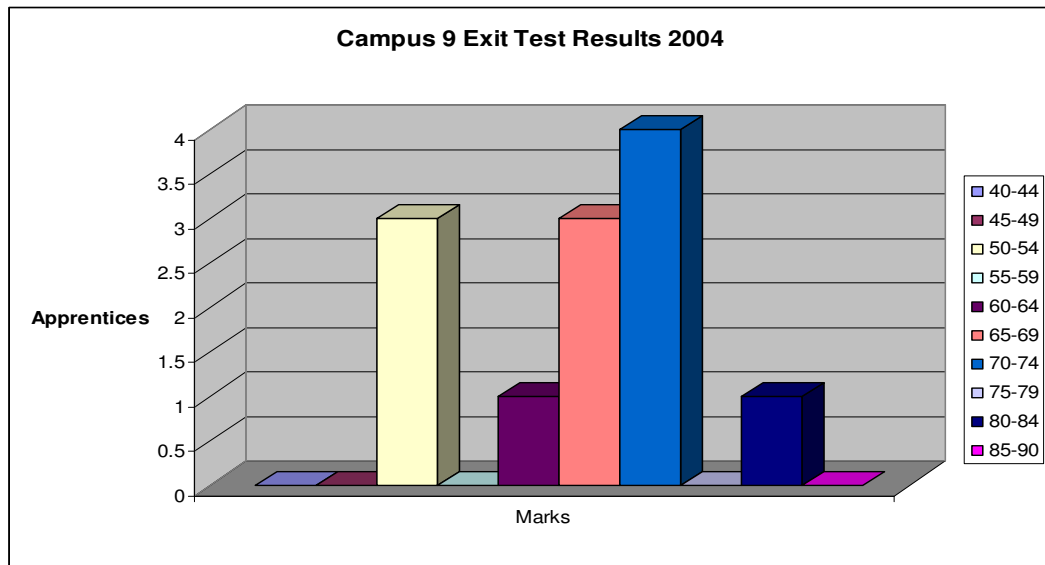
Part C calculations question marks clustered at the 6-7 range as illustrated in Figure K42 and Table K42.

Part D development question as shown in Table K43 show marks peaked at 8-9 bracket as illustrated in Figure K43.

Table K39 Campus 9 Exit Test Results 2004

Marks	50	52	53	62	65	68	71	72	73	74	83
Apprentices	1	1	1	1	1	2	1	1	1	1	1

Figure K39 Campus 9 Exit Test Results 2004



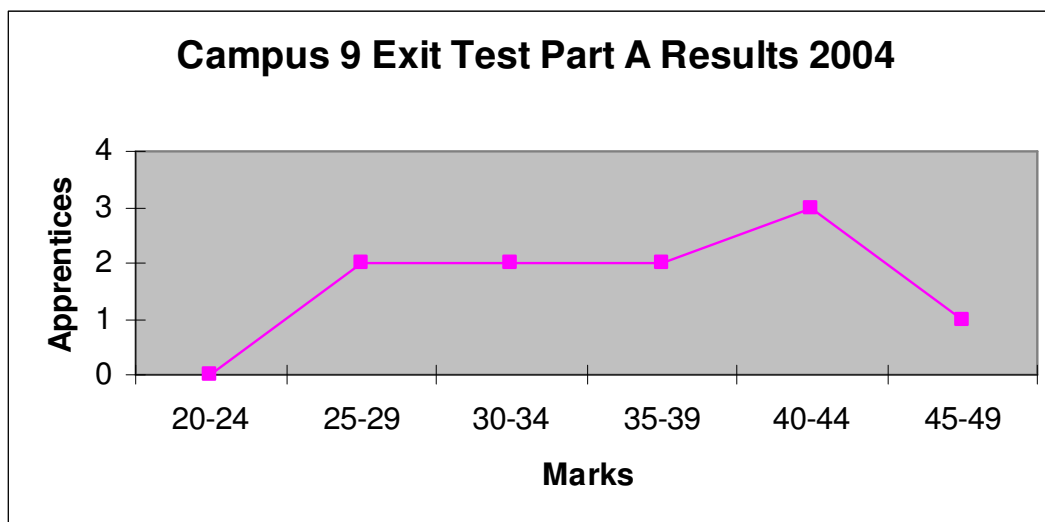
Part A Multiple Choice Questions

Range 25-46 (Max 60 marks) Mean 35.9 Apprentice Numbers 12

Table K40 Campus 9 Part A Results

Marks	25	28	30	33	36	37	40	43	46
Apprentices	1	1	1	1	2	2	2	1	1

Figure K40 Campus 9 Exit Test Part A Results 2004



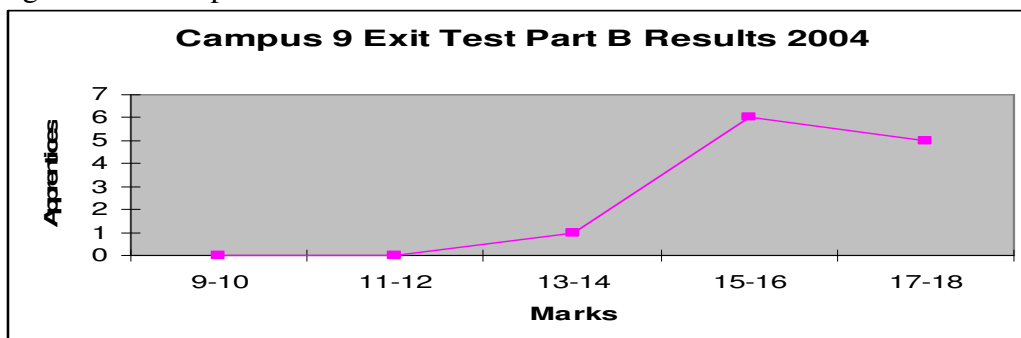
Part B Short Answer Questions

Range 13-18 (Max 18 marks) Mean 16.2 Apprentice Numbers 12

Table K41 Campus 9 Part B Results

Marks	13	15	16	17	18
Apprentices	1	2	4	3	2

Figure K41 Campus 9 Exit Test Part B Results 2004



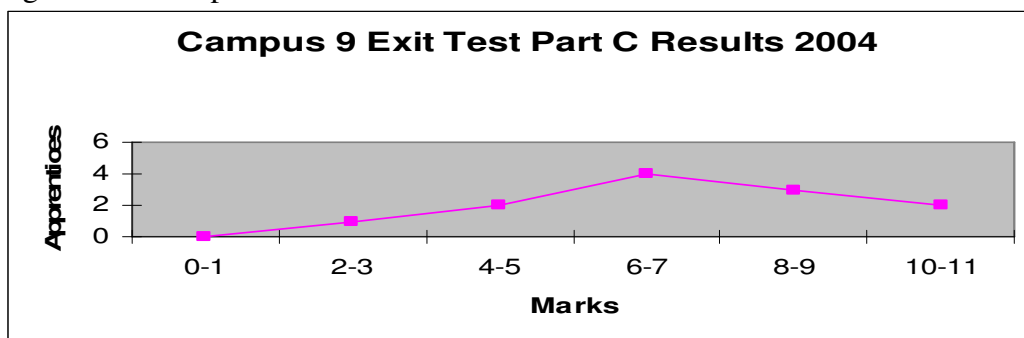
Part C Calculations Questions

Range 2-11 (Max 11 marks) Mean 7.2 Apprentice Numbers 12

Table K42 Campus 9 Part C Results

Marks	2	4	5	6	7	8	9	11
Apprentices	1	1	1	1	3	1	2	2

Figure K42 Campus 9 Exit Test Part C Results 2004



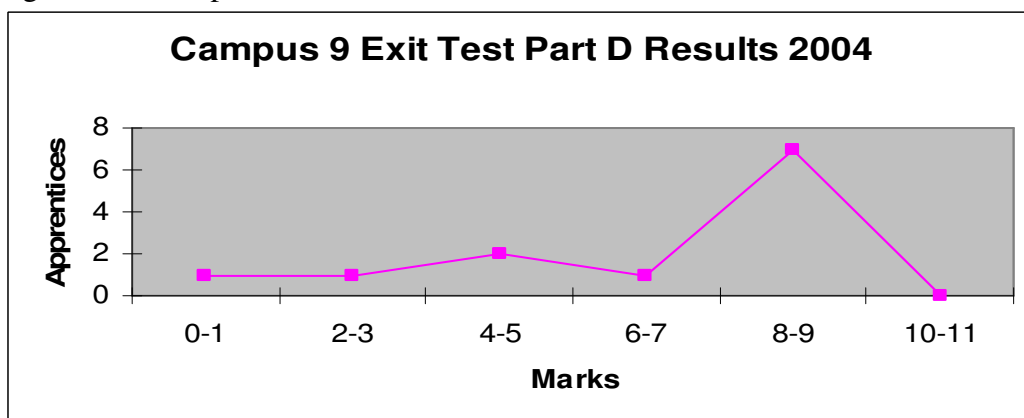
Part D Development Questions

Range 1-9 (Max 11 marks) Mean 6.7 Apprentice Number 12

Table K43 Campus 9 Part D Results

Marks	1	3	5	7	8	9
Apprentices	1	1	2	1	4	3

Figure K43 Campus 9 Exit Test Part D Results 2004



Campus 10 as indicated in Table K44 is a rural campus located in the southern part of the Riverina area. The response rate was 100% with a mean of 58.3% and a range of 47-80 as illustrated in Figure K44.

.Part A multiple choice questions from Table K45 show a cluster of marks between 35-39 marks with a mean mark of 34.9 as illustrated in Figure K45.

Part B short answer questions as indicated in Table K46 show the marks peak at 15-16 with more than half of the marks at this range as shown in Figure K46.

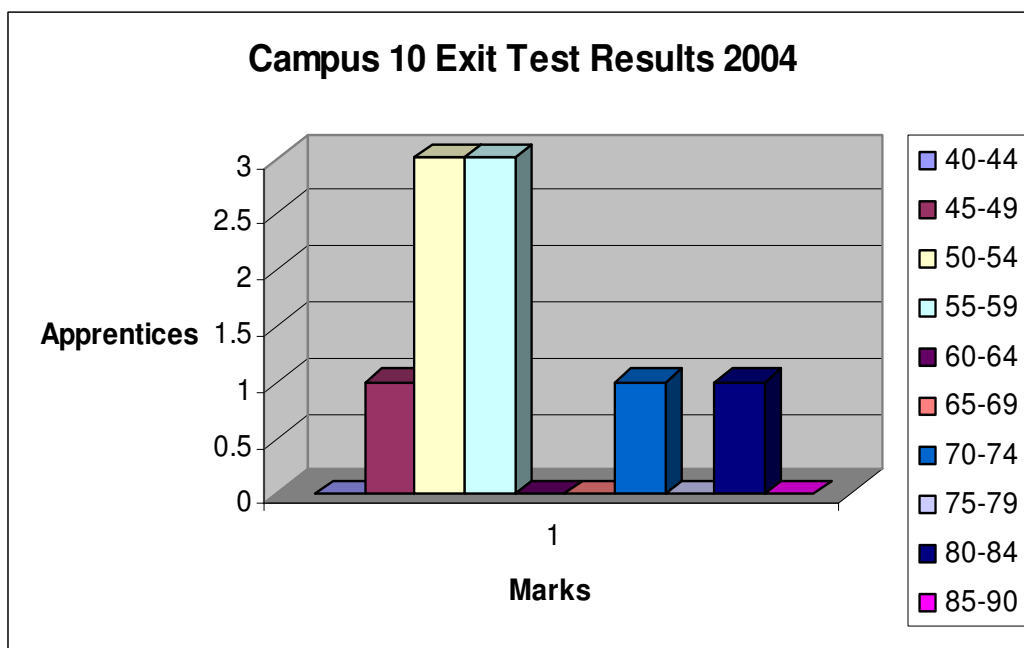
Part C calculations question marks were evenly spread across the range of marks as illustrated in Figure K47 and Table K47.

Part D development question as shown in Table K48 show marks clustered at 0-2 bracket as illustrated in Figure K48.

Table K44 Campus 10 Exit Test Results 2004

Marks	47	50	53	55	56	57	73	80
Apprentices	1	1	2	1	1	1	1	1

Figure K44 Campus 10 Exit Test Results 2004



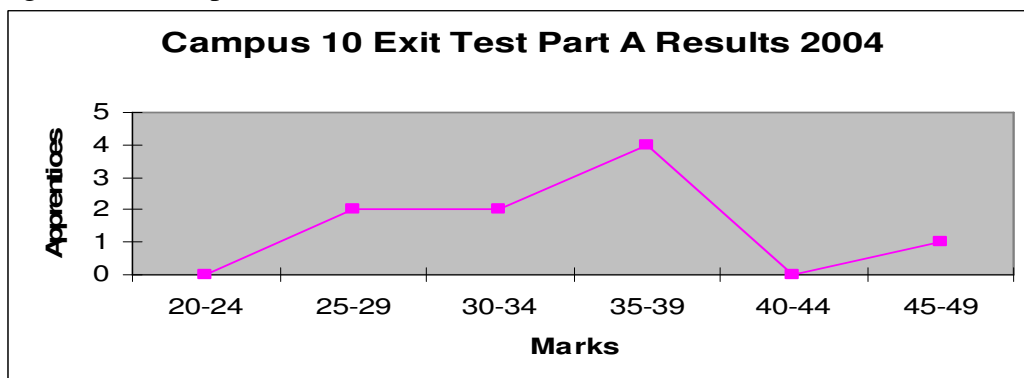
Part A Multiple Choice Questions

Range 28-46 (Max 60 marks) Mean 34.9 Apprentice Numbers 9

Table K45 Campus 10 Part A Results

Marks	28	29	33	34	35	37	46
Apprentices	1	1	1	1	2	2	1

Figure K45 Campus 10 Exit Test Part A Results 2004



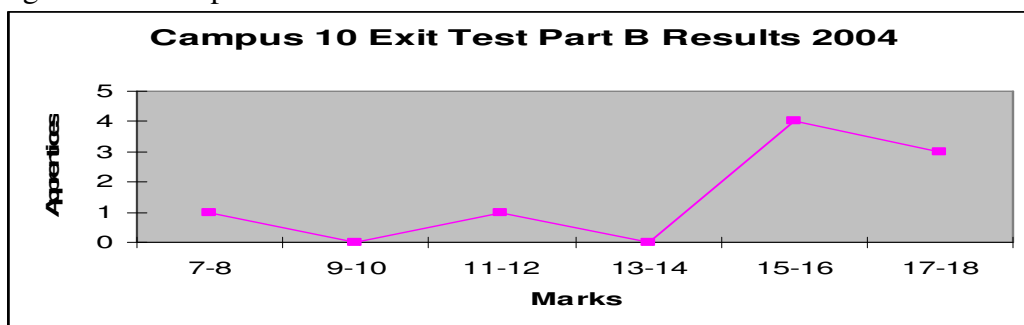
Part B Short Answer Questions

Range 8-18 (Max 18 marks) Mean 14.8 Apprentice Numbers 9

Table K46 Campus 10 Part B Results

Marks	8	12	15	16	17	18
Apprentices	1	1	3	1	2	1

Figure K46 Campus 10 Exit Test Part B Results 2004



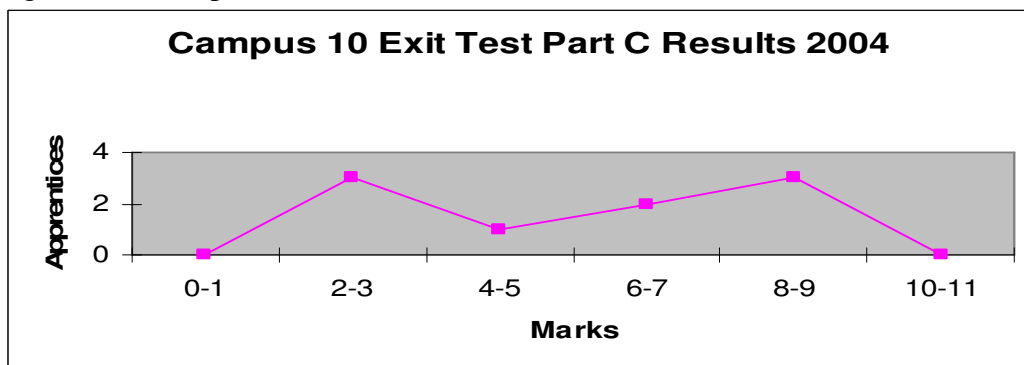
Part C Calculations Questions

Range 2-9 (Max 11 marks) Mean 5.8 Apprentice Numbers 9

Table K47 Campus 10 Part C Results

Marks	2	3	5	6	7	8	9
Apprentices	1	2	1	1	1	1	2

Figure K47 Campus 10 Exit Test Part C Results 2004



Part D Development Questions

Range 0-9 (Max 11 marks) Mean 2.8 Apprentice Number 9

Table K48 Campus 10 Part D Results

Marks	0	1	2	9
Apprentices	3	1	3	2

Figure K48 Campus 10 exit Test Part D Results 2004

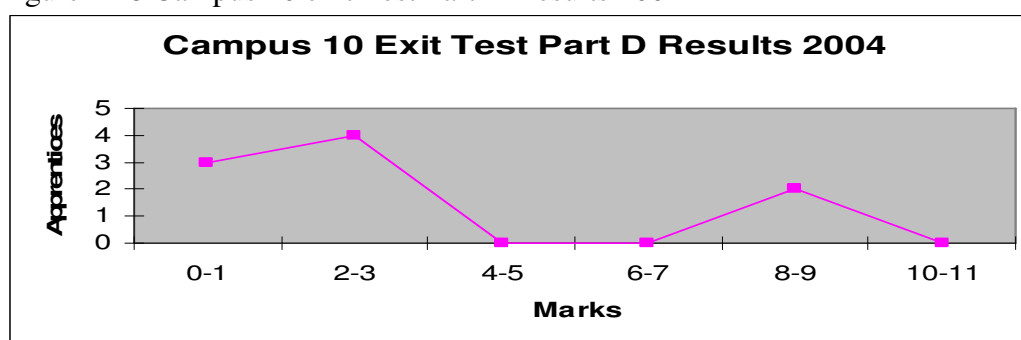


Table K49 represents Campus 11 which is an urban campus located in Sydney. The response rate was 33% with a mean of 53% and a range of 42-68 as illustrated in Figure K49.

Part A multiple choice questions from Table K50 show a cluster of marks between 35-39 marks with a mean mark of 31.6 as illustrated in Figure K50.

Part B short answer questions as indicated in Table K51 show the marks peak at 15-16 with more than half of the marks at this range as shown in Figure K51.

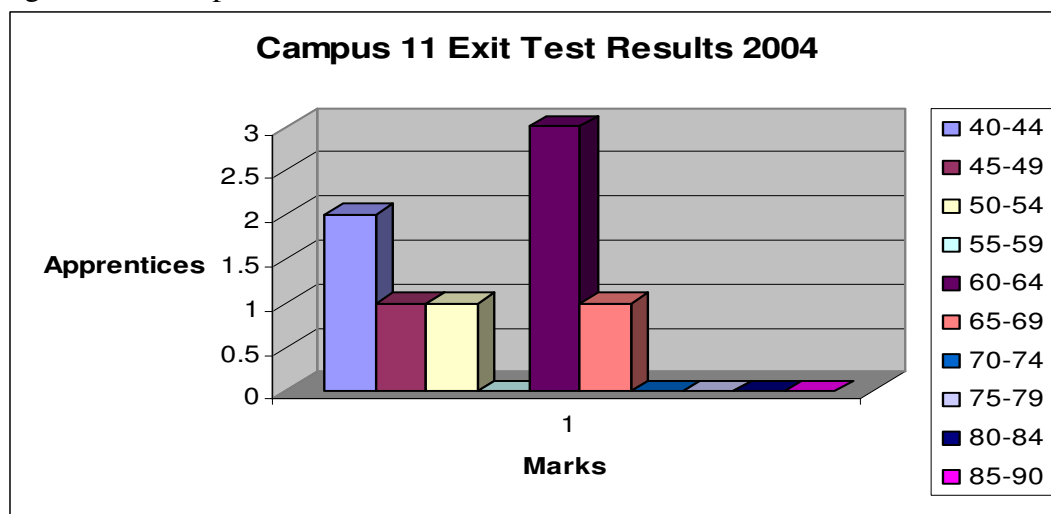
Part C calculations question marks were evenly spread across the range of marks as illustrated in Figure K52 and Table K52.

Part D development question as shown in Table K53 show marks peaked at 4-5 bracket as illustrated in Figure K53.

Table K49 Campus 11 Exit Test Results 2004

Marks	42	43	48	50	63	64	68
Apprentices	1	1	1	1	1	2	1

Figure K49 Campus 11 Exit Test Results 2004



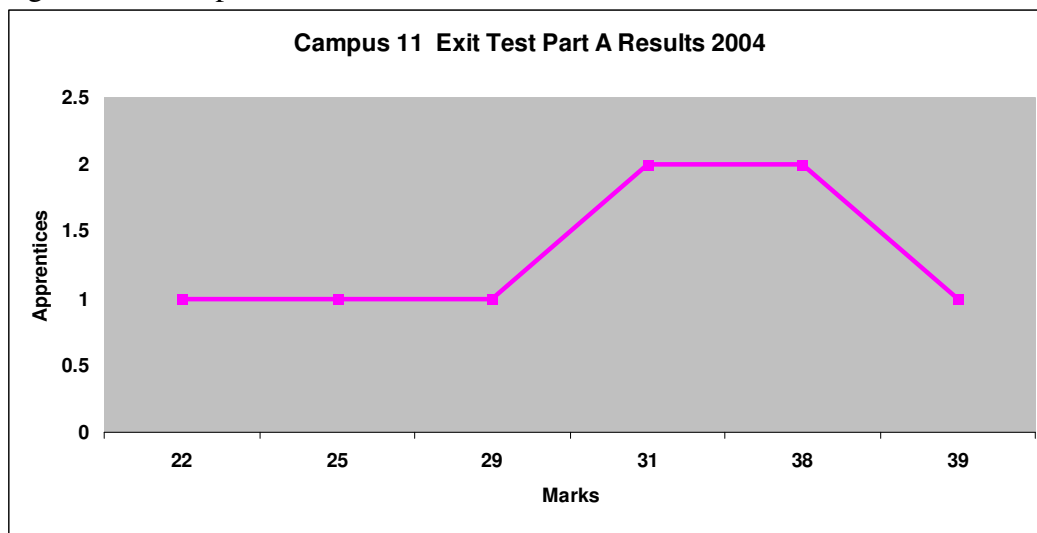
Part A Multiple Choice Questions

Range 22-39 (Max 60 marks) Mean 31.6 Apprentice Numbers 8

Table K50 Campus 11 Part A Results

Marks	22	25	29	31	38	39
Apprentices	1	1	1	2	2	1

Figure K50 Campus 11 Exit Test Part A Results 2004



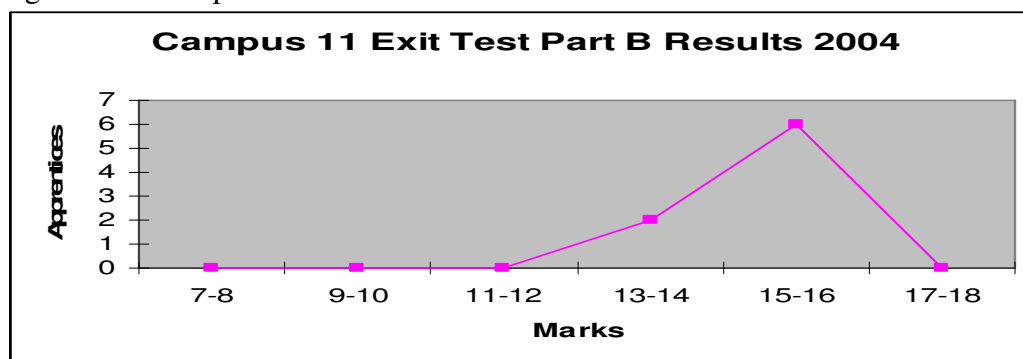
Part B Short Answer Questions

Range 14-16 (Max 18 marks) Mean 15 Apprentice Numbers 8

Table K51 Campus 11 Part B Results

Marks	14	15	16
Apprentices	2	4	2

Figure K51 Campus 11 Exit Test Part B Results 2004



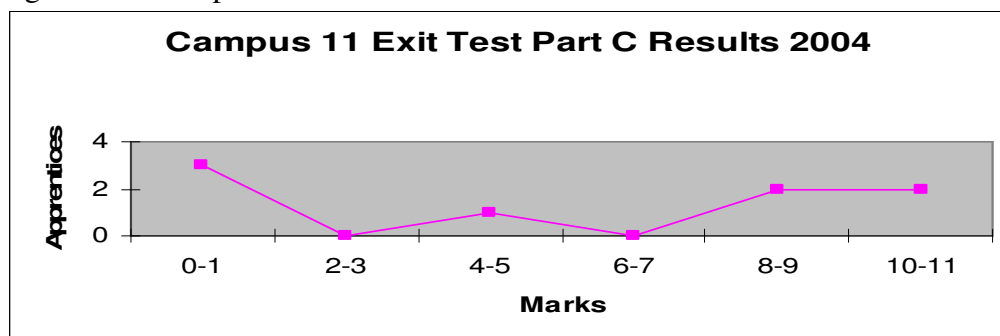
Part C Calculations Questions

Range 0-11 (Max 11 marks) Mean 5.6 Apprentice Numbers 8

Table K52 Campus 11 Part C Results

Marks	0	1	5	9	10	11
Apprentices	2	1	1	2	1	1

Figure K52 Campus 11 Exit Test Part C Results 2004



Part D Development Questions

Range 0-8 (Max 11 marks) Mean 0.8 Apprentice Number 8

Table K53 Campus 11 Part D Results

Marks	0	4	8
Apprentices	3	4	1

Figure K53 Campus 11 Exit Test Part D Results 2004

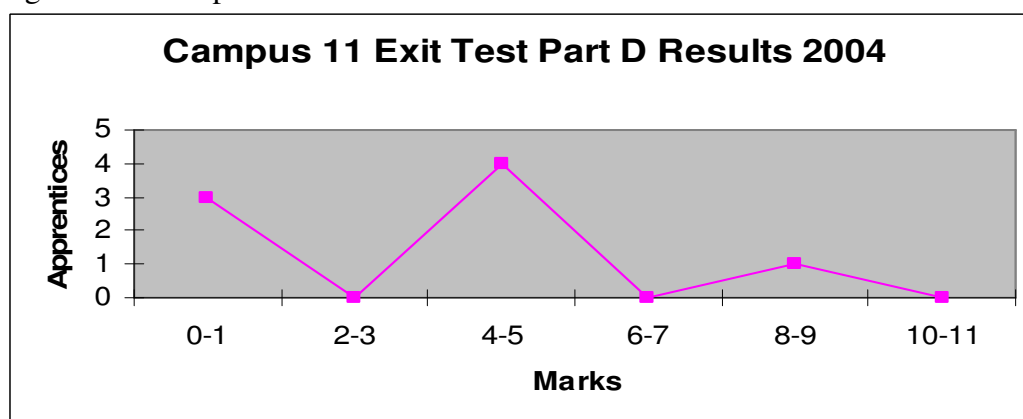


Table K54 TAFE NSW MF&W (Heavy) Part A Results 2004

Marks	20-24	25-29	30-34	35-39	40-44	45-49
Apprentices	2	11	18	39	14	11

Table K55 TAFE NSW MF&W (Heavy) Exit Test Part B 2004

Marks	8-10	11-12	13-14	15-16	17-18
Apprentices	2	1	6	37	49

Table K56 TAFE NSW MF&W (Heavy) Exit Test Part C Results 2004

Marks	0-1	2-3	4-5	6-7	8-9	10-11	
Apprentices	5	6	16	19	31	9	

Table K57 TAFE NSW MF&W (Heavy) Exit Test Part D Results 2004

Marks	0-1	2-3	4-5	6-7	8-9	10
Apprentices	22	17	14	14	21	7

Table K58 Rural and Urban Campuses Marks Part A 2004

Marks	20-24	25-29	30-34	35-39	40-44	45-49
Rural	0	8	13	25	10	9
Urban	2	4	4	13	4	1

Table K59 Rural and Urban Campuses Marks Part B 2004

Marks	8	9	10	11	12	13	14	15	16	17	18
Rural	1	1	0	0	1	1	1	9	13	32	7
Urban	0	0	0	0	0	0	4	7	8	8	2

Table K60 Rural and Urban Campuses Marks Part C 2004

Marks	0	1	2	3	4	5	6	7	8	9	10	11
Rural	1	0	4	2	5	5	6	11	6	11	9	6
Urban	2	2	0	0	2	5	2	2	0	8	3	3

Table K61 Rural and Urban Campuses Marks Part D 2004

Marks	0	1	2	3	4	5	6	7	8	9	10	11
Rural	6	6	7	7	4	3	7	6	8	7	5	0
Urban	7	2	1	3	5	1	2	1	2	2	3	0

Appendix “L”

Clause 6E of the Metal Industry Award 1984 - Part I,

AWARD PROVISION ON THE IMPLEMENTATION OF COMPETENCY STANDARDS

Clause 6E of the Metal Industry Award 1984 - Part I, is reproduced in this Annexure [Note: this is extracted from Prints M3565 and N1674 of the Australian Industrial Relations Commission]. Similar provisions apply to Parts 2 and 5 of the Award for technical and supervisory employees.

6E - CLASSIFICATION/RECLASSIFICATION

(a) In order to assist in the classification or reclassification of employees, the following arrangements shall apply:

- (i) The parties at each enterprise shall undertake appropriate consultation in accordance with subclause 6B(b) of the award.
- (ii) Any disputes in relation to classification or reclassification shall be handled in accordance with the avoidance of industrial disputes procedures of clause 6 of the award.
- (iii) Employees will have transferred to the new classification structure without loss of pay in accordance with appendix H agreed between parties which lines up the old classification with the new levels.

Introduction of competency standards

(b) The parties to the award are committed to competency standards because of the gains to be made in work reorganisation, skills enhancement and labour flexibility, and the opportunities for employees who will gain access to career paths, skills portability and work classification based on competency.

It is expected that the implementation of the competency standards will revolutionise the training system in the industry and enable the 14 level classification structure in the award to operate as it was intended. The standards are designed to:

- assist in identifying the skills needed to perform existing jobs and new jobs in a more objective, precise and comprehensive manner;
- facilitate work reorganisation and job redesign based on higher, broader based skills;

- assess the current skills gap for the purpose of developing training plans at the enterprise as provided for in clause 6C of the award;
- provide a flexible data base that reflects the industry's changing skills needs and provide a basis for determining formal training curricula;
- facilitate and encourage workplace change and skill development across the whole industry;
- provide the mechanism for appropriately classifying employees and giving them access to a career path;
- provide the basis for nationally recognised and portable qualifications and for industry leadership of the education and training system, including better integration of on and off the job learning and improved recognition of prior learning and credit transfer.

The parties have recognised the need for a staged implementation of the standards throughout the industry and the necessity for issues that remain unresolved out of the Model Implementation Program to be resolved to the greatest extent possible. The parties also recognise that there are a number of enterprises in a position to proceed to implement standards at the earliest possible opportunity and that in the interests of providing best practice models for others to follow the parties agree that implementation for these enterprises needs to be facilitated.

Classifying employees utilising the competency standards

- (c) (i) It shall be a term of the award that where there is agreement to implement the standards at the enterprise, or in the event that the classification of an employee is called into question, the issue shall be settled by the application of competency standards in accordance with this clause and the Guide for Implementing Competency Standards in the Metal and Engineering Industry, or by reference to the minimum training requirement in the relevant classification definition, except as provided in paragraphs (ii), (iii) and (iv) below. This shall take effect from 18 March 1996. The Guide shall constitute an appendix to this award.
- (ii) Where the employee has the relevant qualification recognised as a minimum training requirement for the level at which the employee seeks to be classified, and he/she is exercising or will be required to exercise the skills and knowledge gained from that qualification necessary for that level of work the employee shall be classified appropriately.

- (iii) Where skill standards have not been finalised in respect of any class of work, and this is necessary for determining an employee's classification, employees performing such work shall not be reclassified until such standards are available except as provided for in paragraphs (ii) and (iv) of this subclause.
- (iv) Where the situation described in paragraph (iii) above applies, but not under any other circumstances, an employee may be reclassified on the basis that the employee meets the requirements of the classification definitions prescribed in Appendices G and H of the award (the old classification definitions) or on the basis of the relevant provisions of the award Restructuring Manual sections 6.2 and 10.
- (v) All employees engaged under the award at the relevant classification levels shall be subject to the metal and engineering competency standards.

Other provisions to be followed where Competency Standards
are being implemented in an enterprise

- (d) (i) Model Implementation Program enterprises will be "audited" by training advisers for the purpose of identifying any problems and offering advice for overcoming any such problems before implementation in those enterprises is finalised.
- (ii) Management and employee representatives responsible for overseeing the implementation of competency standards within enterprises should be given access to briefings and/or training courses on the standards prior to implementation.
- (iii) Such briefings/training courses on the metal and engineering competency standards and Implementation Guide should be approved by the Manufacturing Engineering and Related Services Industry Training Advisory Board. These briefings/training courses can be either a joint briefing delivered by the parties or by one party with the approval of other relevant parties at the enterprise or an approved course delivered by a MERSITAB recognised provider with the approval of the relevant parties at the enterprise level.

The above does not exclude the delivery of additional training or advice by the parties or the MERSITAB to enterprises.

- (iv) In those enterprises where standards have been implemented the indicative tasks listed in the classification definitions shall not apply for the purpose of determining appropriate award classifications.
- (v) In the period until 31 December 1996 all skill profiles finalised at the end of the implementation process in an enterprise for jobs currently classified above C10 shall be forwarded to the National Oversighting Committee to allow proper monitoring of implementation. If the Committee (or an agreed subcommittee) identifies a flaw in a profile that could lead to significant problems it will refer it to the enterprise for appropriate action.
- (vi) In the period until 31 December 1996 where a party at an enterprise is concerned about the implication of any skill profile which involves significant use of toolmaking, electrical, electronic or instrument units arrived at through the first four steps of the process in the Guide, then the process shall not proceed to the implementation of Step 5 - reclassification, for those profiles until it has been considered by the National Oversighting Committee or an agreed subcommittee. The Committee (or subcommittee) shall make a recommendation to the parties at the enterprise to ensure that outcomes are consistent with the Guide and the standards. In the absence of agreement the Chair shall make the recommendation. Should this process not resolve the problem a member of the Committee may utilise the provisions of subparagraph 6E(e)(iii)(2) to delay implementation at that enterprise while the processes outlined in that subparagraph are followed.

Facilitation of implementation

- (e) (i) A Committee to facilitate the implementation of standards, chaired by a member of the Commission and consisting of the MTIA, ACM and unions party to the award shall continue to meet regularly to monitor the implementation of standards during 1996. The Executive Officer of the Manufacturing, Engineering and Related Services Industry Training Advisory Board shall also be a member of the Committee.

The Committee will be responsible for determining any refinement of the standards in respect of their use within the awards, any variation to the Guide for Implementing Competency Standards in the Metal and Engineering Industry in the light of experience during the implementation process and coordinating any further information or advice to enterprises.

The Committee will undertake a major review of the standards and the implementation process from March 1996.

Priority in this review is to be given to editing of units in conjunction with the Manufacturing, Engineering and Related Services Industry Training Advisory Board particularly toolmaking, electrical, electronic and instrumentation units. Editing in these areas should be complete by 30 June 1996 and be subject to monitoring by the National Oversighting Committee. The following matters are also to be given priority in the March review:

- Concerns at various enterprises about particular production and rigging units;
 - Any gaps in the electrical/electronic production area;
 - Any gaps in the electrical service area; and
 - The process for the expeditious development of C & D units.
- (ii) A Board of Reference shall be established from time to time for the purpose of resolving any disputes or difficulty or likely dispute or difficulty in relation to the implementation of competency standards either at the industry or enterprise level as set out in subclause 40(j).
- (iii) Until 31 December 1996, the following additional provisions shall apply.
1. If, any problem arises in relation to implementation of the standards at the enterprise level the relevant industry parties will immediately confer to resolve the problem(s). If resolution is not achieved, the matter will be referred to the Board of Reference constituted to deal with standards implementation.
- Notwithstanding the above, the rights of any party to pursue whatever other course of action is available under the Industrial Relations Act remains available.
2. If any party to the award initiates a meeting at industry level in relation to major concerns about the implementation of standards, including the application of

points as set out in subclause (f), the following procedures shall apply:

- If the major concerns involve problems at enterprise level the implementation process shall be suspended at those enterprises and there shall be no industrial action in relation to the problem;
- National officials of the relevant industry parties shall meet immediately to attempt to resolve the concerns;
- Where necessary, arrangements shall be made for an assessment and report by experts representing the relevant industry parties;
- The relevant industry parties shall consider the experts' report(s) and agree on a course of action to resolve the concerns of the initiating party;
- If the concerns are not resolved any party may pursue any available course of action under the Industrial Relations Act;
- The parties will endeavour to identify industry level problems by 31 July 1996.

The above provisions were reviewed by the parties in December 1996.

Points

(f) Subject to subclause (e) of this clause, the points to be assigned to the classification levels under the award shall be:

Table L 1. Award Classification Levels

Award classification level	Recommended points
C14	-
C13	-
C12	32
C11	64
C10	96
C9	12 additional points above C10
C8	24 additional points above C10
C7	36 additional points above C10
C6	48 additional points above C10
C5	60 additional points above C10
C4	Standards and points to be finalised

C3	Standards and points to be finalised
C2a	Standards and points to be finalised
C2b	Standards and points to be finalised
C1a	Standards and points to be finalised
C1b	Standards and points to be finalised

and in accordance with Table 2 in the Guide for Implementing Competency Standards in the Metal and Engineering Industry.

Competency standards further tasks

- (g) The parties shall:
 - (i) develop additional recommended pathways to supplement the standards;
 - (ii) develop evidence guides. Evidence guides in respect of 30 agreed units to be completed by 30 June 1996. Each evidence guide is to clearly state how credit in that unit is to be achieved;
 - (iii) finalise longer term industry assessment proposals;
 - (iv) continue the ongoing review, updating and development of the standards;
 - (v) delete the indicative tasks from the award classification upon finalisation of guidelines for qualifications at each level in the Australian Standards Framework (ASF) and Australian Qualifications Framework and ensure that national qualifications based on the standards continue to include adequate depth in particular skill areas broadly equivalent to the current qualification requirement (e.g. at least 10 modules from stream for trade certificate). If guidelines have not been developed by 30 June 1996, the matter shall be determined by arbitration.

Appendix “M”

Exit Test

By completing this exit test you are consenting to taking part in this study

A Comparative Study of Metal Fabrication and Welding (Heavy Trade Course in TAFE NSW between 2001-2004

Exit Assessment

Fabrication Engineering Certificate III Metal Fabrication and Welding (Heavy) Trade Course (3449)

2004

Time allowed – 2 hours

All Questions to be attempted

Calculators and drawing instruments may be used.

Contents

The following exit test is designed to establish a statistical database whereby a comparison can be established between the Metal Fabrication and Welding Certificate III Trade Course 7792, 6059 and 3449. The exit test results **will not** affect any outcome to the completion of the current course you are undertaking and your name will not be used in any published documentation.

The following exit test contains four (4) sections and a questionnaire

Section A 60 Multiple Choice Questions

Section B 5 Short Answer Questions

Section C 6 Calculation Problems

Section D 3 Development Sketches

Section A – Multiple Choice Questions

For questions 1 to 60 select the correct answer and write A,B,C or D in the bracket provided next to the question.

Occupational Health and Safety

- 1 Who may legally remove a danger tag:
 - a. the supervisor.
 - b. the person that attached it.
 - c. the person that fixed the problem.
 - d. the safety officer. ()

- 2 The recommended ratio for leaning a ladder against a wall is:
 - a. 3 : 1
 - b. 5 : 2
 - c. 4 : 1
 - d. 5 : 1 ()

- 3 O,H&S laws are necessary because they provide:
 - a. a set of minimum standards to protect the health and safety of workers.
 - b. a complete set of laws that cover every workplace situation and activity.
 - c. protection against prosecution.
 - d. national standards. ()

- 4 The risk of suffering injury due to the hazards associated with manual handling (Especially back injury) can be reduced if you:
 - a. use mechanical aids.
 - b. learn the correct method for lifting and carrying.
 - c. get someone else to do the job.
 - d. both a and b above. ()

- 5 The major function of the O, H&S committee is to help to develop:
 - a. a safe working environment.
 - b. safe systems of work.
 - c. occupational health and safety policy suitable for that place of work.
 - d. all the above. ()

Thermal Cutting and Associated Processes

- 6 Which characteristics of acetylene regulators are different from oxygen regulators?
- (a) heat dissipating rod.
 - (b) colour.
 - (c) threaded connections.
 - (d) all of the above. ()
- 7 The temperatures reached in plasma cutting is between:
- (a) $815^{\circ} - 1450^{\circ} \text{C}$
 - (b) $3100^{\circ} - 6000^{\circ} \text{C}$
 - (c) $6000^{\circ} - 10000^{\circ} \text{C}$
 - (d) $20000^{\circ} - 35000^{\circ} \text{C}$ ()
- 8 A nozzle type "41" is:
- (a) a screw in hydrogen nozzle
 - (b) a tapered seated seat acetylene nozzle
 - (c) a tapered seat LP gas nozzle
 - (d) a screw in low pressure acetylene nozzle ()
- 9 The ignition temperature of low carbon steel is approximately:
- (a) 1450 Deg C
 - (b) 815 Deg C
 - (c) 420 Deg C
 - (d) none of the above ()
- 10 The recommended maximum working pressure for acetylene regulators is:
- (a) unlimited
 - (b) 100 kpa
 - (c) 150 kpa
 - (d) 200 kpa ()
- 11 Which of the following materials would be most suitable for making a template for a magnetic tracing head profile cutter:
- (a) Aluminium
 - (b) Brass
 - (c) Cast Iron
 - (d) Steel ()
- 12 The usual power source for plasma cutting is:
- (a) a direct current unit.
 - (b) an alternating current unit.
 - (c) a transformer/Rectifier unit.
 - (d) an inverter unit ()

- 13 Photo-electric tracing templates should be drawn with:
- (a) a fluorescent pen.
 - (b) a dark lead pencil.
 - (c) a black ink pen.
 - (d) a red marking pen.
- ()
- 14 The electrode for plasma cutting is commonly made from:
- (a) Copper.
 - (b) Tungsten.
 - (c) Ceramic.
 - (d) Platinum.
- ()
- 15 When making a magnetic template the allowance is:
- (a) half the roller diameter.
 - (b) half the roller diameter less the kerf width.
 - (c) half the kerf diameter.
 - (d) half the roller diameter plus the kerf width.
- ()

Manual Metal Arc Welding

- 16 What type of flux is used on E4112 and E4113 electrodes?
- (a) cellulose
 - (b) rutile
 - (c) hydrogen controlled
 - (d) iron powder
- ()
- 17 Post heat is used to slow the cooling rate and allow:
- (a) less chance of underbead cracking
 - (b) reduced heat input
 - (c) increased welding speed
 - (d) less expansion of the weld
- ()
- 18 Hydrogen controlled electrodes are recommended for welding:
- (a) non-ferrous metal
 - (b) sheet steel
 - (c) low alloy steels
 - (d) all of the above
- ()
- 19 The compound that forms on the surface of stainless steel to give corrosion resistance is:
- (a) iron oxide
 - (b) chromic oxide
 - (c) nickel oxide
 - (d) silicon oxide
- ()

- 20 The electrode type most suitable for welding grey cast iron using the hot method is:
- (a) E4111
 - (b) E4814
 - (c) E4816
 - (d) E4824
- ()
- 21 When butt welding stainless steel it is recommended that:
- (a) frequent tacking is used
 - (b) large tacks are used
 - (c) minimum tacking is used
 - (d) welds are made only in the flat position
- ()
- 22 Compared to rutile electrodes, hydrogen controlled electrode weld deposits generally require:
- (a) Less pre-heating
 - (b) More pre-heating
 - (c) The same pre-heating
 - (d) No pre-heating
- ()
- 23 In the electrode classification E4816, the 48 indicates:
- (a) the welding position
 - (b) the flux type
 - (c) both the welding position and the flux type
 - (d) the tensile strength of the deposited metal
- ()
- 24 The main reason for specifying pre and post heat treatment in a welding procedure is to:
- (a) increase the cooling rate
 - (b) allow hydrogen to diffuse out
 - (c) increase the tensile strength
 - (d) decrease the tensile strength
- ()
- 25 Moisture pick-up must be controlled in hydrogen controlled electrodes because it:
- (a) destabilises the electrode's operating characteristics
 - (b) decreases the weld's tensile strength
 - (c) increases slag inclusions
 - (d) increases the possibility of underbead cracking
- ()
- 26 The most effective method of reducing your intake (breathing in) of dangerous fumes when welding coated materials is to:
- (a) use a well ventilated workshop
 - (b) weld out doors
 - (c) use a fan
 - (d) use a respirator
- ()

- 27 The weld defect “undercut” can be caused by:
- (a) welding current being too low
 - (b) welding current being too high
 - (c) arc length too short
 - (d) alternating to direct welding current ()
- 28 E4816 electrodes deposit weld metals with tensile strength of approximately:
- (a) 160 Mpa
 - (b) 816 Mpa
 - (c) 480 Mpa
 - (d) 4816 Mpa ()
- 29 The flux coating for a E4111 electrode is:
- (a) iron powder
 - (b) iron oxide
 - (c) cellulose
 - (d) rutile ()
- 30 An E4827 electrode is suitable for fillet welding in the following positions:
- (a) flat, vertical and overhead
 - (b) flat and vertical
 - (c) flat only
 - (d) flat and horizontal ()
- 31 The electrode with the best root penetration characteristics is:
- (a) cellulose
 - (b) iron powder
 - (c) hydrogen controlled
 - (d) nickel based ()
- 32 Slag inclusions are caused by:
- (a) failure to clean inter-pass runs
 - (b) excessive current
 - (c) excessive arc length
 - (d) excessive travel speed ()

Gas Metal Arc Welding

- 33 The gas metal arc welding metal transfer mode that gives the highest deposition rate is:
- (a) short arc
 - (b) spray
 - (c) dip transfer
 - (d) globular ()
- 34 A kinked or bent cable liner will result in:
- (a) poor wire feed
 - (b) reduced currents
 - (c) increased voltages
 - (d) all of the above ()
- 35 The most likely cause of weld metal porosity in the GMAW process is:
- (a) over tensioning the feed rolls
 - (b) a dirty liner
 - (c) using too large a contact tip
 - (d) a blocked gas nozzle ()
- 36 Undercut is most likely caused by:
- (a) excessive arc lengths
 - (b) excessive currents
 - (c) excessive gas flow rates
 - (d) too slow travel speed ()
- 37 The major deoxidising agent used in gas metal arc welding wires is:
- (a) silicon
 - (b) copper
 - (c) carbon
 - (d) argon ()
- 38 The most suitable shielding gas for welding low carbon steel is:
- (a) argon
 - (b) carbon dioxide
 - (c) helium
 - (d) argon/carbon dioxide gas mixture ()
- 39 An increase in wire feed rate results in:
- (a) increased current
 - (b) decreased voltage
 - (c) decreased deposition rate
 - (d) increased stickout ()

- 40 The prime function of a deoxidising agent is to:
- (a) stabilise the arc
 - (b) aid metal transfer
 - (c) remove oxides from the weld
 - (d) increase input ()
- 41 Overroll is determined by:
- (a) the amount of weld spatter on the job
 - (b) the size of the weld
 - (c) the operator inspecting the weld
 - (d) none of the above because it's never a problem with GMAW welding ()
- 42 The function of a shielding gas in the GMAW welding process is to:
- (a) act as deoxidiser to the wire
 - (b) increase heat input
 - (c) conduct current
 - (d) prevent atmospheric contamination ()
- 43 In AS 2717 Part 1, solid electrode wires are classified eg ES2-GM-W503H. The "H" signifies/stand for:
- (a) Shielded with a mixture of gases
 - (b) Weld metal tensile strength
 - (c) Hydrogen control
 - (d) Chemical composition ()
- 44 Undersized welds are:
- (a) likely to fail in service
 - (b) more ductile than oversized welds
 - (c) more expensive to produce
 - (d) less prone to undercut ()
- 45 Insufficient tension on the feed roll may cause the electrode wire to:
- (a) increase its resistance to the flow of current
 - (b) feed erratically
 - (c) lose its copper coating
 - (d) reduce its resistance to the flow of current ()
- 46 The cylinder colour code for a argon/carbon dioxide (CO-2) shielding gas is:
- (a) peacock blue with a grey collar
 - (b) french grey with a peacock blue collar
 - (c) dark brown with a grey collar
 - (d) admiralty grey with a white collar ()
- 47 Seamless flux cored wires are manufactured by:
- (a) drawing
 - (b) rolling
 - (c) extruding
 - (d) spinning ()

48 A safety hazard of the flux-cored process is:

- (a) heavy spatter
- (b) overheated welding gun
- (c) fumes
- (d) overheated work clamp ()

49 One limitation of using the flux-cored process is:

- (a) it's low deposition rate
- (b) it is affected by windy conditions
- (c) it is not recommended for pipe welding
- (d) it can only be used on fillet welds ()

50 Generally, the largest commercially made flux-cored wire for gas metal arc welding steel is:

- (a) 6 mm
- (b) 3.2 mm
- (c) 2.6 mm
- (d) 5 mm ()

Gas Tungsten Arc Welding

51 The non-consumable electrode used with the gas tungsten arc welding (GTAW) process is made from:

- (a) Tungsten
- (b) Copper sulphide
- (c) Chromium oxide
- (d) Stainless steel ()

52 Which of the following gases is used for gas tungsten arc welding?

- (a) nitrogen
- (b) carbon dioxide
- (c) argon
- (d) hydrogen ()

53 Which of the following metals can be welded with the GTAW process?

- (a) Aluminium
- (b) Lead alloys
- (c) Silicon
- (d) Mercury ()

54 The function of the flow-metre is to regulate the:

- (a) flow of current to the torch
- (b) flow of gas to the arc area
- (c) flow of gas to cool the power source
- (d) flow of gas to cool the nozzle ()

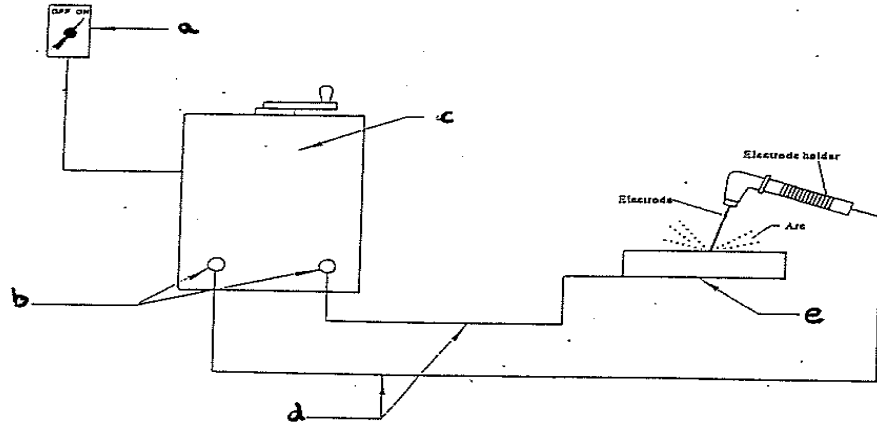
- 55 The typical occupational health and safety factor of GTAW is:
- (a) the equipment is not electrically insulated
 - (b) electric shocks are increased because of high frequency current being used
 - (c) excessive amounts of sparks are produced
 - (d) the equipment is too heavy to move ()

Structural

- 56 The mass of rolled steel angles is calculated using the formula:
- (a) Length x thickness x mass per metre
 - (b) Mass per metre x length
 - (c) Width of flange x thickness of flange x length
 - (d) Mass per metre x thickness x length ()
- 57 What does nominal size mean in terms of structural sections?
- (a) minimum allowed size of the section
 - (b) average size of the section
 - (c) maximum size of the section
 - (d) size allocated by the manufacturer ()
- 58 The formula derived from Pythagoras' theorem is:
- (a) $A^2 + B^2 = C$
 - (b) $(A + B) = C$
 - (c) $A^2 + B^2 = C^2$
 - (d) $A^2 - B^2 = C^2$ ()
- 59 A rolled section is a 310 UC x 283 x 570. The 570 indicates the:
- (a) depth of the web
 - (b) required length
 - (c) width of the flange
 - (d) mass per metre ()
- 60 Universal column sections have:
- (a) web depth and flange width roughly equal
 - (b) their web depth less than the flange width
 - (c) a longer web length than the flange
 - (d) thin flanges and thick web ()

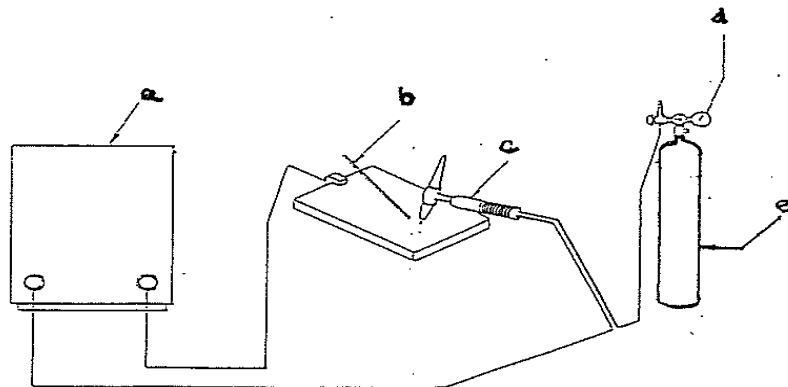
Section B – Short answer question

- 1 Identify the parts of the MMAW circuit by labelling the parts in the spaces provided.



- (a) _____
- (b) _____
- (c) _____
- (d) _____
- (e) _____

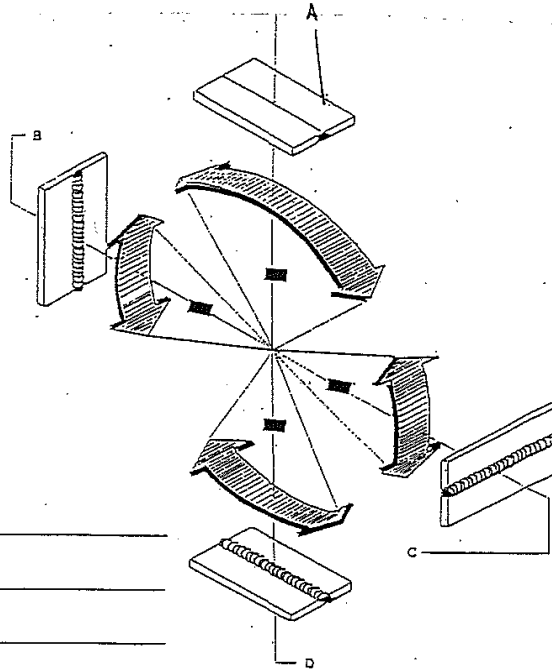
- 2 Identify the parts of the GTAW circuit by labelling the parts in the space provided.



- (a) _____
- (b) _____
- (c) _____
- (d) _____
- (e) _____

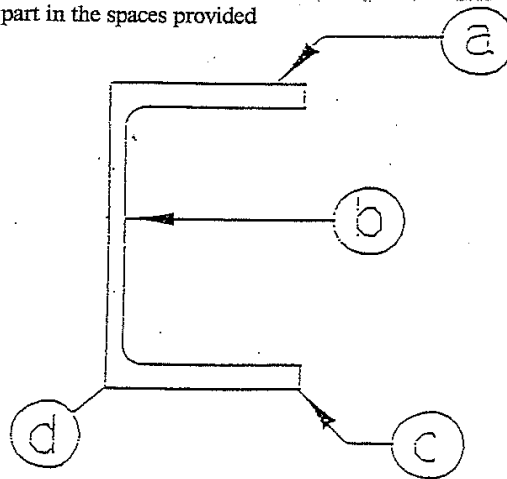
- 3 Identify the weld positions by writing their names in the spaces provided.

Note: The angles shown are those through which the joints may be tilted before it is considered to have changed position.






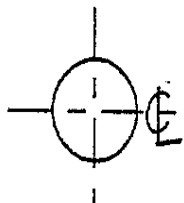
- A _____
 B _____
 C _____
 D _____

- 4 Name the rolled steel section and label each part in the spaces provided



- (a) _____
 (b) _____
 (c) _____
 (d) _____

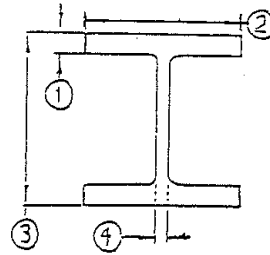
- 5 Fill in the missing descriptions of the symbols in the table below:

Symbol	Description	Example
a. 		$\varnothing 50$
b. 		R 30
c. 		
d. FL		50 x 20 FL

Section C – Calculations

- 1 Use the table to fill in the missing dimensions of the 310 UC x 158 as drawn.

1 _____ 2 _____
3 _____ 4 _____

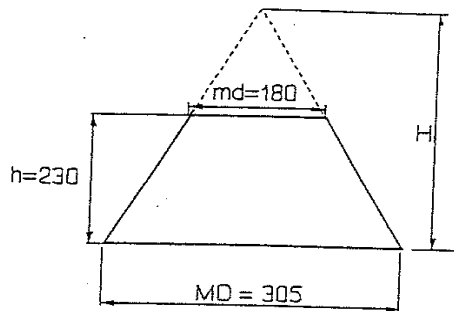


UNIVERSAL COLUMNS - Dimensions and properties						
Designation	Depth of Section d	Flange		Web Thickness t_w	Radius root r_1	Depth between Flanges d_1
		Width b	Thickness t			
kg/m	mm	mm	mm	mm	mm	mm
310 UC 283	365	322	44.1	26.9	15.2	277
240	353	318	37.7	23.0	15.2	277
198	340	314	31.4	19.2	15.2	277
158	327	311	25.0	15.7	15.2	277
137	321	309	21.7	13.8	15.2	277
118	314	307	18.7	11.9	15.2	277
96.8	308	305	15.4	9.9	15.2	277
250 UC 89.5	260	256	17.3	10.5	12.7	226
72.9	254	254	14.2	8.8	12.7	226

- 2 Calculate the mass of twelve (12) lengths of universal column (UC) above
Each length is eight (8) meters long

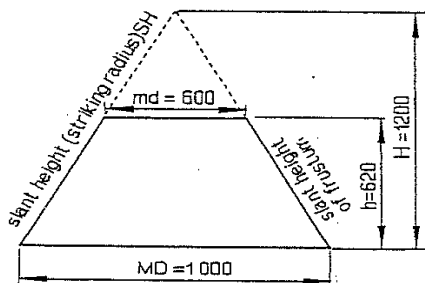
Formula: $\text{Mass} = \text{kg/m} \times \text{length (m)} \times \text{No.}$

- 3 Calculate the apex height for the frustum of a right cone drawn below



$$\text{Formula } H = \frac{D \times h}{D - d}$$

- 4 Calculate the slant height (striking radius) and the slant height of the frustum below:

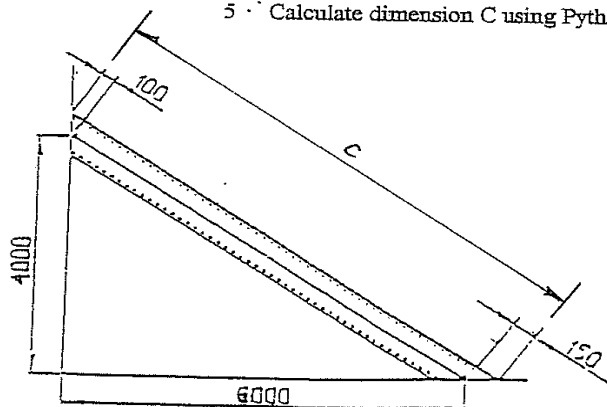


Formulas:

a. Slant height = $\sqrt{H^2 + MR^2}$
(Striking radius)

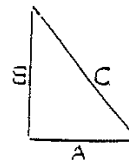
b. Slant height = $\sqrt{h^2 + \left(\frac{D - d}{2}\right)^2}$
(Frustum)

- 5 Calculate dimension C using Pythagoras' theorem

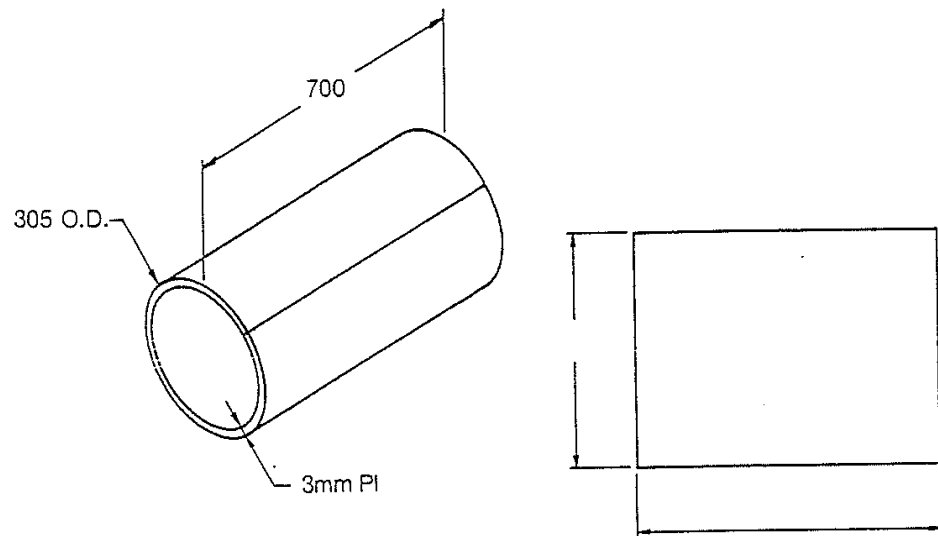


Useful formula $C^2 = A^2 + B^2$

length C = $(\sqrt{A^2 + B^2})$ + end dimension

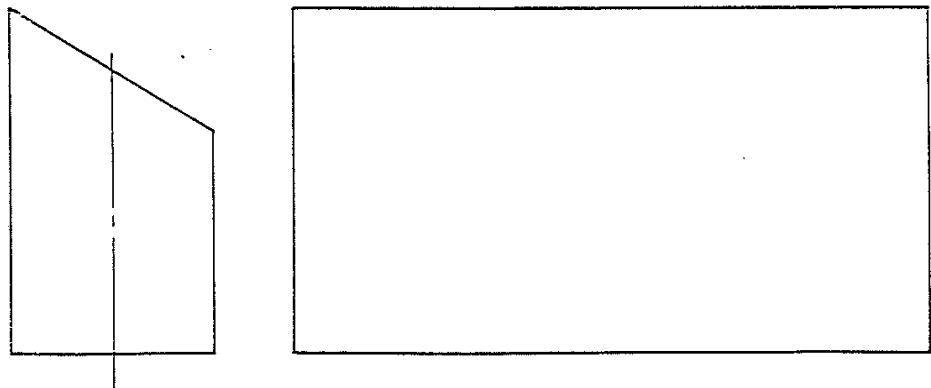


- 6 Calculate the stretchout length of the cylinder. Fill in the missing dimensions on the Sketch below



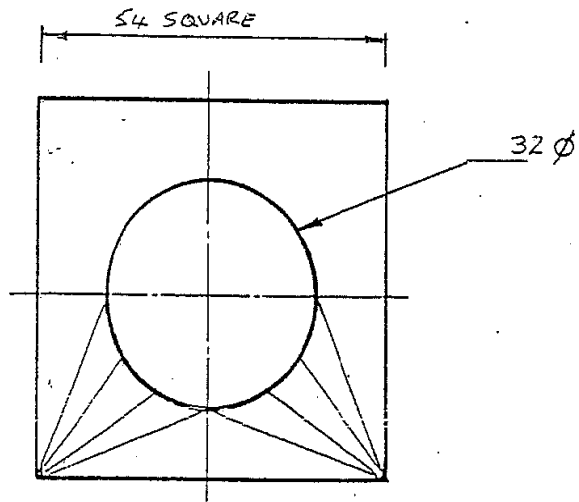
Section D – Development Sketches

- 1 Develop the pattern for a truncated cylinder

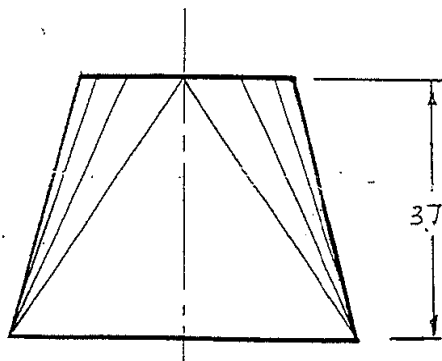


2 On the views below complete the following:

- Apply a numbering/lettering system to both the views and half pattern
- Mark out the true length lines on the true length diagram
- Develop a half pattern
- Calculate the circumference of the top part of the transition.



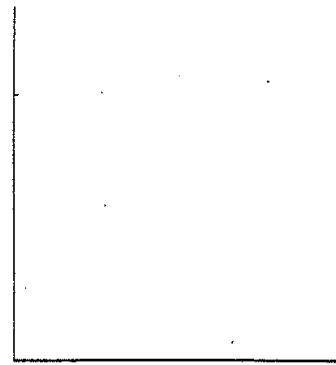
TOP VIEW



FRONT VIEW

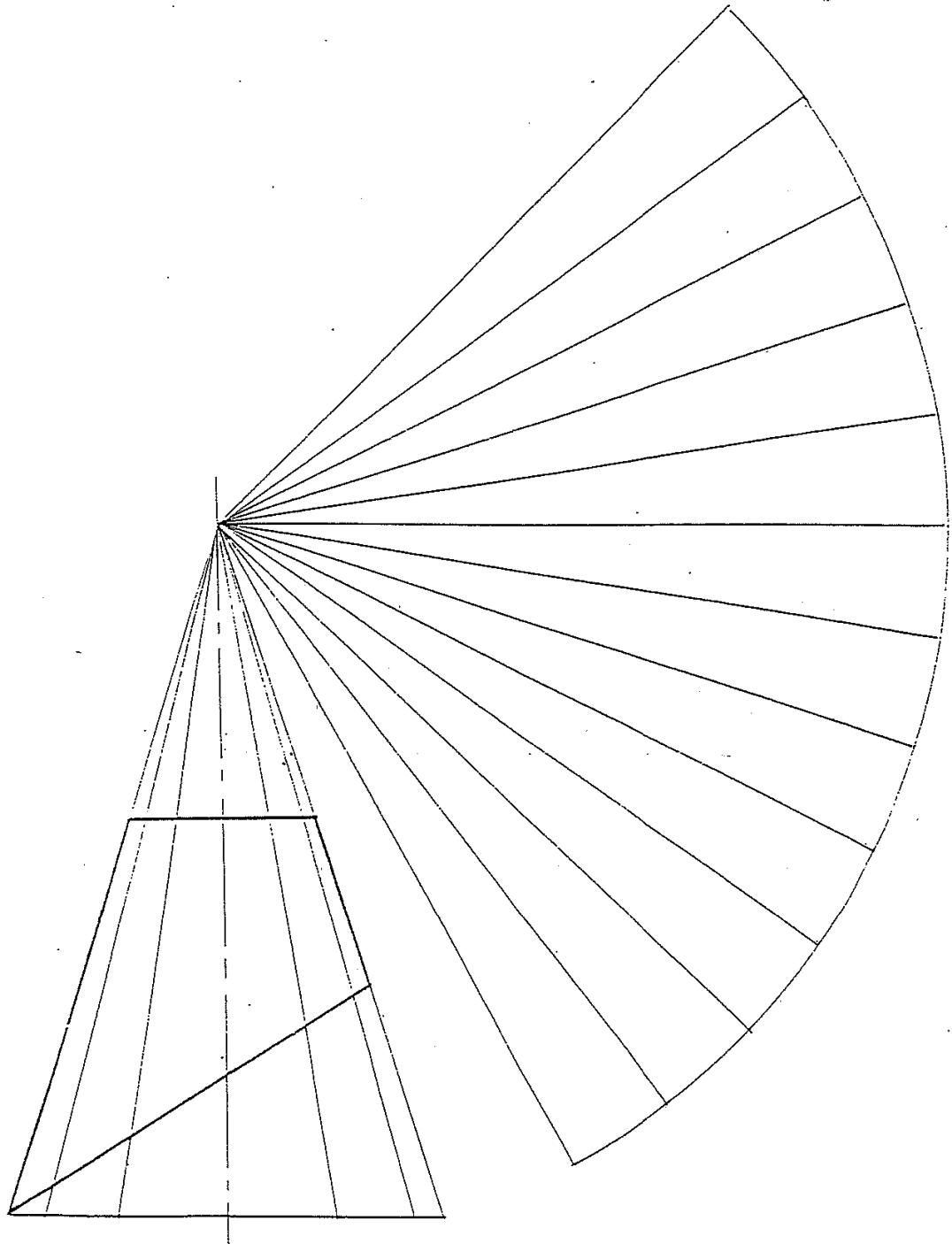


DEVELOP HALF PATTERN



TRUE LENGTH DIAGRAM

- 3 Complete the full pattern of the truncated cone drawn below with the seam on the shortest side:



Appendix “N”

Exit Test Question Explanations

Section A - Comprised 60 Multiple Choice Questions

Section A – Multiple Choice Questions

Question 1 to 5 of the exit test covered the topic of NBB01 Occupational Health and Safety (OH&S) 7793T in the Metal Fabrication and Welding industry.

Question 1

Asked the apprentice who could legally remove a danger tag on a job. This question was designed to ascertain the apprentice's knowledge of who is responsible for removing a danger tag placed on a job. (The person who attached it)

Question 2

Asks the apprentice what ratio a ladder should be leaning against a wall. This question was designed to find out if the apprentice knew the angle to what ratio/angle a ladder should be placed for safety against a wall or a job. (4:1)

Question 3

Gauges the apprentice's knowledge of the OH&S Act 2001. This question was designed to judge the apprentice's level of knowledge associated with the NSW OH&S Act 2000 No 40. (a set of minimum standards to protect the health and safety of workers)

Question 4

Inquires what the apprentice knows about manual handling and lifting. This question was designed to ascertain the apprentice's knowledge about manual handling and lifting jobs. (Use mechanical aids and learn the correct method for lifting and carrying)

Question 5

Asks the apprentice what the major function of an OH&S committee is to help develop in the workplace. This question was designed to find out the apprentices understanding of the functions of an OH&S Committee in the workplace. (a safe working environment, safe systems of work and OH&S policy suitable for that place of work)

Question 6 to 15 of the exit test covered the topic of NF 13 Thermal Cutting and Associated Processes (TC&AP) and incorporates NBB09 Welding and Thermal Cutting (W&TC) in the Metal Fabrication and Welding industry.

Question 6

To find out the apprentice understanding of acetylene regulators compared to oxygen regulators. This question was designed to see if the apprentice understood the differences between acetylene and oxygen regulators used in the industry. (heating dissipating rod, colour and threaded connections)

Question 7

Ascertains whether the apprentice knows the temperature reached when he/she does plasma cutting. This question was designed to know if the apprentice knew the range of temperature when plasma cutting. (20000 – 35000 degrees celius)

Question 8

Seeks to find out the apprentice's understanding of the types of cutting nozzles used in oxygen/acetylene cutting of low carbon steel. This question was designed to find out if the apprentice knew what a 41 type cutting nozzle was. (a tapered seated acetylene nozzle)

Question 9

Seeks to finds out whether the apprentice knows the ignition temperature of low carbon steel. This question was designed to find out if the apprentice knew the ignition temperature of low carbon steel. (815 degrees celius)

Question 10

Aims to find out if the apprentice knows the recommended working pressure for acetylene regulators. This question was designed to ascertain if the apprentice knew the recommended maximum working pressure for acetylene regulators. (100kpa)

Question 11

Asks the apprentice what type of material would be best used when making a template for a magnetic template. This question was designed to gauge the knowledge of the apprentice about magnetic profile cutting templates. (Steel)

Question 12

Inquires about the power source used for plasma cutting. This question was designed to ascertain if the apprentice knew what power source is used when operating a plasma cutter. (a direct current unit)

Question 13

Asks the apprentice what photo-electric tracing templates should be drawn with. This question was designed to find out if the apprentice knew how a photo-electric tracing template should be drawn with so as to use it on the profile cutter. (a dark lead pencil)

Question 14

Asks what electrode is commonly used for plasma cutting. This question was designed to find out if the apprentice knew what electrode is used in a plasma cutter. (Tungsten)

Question 15

Aims to find out if the apprentice knows the allowance used on a magnetic template. This question was designed to find out if the apprentice knew the allowance used to make a magnetic profile template. (Half the roller diameter less the kerf width)

Question 16 to 32 of the exit test covered the topics of Manual Metal Arc Welding (MMAW) processes NF01, NF05 and NF10 in the Metal Fabrication and Welding industry.

Question 16

Asks the apprentice what type of flux is used on E4112 and E4113 electrodes. This question was designed to find out if the apprentice knew what type of flux is used on E4112 and E4113 electrodes.(Rutile)

Question 17

Aims to find out what post heat is used for in the Fabrication and Welding industry? This question was designed to ascertain if the apprentice knew what post heat is used for in the Fabrication and welding industry. (less chance of under bead cracking)

Question 18

Asks the purpose for which hydrogen controlled electrodes are used for? This question was designed to gauge the understanding of the apprentice when choosing electrodes for the MMAW processes. (Low alloy steels)

Question 19

What is the compound that forms on the surface of stainless steel to give corrosion resistance. This question was designed to find out if the apprentice knew what the compound formed on the surface of stainless steel to make them corrosion resistant. (chromic oxide)

Question 20

What electrode type is used in the hot method of welding grey cast iron. This question was designed to find out if the apprentice understood what type of electrode is used to weld grey cast iron in the hot method. (E4816)

Question 21

Asks when the butt welding stainless steel is recommended. This question was designed to ascertain whether the apprentice knew what tacking process took place when butt welding stainless steel is produced. (frequent tacking is used)

Question 22

Asks the apprentice to describe the comparison between rutile and hydrogen controlled electrodes. This question was designed to ascertain whether the apprentice knew the difference between rutile and hydrogen control electrodes. (less pre-heating)

Question 23

What does the 48 in the Electrode E4816 stand for? This question was designed to find out if the apprentice knew what the 48 stood for in the electrode E4816. (the tensile strength of the deposited metal)

Question 24

What is the main reason for specifying pre and post heat treatment in a welding procedure. This question was designed to find out if the apprentice knew why pre and post heat are used in the fabrication and welding industry. (to allow hydrogen to diffuse out)

Question 25

Why does moisture have to be controlled in hydrogen controlled electrodes?

This question was designed to find out if the apprentice knew why controlling moisture is important when using hydrogen controlled electrodes. (increases the possibility of under bead cracking)

Question 26

What procedure should be used to reducing the intake of dangerous fumes? This question was designed to find out if the apprentice was aware of the hazards associated with welding coated materials and knew what procedure should be used to reduce the intake of dangerous fumes. (Use a respirator)

Question 27

What is undercut and what causes it? This question was designed to find out if the apprentice understood what the weld defect undercut was and what caused it. (welding current too high)

Question 28

What is the tensile strength of a E4816 deposit weld? This question was designed to find out if the apprentice knew what the Mega Pascal (Mpa) strength of a E4816 electrode was. (480Mpa)

Question 29

What is the flux coating for a E4111 electrode is? This question was designed to establish whether the apprentice knew what coating is used on a E4111 electrode. (Cellulose)

Question 30

What position should an E4827 electrode be used in? This question was designed to ascertain if the apprentice knew what position a E4827 should be welded in. (Flat and horizontal)

Question 31

Asks what type of electrode has the best root penetration characteristics? This question was designed to find out if the apprentice could determine the best electrode for root penetration. (Cellulose)

Question 32

What causes the weld defect slag inclusion? This question was designed to ascertain if the apprentice could explain what caused the weld defect slag inclusion. (failure to clean inter-pass runs)

Question 33 to 50 of the exit test covered the topics of Gas Metal Arc Welding (GMAW) processes NF02, NF07 and NF14 in the Metal Fabrication and Welding industry.

Question 33

Which transfer mode gives the highest deposition rate? This question was designed to find out if the apprentice understood which transfer mode was used for the highest deposition rate. (Spray)

Question 34

What will happen if kinked or bent cable line is used? This question was designed to find out if the apprentice knew what would happen if a kinked or bent line was used in the GMAW process. (poor wire feed)

Question 35

What is the most likely cause of weld metal porosity in the GMAW process? This question was designed to find out if the apprentice knows the most likely cause of weld metal porosity in the GMAW process. (a blocked gas nozzle)

Question 36

What is the most likely cause of undercut in welding? This question was designed to find out if the apprentice understood what causes undercut. (excessive currents)

Question 37

The major deoxidising agent used in gas metal arc welding wires is? This question was designed to ascertain if the apprentice knew what major deoxidising agent is used in the GMAW wire. (silicon)

Question 38

What is the most suitable shielding gas for welding low carbon steel?

This question was designed to get the apprentice to nominate the best shielding gas when welding mild steel. (argon/carbon dioxide gas mixture)

Question 39

What could cause an increase in the wire feed rate? This question was designed to find out if the apprentice could determine what would happen if an increase in wire feed occurred. (increased current)

Question 40

What is the prime function of a deoxidising agent? This question was designed to ascertain whether the apprentice knew the prime function of a deoxidising agent. (remove oxides from the weld)

Question 41

What determines overroll? This question was designed to find out if the apprentice knew what causes overroll. (the size of the weld)

Question 42

What is the function of a shielding gas in the GMAW welding process? This question was designed to establish whether the apprentice understood the function of the shielding gas in the GMAW process. (prevent atmospheric contamination)

Question 43

In AS 2717 Part 1, solid electrode wires are classified eg ES2-GM-W503H. The “H” signifies/stand for? This question was designed to find out if the apprentice knew what the H was in the GMAW classification ES2-GM-W503H. (Hydrogen control)

Question 44

What are the undersized welds? This question was designed to find out if the apprentice knew the consequences of undersized welds. (likely to fail in service)

Question 45

What would happen to the electrode wire if there is insufficient tension on the feed roll? This question was designed to find out if the apprentice knew what would happen to the electrode wire if there was insufficient tension on the roll feed. (feed erratically)

Question 46

What should be the cylinder colour code of an argon/carbon dioxide (CO-2) shielding gas? This question was designed to find out whether the apprentice knows the correct colour of shielding gas cylinder. (peacock blue with a grey collar)

Question 47

How are seamless flux cored wires manufactured? This question was designed to find out if the apprentice knew the method for manufacturing seamless flux cored wire. (drawing)

Question 48

What is a safety hazard of the flux-cored process? This question was designed to find out if the apprentice knew the hazards associated with flux-cored welding. (fumes)

Question 49

What is the limitation of using the flux-cored process? This question was designed to ascertain whether the apprentice knew the limitation associated when using flux-core welding. (it is affected by windy conditions)

Question 50

In generally, what is the largest commercially made flux-cored wire for gas metal arc welding steel? The question was designed to establish whether the apprentice knew what flux core welding wire size. (3.2mm)

Question 51 to 55 of the exit test covered the topic of NF03 Gas Tungsten Arc Welding process (GTAW) in the Metal Fabrication and Welding industry.

Question 51

What type of non-consumable electrode is used with the gas tungsten arc welding (GTAW)? This question was designed to establish whether the apprentice knew what type of non-consumable electrode is used in the GTAW process. (Tungsten)

Question 52

Which of the following gases is used for gas tungsten arc welding? This question was designed to find out if the apprentice knew what gas is used in the GTAW process. (argon)

Question 53

Which of the following metals can be welded with the GTAW process? This question was designed to ascertain whether the apprentice knew what metal could be welded with the GTAW process. (aluminium)

Question 54

The function of the flow-metre is to regulate the? This question was designed to find out if the apprentice knew what a flow meter does. (flow of gas to the arc area)

Question 55

What are the typical occupational health and safety factors associated with GTAW? This question was designed to establish whether the apprentice knew the health and safety problems associated with the GTAW process. (electric shock is increased because of high frequency current being used)

Question 55 to 60 of the exit test covered the topic of NF33 Structural 1 in the Metal Fabrication and Welding industry.

Question 56

What formula is used to calculate the mass of rolled steel angles? This question was designed to ascertain whether the apprentice knew the formula for calculating the mass of roll steel sections. (mass per metre x length)

Question 57

What does nominal size mean in terms of structural sections? This question was designed to find out if the apprentice knew what a nominal size means in the fabrication industry. (size allocated by the manufacturer)

Question 58

What is the formula derived from Pythagoras' theorem? This question was designed to establish whether the apprentice knew the Pythagoras' theorem.

$$(A^2 + B^2 = C^2)$$

Question 59

A rolled section is a 310 UC x 283 x 570. The 570 indicates the? This question was designed to find out if the apprentice could determine what the 570 represented in the 310UCx283x570. (required length)

Question 60

How do you identify a Universal column section? This question was designed to ascertain whether the apprentice knew what a universal column is. (web depth and flange width roughly equal)

3.4.4 Section B – Comprising 5 Short Answer Questions

Questions 1 and 2 were valued at 5 marks each

Question 3 was valued at 4 marks

Questions 4 and 5 were valued at 2 marks each.

Question 1

How do you identify particular parts of a Manual Metal Arc Welding circuit NF01 MMAW? This question was designed to gauge whether the apprentice knew what are the parts of the MMAW circuit were and if they knew the individual parts associated with the processes so as to assemble and disassemble the welding plant or repair parts associated with the processes. (Mains electricity switch, welding machine terminals, welding machine, secondary lead and parent metal/work piece)

Question 2

How do you identify particular parts of a Gas Tungsten Arc Welding circuit NF03 GTAW? This question was designed to ascertain whether the apprentice knew what are the parts of the GTAW circuit were and if they knew the individual parts associated with the processes so as to assemble and disassemble the welding plant or repair parts associated with the processes.

Question 3

How do you identify the welding positions used in the welding processes? This question was designed to establish whether the apprentice knew the welding positions associated with welding in the fabrication and welding industry. (Overhead, vertical, horizontal and down hand/flat)

Question 4

How do you identify parts of a rolled steel section NF33 Structural 1? This question was designed to find out if the apprentice knew the name of the roll section piece and to name the parts of the section. (Parallel flange channel, flange, web, toe and heel)

Question 5

How do you identify symbols used on fabrication drawings in MEC075 and MEC076 Engineering Sketching and Drawing Interpretations 1? This question was designed to find out if the apprentice knew the drawing symbols associated with print reading, interpretation of drawing and production instructions on the job. (Diameter, radius, centre line and flat bar)

3.4.5 Section C - Comprising 6 Calculative Questions

Question 1 was valued at 4 marks

Questions 2, 3 and 5 were valued at 1 mark

Question 4 was valued at 2 marks

Question 1

Asked to fill in the missing dimensions of a Universal Column? (NF 34 Structural 2 and NF 35 Structural 3.) This question was designed to ascertain if the apprentice knew what a universal column was and to label the parts on the drawing provided from a materials table. (25, 311, 327 and 15.7)

Question 2

Asks to calculate the mass of universal columns from a table provided? (NF34 Structural 2 and NF35 Structural 3.) This question was designed to establish whether the apprentice knew how to calculate the mass of 12 universal columns using a formula supplied which is used in industry to determine the weight of fabricated jobs for lifting. (15168kgs/15.168 tonnes)

Question 3

Asks to calculate the apex height from a sketch provided? (NF46 Conical Development.) This question was designed to find out if the apprentice could calculate, using a formula supplied, the apex height of a right cone. (AH=561.2)

Question 4

Asks to calculate slant height from a sketch provided? (NF46 Conical development.) This question was designed to ascertain if the apprentice could calculate the slant height of a right cone and the frustum of a right cone. (SH=1300, sh=651.459)

Question 5

Asks to calculate a missing dimension using Pythagoras's theorem from a sketch provided? (NF35 Structural 3.) This question was designed to see if the apprentice knew how to use Pythagoras' theorem in an industry type calculation. (7461.103)

Question 6

Asks to calculate a missing dimension of a cylinder from a sketch provided? (NF47 Parallel Development.) This question was designed to find out if the apprentice knew how to calculate the length of a cylinder using the mean diameter x 3.1416 and then to label the drawing of flat pattern of the cylinder with the correct dimensions. (length=700 and mc=948.763).

3.4.6 Section D - Comprising 3 Development Sketching Questions

Question 1 was valued at 3 marks

Question 2 and 3 were valued at 4 marks each.

Question 1

Required the participant, , to develop the pattern of the truncated cylinder from the sketch provided by using parallel development methods. (NF47 Parallel Line Development.) This question was designed to ascertain whether the apprentice knew how to develop a pattern of a truncated cylinder and correctly label the pattern.

Question 2

Required the participant, to develop a half pattern of a square to round transition piece and a true line diagram from the sketch provided by using triangulation development methods. (NF45 Triangular Line Development.) This question was designed to find out whether the apprentice knew how to develop a half pattern of a square to round, draw and label the top view, draw and label the true length diagram, correctly draw and label the half pattern of the square to round, and calculate the mean circumference of top round section.

Question 3

Required the participant, by using radial line development methods, to develop a pattern of a truncated cone from the sketch provided. (NF46 Conical Line Development). This question was designed to ascertain whether the apprentice knew how to develop a pattern of a truncated cone and correctly label the pattern.