DOCUMENT RESUME

ED 275 840 CE 045 425

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TITLE A Study of Apprentice Learning with Respect to the Impact of In-Plant Training Centre Experience and Acceleration. Replication Study.
INSTITUTION TAFE National Centre for Research and Development, Payneham (Australia).
REPORT NO ISBN-0-86397-161-X
PUB DATE 86
NOTE 146p.; Some test materials may not reproduce clearly.
PUB TYPE Reports - Research/Technical (143) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC06 Plus Postage.
DESCRIPTORS *Acceleration (Education); *Apprenticeships; Auto Mechanics; Comparative Analysis; Electrical Occupations; Foreign Countries; *Inplant Programs; Job Performance; Machinists; Metal Working; *Off the Job Training; *On the Job Training; Outcomes of Education; Postsecondary Education; Program Effectiveness; Training Methods; *Work Experience
IDENTIFIERS *Australia

ABSTRACT

A study examined whether there were any differences in the performance of apprentices trained in off-the-job, on-the-job, or in-plant training programs. A 1984 apprentice intake sample of over 500 apprentices and information supplied by 16 in-plant training centers and 9 colleges were used to collect data on the job performance of apprentices in the following trades: fitting and machining, electrical, sheet metal, and motor mechanics. Because of problems with program variations and training pattern inconsistencies, no effective measure could be devised to compare the performance of electrical occupations and motor mechanics apprentices placed in different types of training programs. With respect to fitting and machining, however, apprentices at off-the-job training centers developed higher levels of practical skills, and accelerated apprentices attached to training centers showed higher levels of skill development than did their nonaccelerated counterparts. In sheet metal, on-the-job apprentices generally worked faster than training center apprentices on their college modules. Thus, it was recommended that more accelerated training programs involving close liaison and cooperation between training centers and colleges be developed. (Appendixes include the mathematics, reading, fitting and machining modules, and practical electrical tests used in the project, the observation and interview schedule, a fitting and machining two-way analysis of variance, and study recommendations based on 1983 appendice intake. A select bibliography is also provided.) (MN)

TAFE NATIONAL CENTRE FOR
RESEARCH AND DEVELOPMENT

A Study of APPRENTICE LEARNING with respect to the impact of IN-PLANT TRAINING CENTRE EXPERIENCE and ACCELERATION

REPLICATION STUDY

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ISBN 0 86397 161 X
TD/TNC: 12.13

Edited by: M. Cominos

Published by:

TAFE National Centre for
Research and Development
296 Payneham Road
Payneham SA 5070

(Incorporated in South Australia)

Distributed by Nelson Wadsworth, PO Box 4725, Melbourne VIC 3001,
for TAFE National Centre for Research and Development Ltd.

Printed by D. J. WOOLMAN, Government Printer, South Australia

ACKNOWLEDGEMENTS

The authors extend grateful thanks to project committee members Peter Brereton, Chairman, Hawthorn Institute of Education, Geoff Hayton, TAFE National Centre for Research and Development, Michael Burton, National Training Council, Maurice Hayes, National Training Council, Graham Hermann, National Training Council, Barry Ridgway, Repco, Kevin Lee, GMH-MATEC, Dr. John McArthur, Monash University and Australian Education Council, Ray Davey, Gordon College of TAFE and Syd Strong, Hawthorn Institute of Education, who assisted with consultative advice; in-plant training centre managers, supervisors and instructors who co-operated in the observations and interviews; TAFE college principals, heads of departments and instructors who conducted and assisted in the practical testing and provided module results; Graeme Scott, Malcolm Wraight, Bob Botteril and Geoff Hodgson of Hawthorn Institute of Education and Geoff Haddock of Collingwood College of TAFE who assisted with the electrical practical test; apprentices in the sample groups who participated in the testing program and interviews; Hawthorn Institute of Education lecturers - Fred Calhoun, fitting and machining, John Holley, sheetmetal and George Jones, motor mechanics - who conducted the interviews and observations; Malcolm Kays, Tasmanian Education Department and Michael Stock, Canberra College of TAFE who gave permission to use the Q.S. mathematics and M.S. reading tests; and Liz Dent who typed the report.

CONTENTS

FIGURES

ABSTRACT

This study replicates a similar one based on the 1983 apprentice intake in the fitting and machining, electrical, sheetmetal and motor mechanics trades, where a large sample was investigated to determine whether there were any differences in performance between apprentices trained in off-the-job, in-plant training centres and those trained on-the-job.

Using a 1984 intake sample of over 500 apprentices, and with the co-operation of 16 in-plant training centres and nine TAFE colleges, this study attempted to confirm and consolidate the findings of the previous study.

The trades involved - fitting and machining, electrical, sheetmetal and motor mechanics - were the same as in the previous investigation.

Major intentions were to:

(i) investigate the effectiveness of off-the-job, in-plant training centre apprentice training compared with training received by apprentices employed on-the-job;

(ii) investigate the benefits of accelerated apprentice training programs;

(iii) qualitatively compare training centre facilities and programs.

In fitting and machining, the findings of the previous study were generally confirmed. Overall, off-the-job training centre apprentices develop higher levels of practical skills than on-the-job apprentices. Accelerated apprentices attached to training centres show superior levels of skill development compared with non-accelerated apprentices either in a training centre or employed on-the-job. However, significant differences in skill levels were not found between non-accelerated groups, whether attached to training centres or employed on-the-job.

In electrical, results were affected by a syllabus change - virtually all electrical apprentices involved in the study were in non-accelerated programs. No significant difference was found between the practical test scores of training centre and on-the-job apprentices.

In sheetmetal, the previous study's tentative findings were confirmed. On-the-job apprentices generally work faster than training centre apprentices on their TAFE college modules. However, it is now considered that the nature of training centre influence and the type of employment (e.g. aircraft versus general sheetmetal) affect TAFE college "work rate".

No effective measure was devised for the purpose of comparing motor mechanics apprentice groups due to program variations and training pattern inconsistencies.

Variation between nature and quality of training centre programs, training centre facilities, and training centre-TAFE college liaison were found to be very important influences on apprentices' learning.

This investigation is to be seen as part of a longitudinal study of apprentice training methods within the trades involved.

The study's results have implications for apprentice training policies of groups such as governments, private and government employers, training authorities, and the TAFE system.

Study of the 1983 and 1984 cohorts, is being continued under the auspices of the National Training Council, with special reference to acceleration and long-term effects.

1. PROJECT OVERVIEW

1.1 Background

This replication project continued the study by Hayes and O'Sullivan (1984) of first year apprentice learning with respect to the impact of in-plant training centre experience and acceleration.

The main objectives of that study were: to compare the performance of apprentices (first year) trained in in-plant training centres with those trained on-the-job (fitting and machining, electrical, motor mechanics, sheetmetal trades), to establish whether there were any characteristic differences between the two groups at the end of the first year; also to compare the performance of apprentices within the training centre group to establish the degree of association between aspects of the training centre programs and the performance of the apprentices.

The study involved 517 apprentices. Of these, 303 were in in-plant training centres and 214 were trained on-the-job. A total of 18 in-plant training centres and eight colleges of TAFE were involved. All apprentices were pre-tested (written) at the year's beginning (1983) and those in fitting and machining and electrical (the two largest apprentice groups) were re-tested at the year's end by a practical test (module results were collected for motor mechanics and sheetmetal apprentices).

Results regarding training centre training versus on-the-job training were not clear-cut, except in fitting and machining where training centre apprentices indicated appreciably higher levels of practical skills than on-the-job apprentices. Acceleration emerged as a main factor, with accelerated fitting and machining and electrical apprentices outperforming non-accelerated apprentices on practical skills attainment. Overall results were inconclusive for apprentices in motor mechanics and sheetmetal.

1.2 Rationale

As an outcome of the previous study, it seemed highly desirable to both the researchers and the project steering committee to replicate sections to confirm some of the main findings and address some of the several outstanding issues; also to maintain the network of in-plant training centre and TAFE college contacts that had been established, recognising the high level of interest and the assured co-operation in testing, observing and interviewing; and to continue addressing the literature, some of it new, to help draw-up a profile of training centres.

1.3 Objectives

The replication project's objectives were to:

1.3.1 test certain propositions (hypotheses) by comparison of first-year apprentice groups -

(a) fitting and machining

(i) accelerated in-plant training centre,
(ii) non-accelerated in-plant training centre,
(iii) accelerated on-the-job,
(iv) non-accelerated on-the-job;

(b) electrical

(i) accelerated in-plant training centre,
(ii) non-accelerated in-plant training centre,
(iii) accelerated on-the-job,
(iv) non-accelerated on-the-job;

(c) motor mechanics

(i) accelerated in-plant training centre,
(ii) non-accelerated in-plant training centre,
(iii) non-accelerated on-the-job;

(d) sheetmetal

(i) non-accelerated in-plant training centre,
(ii) non-accelerated on-the-job

by measurements, as appropriate, including end-of-year practical skills test, TAFE college module results, instructor/supervisor rating scale, survey instrument responses;

1.3.2 draw conclusions in respect of findings in order to confirm the previous results and to clarify the outstanding issues; and

1.3.3 address the consolidated findings to industrial training policy makers and other interested groups.

1.4 Project plan

The project plan was as follows:

1.4.1 component 1, which flowed directly from the Hayes and O'Sullivan (1984) study, involving:

(a) further analysis of data on 1983 apprentice intake in four trades,
(b) survey of relevant literature,
(c) identification of key issues requiring further investigation and analysis,
(d) reformulation of research propositions;

1.4.2 component 2, which involved identification of the necessary participant apprentice groups, including:

(a) liaison with in-plant training centre and TAFE college personnel,
(b) organisation of access to necessary comparison groups,
(c) preparation of data gathering instruments;

1.4.3 component 3, which took place in 1984 during, and at the end of, the "treatment" (teaching and learning) phase of the year, involving:

(a) monitoring apprentice learning behaviour,
(b) collection of in-plant training centre and TAFE college data,
(c) ascertaining apprentice/instructor/supervisor/manager impressions,
(d) administration of practical skills tests where appropriate,
(e) analysing data and detailing and interpreting outcomes;

1.4.4 component 4, writing and publishing report.

2. LITERATURE SURVEY

2.1 Patterns of development

Patterns of development of training centres have indicated steady growth over about 40 years to 1981 (with the main development period between 1960 and 1981) and then a reversal of trends, though some of the published figures are difficult to equate.

The Williams Report (1979) on education, training and employment tentatively recommended the wider provision of systematic industrial training, for a year or more, in off-the-job training centres.

Williams noted that the majority of apprentices did not receive this kind of training, citing examples from Queensland, where in 1977, "four per cent of apprentices (including 174 employers) were provided with benefits of off-the-job training schools" (p. 363), and Victoria, where "less than three per cent of all apprentices in that State were provided with such off-the-job training opportunities" (p. 363).

However, the Report observed that there "has been some increase in off-the-job training schemes and part of the impetus ... has come from the Commonwealth Government's financial assistance to employers who participate" (p. 363).

Cunningham's (1984) study for the National Training Council of major off-the-job (in-plant) training centres reported that in 1981 there were 137 off-the-job (in-plant) training centres throughout Australia approved to receive such financial assistance, i.e. the Commonwealth Rebate for Apprentice Full-time Training (the "CRAFT rebate") (p. 4).

The Kirby Report (1985) on labour market programs used this criterion to distinguish centres, i.e. eligibility to receive the CRAFT rebate, and quoted figures from an unpublished 1981 Department of Employment and Industrial Relations (DEIR) survey: that "there were 137 approved training centres throughout Australia, 60 of which had more than 20 first year apprentices of their own" (p. 136).

Rumsey (1983), in a paper on improving forms of training for skills, indicated, on the basis of 1980-81 estimates, that there were "385 off-the-job training workshops operated by either government departments or industry [which] provided for some 8,256 apprentices forming approximately 18 per cent of the national intake at that time" (p. 46). Clearly, these figures imply a different criterion for counting to that used by Cunningham and Kirby.

Of the growth of off-the-job training provisions, Cunningham (1984) reported four time-related patterns represented in the 70 centres used in his sample: before the end of the Second World War, in which four centres had opened; 1940-1960, in which approximately two centres opened every three years; the period between 1960 and 1981, during which centres developed

at an even rate of approximately five every two years; and the period after 1981, including projections for 1983, which indicated a "reversal of the pattern of growth in the post World War II period" (p. 8). Cunningham identified a major issue as being the significant down-turn in off-the-job training leading to "the under-utilisation of industry's training resources during the current recession" (p. 53).

The Kirby Report (1985) noted this reversal in terms of the fall in the number of apprentices attracting the CRAFT rebate, quoting figures: "(since) 1981, the total number of apprentices (including some second and third year apprentices) attracting the OTJ Rebate annually has declined from 11,000 to 6,000" (p. 136); and the decline represented both "own" and "hosted" apprentices - regarding the latter, in 1983-84, "only 113 employers, with a total of 401 apprentices made use of this provision" (p. 136).

This serious reversal was judged by the Report to have powerful implications both for funding the CRAFT off-the-job training rebate ($14.7 mil. in 1984-85) and the operations of, and nature of the work done in, off-the-job (in-plant) training centres.

2.2 Training centres' rationale

Propositions on the training centres' reason for existence have mainly centred on acceleration, the practical nature of training programs in the centres and the benefits of off-the-job training to industry.

The Williams Report (1979) noted implicit acceleration advantages, reporting claims referred to by the Victorian Industrial Training Commission that "after 12 months in a training centre the apprentice has the skills normally attributed to a third year apprentice" (p. 363).

The discussion paper, TAFE and Training for Skills (1979) drew attention to practical training concerns, and proposed, among others, a mode which incorporated theory and related practical studies in TAFE, with "field training" by practice in a real or simulated work environment "in either government or industry-run training centres" (pp. 10,16).

Engelmann et al's (1982) report for the Metal Trades Industry Association of Australia (Victorian Branch) identified three types of programs (or program elements) evident in the in-plant training centres surveyed: programs intended to intensify and accelerate normal training, programs intended to adapt normal training to local needs, and programs intended to underpin normal training with a better foundation of "basics". In summary, however, the report observed that: "most of the work in most centres is aimed at accelerating training" (p. 7).

On an historic note, Chard (1984), in a paper on maximising on-the-job training quality, recalled how 31 years ago, he and five others were in "simulated skill centre conditions" at the then South Australia Railways Islington Workshops, and

he believed then, and now, that "his rate of skill development was considerably advanced..." (p. 34).

Chard's paper cited opportunities currently provided to first year apprentices by the training centre approach, such as: broadly based foundation training, full integration between TAFE and on-the-job training, trainee-centred reviewing and monitoring of progress, trainee-centred rather than production-orientated approaches, and instilling of sound work habits.

By implication, Rumsey (1983) suggested some of the functions of training centres in recommending improved arrangements for both on-the-job and off-the-job training, including the setting-up of both industry based and TAFE based training centres, "as well as more structured approaches to the provision of either simulated or real work experiences aimed at developing competencies in, or transfer to, a range of occupational tasks" (p. 56).

Cunningham's (1984) report quoted responses to a training centre employer/manager/instructor survey which addressed questions of the centres' rationale. Responses, in order of popularity, were: produce more specialised training to meet company needs; accelerate training; provide initial basic training; improve the quality of training; formalise training and make it more systematic; provide transition from school to work; cope with increased training volume; reduce the cost of training; improve safety standards; overcome gaps that may be inherent in specialised training; and, other responses.

However, Cunningham concluded that, notwithstanding these various opinions, "in the overwhelming majority of cases apprentices observed (in training centres) were engaged in ... 'basic' rather than 'specialised' training ... [and] ... training provided for apprentices within one industry grouping did not appear to vary significantly from centre to centre" (p. 44).

Regarding the general training operation, Cunningham's findings were, among other things: knowledge of the training staff provided the basis for 55 per cent of programs; 42 per cent of centres relied only on exercises which performed a negligible amount of production work; production of live work was a significant element in training programs in 58 per cent of centres (compare the Engelmann et al. findings based on apprentices' views: 82.8 per cent worked on production/maintenance jobs, most indicating a very strong desire to be involved in this "real" work); all centres used group and individual instruction in workshops, with varying time proportions; 94 per cent of centres used classroom teaching at some stage during their program; some variation of the self-paced learning mode was used by 31 per cent of centres; 65 per cent of centres had conducted reviews of programs in the past eight years; assessment methods used were - progressive skills tests (94 per cent), general behavioural assessment (71 per cent), progressive written tests (59 per cent); practical skills test at end (11 per cent); written test at end (8 per cent); other (6 per cent) - (the most common method of apprentice assessment "was to

examine the output which they produce in the workshop") (p. 41); the training period was continuous in 83 per cent of centres; a few centres had a formal, follow-up arrangement once apprentices left the program; there were very few examples of training centre-TAFE college integrated programs; and a large area of overlap existed between training centre and TAFE programs: ("The impression gained ... was that of two separate training sectors rather than two parts of an integrated system of training" p. 49).

Last, the Kirby Report (1985) reiterated Cunningham's survey results to provide main reasons for the establishment of centres, from the industry viewpoint, to: provide more specialised training to meet company needs, accelerate training, provide initial basic training, and improve training quality.

In summary, the Report outlined the nature of off-the-job (in-plant) training as follows:

> For first year apprentices the training provided varies from a simple induction program with little or no actual skill training to full year, full-time programs. This training is best described as basic rather than specialised or company-specific. The major activity of these centres is the training of apprentices during their first year. However, some second, third and fourth year apprentices receive remedial, advanced, or specialised training through short courses conducted in these centres. (p. 135).

2.3 Hayes and O'Sullivan's (1984) study

At a general level, results from the Hayes and O'Sullivan (1984) study showed some clear indications: apprentices currently being selected for apprenticeships have above average cognitive attainment levels, suggesting why they can readily undertake acceleration; practical tests on aggregated modules, (fitting and machining 1-8 and electrical 1-6), provide reliable measurements of apprentices' practical skills performance; close collaboration between training centres and TAFE colleges, particularly with respect to facilitating acceleration, provides beneficial results for all the parties concerned; and both the training centre and TAFE college groups desire greater collaboration.

Results at a more particular level, however, were inconclusive regarding the apprentice groups being investigated, with strong data only being collected to test hypotheses dealing with entry level characteristics and levels of trade skills development.

Regarding the latter, whereas in fitting and machining, those apprentices trained in training centres had achieved significantly higher practical skills levels than those trained on-the-job, in the electrical trades, little difference was found between the skills acquired by those trained for one year in training centres and those trained on-the-job. In sheetmetal and motor mechanics, because of

the non-availability of comparable "across trade" skills test results only the most tentative conclusions could be drawn.

Acceleration was the most important factor that emerged in both fitting and machining and electrical results. The main difference between first-year apprentices was between those who had undertaken an accelerated apprenticeship program and those who had undertaken a non-accelerated program. The accelerated training program was seen to be a good deal more effective for advancing skills development.

2.4 The Kirby Report (1985) recommendations

The Kirby Report (1985) considered training centres' objectives in labour market terms of: increasing apprentice intakes, lifting apprentice productivity and improving training quality - assisted by payment of the CRAFT off-the-job training rebate. Specifically, the rebate's objective was to "promote the acquisition of productive skills at an earlier stage of apprenticeship through systematic programs of professionally organised and supervised training in industry ... to increase the attractiveness of apprenticeship to employers and ... increase apprentice intakes" (p. 135).

Serious doubts were raised in the Kirby Report about the effectiveness of the rebate, based on: (as mentioned elsewhere) the decline since 1981 (from 11,000 to 6,000) in the number of apprentices attracting it; the limited use by small employers of host training provisions; suggestions in the Cunningham (1984) study that its introduction in 1977 did not significantly lift the number of training centres; indications that it had not increased the attractiveness of apprenticeship to employers; and the inconclusive findings of the Hayes and O'Sullivan (1984) study, as to whether there were clear benefits evidenced in increased apprentice productivity and improved training quality.

So, the Report was led to question objectives of the rebate and to assert that "the OTJ Rebates are not an appropriate vehicle for increasing apprenticeship intakes" (p. 137).

Alternatively, it supported broadly-based pre-employment trade courses as the normal apprenticeship entry avenue, noting that "in some cases, it may be advantageous for trades based pre-employment students to undertake part of their studies in industry centres" (p. 137).

Even more significant was its proposal changing the very nature of the training centres: that "industry training centres should be in the best position to provide advanced, specialist and 'high-tech' practical training", and that they should "move away from basic training to specialised instruction" (p. 137). Hence, the Kirby Report's recommendation 39: "Government support for industry training centres should encourage them to become more involved with specialised and advanced training for a wide range of employees" (p. 137).

3. EXPERIMENTAL AND ORGANISATIONAL DETAILS

This chapter provides a general outline of the way the study was conducted, and data collected on the 1984 intake of apprentices.

Although this study was basically a replication of the study of the 1983 apprentice intake, some modifications were made to some of the experimental procedures and details. All colleges and training centres who participated in 1983 initially consented to participate again in 1984. Additional colleges and training centres also expressed willingness to be involved. Toward the end of 1984, various local factors (e.g. facilities use, renovations, shortage of time needed to finish courses) caused some to drop out. However, the researchers managed to involve a large and representative sample of apprentices in each of the four trades being examined. Full details of the distribution and location of the apprentices involved are given in Chapter 4.

3.1 Major issues and questions

As in the study of the 1983 apprentice intake, the broad questions being examined were as follow:

(a) What advantages accrue, with respect to apprentice skill, attitudes and performance, as a result of participation in an off-the-job training centre program?

(b) How do off-the-job training centre apprentices compare with apprentices employed on-the-job, with respect to skill, attitudes and performance, at the end of the first year of training?

(c) How do apprentices who are accelerated in an off-the-job training centre program compare with on-the-job apprentices (accelerated and non-accelerated) and off-the-job training centre apprentices in non-accelerated programs?

And a new question was:

(d) How do the results of the study based on the 1984 apprentice intake compare with those based on the 1983 intake?

The data gathered during 1984, using tests, observation, interview and surveys, attempted to provide answers to these questions. In addition, data were gathered on actual training centre conditions and their relationship with TAFE colleges.

3.2 Changes from procedure used in the study of the 1983 intake

In 1983, data on the entry level characteristics of the majority of first year apprentices involved were gathered, using a comprehensive range of cognitive and attitudinal measures.

In three trades, (fitting and maching, sheetmetal and motor mechanics) it was found that there was no correlation between scores on these tests and end-of-year performance levels in trade skills. Therefore, in view of the huge outlay of time in administering the entry-level tests, together with the degree of program disruption that occurred in TAFE locations, it was decided to drop the tests for the 1984 intake sample. The little information thought likely to be gained was not considered to be worth the problems involved in mass test administration. However, some spot checks were made, and tests in mathematics and reading were conducted with two apprentice groups in the fitting and machining trade. This matter is discussed in Section 4.11.

In the electrical trade, correlations were found, in 1983, between some of the entry-test scores and the end-of-year practical skills test, with mathematics and reading emerging as the strongest predictors of end-of-year performances. Mathematics and reading tests were administered to as many of the 1984 first year electrical sample as possible. As in 1983, the major purposes of this were (a) to detect differences in cognitive ability level between groups and (b) to have suitable scores for use as co-variates if differences between groups became apparent.

Also, in the electrical trade, significant procedural changes were due to the fact that, apart from one small group at a particular TAFE college, no other groups of electrical apprentices were accelerated in 1984 due to a major syllabus change being implemented. (See discussion in Section 3.7.)

3.3 Similarities with the study of the 1983 intake

The 1983 and 1984 cohorts were similar with respect to age structure and secondary school background. For both years, the modal entry level was year 11 and apprentices were drawn from a variety of secondary school types - high, technical and private. Employers in general indicated that similar selection criteria were used in each year. A similar set of employers conducting in-plant training centres were used - augmented in 1984 by a large non-metropolitan centre. The same TAFE colleges were involved, with the addition of a large non-metropolitan college. In the light of the above factors, the researchers considered that there was no evidence to suggest that the two cohorts differed in any way likely to adversely affect the validity of the study. In the outcome, the judgement was confirmed by the final practical test scores in fitting and machining and electrical, which indicated virtually no difference on the aggregated groups. Also pre-testing in reading and arithmetic on a large sample of electrical apprentices across all TAFE college groups, as well as on fitting and machining apprentices in two large training centres, confirmed comparability of the respective apprentice groups.

In general, the basic points of contact for most of the sample of participating apprentices were the TAFE colleges. Exceptions were where contact was made through two large fitting and machining training centres in which apprentice testing, observation and surveying took place. In all

other cases, apprentices were tested, observed and surveyed in the respective TAFE colleges to which they were attached.

As in the study of the 1983 intake, the basic treatment for all 1984 apprentices involved attendance at a TAFE college and either attendance at an off-the-job training centre or employment on the job. Some accelerated apprentices attended TAFE college two days per week. In some cases, acceleration was supported by collaborative and co-operative programs devised by particular training centre-TAFE college partnerships. Both day release and block release attendance patterns were used, depending on particular TAFE college/employer/training centre preferences.

3.4 Outline of experimental procedures

The overall experimental procedure is indicated in the following Table 1.

TABLE 1

TRADE	APPRENTICE COMPARISON GROUPS	COGNITIVE (ENTRY LEVEL) TESTS	TREATMENT (TRAINING RECEIVED DURING YEAR)	END-OF-YEAR SKILL LEVEL INDICATOR LEVEL
Fitting and machining	1.Accelerated* off-the-job training centre.	Two large groups given reading and mathematics tests.	Off-the-job training centre program and TAFE college attendance.	Module 1-8 practical skills test.
	2.Accelerated on-the-job employment.	Not tested.	On-the-job employment and two days/week TAFE college attendance.	Module 1-8 practical skills test.
	3.Non-accelerated** off-the-job training centre.	Not tested.	Off-the-job training centre. TAFE college attendance one day/week or block release (one week college and four weeks in training centre).	Module 1-8 practical skills test.
	4.Non-accelerated on-the-job employment.	Not tested.	On-the-job employment usually four days/week and TAFE college attendance one day/week. (Some block release as in (3) above.)	Module 1-8 practical skills test.

Table 1 continued

TRADE	APPRENTICE COMPARISON GROUPS	COGNITIVE (ENTRY LEVEL) TESTS	TREATMENT (TRAINING RECEIVED DURING YEAR)	END-OF-YEAR SKILL LEVEL INDICATOR LEVEL
Electrical	1.Accelerated off-the-job training centre (one small group).	Not tested.	Off-the-job training centre (three days/week), TAFE college attendance two days/week on "old" syllabus.	Level one practical test.
	2.Non-accelerated off-the-job training centre.	Most apprentices given reading and mathematics test.	Off-the-job training program four days/week TAFE college one day/ week on "new" syllabus.	Level one practical test.
	3.Non-accelerated on-the-job employment.	Most apprentices given reading and mathematics test.	On-the-job employment four days/week TAFE college one day/week on "new" syllabus.	Level one practical test.

Table 1 continued

TRADE	APPRENTICE COMPARISON GROUPS	COGNITIVE (ENTRY LEVEL) TESTS	TREATMENT (TRAINING RECEIVED DURING YEAR)	END-OF-YEAR SKILL LEVEL INDICATOR LEVEL
Sheetmetal	1.Off-the-job training centre. (No acceleration formally attempted although "self paced" program and "non compulsory" extra attendance can optionally facilitate more rapid completion of TAFE college work for individual apprentices.)	Not tested.	Off-the-job training centre and TAFE college attendance block release (four weeks at training centre one week at TAFE college).At TAFE college apprentices work at "self paced" modules.	Number of modules completed in available time. (Work rate = av. time per module throughout the whole year.)
	2.On-the-job employment. (Same comment as above also applies.)	Not tested.	On-the-job employment and TAFE college attendance (block release as above).	Number of modules completed in available time. (As above.)

Table 1 continued

TRADE	APPRENTICE COMPARISON GROUPS	COGNITIVE (ENTRY LEVEL) TESTS	TREATMENT (TRAINING RECEIVED DURING YEAR)	END-OF-YEAR SKILL LEVEL INDICATOR LEVEL
Motor mechanics	1.Accelerated off-the-job training centre.	Not tested.	Off-the-job training centre three days per week. TAFE college attendance two days week (day release).Self paced modules in TAFE colleges.	Number of modules completed in available time. (Work rate = av. time per module from date first college day.)
	2.Non-accelerated on-the-job.	Not tested.	On-the-job employment four days per week TAFE college attendance one day per week (day release).Self paced modules in TAFE colleges.	Number of modules completed in available time. (As above.)

*Accelerated apprenticeship training.
For the purpose of this study, accelerated apprenticeship training generally means that apprentices will complete the TAFE college component of their training in substantially less time than "normal". In most cases, this means two years at TAFE college instead of the normal three.

(At present all apprenticeships in the trades discussed in this study are for a period of four years and thus "acceleration" does not reduce the total apprenticeship period.)

**Non-accelerated apprenticeship training.
This generally means that apprentices are attached to training programs normally requiring three years of TAFE college attendance. In trades with "self pacing" the total time taken to complete all the required TAFE college work may be shortened somewhat.

3.5 Tests used

The tests used in the study were selected from the battery used for the study of the 1983 apprentice intake.

Apprentices tested in mathematics were given Part A (the first 50 questions of the Q.S. mathematics test). (See attachment 1.)

Apprentices tested in reading received the M.S. reading test. (See attachment 2.)

Fitting and machining apprentices were post-tested using the module 1-8 practical skills test devised and used with the 1983 apprentices intake. (See attachment 3.)

At one major training centre using an accelerated program, all apprentices received this test in August, close to the time of finishing the eighth module. At another major training centre using acceleration, half of the apprentices were tested in August and the remainder toward the end of the year in late October. All other fitting and machining apprentices in this sample were given the practical skills test in late October or during November, at the convenience of the participating TAFE colleges in which the tests were conducted.

Electrical apprentices were post-tested using the level one practical test devised and used with the 1983 apprentice intake. (See attachment 4.)

3.6 The sheetmetal and motor mechanics module results analysis "problem"

The problem of analysing and interpreting module results in the sheetmetal and motor mechanics trades was similar to that encountered in respect of the 1983 apprentice intake.

Self paced, mastery learning-teaching methods, where marks are not given and work is assessed as "pass" or "not pass" (in which case work is repeated until "criterion" is attained), are used in these trades. Staff involved are not in favour of mass practical testing at the end of the first year. Theoretically, the more able apprentices will do more work, and complete more modules. On this basis, a "work rate" measure is used. Colleges generally calculate "work rate" by the formula

$$\text{Work rate} = \frac{\text{Number of days attended}}{\text{Number of modules completed}}$$

giving an estimate of the average time per module throughout the whole year. The assumption is that lower scores indicate better (i.e. more skilful and productive) workers.

In looking at the data provided by TAFE colleges it was noticed that some apprentices attended optionally in the evenings. This, it was considered, may have distorted the

results obtained using the TAFE college formula cited earlier. As a check on this, an estimate of the total number of hours worked by apprentices during the year was made, taking both days attended and nights attended into account. A modified work rate formula is given by

$$\text{Work rate} = \frac{\text{Total number of hours worked}}{\text{Number of modules completed}}$$

which produces an estimate of the average number of hours spent per module throughout the whole year. Again, lower scores (theoretically) supposedly indicate better workers.

The researchers have strong reservations about the validity of only using "work rate" to measure skills performance in sheetmetal and motor mechanics. Nevertheless, it is the only quantitative measure presently used by the TAFE colleges involved in the study, and currently available for the reasons previously outlined.

Results using both the above formulae are provided in Chapter 4.

3.7 Effects of the new electrical syllabus

In the study of the 1983 apprentice intake, a considerable proportion of the electrical training centre apprentices involved were engaged in accelerated programs. The adoption of the new electrical syllabus for first year apprentices in 1984 meant that accelerated programs within the TAFE colleges could not be conducted. Within the sample of electrical apprentices participating, only one small group at a particular TAFE college using the old syllabus was accelerated. So, acceleration, as a factor influencing development of electrical apprentices, could not be studied to anywhere near the same depth as was possible in the previous study. It was, however, possible to compare the small (old syllabus) group mentioned above with the apprentices using the new syllabus.

3.8 Comparisons between training centres

Observation data were collected in recognition of the fact that conditions vary greatly between training centres.

Visits to centres were carried out by Bob Hayes and John O'Sullivan and other members of the Hawthorn Institute of Education staff with expertise in the trade areas - Fred Calhoun (fitting and machining), John Holley (sheetmetal), and George Jones (motor mechanics). An extensive checklist on training centre characteristics and facilities was devised, and this was used in co-operation with training centre personnel to gather data, enabling comparison to be made between centres. (See attachment 5.)

It was assumed that training centre conditions and methods would affect apprentice (and staff) performance and attitudes and that the effects would be related to the performance

scores in the skill tests administered and other measures used (e.g. work rate).

4. RESULTS AND DATA ANALYSIS

4.1 Fitting and machining 1984 apprentice intake distribution

A sample of 238 first year fitting and machining apprentices, attached to eight TAFE colleges, was involved in the study in 1984. Each of the participating apprentices attempted the module 1-8 practical test. Table 2, below, shows the distribution of apprentices within the TAFE colleges and also the numbers of apprentices within the various training modes being investigated.

TABLE 2

DISTRIBUTION OF FITTING AND MACHINING APPRENTICE SAMPLE WITHIN TAFE COLLEGES AND TRAINING MODES

College	Total F & M Apps	Trg Centre	On-the-job	Accel Trg Centre	Non-accel Trg Centre	Accel On-the-job	Non-accel On-the-job
Box Hill	32	3	29	-	3	-	29
C'wood	37	27	10	22	5	5	5
F'kston	7	7	-	-	7	-	-
Gordon	18	9	9	9	-	4	5
M'rbn	23	23	-	23	-	-	-
Newport	22	18	4	12	6	-	4
RMIT	61	61	-	61	-	-	-
Yallourn	38	31	7	-	31	-	7
Totals	238	179	59	127	52	9	50

Box Hill and Yallourn were additional colleges for the study of the 1984 apprentice intake. The other six had previously been involved in the study based on the 1983 apprentice intake.

Each training centre fitting and machining apprentice was attached to one of eight training centres as indicated by Table 3. Some were employed by the company or authority providing the training centre (i.e. own apprentices) while others were being hosted (i.e. employed by another employer but released during the first year to attend the training centre). Some training centre apprentices were being accelerated during their first year (i.e. attempting to complete the first two years of the normal apprenticeship in one year). This table also indicates the number of accelerated and non-accelerated apprentices and the various TAFE colleges used by training centre apprentices.

TABLE 3

DISTRIBUTION OF FITTING AND MACHINING APPRENTICES ATTACHED TO TRAINING CENTRES

Trg Centre	Total Apps Attach	Own Apps	Hosted Apps	Accel Apps	Non-accel Apps	TAFE Coll Used
Ordnance Factory	38	10	28	38	-	RMIT
REPCO	58	16	42	58	-	C'wood 12 M'bin 23 RMIT 23
MATEC (GMH)	22	15	7	22	-	C'wood 10 N'port 12
SEC	31	31	-	-	31	Yall'n
Gas Fuel	3	3	-	-	3	B'Hill
C'wealth Aircraft	5	5	-	-	5	C'wood
Ford	9	9	-	9	-	Gordon
Lysaght	7	6	1	-	7	F'kston
State T'port Auth.	6	6	-	-	6	Newport
Totals	179	101	78	127	52	

4.2 Training centre versus on-the-job fitting and machining apprentices

The major instrument used for the study and comparison of apprentice performance and skill acquisition was the module 1-8 practical skills test. Results on this test have been used to compare the various fitting and machining training modes being investigated. Table 4 compares all training centre apprentices with all on-the-job apprentices.

TABLE 4

MEAN SCORES FITTING AND MACHINING MODULE 1-8

PRACTICAL TEST FOR ALL APPRENTICES TESTED (n = 238)

	Trg Centre Apps (n = 179)	On-the-job Apps (n = 55)	"t" Value (236 d.f.)	Sig Level
MEAN	72.8	65.5	3.41	$p < .001$
S.D.	15.0	11.8		

Maximum score possible = 100

Taken as groups, it is apparent that fitting and machining apprentices attached to training centres have performed significantly better than those employed on-the-job, with a 7.3 per cent difference between mean scores obtained.

4.3 Accelerated training centre versus non-accelerated training centre fitting and machining apprentices

Table 5 compares accelerated training centre fitting and machining apprentices with non-accelerated training centre fitting and machining apprentices.

TABLE 5

MEAN SCORES FITTING AND MACHINING MODULE 1-8
PRACTICAL TEST FOR ALL TRAINING CENTRE APPRENTICES TESTED (n = 173)

	Accel Trg Centre Apps (n = 127)	Non-accel Trg Centre Apps (n = 46)	"t" Value 171 d.f.	Sig Level
MEAN	75.0	67.3	3.19	p < .002
S.D.	14.6	14.8		

Evidence suggests that the accelerated training centre fitting and machining apprentices performed significantly better than the non-accelerated fitting and machining apprentices, with a mean score difference of 7.7 per cent between the two groups.

4.4 Accelerated training centre fitting and machining apprentices versus accelerated on-the-job fitting and machining apprentices.

Unfortunately, the number of accelerated on-the-job fitting and machining apprentices involved was small and, therefore, valid comparison between the two groups is risky. However, the results obtained are given in Table 6.

TABLE 6

MEAN SCORES FITTING AND MACHINING MODULE 1-8

PRACTICAL TEST FOR ALL ACCELERATED APPRENTICES TESTED (n = 136)

	Accel Trg Centre Apps (n = 127)	Accel On-the-job Apps (n = 9)	"t" Value (134 d.f.)	Sig Level
MEAN	75.0	68.7	1.27	n.s.
S.D.	14.6	13.5		

No statistically significant difference between the two groups was found. A much larger number of accelerated on-the-job fitting and machining apprentices would need to be available to enable worthwhile comparison.

4.5 Non-accelerated training centre fitting and machining apprentices versus non-accelerated on-the-job fitting and machining apprentices.

Table 7 compares the two groups' performances.

TABLE 7

MEAN SCORES FITTING AND MACHINING MODULE 1-8

PRACTICAL TEST FOR ALL NON-ACCELERATED APPRENTICES TESTED (n = 92)

	Non-accel Trg Centre Apps (n = 46)	Non-accel On-the-job Apps (n = 46)	"t" Value (90 d.f.)	Sig Level
MEAN	66.7	64.5	0.77	n.s.
S.D.	14.3	11.6		

For non-accelerated apprentices in fitting and machining, there appeared to be no evidence that skills, as measured in the practical test, differed substantially between the training centre group and the on-the-job group.

4.6 Accelerated on-the-job fitting and machining apprentices versus non-accelerated on-the-job fitting and machining apprentices.

Again, the small number of accelerated on-the-job fitting and machining apprentices was a problem. However, the results obtained are shown in Table 8.

TABLE 8

MEAN SCORES FITTING AND MACHINING MODULE 1-8

PRACTICAL TEST FOR ALL ON-THE-JOB APPRENTICES TESTED (n = 59)

	Accel On-the-job Apps (n = 9)	Non-Accel On-the-job Apps (n = 50)	"t" Value (57 d.f.)	Sig Level
MEAN	68.7	64.9	0.89	n.s.
S.D.	13.5	11.6		

No statistically significant performance differences were found between the two groups, accepting the above qualification regarding small apprentice numbers.

4.7 Overall summary of comparisons between fitting and machining apprentice groups

Table 9 summarises the comparisons made in the previous four sections between fitting and machining apprentices being trained in the various modes.

TABLE 9

SUMMARY OF MEAN SCORES OF ALL APPRENTICES TESTED ON MODULE 1-8 PRACTICAL TEST (n = 238)

	Accel	Non-accel	Accel v Non-accel	Overall	Training Centre v On-the-job
Training Centre	Mean 75.0 S.D. 14.6 N 127	Mean 67.3 S.D. 14.8 N 52	t = 3.19 (177 d.f.) p < 0.002	Mean 72.8 S.D. 15.0 N 179	t = 3.71 (236 d.f.) p < .001
On-the-job	Mean 68.7 S.D. 13.5 N 9	Mean 64.9 S.D. 11.5 N 50	t = 0.89 (57 d.f.) n.s.	Mean 65.5 S.D. 11.8 N 59	
Trg Centre v On-the-job	t = 1.27 (134 d.f.) n.s.	t = 0.80 (100 d.f.) n.s.			
Overall	Mean 74.6 S.D. 14.5 N 136	Mean 66.1 S.D. 13.3 N 102			
Accel v Non-accel	t = 4.61 (236 d.f.) p < .001				

Overall, it seems clear that accelerated training centre fitting and machining apprentices, as a group, performed better than any of the other fitting and machining group combinations examined. Accelerated apprentices performed better than non-accelerated apprentices and training centre apprentices performed better than on-the-job apprentices. This is consistent with the findings of the study on the 1983 fitting and machining apprentice intake. A two way analysis of variance (hierarchical approach) on the groups indicated by the four cells in the top left hand corner of Table 9 indicates that there are differences between the four groups ($F_{3,234} = 7.918$, $p < 0.001$), training centre apprentices are superior to on-the-job apprentices ($F_{1,234} = 12.084$,

$p < .001$) and accelerated groups are clearly superior to non-accelerated groups ($F_{1,234} = 11.288$, $p < 0.001$). No significant two way interaction was found between training locations (training centre, on-the-job) and training mode (accelerated, non-accelerated) - $F_{1,234} = 0.490$, $p > 0.485$. (A larger sample (currently not available) of accelerated on-the-job apprentices would be needed to investigate this further.) The full ANOVA table is given in attachment 6.

4.8 TAFE college comparisons in fitting and machining

Table 10 indicates the mean scores obtained by fitting and machining apprentices attached to the various TAFE colleges involved in the study.

Actual colleges are not identified, and information that could give the identity of the respective colleges is not given. The researchers were aware that the focus of this study was on apprentices learning in in-plant training centres not in colleges, though the TAFE college factor was not to be ignored. Also, several TAFE colleges indicated that they would not participate in a study which attempted to openly compare performances between colleges.

TABLE 10

MEAN SCORES FITTING AND MACHINING MODULE 1-8
PRACTICAL TEST FOR ALL TAFE COLLEGES INVOLVED

	Overall		Trg Centre Apps		On-the-job Apps	
College	Mean	S.D.	Mean	S.D.	Mean	S.D.
A	63.3	12.8	69.1	11.3	57.4	11.9
			t = 2.13, (p < .05)			
B	63.5	13.2	63.3	13.1	64.4	14.8
			t =-0.20, (n.s.)			
C	79.8	9.6	81.4	10.3	74.6	3.7
			t = 1.94, (n.s.)			
D	71.6	15.4	71.6	15.4	-	-
E	64.7	6.9	64.7	6.9	-	-
F	86.9	6.6	86.9	6.6	-	-
G	64.8	10.7	69.7	11.5	64.3	10.7
			t = 0.82, (n.s.)			
H	55.7	8.6	55.7	8.6	-	-

It is clear that performances varied widely between the TAFE colleges for both training centre fitting and machining apprentices and on-the-job fitting and machining apprentices. For training centre apprentices, means varied from 63.3 (college B) to 86.9 (college F) and for on-the-job apprentices from 57.4 (college A) to 74.6 (college C). Aggregating all fitting and machining apprentices reveals a substantial and statistically significant difference in performances between colleges, ranging from 55.7 (college H) to 86.9 (college F). Using a one way analysis of variance, the F value obtained ($F_{6,214} = 15.3$) was significant at the $p < .001$ level. The study identified various patterns and co-operative schemes for sharing the training programs that exist between the training centres and the colleges. These arrangements are discussed elsewhere in this report. (See Chapter 5.)

4.9 Comparisons between training centres - fitting and machining apprentices

Table 11 shows the mean scores obtained by fitting and machining apprentices within various training centres. Again, for reasons of propriety, the identity of the actual training centres has been withheld.

TABLE 11

MEAN SCORES FITTING AND MACHINING MODULE 1-8 PRACTICAL TEST FOR TRAINING CENTRES WITH SUFFICIENT APPRENTICES INVOLVED IN THE STUDY TO FACILITATE MEANINGFUL COMPARISONS

Training Centre	Apprentices Accelerated		Apprentices Non-accelerated	
	Mean	S.D.	Mean	S.D.
A	63.4	12.2	-	-
B	86.4	7.6	-	-
C	-	-	63.3	13.1
D	69.1	11.3	-	-
E	-	-	55.7	8.6
F	68.2	6.4		-
G	-	-	79.8	12.4

It is evident that performances vary widely and statistically significantly between training centres both for fitting and machining apprentices undertaking accelerated programs ($F_{3,123} = 56.6$, $p < .001$) and non-accelerated programs ($F_{2,42} = 15.7$, $p < .001$). A detailed look at some centres and their programs and facilities has been carried out, and the influences that produce the performance differences are discussed elsewhere in this report. (See Chapter 5.)

4.10 Comparison between 1983 and 1984 fitting and machining apprentice intake groups

Table 12 compares the practical test scores of the various fitting and machining apprentice training mode groups in the 1983 and 1984 intakes.

TABLE 12

COMPARISONS BETWEEN 1983 AND 1984 FITTING AND MACHINING APPRENTICE GROUPS ON THE MODULE 1-8 PRACTICAL TEST

(The same test was given in each year.)

App Intake		Trg Centre Apps		On-the-job Apps		Overall
		Accel	Non-accel	Accel	Non-accel	
1983	Mean	80.0	63.8	73.0	59.3	70.3
	S.D.	12.5	11.6	10.0	15.4	13.6
	Number	117	74	4	60	255
1984	Mean	75.0	67.3	68.7	64.5	70.9
	S.D.	14.6	14.8	13.5	11.6	13.9
	Number	127	52	9	50	238
	"t" Value	2.95	-0.86	0.57	-1.93	-0.10
	d.f.	242	124	11	108	491
	Sig. Level	$p < 0.01$	n.s.	n.s.	n.s.	n.s.

Overall, comparisons between the 1983 and 1984 fitting and machining apprentice intakes showed that the performance of accelerated training centre apprentices, as a group, declined significantly in 1984 while other groups, where comparisons were possible, tended to show slight (but statistically non-significant) gains. However, accelerated apprentices, particularly those attached to training centres, remained, still, as the clear performance leaders. Interestingly, it is noted that the overall means for all apprentices tested in each year are extremely consistent.

4.11 A check on cognitive skills

Within the replication study, it was decided that to administer a battery of entry-level tests to all fitting and machining apprentices involved would be of little value. This was on the basis of our findings in 1983 which showed little entry-level difference between training centre apprentices and on-the-job apprentices. In addition, it could be reasonably thought that persons successful in obtaining a fitting and machining apprenticeship within the current economic conditions, where up to 400 may apply for as few as six positions, should have well above average cognitive skills and personal attributes. Moreover, in 1983, our entry-level measures did not correlate at all with practical skill performance, nor did entry level measures vary significantly between apprentices attached to the various fitting and machining training modes used.

As a partial check on the above, though, all of the apprentices at two major fitting and machining training centres were given tests in arithmetic and reading - the identical tests to those administered to the 1983 apprentice intake.

Table 13 shows the mean scores obtained on the arithmetic, reading and practical skills test for the two fitting and machining groups tested.

TABLE 13

COMPARISON BETWEEN 1983 AND 1984 APPRENTICE GROUPS AT TWO MAJOR FITTING AND MACHINING TRAINING CENTRES ON SCORES OBTAINED IN ARITHMETIC*, READING* AND MODULE 1-8 PRACTICAL TEST*

(The same tests were given in each year.)

Apprentice Intake	Training Centre A			Training Centre B		
	Arith	Read	Prac Test	Arith	Read	Prac Test
1983 Mean	37.3	69.7	88.7	36.7	59.4	79.7
S.D.	6.6	17.4	8.1	6.3	19.5	9.0
1984 Mean	40.3	70.5	86.5	37.9	68.4	63.4
S.D.	4.5	14.9	7.6	6.1	15.4	12.2
"t" Value	2.80	0.27	0.82	0.60	2.20	4.78
Sig. Level	$p < 0.01$	n.s.	n.s.	n.s.	$p < 0.05$	$p < 0.001$

*Maximum scores possible in the respective tests were arithmetic -50, reading -90, practical test -100.

It is clear that in both centres where fitting and machining apprentices were tested, the level of performance in cognitive skills had, if anything, increased in arithmetic at centre A and in reading at centre B. However, in centre B a big drop in practical skills test performance was noted. Training centre personnel interviewed considered that attitudinal factors were operative within this apprentice group and this issue is taken up elsewhere in this report. (See pp. 71-72.) Mean practical test scores in centre A were slightly (but not statistically significantly) lower in 1984.

In 1983, arithmetic and reading test scores did not correlate with end-of-year practical test scores. For training centres A and B above, in 1984 the product moment correlation coefficients are indicated by Table 14 which follows.

TABLE 14

1984 PRODUCT MOMENT CORRELATION COEFFICIENTS
AT TWO MAJOR FITTING AND MACHINING TRAINING CENTRES
ON SCORES OBTAINED IN ARITHMETIC, READING AND
MODULE 1-8 PRACTICAL TEST

	Reading/ Arith	Arith/ Prac Test	Reading/ Prac Test
Training Centre A	0.28	0.04	-0.004
Training Centre B	0.44**	0.39*	0.15

* $p < 0.02$ ** $p < 0.01$

On the 1984 results, no significant correlations were found at training centre A between the various pairs of scores. However, at training centre B there were significant correlations between arithmetic and reading (similar to the general result in 1983) and between arithmetic and the practical test (no correlation found in 1983). No correlation was found between reading and practical test scores - a similar result to that found for the general group in 1983.

Scatter plots of the results from which the product moment correlations in Table 14 above were calculated are given in the following Figures 1-6. Positions of points denoting apprentices scores are given by asterisks (*). Because of procedures within the computer program used to produce these graphs, the regression line (i.e. "predictor" line) for each pair of score sets is denoted by "R's". Question marks (?) on the figures indicate "collisions" between asterisks and "R's".

FIGURE 1

SCATTER PLOT TRAINING CENTRE A (1984)

ARITHMETIC (Up) V READING (Across)
r (reading, arith) = 0.28 (n.s.)

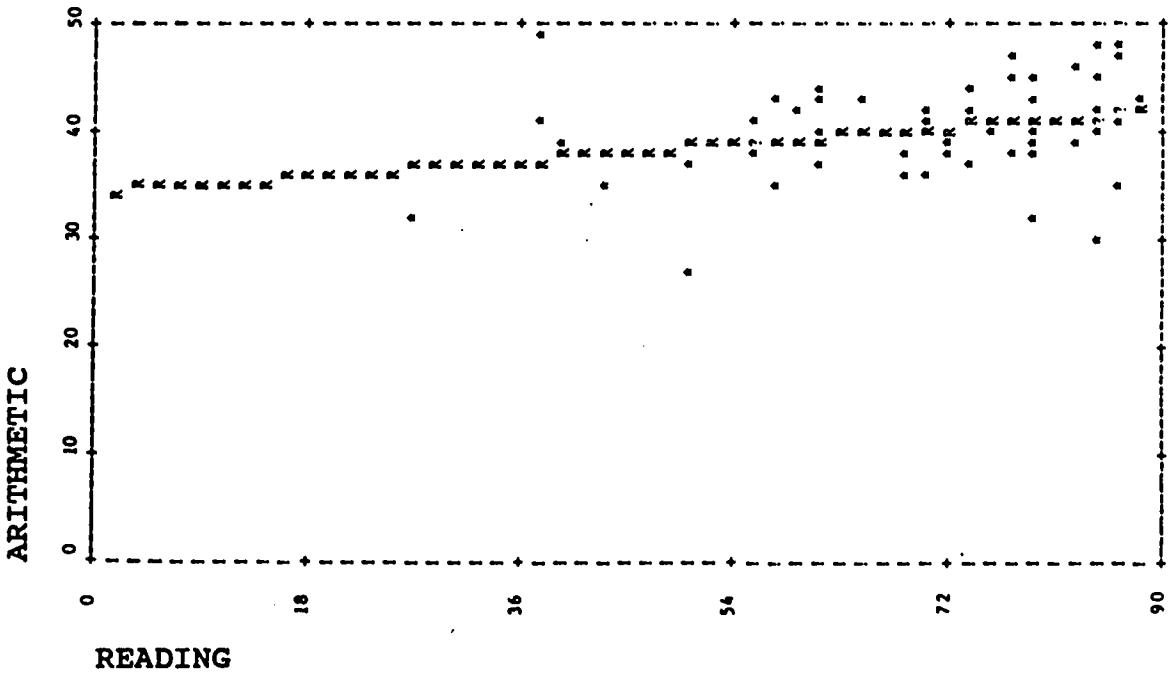


FIGURE 2

SCATTER PLOT TRAINING CENTRE B (1984)

ARITHMETIC (Up) V READING (Across)
r (reading, arith) = 0.44 (p <0.01)

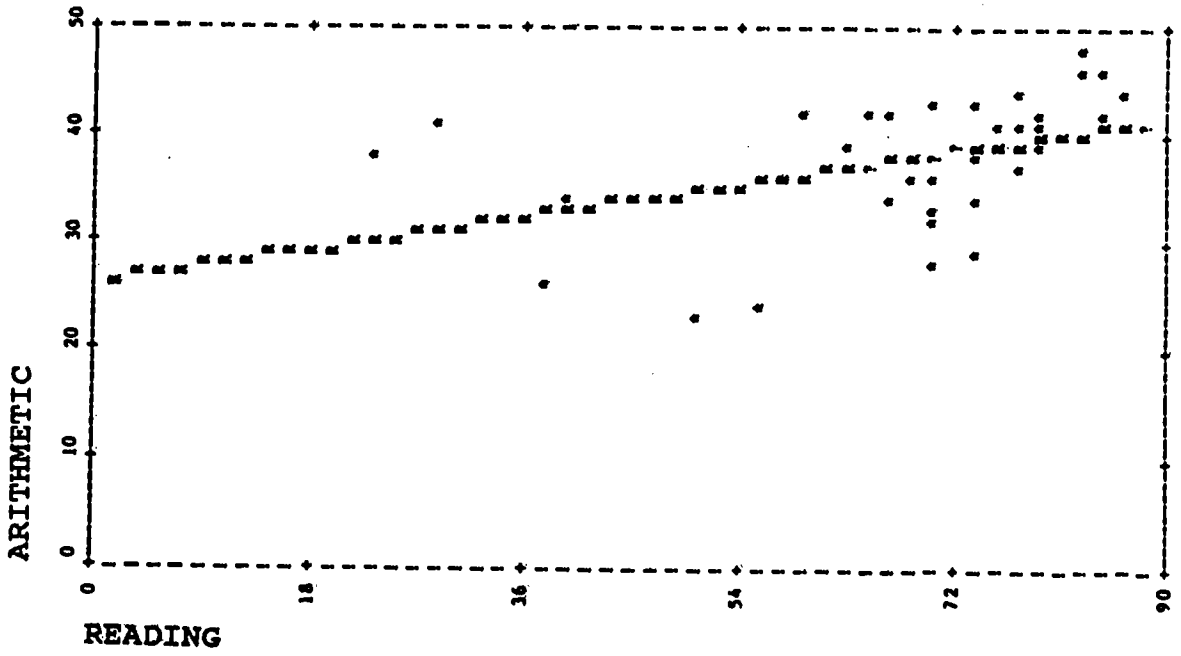


FIGURE 3

SCATTER PLOT TRAINING CENTRE A (1984)

PRACTICAL TEST (Up) V ARITHMETIC (Across)
r (arith, prac) = 0.04 (n.s.)

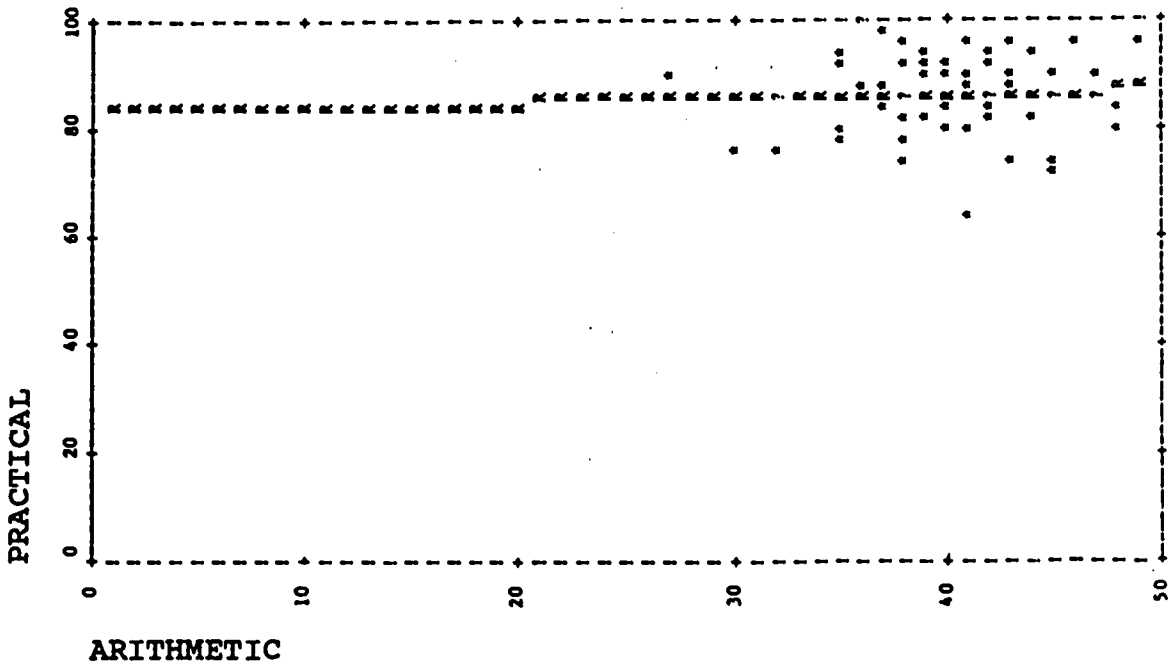


FIGURE 4

SCATTER PLOT TRAINING CENTRE B (1984)

PRACTICAL TEST (Up) V ARITHMETIC (Across)
r (arith, prac) = 0.39 ($p < 0.02$)

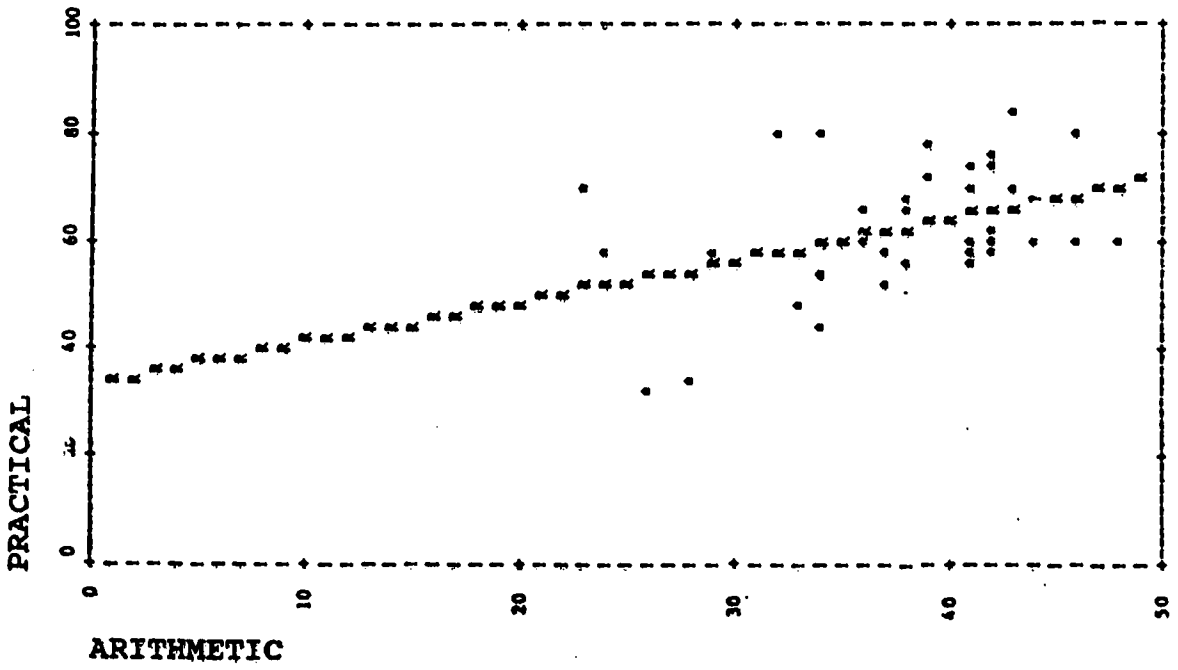


FIGURE 5

SCATTER PLOT TRAINING CENTRE A (1984)

PRACTICAL TEST (Up) V READING (Across)
r (reading, prac) = -0.004 (n.s.)

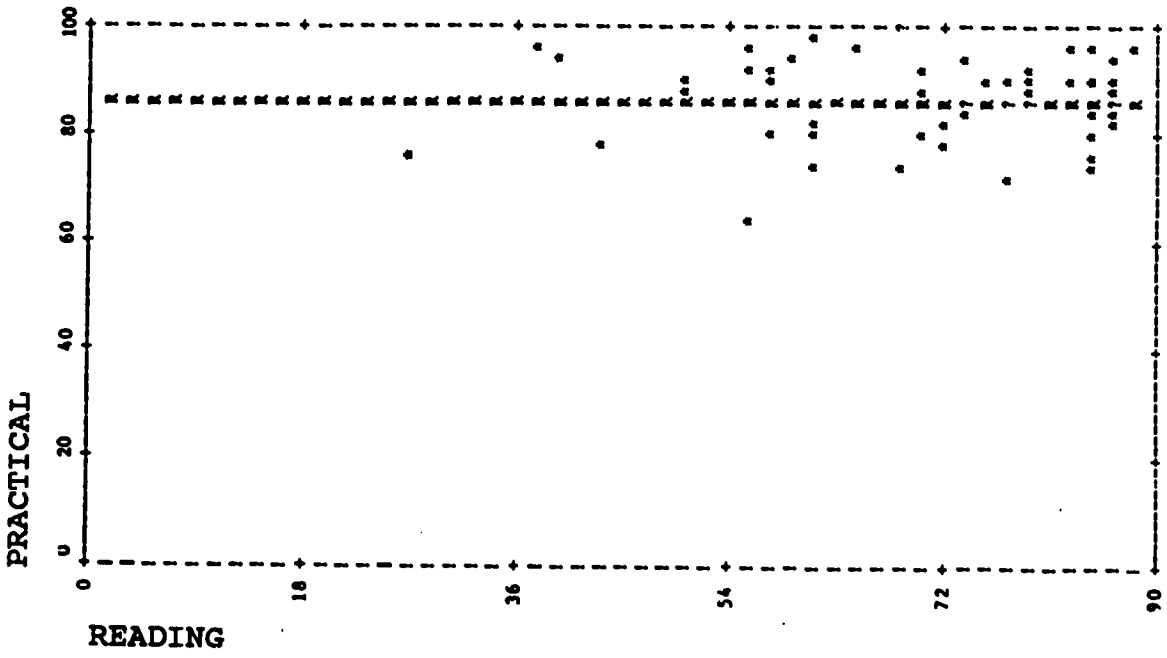
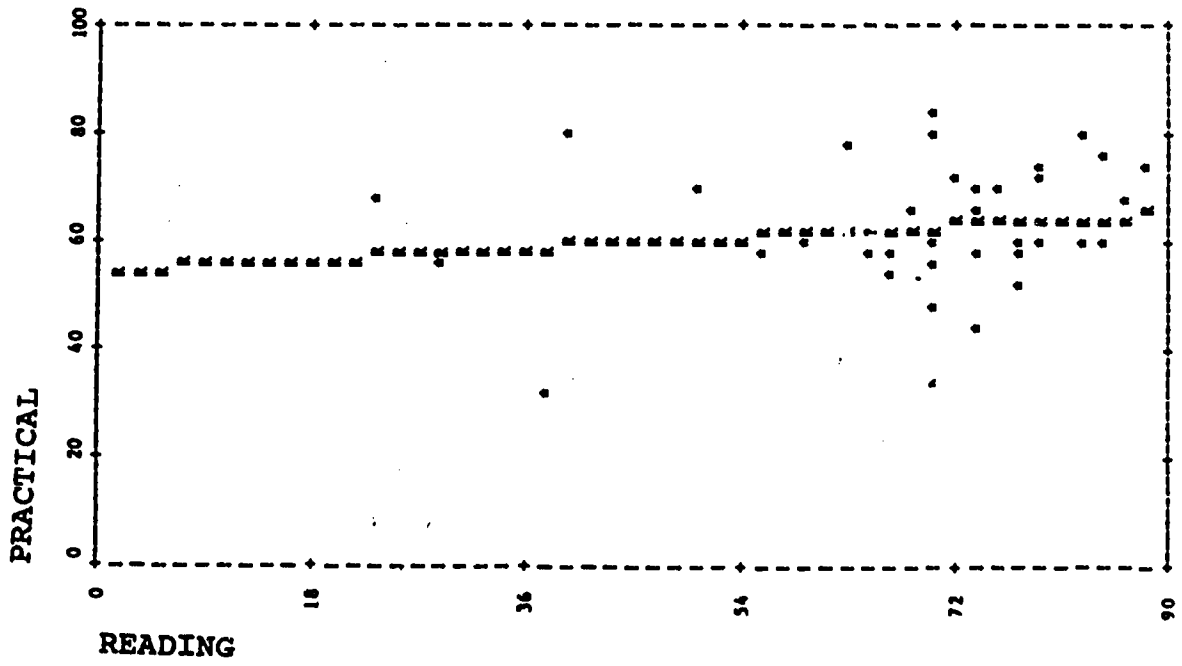


FIGURE 6

SCATTER PLOT TRAINING CENTRE B (1984)

PRACTICAL TEST (Up) V READING (Across)
r (reading, prac) = 0.15 (n.s.)



The scatter plots indicate why, in most cases, there is no correlation between pairs of scores.

At centre A, the regression line has practically zero gradient in each case. The points are widely scattered on each plot. It is impossible to predict scores between the measures, e.g. a high/low arithmetic or reading score does not predict high/low practical test score.

At centre B, the plots show upward trends on both the arithmetic/reading and practical test/arithmetic plots - the cases where low but significant correlations exist (i.e. high/low scores predict high/low scores). This is the only instance where a significant positive relationship has been found between practical test scores and arithmetic scores. On the evidence available, it is difficult to determine the reason for this. One suggestion offered linked this atypical result with attitudinal factors operative with this training centre group, which are discussed elsewhere in this report. (See pp. 71-72.) The points are still rather scattered. No trend is shown by the practical test/reading plot for centre B.

This analysis of apprentices' performances at these two centres appears to reveal a similar type of behaviour to that found last year. Cognitive test scores were found in 1983 to be unreliable predictors of practical test scores. The scatter plots on a sample of approximately 100 apprentices in 1984 tend to confirm the researchers' 1983 findings and give some justification to their decision not to mass test all fitting and machining apprentices involved in the replication study.

4.12 Electrical 1984 apprentice intake distribution

A sample of 182 first year electrical apprentices from six TAFE colleges was involved in the study of the 1984 intake. The distribution of the electrical apprentices within the colleges and within the training modes used is shown in Table 15.

TABLE 15

DISTRIBUTION OF ELECTRICAL APPRENTICES ATTACHED TO THE TAFE COLLEGES INVOLVED IN THE STUDY

College	Total Appr Invol	Trg Centre	On-the-job	Trg Centre Accel	Trg Centre Non-accel	On-the-job Non-accel
C'wood	34	26	8	-	26	8
F'ston	16	5	11	-	5	11
Gordon	46	29	17	-	29	17
Newport	44	35	9	-	35	9
RMIT	10	6	4	6	-	4
Yallourn	32	25	7	-	25	7
Totals	182	126	56	6	120	56

The RMIT group used the old electrical syllabus and were able to accelerate their training centre apprentices. Other TAFE colleges had adopted the new electrical syllabus and were unable to accelerate their electrical apprentices. (See Section 3.7 for explanation.)

Eight companies or authorities conducting training centres for first year electrical apprentices were involved in the study. The following table (16) indicates the distribution of electrical apprentices within the training centres. Hosting is far less prevalent in the electrical trade than in fitting and machining. Only one small group of electrical apprentices were accelerated.

TABLE 16

DISTRIBUTION OF ELECTRICAL APPRENTICES WITHIN TRAINING CENTRES

Training Centres	Total App	Own App	Hosted App	Accel	Non-accel	TAFE Coll Used
Ford	24	24	-	-	24	Gordon
Alcoa	5	5	-	-	5	Gordon
MATEC (GMH)	26	20	6	-	26	C'wood
Aust Post	6	6	-	6	-	RMIT
SEC	25	25	-	-	25	Yall'n
Lysaght	5	4	1	-	5	F'ston
V Line	34	34	-	-	34	N'port
F'scray Amm Fact	1	-	1	-	1	N'port
Totals	126	118	8	6	120	

4.13 Cognitive abilities of electrical apprentices

In the study of the 1983 electrical apprentice intake, it was found that there were statistically significant differences between training centre apprentices and on-the-job apprentices and a correlation between practical test scores and scores on entry-level arithmetic and reading tests. For this reason, it was decided to administer arithmetic and reading tests to as many of the 1984 electrical apprentice intake group as possible. Ninety-one training centre apprentices and 35 on-the-job apprentices were given arithmetic and reading tests. Arithmetic and reading tests were given at mutually convenient times during the year.

Also, all of the above 126 electrical apprentices were tested at the end of 1984 using the practical skills test. The tests used were the same as those used for the 1983 intake group. The practical skills test was done at the end of the year, either in late October or during November, at convenient times to the respective TAFE colleges. The results are shown in Table 17.

TABLE 17

MEAN SCORES OF ALL THE ELECTRICAL APPRENTICES WHO ATTEMPTED ARITHMETIC AND READING TESTS

Test	Trg Centre (n = 91)		On-the-job Apps (n = 35)		"t" Value (124 d.f.)	Sig Level
	Mean	S.D.	Mean	S.D.		
Arithmetic*	37.7	7.6	32.0	9.8	3.47	p < .001
Reading*	73.5	10.1	71.4	12.0	1.00	n.s.
Practical Skills*	74.5	10.3	73.3	13.1	0.53	n.s.

*Maximum scores possible in the tests were arithmetic -50; reading -90; practical skills -90.

The above table indicates that the difference between the mean scores of 5.7 in arithmetic was statistically significant in favour of the training centre electrical apprentices. A similar difference was found in the previous study.

No significant difference was evident between the two electrical groups discussed above on either the reading test or the end-of-year practical skills test scores. In the previous study, there was a significant difference in favour of the training centre group in reading but not on end-of-year practical skills scores.

Overall, it seems that the training centre electrical apprentices may be a little better on entry-level cognitive skills. However, this difference does not appear to work to their advantage on the end-of-year practical skills test.

Table 18, below, shows the product moment correlation coefficients between arithmetic, reading and end-of-year practical skills test scores for the groups of electrical apprentices discussed above.

TABLE 18

PRODUCT MOMENT CORRELATION COEFFICIENTS FOR 1984 ELECTRICAL APPRENTICES

(n = 126)

Test	Arithmetic	Reading
(i) During Year Arithmetic Reading	0.40 *	
(ii) End of Year Prac Test	0.19	0.17

* $p < 0.01$

A significant correlation was found to exist between arithmetic and reading scores for the electrical apprentice groups. Apprentices best at arithmetic were also best at reading.

End-of-year practical test scores did not correlate with either arithmetic or reading scores for the electrical apprentice groups.

It appears that all electrical apprentices can calculate and read well enough to cope with the skills tested on the end-of-year practical skills test. Differences between apprentices on practical test scores do not appear to be influenced by differences in arithmetic and reading skills.

4.14 Overall practical skills electrical test results

A total of 182 first year electrical apprentices received the end-of-year practical skills test.

Table 19, below, shows the results for the total electrical apprentice groups.

TABLE 19

MEAN SCORES OF ALL 1984 ELECTRICAL APPRENTICES TESTED ON PRACTICAL SKILLS* CONTAINED IN LEVEL ONE (FIRST YEAR) UNITS

Trg Centre Apps (n = 126)		On-the-job Apps (n = 56)		"t" Value (184 d.f.)	Sig Level
Mean	S.D.	Mean	S.D.		
74.6	10.3	74.1	12.0	0.27	n.s.

* Maximum score possible = 90

Overall Table 19, above, indicates that, on the range of practical skills tested, no significant difference in ability between the two groups was apparent. Even then, only qualified inferences can be drawn, in the light of the following. As one training centre manager commented: he would be happy if his apprentices were at least keeping pace with others on the skills tested, considering that considerable time was devoted to "other areas" (such as electronics) within the training centre program; his apprentices probably would not have had the same opportunity for wiring experience as many on-the-job apprentices.

4.15 TAFE college comparisons in electrical

Table 20, below, shows the test results within TAFE colleges for all electrical apprentices tested. (Actual identities of particular colleges are withheld - see explanation Section 4.8.)

TABLE 20

MEAN TEST SCORES OF 1984 FIRST YEAR ELECTRICAL APPRENTICES WITHIN TAFE COLLEGES

College	Arithmetic				Reading				Prac Test			
	Trg Cen		On-the-job		Trg Cen		On-the-job		Trg Cen		On-the-job	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
A	31.4	9.6	24.3	12.9	72.6	9.9	65.1	7.8	77.8	8.7	71.4	14.5
B	39.7	5.9	32.6	8.2	73.2	8.7	69.5	13.0	76.7	7.4	76.4	8.6
	($t = 2.67$, $p < .02$)											
C	41.0	4.2	33.6	9.5	84.6	3.9	74.7	14.3	89.0	0.7	81.0	10.6
D	-	-	-	-	-	-	-	-	69.2	7.8	65.8	7.2
E	-	-	-	-	-	-	-	-	76.0	7.9	77.7	8.1
F	40.3	4.2	35.3	6.6	72.9	11.1	74.0	10.0	68.3	10.3	62.6	11.8
	($t = 2.76$, $p < .001$)											
Overall	37.7	7.6	32.0	9.8	73.5	10.1	71.4	12.0	74.5	10.3	73.3	13.1
	($t = 3.47$, $p < .001$)											

In all TAFE colleges where arithmetic was tested, training centre electrical apprentices scored better than on-the-job electrical apprentices. In three out of four colleges where reading tests were given, training centre electrical apprentices scored better than on-the-job electrical apprentices.

College C displays big differences in favour of training centre electrical apprentices on both arithmetic (7.4) and reading (9.9), and a similar difference is also evident with respect to the practical test scores (8.0). In five out of the six TAFE colleges, training centre electrical apprentices scored higher than on-the-job electrical apprentices on the practical test. However, the only statistically significant results were in arithmetic, i.e. with respect to TAFE colleges B and F and also the overall arithmetic scores.

4.16 Training centre comparisons - electrical apprentices

Table 21, below, indicates the mean practical test results within particular electrical training centres. Identity of actual training centres is withheld.

TABLE 21

MEAN SCORES ELECTRICAL LEVEL ONE PRACTICAL TEST FOR TRAINING CENTRES WITH SUFFICIENT APPRENTICES INVOLVED IN THE STUDY TO FACILITATE MEANINGFUL COMPARISONS

Trg Centre	Accel Apps (old syllabus)		Non-accel Apps (new syllabus)	
	Mean	S.D.	Mean	S.D.
A	-	-	74.3	10.7
B	-	-	83.8	6.1
C	-	-	76.7	7.4
D	-	-	77.8	8.7
E	69.2	7.8	-	-
F	-	-	68.4	10.5
G	-	-	89.0	0.7

Overall Mean = 74.6 S.D. = 10.3
(All Training Centre Apprentices)

Overall Mean = 74.1 S.D. = 12.0
(All On-the-job Apprentices)

The scores in Table 21, above, indicate that there is a wide and statistically significant difference of practical test performance scores between the respective centres*. In particular, apprentices from training centre G exhibit a high level of mastery of the material tested. It is interesting to note that the one group of accelerated apprentices using the old syllabus performed relatively poorly, with the second lowest mean score. A discussion of the conditions and practices at some of the training centres that possibly influence apprentice performance follows in the next chapter.

*Using a one way analysis of variance, the F value obtained ($F_{6,118} = 6.59$) was significant at the $p < .001$ level.

4.17 Comparisons between 1983 and 1984 electrical apprentice intakes

Table 22, below, compares the practical test scores of the various electrical apprentice groups in 1983 and 1984.

TABLE 22

COMPARISON BETWEEN 1983 AND 1984 APPRENTICE GROUPS ON THE END-OF-YEAR LEVEL ONE PRACTICAL TEST. (SAME TEST GIVEN AT END OF EACH YEAR.)

Apprentice Intake		Trg Centre Apps	On-the-job Apps	"t" Value
1983	Mean	72.2	70.3	
	S.D.	11.0	10.1	0.95
	Number	59	52	(n.s.)
1984	Mean	74.6	74.1	
	S.D.	10.3	12.0	0.27
	Number	126	56	(n.s.)
	"t" Value	1.39	1.76	
		(n.s.)	(n.s.)	

The results in Table 22, above, indicate no statistically significant difference between the various groups compared although, overall, the mean scores of training centre apprentices were marginally better than on-the-job apprentices in each year and the 1984 mean scores were slightly better than those achieved in 1983 for both training centre apprentices and on-the-job apprentices. In general, the 1984 electrical apprentices did not seem to be in any way disadvantaged by the, now aborted, "new" syllabus - in fact, their overall learning level may have been raised fractionally by it.

4.18 Sheetmetal 1984 apprentice intake distribution

A sample of 79 first year sheetmetal apprentices from two TAFE colleges was involved in the study in 1984. The distribution of the apprentices withih the colleges and within the training modes is shown in Table 23.

TABLE 23

DISTRIBUTION OF SHEETMETAL APPRENTICES ATTACHED TO THE TAFE COLLEGES INVOLVED IN THE STUDY

College	Total Apprentices Involved	Training Centre	On-the-job
Richmond	61	14	47
RMIT	18	2	16
Totals	79	16	63

The 1983 Richmond sheetmetal apprentice intake was included in the previous study but the 1983 RMIT sheetmetal intake of apprentices was not.

The distribution of the 16 training centre sheetmetal apprentices with respect to employers is shown in Table 24. None of the sheetmetal training centre apprentices were hosted.

No accelerated programs were run, although the self-paced teaching methods adopted at the TAFE colleges facilitates faster progress for some apprentices. Night class attendance is optional.

TABLE 24

DISTRIBUTION OF SHEETMETAL APPRENTICES ATTACHED TO TRAINING CENTRES

Training Centre	Number of Apprentices	TAFE College Attended
Government Aircraft Factory (GAF)	8	Richmond
Trans Australian Airlines (TAA)	6	Richmond
Dockyards (Royal Australian Naval Dockyards)	2	RMIT
Total	16	

4.19 Training centre versus on-the-job sheetmetal apprentices

As discussed earlier (see Section 3.6) it was not possible to administer practical tests on an aggregate of modules to sheetmetal apprentices at the end of the first year. The TAFE colleges measure progress by an index termed the "work rate" which is defined as the average time taken per module during the TAFE college component of their apprenticeship. The assumption used is that better apprentices will, on average, take less time per module (e.g. an apprentice averaging five days per module is assumed by the college to be a better performer - more skilful, more productive, etc. - than an apprentice averaging seven days per module).

Table 25, below, gives mean values for number of modules completed and work rate calculated in the following ways - days per module and total hours per module. The latter index takes into account optional night class attendance. Some apprentices attended night classes more frequently than others.

TABLE 25

WORK RATES OF SHEETMETAL APPRENTICES

TAFE College Attended		No. of Modules	Overall Work Rate		Trg Centre Apprentices		On-the-job Apprentices	
			Days/ Module	Hrs/ Module	Days/ Module	Hrs/ Module	Days/ Module	Hrs/ Module
A	Mean	4.8	7.9	56.0	8.3	59.9	7.8	54.8
	S.D.	2.1	2.6	17.8	1.7	13.3	2.8	18.9
B	Mean	7.4	5.2	35.0	3.9	25.3	5.4	36.3
	S.D.	2.0	1.1	8.0	0.8	5.1	1.0	7.4
	"t" Value	4.69*	4.33*	4.83*	3.45*	3.56*	3.41*	3.81*

*In each case the differences between the means have high statistical significance ($p < .01$).

In the case of college A, the product moment correlation coefficent between days/module and hours/module for all students was 0.97, while for college B the correlation was 0.94. This indicates that evening class attendance has virtually no effect on overall work rate of the apprentices who seem to be using the optional extra time to catch up rather than race ahead. Evidence suggests that the days/module index is a relatively accurate work-rate figure in both colleges.

According to information supplied to the project observer in sheetmetal, John Holley, both TAFE colleges teach the same syllabus, using similar self-paced instructional methods. Yet, it is clearly evident in Table 25 that apprentices at college B proceed through modules more rapidly than apprentices at college A. Overall, the mean number of modules completed during first year by college B apprentices is 7.4 compared with 4.8 by college A apprentices.

This difference may be explained by the apparently different approaches to learning between the two colleges. College B appears to be a lot more directive in style, while the other tends to place more responsibility on the apprentices and be less directive. It is evident that the more directive approach used at college B produces a higher work rate.

Within college A, training centre apprentices work at a slightly slower rate than on-the-job apprentices, but the difference is not statistically significant. An influential factor is that training centre apprentices are from the aircraft industry which demands very accurate work, and the apprentices are required to chase small tolerances. In this case "fast" is not always "best".

The training centre apprentices at college B were among the fastest workers. However, the small number involved does not provide enough evidence to conclusively favour the training centre approach against on-the-job training.

In general, the data obtained and analysed seem to indicate greater differences between TAFE colleges than between training centre and on-the-job training modes. However, the issue is still clouded by the method of measuring performance. For research purposes, the "work rate" measure used lacks sufficient precision and makes the task of comparison between training approaches and related issues extremely difficult. Effective comparison could, perhaps, be facilitated by more discriminative performance measures if they were able to be applied.

4.20 Comparison between 1983 and 1984 results in sheetmetal

Within the TAFE college that participated for both the 1983 and 1984 sheetmetal apprentice intakes, the findings are fairly consistent. On-the-job apprentices showed higher mean work rate figures than training centre apprentices in both years. Though the sample observed in 1983 was much smaller than the 1984 one, nevertheless, the trend was similar. An influential factor is that in 1983, the training centre apprentices were attached to the aircraft industry which consistently reduces work rate, as discussed above. Table 26 summarises the key results for the TAFE college discussed. No statistically significant difference emerged between the results for each year.

TABLE 26

COMPARISON BETWEEN 1983 AND 1984 SHEETMETAL APPRENTICE WORK RATES (DAYS PER MODULE) AT A PARTICULAR TAFE COLLEGE

Apprentice Intake		Trg Centre Apps	On-the-job Apps	All Apps
1983	Mean	9.8	6.8	7.4
	S.D.	3.1	1.5	1.8
	Number	5	21	26
1984	Mean	8.3	7.8	7.9
	S.D.	1.7	2.8	2.6
	Number	14	47	61
	"t" Value	1.37 (n.s.)	1.59 (n.s.)	0.82 (n.s.)

4.21 Motor mechanics apprentices

Valid comparison of training centre training methods with on-the-job training, in terms of performance measures, was not possible for the 1984 apprentice intake in the motor mechanic trade. Two TAFE colleges, Newport and Richmond, supplied data on the number of modules completed by apprentices and number of days attended. However, the following reasons render statistical analysis and interpretation of the data purposeless.

(i) All training centre apprentices were accelerated (they spent two days per week at TAFE college).

(ii) All non-training centre apprentices were non-accelerated (attended TAFE college one day per week).

(iii) Non-training centre apprentices started their TAFE college programs over a wide variety of dates and periods during the year (facilitated, of course, by the self-paced, individualised instructional methods used).

The data collected may be useful in the longer term, such as in the proposed longitudinal study of apprenticeship training methods. However, at this stage, there are too many gaps, program variables and inconsistencies to justify detailed statistical analysis. In the next chapter, a qualitative discussion is included, based on observational data collected by a project observer, comparing the two training centres involved with motor mechanics apprentices attending Richmond and Newport TAFE colleges.

5. A PROFILE OF SOME TRAINING CENTRES AND THEIR PROGRAMS

5.1 Introduction

In this project, contact has been established with many training centres. Although the category "training centre apprentice" has been regarded somewhat as an aggregate of apprentices in each of the four trades involved, it would be wrong to assume that all training centres in each trade are equal. Certainly, some training facilities and methods are similar across the centres and there is much evidence of a degree of sharing of ideas and approaches to training between instructors from the different centres.

Instructors from the various centres train at common institutions (i.e. Hawthorn Institute of Education and Melbourne Training Centre). They are usually members of the Apprentice Training Officers Association which exists, among other things, for their mutual professional benefit, and visits are made to one another's centres

Nevertheless, clear program differences do exist, personnel and company policies differ and, as a consequence, characteristic influences can be assumed to affect apprentice development within the respective training centres.

To attempt to understand training centres better, in the light of the statistical findings reported in the last chapter, a team of project observers, Fred Calhoun, John Holley and George Jones, assisted the project researchers, Bob Hayes and John O'Sullivan to gather data from a selection of the major training centres involved, using a specially compiled checklist of items (see attachment 5). The rest of this chapter is a series of small case studies, based on evidence gathered and impressions of the respective observers concerning training centre influence within the overall training process. Again, the actual identity of particular centres is withheld as we will attempt to point out what we feel to be both the strengths and weaknesses when the latter are thought to exist. In addition, some of the information developed for the observers was confidential and, thus, some anonymity and discretion must necessarily be preserved.

5.2 Centre A - fitting and machining

Centre A is a major metropolitan private enterprise centre training the company's own as well as a number of hosted apprentices. In recent years, hosted apprentices have comprised by far the greater number.

The apprentice/instructional staff ratio is approximately seven to one, and an adequate number of non-teaching support staff is employed. Personnel consultants are used in the staff selection process. Instructional staff are given training (Hawthorn Institute of Education Vocational Training Instructors' courses and Melbourne Training Centre courses as well as internal training and an induction program).

The company selects its own apprentices using a comprehensive selection procedure involving cognitive and affective testing, medical testing, short-listing and interviewing. Selected apprentices are given a tour of the training centre and prior to employment are given 14 days to reach a decision regarding acceptance of a job offer. In general, hosted apprentices are those sent by the collection of small employers patronising the training centre, and they are accepted following satisfactory interview, and if training centre accommodation is available. In one case, the hosted employer allows the training centre to select the firm's apprentices using the procedures outlined above. Full control of the hosted apprentices is given to training centre personnel who maintain liaison with the employing company by periodic visits (three per year by company representative) and rating reports (three per year). Contact is maintained with the parents of hosted apprentices and at the end of the probation period results are given. Very tight discipline is maintained by the training centre. On day one at the centre, apprentices are told exactly what is expected of them. For their part, the instructors are required to set a good example and maintain good standards of behaviour and performance.

The training centre usually sends its apprentices to one of three TAFE colleges with whom it maintains close liaison. The patterns of liaison and relationships vary between the centre and the respective TAFE colleges. The degree of program sharing and collaboration appears to be higher with one TAFE college than the other two. Two way visits between the centre and the colleges are conducted each term. All apprentices are accelerated and attend the training centre four days per week and TAFE college one day per week. Most of the practical work (and much of the theory) is done at the training centre, and this enables the apprentices to complete 16 modules in the year.

The training centre provides the colleges with a needs-based supplementary program which the TAFE colleges apparently teach. There is not a great deal of mutual co-operation with respect to teaching functions, although an end of year practical test is supervised in the centre by college staff, and one TAFE college does the theory testing at the centre.

The training centre is well equipped in both its workshops and teaching/instruction areas, with a full complement of essential equipment, machines, teaching aids and resources.

Theory teaching is done in what appears to be a fairly traditional classroom approach (using chalkboard, OHP, models, films, video) supplemented by assignments using self-paced slide-tape programs and, if necessary, a computer for remedial work. Apprentices are given a list of requisite objectives to be achieved on each subject.

Within the workshops, apprentices are given responsibility roles on a rotation basis. One is appointed leading hand for the day. They all participate in a National Safety Council safety program. A suggestion scheme operates, for which a

prize is given. Apprentices look after the canteen and toilet area on a roster basis.

Apprentices at this training centre do no live work. Practical work is done on models intended to develop the required skills at each stage of the program. Work on each model - for which there is no time limit - is marked and the model must be repeated if it is scored at less than 65 per cent. Three, timed skill-tests (simulating Craft Module 20 test conditions) are given during the year. The centre sees these as important in the development of apprentices. Test papers with performance details and deficiencies noted are returned to the apprentices after correction.

With respect to personal and social needs, a senior staff member generally looks after apprentice counselling, and an industrial chaplain visits twice per week. A personal record card is kept on each apprentice. Recreational facilities are limited - at present there is a lack of suitable space which may be met with a move to new premises in the near future - and no social or club facilities which could involve the apprentices are operating within the firm.

In general, the training centre seems very well organised and run, with comprehensively prepared program documents (syllabus, teaching notes, policy statements), and ample provision for staff initiative and innovation.

Instructor performance is evaluated in-house and sometimes video is used for the purpose of instructor performance feedback and evaluation, so parts of a lesson can be discussed and reviewed.

The annual budget for the centre is estimated at about $1 mil. with the funds coming from fees for services within the total group of companies to which the centre belongs, and also government subsidies under the rebate system.

Instructional staff interviewed indicated very positive attitudes about the value of the training centre method of apprentice training, the way in which this particular centre was operating and their respective roles within the scheme. Only one common criticism emerged regarding the centre - space was insufficient, and all instructors anticipated that the new move would overcome this.

Apprentices interviewed at the centre were also generally very positive about the training they were currently receiving and gave the general impression that this particular method was efficient, well structured and challenging; it developed responsibility and provided opportunity for more advanced training. However, apprentices surveyed toward the end of 1984 made some specific criticisms of the centre and its methods. Some did not like the unproductive nature of the practical tasks and would have preferred some opportunity for live work. Some regarded the centre as being too much like "school" and resented being treated like children. Comment was made on relationships with some instructors who were judged to have two sets of rules - a set for those they liked and a set for those they

did not like. Some apprentices said they would have preferred the centre to be more "like work". A recurring comment was: "more work on machines and in the workshop, and less on theory". Some were critical of the training centre-TAFE college relationship in the scheme and commented on what they perceived as unnecessary duplication of work - particularly with respect to theory. The length of theory sessions did not appeal to some - they would have preferred shorter sessions (apparently their concentration spans were taxed). Some apprentices seemed to find the accelerated program too rushed for them personally. Hosted apprentices tended to be a little more critical of the training scheme than the company's own apprentices who, in general, liked what they were getting.

Regarding this training centre's results, overall, this centre's apprentices, both own and hosted, were among the top performers on the end-of-year practical test run as part of this study.

5.3 Centre B - various trades

This training centre caters for apprentices in three trades - fitting and machining, electrical and motor mechanics - in the one large building. The workshop and practical areas for each trade are divided off. The classroom area is shared by each of the trades. Overall, in recent years, the number of own and hosted first year apprentices undergoing training in the centre has declined markedly. At the present time, the majority of apprentices in fitting and machining and motor mechanics are hosted. Overall, it appears that the facilities available could cater for many more apprentices than are currently being trained.

The annual budget for the centre is well in excess of $1 mil., and funds derive from sources within the company, some reimbursement from host training fees, and CRAFT subsidies. In general, the money provided is "enough to survive", but it does not allow for large scale modernisation and innovation.

The centre seems to be adequately staffed with instructional and administrative and support personnel. Instructional staff are usually ex-tradesmen, some of whom have been the company's own apprentices. They are selected for work in the training centre on the basis of reports of their competence, attitudes, interests and suitability as instructors. Instructors attend the Vocational Training Instructors' courses at Hawthorn Institute of Education. Internal courses are also conducted to prepare new instructors for the tasks of supervision, assessment and report writing.

The procedure used to select the company's own apprentices is a notable feature. Selection is initially through the Commonwealth Employment Service (CES). The steps used are listed in order:

(a) CES sends out apprentice requirements of the company to TAFE colleges and technical, high and private schools;

(b) potential applicants write (in own handwriting) to CES for an application form;

(c) CES sends an application form to potential applicants;

(d) applicants send completed application forms to CES;

(e) CES sorts and ranks the applicants within the trades required (CES may eliminate some applicants);

(f) CES tests the listed applicants - several hundred - using a four-hour battery of ACER tests;

(g) following the tests, applicants are chosen for interview (shortlisted), by the company and final selection is made on the basis of test scores, appearance and suitability, as assessed at the company interview.

Approximately 10 per cent of the tested applicants eventually succeed in getting an apprenticeship with the company.

The company concerned has no say in the selection of hosted apprentices, accepting any that the host firm selects and sends. (Instructors indicated they would like some say in hosted apprentices' selection.)

In the training centre, tight discipline is generally maintained. Apprentices are given very little latitude. Troublesome behaviour is nipped in the bud. If necessary, a report on a transgressor is filled in. This is the first step in a dismissal procedure.

Regular feedback is provided to host employers regarding their apprentices' performance. (This is in the form of a quarterly rating sheet. Employers are invited to make contact if further information is required.)

The training centre does not have a formal pastoral care program operating for its apprentices. The supervisor in charge is expected to fulfil the counselling role and deal with personal and home problems. The company has a social club but apprentices generally do not participate due to its being located at the main plant several kilometres away from the centre.

Apprentices, in each of the three trades, are sent by the company to selected TAFE colleges for each trade. Three TAFE colleges are used - two for fitting and machining, two for motor mechanics and one for electrical.

To the project observers it appeared that relationships between the training centre and the respective colleges varied somewhat. In particular trades, and with particular colleges, close co-operation and good liaison were evident.

Certainly this collaboration helped relationships and was a positive factor with respect to apprentice performances and attitudes.

Apprentices interviewed appeared to be well aware when particular training centre-TAFE college partnerships were working effectively. They were also highly critical when program gaps and overlaps caused them problems.

The general view of the project observers was that this training centre did not liaise and co-operate with TAFE colleges as much as other centres observed as part of the project.

External consultants have been employed by the training centre to write detailed training syllabuses and work programs in both motor mechanics and electrical.

An accelerated training program was undertaken by fitting and machining and motor mechanics first year apprentices in 1984. This was facilitated by them attending TAFE colleges two days per week. All module work was done and tested within the TAFE colleges. In the training centre, apprentices generally worked on supplementary and company specific tasks from within the centre's syllabus for each trade.

Electrical apprentices were not accelerated in 1984 due to the introduction of the new TAFE syllabus - they attended the training centre four days per week and one particular TAFE college one day per week. In the previous years, electrical apprentices were accelerated, facilitated by compulsory four hours night school attendance on the day they normally attended the TAFE college.

Performances of fitting and machining apprentices on the end-of-year practical skills test indicated variations between the two TAFE colleges used. Observers' impressions were that one college applied much tighter teaching and testing procedures than the other. On the evidence gathered from apprentice interviews, the end-of-year test was taken much more seriously in one college than the other. Some apprentices who displayed similar levels of skill competencies within the training centre performed at markedly different levels on the practical skills test. Observers suggested that some inconsistencies could be attributed to unsatisfactory apprentice-instructor relationships at one of the colleges.

Observers indicated that fitting and machining and electrical workshops and practical areas in the training centre are generally well organised and maintained. Fitting and machining facilities and equipment are suitable for basic training (there is the possibility of installation of a numerical control machine in the future). The electrical practical workshop is functional for basic training and is being developed with more modern equipment (e.g. electronic) in line with company-specific needs over and above basic level-one electrical apprentice training.

Fitting and machining instructional staff interviewed expressed a high level of satisfaction with the training centre work - they liked the work, saw opportunity for advancement and personal development, shared in decision-making and program formulation, enjoyed working with apprentices and having an active role in their development, and approved of the training methods used. Some would like better equipment. One would like to see more communication with other similar centres. Similar sentiments were expressed regarding the above by electrical staff interviewed.

Electrical instructors indicated satisfaction that the training centre apprentices performed as well as on-the-job apprentices in the end-of-year practical skills test. This was despite the likelihood that their apprentices had not had as much practice as on-the-job apprentices in basic wiring, having been given more advanced electronic work. Instructors were pleased that their apprentices had at least kept up in the basic skill area.

The observer in motor mechanics considered the teaching area to be barely suitable for the type of training. At present, there is a heavy emphasis on theory, and the existing facilities tend to limit the amount of practical training possible with insufficient bench space and hand tools. An "open plan", combined theory/practical work area has been set up. The instructional mode is self-paced programs using workshop manuals as reference materials. The instructors interviewed expressed reservations about the existing programs and the self-paced learning methods used.

To the observer there was little evidence of well-prepared teaching aids, recent program development or program review in progress. And his comments regarding apprentices' work habits were: "on the surface the apprentices appeared to be working reasonably well but at close examination the work being produced was of a very small amount"; "the apprentices have mastered the art of appearing busy on their written work"; "those apprentices who were involved in practical tasks were more productive and highly motivated". He was critical of the inefficient correction procedures adopted and the time wasted by apprentices waiting for correction of written work before being permitted to proceed to new tasks. The apprentices interviewed indicated they do not like the amount of theory and the hassles and time involved in getting their work corrected.

Such observations indicate that a close examination of the centre's motor mechanics teaching area may be beneficial as several problems associated with the way it is currently operating appear to exist.

5.4 Centre C - various trades

This training centre, run by a State government instrumentality, provides training in several trades including fitting and machining and electrical.

It caters for comparatively large numbers of apprentices with 32 currently in fitting and machining (25 in 1984) and 53 in electrical (37 in 1984). None of the apprentices are hosted.

Apprentices are selected following media advertisement, using a comprehensive testing and interview procedure. The number of applicants always far exceeds the number of positions available. Instructional staff have no say in the selection of apprentices. (Some instructors said that they would like to participate; others said their job was to train whoever walked in the door, and they preferred not to be involved.) Apprentices have a three-month probationary period which may be extended, if necessary. Apprentices' progress and attitudes are recorded on a comprehensive report sheet, but the apprenticeships of problem or poorly performing apprentices are never terminated, no matter what the instructional staff may report.

Initially, apprentices undergo a comprehensive induction program, and the social, recreational, friendly society welfare and credit facilities of the instrumentality are explained and offered to them. Also, in the program, a strong emphasis is placed on safety on-the-job. Safety is also the subject of an annual seminar which all apprentices attend.

The training program for both fitting and machining and electrical apprentice groups is not accelerated, and a day release pattern (one day at TAFE college, four days at the training centre) is used. There is a variation in this pattern for a group of fitting and machining and electrical apprentices in a technician stream. Their normal TAFE college work is supplemented by extra TAFE college attendance, four hours a day and two hours at night. Such supplementary work is offered to selected apprentices, and they may accept or reject it.

Apprentices from both fitting and machining and electrical trades attend the same nearby TAFE college. Although mutual feedback and liaison procedures regarding apprentice performance and development appear to be well established between the centre and the college, no direct training-program interaction and co-operation have been developed. The respective staffs have mutual access but, with respect to teaching, each place "does its own thing". Instructors claim that duplication of TAFE college work at the centre is avoided, except as reinforcement.

During TAFE college vacation breaks, supplementary programs are run with visits by personnel (e.g. police, finance advisers, safety officers) who give talks on topics such as safety, drugs, alcohol and money management. Such programs are well-established, having been run for many years. All apprentices complete the basic St. John first-aid course, and they can opt to proceed to more advanced levels.

The authority currently employs four instructors in fitting and machining, while electrical has two instructional staff. Instructors are recruited from within the instrumentality by

internal advertisement and in some cases by invitation. The criteria used are possession of suitable trade skills and level of interest in the development of apprentices. Internal training and courses are run for instructional staff and most have completed short trainer training courses at the Melbourne Training Centre.

According to the project observers, fitting and machining practical facilities are good, with a large well equipped workshop. Present machinery is adequate with new machines on order. Classroom facilities, though, are poor. A small classroom (part of a recently acquired relocatable building), shared with the electrical trade, is at present stark and inadequate. However, the emphasis in fitting and machining is on the practical side and theory is generally handled in small groups in the workshop. In the practical workshop, fitting and machining apprentices work on a large number of graded models, proceeding at their own rate. No marks are awarded. Work not up to standard is repeated. Occasional live work is provided.

In the observers' view, electrical practical facilities are poor, having been affected by a series of shifts. The practical equipment has been moved and re-installed four times and has consequently deteriorated in both appearance and effectivenss. Part of the practical work is conducted in a small corner room, previously a locker room, of the fitting and machining workshop. At the time of writing an industrial dispute had halted cleaning, and the room was both dirty and untidy. Some electrical practical work is also done in a part of the previously mentioned relocatable building. Electrical theory is taught in the small instructional room shared with fitting and machining. For teaching theory an array of audiovisual teaching aids is available. However, the main teaching emphasis is on practical work. No marks are awarded. Poor work is repeated. Most work is on models with some production work fed in from outside. A detailed training manual is used with a series of nineteen exercises. Apprentices can contribute to the development of the training program by pursuing individual projects and making suggestions. Suitable ideas can be incorporated in the program for other apprentices to attempt. The avowed "philosophy" is to develop each apprentice to his maximum potential.

As well as sharing some facilities, electrical apprentices do the fitting component of their work with the fitting and machining instructors. It was suggested that this arrangement was "imposed from outside" some time ago when the continuation of the training centre was under threat. While the centre survived, some rationalisation of operations and procedures were implemented, leaving at least some of the training staff unhappy with certain changes that occurred.

Overall, fitting and machining and electrical instructors, as well as apprentices, appear to keep apart as much as possible, giving rise to communications problems between the two groups.

Other problems seem to result from the fact that the general apprentice supervisor is located in the city, remote from the training and work situation of the apprentices and training staff. Although the instructional staff were rather guarded in their comments, observers gathered that some administration problems exist.

Fitting and machining instructors' views regarding the training centre approach were generally very positive. Two instructors claimed to really enjoy the work, but another saw it as "no great challenge - same thing day in day out". All considered that the training centre approach was, at present, the most suitable training method: "these days apprentices can't get the training they need on the job"; "essential source of skilled tradesmen"; "good idea"; "prepares apprentices for working in the 'shop'"; "can be used immediately as a skilled person"; "methods good - a lot of attention paid to skills"; "apprentices learn the correct methods - on-the-job trade methods are not always conducive to good production". One instructor indicated he would like to see more specific skills related to the establishment's direct concerns and methods included in the training program.

All fitting and machining apprentices interviewed were also very positive. They like the trade and the training methods: "better than a factory"; "good, starts with the basics - don't think factory training would be as good"; "get on well with the others"; "work together as a group"; "enjoying work, good trade"; "good, learning skills - precision work".

Electrical staff, on the other hand, expressed some strong misgivings about present training arrangements. They would like some say in apprentice selection ("however, present scheme seems to work"). They do not like the existing work conditions ("five locations - how do you divide your time?"). They do not like sharing the training of their apprentices with fitting and machining ("would like to be autonomous and a single identity - fitting situation is frustrating - hinders role of instruction - want to control our own - electrical apprentices don't need to be trained as toolmakers"). Above all, they do not like the moves: "too many moves and changes - upsets morale - conditions poor"; "a few years ago the training centre complex was to be closed down and staff were given the ultimatum 'plan or be planned' and 'knuckle under, do as you are told - your jobs are on the line'". There were clear indications of low staff morale.

Electrical apprentices, though, did not seem to be adversely affected. They seemed to have adapted to the current, relatively poor workshop and teaching conditions and appeared to work well at the assigned tasks. The common negative comment they expressed was regarding what they felt to be an over emphasis on fitting and machining: "the apprenticeship training should be based more on the electrical side rather than on the fitting and turning side".

Concerning apprentices' practical skills performance levels, compared with other training centres using non-accelerated

training methods, the fitting and machining apprentices performed significantly better on the practical skills test than similar apprentices from elsewhere and, in fact, their general standard of performance was comparable to that of accelerated training centre apprentices. This is probably attributable to the high standard of the training program and the good morale in fitting and machining. Electrical apprentices, however, performed well below the levels reached at other training centres on the practical skills test, which may be a reflection of the poor conditions currently existing for electrical training at this training centre.

5.5 Centre D - motor mechanics

This centre for training first year motor mechanics apprentices is provided by a major automotive importing firm apparently concerned with developing and maintaining sound levels of dealership support and customer satisfaction. It is expected that quality training provided for motor mechanics apprentices will be at least partly instrumental in achieving the company's objectives. Each year the company trains a small number of apprentices (in 1985 one of their own and 12 attached to dealerships).

The training centre switched to accelerated training with the 1984 intake. The accelerated program is achieved by TAFE college attendance two days per week in terms one and two and one day per week in term three. Day release is used.

There are two full-time instructors with part-time assistance, when required, from other qualified personnel. Instructional staff are selected from within the organisation and offered positions in the centre. Staff attend Vocational Training Instructors' courses at Hawthorn Institute of Education.

Apprentices are recruited following interview and on the basis of an ACER mechanical appreciation test. Periodic reports (three for the year) are submitted on each apprentice to employing dealers. Each apprentice keeps a comprehensive pocket log book of all work completed. It gives full details of an apprentice's training record (units completed, time spent on each unit, test details and examiners' comments) as well as details, in behaviourally expressed objective format, of each training unit (a total of 18, and the expected time for completion of each).

Apprentices are "cared" for by one member of the firm's staff who has been designated the job of helping with pastoral (personal) problems. Each apprentice is provided with a full personal tool kit and overalls as well as tickets to attend the motor show. No formal social club exists, but apprentices meet training centre and TAFE college instructors at a barbecue "get together".

The training centre maintains very close liaison with the single TAFE college that all apprentices attend. The respective syllabuses are complementary. The firm donates materials (cut away components, charts, etc.) to the TAFE college for teaching purposes.

According to the observer, facilities at this training centre are first rate. Everything necessary is available and well maintained. Only modern equipment is used. A variety of teaching and instructional methods are used, and the level of instruction is of a very high standard. In workshops, apprentices work under the supervision of an instructor who provides assistance as required. Regarding this, the observer's remarks were: "supervision of apprentices in the workshop was not obvious yet everybody was busy"; "motivation appears to be high due to the way apprentices are treated, the type of work given and the general environment"; "the apprentices are treated like humans and permitted to be involved in discussions regarding the training scheme"; "regular reviews of the program and the facilities are made and no one becomes complacent".

The training centre is also used for company product training and updating of skills and knowledge in line with company marketing policy.

The centre works to a budget provided by the firm. Money is available to adequately maintain the facilities and the training programs.

Both the apprentices and the staff interviewed were very positive and enthusiastic about the type of training provided within the existing environment. Staff satisfaction levels appear to be high, reflecting general administrative attitudes and company policy. The company and its associated dealerships have a very high retention rate, with apprentices remaining with the firm after completing their apprenticeship.

The overall view of the observer was that this centre could be used as a "model" for other training centres within the automotive trade and, possibly, other trades too.

5.6 Centre E - various trades

The training centre discussed here is run by a major transportation concern and provides off-the-job training for first year apprentices in a number of trades. The total number of apprentices at present in the centre is 44, one of whom is hosted. Of the 44 apprentices, six (all employed by the concern) are in sheetmetal. These six sheetmetal apprentices are involved in the present study.

Plans were that the training centre would become a major provider of host training. Despite a substantial amount of government development, the excellent training conditions, and extensive company promotion, hardly any local small employers have availed themselves of the hosting scheme.

To staff the training centre, personnel are selected from within the organisation. Instructors have attended instructor training courses either at Hawthorn Institute of Education or the Melbourne Training Centre.

Apprentices are now recruited by the company, using media advertisement. Previously, the organisation used the CES,

but it was not always successful in getting "the type of lad required" although the number of applicants always far exceeded the number of job vacancies.

Applicants are short listed, comprehensively tested - usually cognitive tests - and then interviewed. In interviews, it is an advantage for applicants to be able to demonstrate a particular interest (via hobbies, reading, activities, etc.) in matters associated with the form of transportation used by the company.

Within the centre, each apprentice is self-paced to a degree, that is, within the time span allocated. Additional skill work is provided for apprentices if time permits.

The training centre manager acts as a father figure and apprentices' counsellor for personal problems and difficulties (personal behaviour, drugs, ear-rings, girl friends, absences, family problems, lateness were items mentioned to the observer as having warranted discussion and/or action).

Disciplinary standards are maintained by the manager and the instructors. If necessary, a series of warnings is given - the third of which threatens the loss of job. A hosted apprentice may be sent back to his employer, and the centre may refuse to offer further training.

Apparently there is a very active apprentice social club organised by the apprentices themselves. Staff and apprentices make salary contributions. Activities include barbeques and snow trips.

At present the six sheetmetal apprentices attend one particular TAFE college where they do the general sheetmetal self-paced instructional course. No teaching collaboration appears to take place between the centre and the TAFE college, though the TAFE college does hand-deliver progress six monthly reports to the training centre. A block release attendance pattern is used, usually four weeks in the training centre followed by one week at the TAFE college. Evening class attendance is optional for any apprentices who fall behind. No apprentice appeared to use the evening classes for getting ahead.

Regarding apprentice assessment, within the centre the nature of the industry requires very tight tolerances with respect to measurement, detail and finish. As a result, it may appear that the training centre apprentices tend to work more carefully and slowly than the on-the-job apprentices in the TAFE college situation. Speed does not seem to be encouraged within the training centre. So this means that "work rate", as used in some instances (particularly within TAFE colleges) to measure apprentice competency, is inappropriate for these training centre apprentices.

The project observer's comments regarding the centre were as follow. The training facilities - workshop and instructional areas - may be classed as excellent. The training section has not long moved into its present premises

but the obvious potential is evident even at this stage. The major emphasis is on practical, hands on work, so not much time is given to formal-type classroom teaching. All equipment needed for instruction is adequate and properly maintained. Apprentice performance within the centre is closely monitored. A practical colour-coded progress chart is used indicating jobs done by each apprentice and shows job standards (started, finished, marked). It acts as a motivator for apprentices. Apprentices produce pieces of equipment and tools of trade, and the production must reach a 70 per cent or better standard. In general, the centre programs are highly developed with total skill packages provided for each of the trades at the centre. The training centre's facilities are presently under-utilised and would, obviously, accommodate many more apprentices.

Staff interviewed transmitted some concern about the industry to which they were attached and the directions in which it was moving. Staff numbers within the industry have rapidly contracted. Staff see the in-plant, off-the-job training method as offering training in modern technology and technological areas but still giving the apprentice a general basic training. They see off-the-job training as a service that they should provide to other firms and are concerned that firms have not responded to the hosting scheme. It was suggested that there had been some marketing problems with the host training scheme.

Apprentices interviewed generally expressed favourable comments regarding training they were receiving. They often admitted prior interest in the particular industry and spoke optimistically of their futures within the trade and with their employer. They gave the impression that they believed that they should be rewarded for hard work. They indicated appreciation of the structured program and tight administration of the training centre. The single hosted apprentice interviewed was a State assisted apprentice attached to a hospital. He liked the training centre conditions and the form of training given. However, he indicated extreme uncertainty about his future in his trade (fitting and machining) and with his employment prospects at the hospital.

In conclusion, this training centre appears to provide good quality training for small manageable groups who receive practically individualised attention in excellent conditions. The facilities are currently under-utilised and could accommodate much larger numbers. The centre has demonstrated its capacity to provide for its own apprentices over a period of many years. The opportunity now exists for large numbers of hosted apprentices to be trained. Unfortunately the response, to date, has been poor.

5.7 Centre F - fitting and machining

This major training centre is sponsored by the Australian Government. It provides training in the fitting and machining trade.

In recent years, the centre has become substantially a host apprentice trainer, due to a decline in the number of apprentices employed by the concern that operates it.

At present, 40 apprentices are being trained in the centre, 33 of whom are hosted. The centre has adequate space and equipment for 60 or more apprentices. So, apparently, it is operating well below full capacity.

Staffing is adequate, with several experienced and trained instructors who are backed-up by a large pool of relieving instructors.

Selection of the firm's own apprentices is per media advertisement and based on school report and interview. No tests are conducted. Hosted apprentices are interviewed, and the host firm retains the right not to take apprentices it deems unsuitable. In practice, most are accepted.

On the evidence of the project findings, cognitive ability levels of apprentices from within this centre tended to be more variable than those of apprentices in other centres. This may reflect the firm's somewhat laisses faire approach to recruitment. Apprentices with relatively low cognitive ability levels do not seem to worry the training staff involved - helping the "battler" seems to be regarded as a challenge.

The centre sends all of the apprentices to a single TAFE college with which it has a well-established liaison and collaborative teaching and instructional program. The apprentices attend the training centre four days per week and the TAFE college one day per week. All practical work is completed and tested at the training centre by training centre staff. Theory is tested by the TAFE college staff. At the end of the year, results are pooled.

At this centre, the project test results showed a marked and significant drop in the module 1-8 practical test scores between the 1983 and 1984 apprentice groups, although mathematics and reading test scores seemed to indicate that the 1984 group possessed more cognitive ability (see results, training centre B, Table 13, p. 33).

To project observers, on the basis of discussions with centre staff, the impression gained was that some looseness in apprentices' attitudes had developed within the 1984 intake, and this seemed particularly to have affected the results of the practical test score. Another factor that may have affected this score was that the test was administered in August closer to the date of completion time of the first eight modules on which the test is based. However, general consensus was that attitude of the apprentices, at the time of the test, was the major factor producing relatively poor scores in 1984.

(An assumption of this study - and similar studies - is that apprentices involved will generally perform to the best of their ability when tested for research purposes. Although care is generally taken to produce uniformity where possible,

local conditions - equipment, weather, time of day, day of the week, background influences, instructors, etc. - are factors that are difficult to control in a study of this nature.)

According to the specialist observer, workshop equipment may be classed as poor to good. Emphasis in the training program is on practical work. Very little live work is done. Apprentices complete a comprehensive range of models. Each instructor is in charge of an apprentice group of about eight members. The instructors work as a team with each instructor in charge of a number of machines. A large classroom, with a variety of audio visual equipment, is used for teaching new work associated with practical work and remedial theory. It is also used by guest speakers.

Staff interviewed indicated a high level of satisfaction with the type of work done. Staff morale seemed generally good, though there were some criticisms. The views of two individuals are noted. One staff member is employed by one of the hosted employers. The employer has transferred its first year apprentice training to the host centre and, as a consequence, the instructor has also been transferred. This instructor likes the training centre and although he is "hosted", he says he has a say in decisions and feels quite at home. Some grumbles from another staff member included "all work - no prep time - 100 per cent on the floor"; "government hasn't done a lot regarding equipment"; "no time for making (revising) training programs"; "no money for buying programs"; "duplicating difficult".

The six apprentices interviewed - four of whom were hosted - also indicated they were highly satisfied with both their trade and the training they received.

In summary, it can be said that this training centre is relatively large and well-staffed, and it provides good basic fitting and machining training. It has, in recent years, become relatively under-utilised. There is a good range of equipment which is well-maintained, but some of it needs to be up-dated in line with modern technology.

In addition to the above-mentioned training centres, members of the Hawthorn observation team visited several others. Although they are not analysed in the same detail as those above, particular features observed and considered relevant to this study are highlighted.

5.8 Centres G - fitting and machining and electrical

A large metal manufacturing firm conducts two compact training centres - one for fitting and machining and the other for electrical.

Fitting and machining has, at present, 12 apprentices - eight "own" apprentices, of whom one is female, and four hosted apprentices. Two others are adult hosted trainees.

Electrical has nine trainees, three of whom are adult; all are employed by the firm conducting the centre.

The present numbers using the centres appear to fit comfortably into the available facilities, though it is also apparent that both centres could accommodate more apprentices.

Managers and staff of both training centres show a firm commitment to development of excellence in training approach. The electrical component, in particular, is highly regarded by staff of other training centres and seen as a model for the development of this form of training. In general, the training program in both centres appears to be clearly formulated and well established.

Fitting and machining practical equipment is regarded by the staff as adequate. Also a full range of audio visual teaching equipment is available.

Electrical staff classify their equipment as "a mixture", "all still used", "most appropriate - not most modern", and adequate for comprehensive basic training.

The apprentices from each trade attend a single TAFE college. Electrical enjoys a good two-way relationship with the TAFE college. Significantly, apprentices from this area displayed a high level of skill mastery on the end-of-year practical skills test. The relationship in fitting and machining is not as good - little continuous feedback is given to the centre by the TAFE college regarding apprentice performance. Also significantly, fitting and machining apprentices from this centre performed relatively poorly on the practical skills test at the end of 1984 - a result the manager is very concerned about.

Apprentices in both fitting and machining and electrical expressed high levels of satisfaction with the training received and praised the manner in which the training program was being conducted. Throughout the year, apprentices have contributed substantially to the development of both centres in building, installation and maintenance. The firm pays for books, fees, overalls, boots, tools and glasses and pays "over award" rates. In fitting and machining, breaches of apprentices' discipline may attract fines which are deducted from the extra pay received.

Both centres have highly developed pastoral care and personal development programs. Fitting and machining also has a

daily, before-work physical fitness program. Apprentices are encouraged to use the firms' well equipped social and recreational facilities and to join in associated activities. Apparently, the firm has a strong commitment to local community welfare, and both staff and apprentices seemed to be aware of this policy.

Of significance, one adult - 28 years, with a family - in electrical has taken a substantial pay cut to take up the training program and at present has another job as well.

5.9 Centres H - various trades

A major government instrumentality conducts substantial training centres in both fitting and machining and electrical as well as other trades not involved in this study.

The centres have been established in a rural location about 150 kms from Melbourne, and developed over a long period. The electrical centre was, at the time of visiting, about to be relocated.

In the centres, 38 apprentices are in fitting and machining and 18 are in electrical (including one female). They come from a wide variety of secondary schools - technical, high, private and TAFE (VOP).

A special feature is that apprentices in both trades attend the training centre for 18 months. This does not seem to speed up the training program but provides opportunity for advanced fitting work for six months. In the past, a self-paced learning method was used in fitting and machining. However, dissatisfaction with the Craft exam results led to the re-adoption of a lock-step teaching/instructional method.

In both training centres, instructional staff numbers appear to be adequate, with seven instructors in fitting and machining and nine in electrical. Instructors are supported by adequate administrative, maintenance and engineering staff. Being a State government establishment, a recognised staffing structure exists within the industry; instructors have positions based on the State industrial award. (By comparison, private enterprise training centres employ instructors across a wide range of salaries and levels, causing concern among training centre staff attached to some training centres.)

Apprentices in both centres attend the one local TAFE college with which training centre instructors apparently maintain close liaison. Fitting and machining uses block release (five days at TAFE college every five weeks), while electrical uses day release.

According to the observer, fitting and machining workshop facilities are good. In the program, safety is stressed. Apprentices show good rapport with the instructors and appear to like the models they produce. Approximately 75 per cent of practical work is on models with the rest of the practical time being spent on live work. In practical work, 70 per cent is the pass mark. Staff also appear to like the work,

although some find it demanding and would appreciate more preparation time.

Fitting and machining apprentices interviewed said they liked their trade and the training. Some remarked travelling was a problem - not unexpected in a country location.

According to instructors facilities and equipment in electrical are not as up-to-date as they would like - "money is a problem"; "equipment is old"; "we have had to scrounge and scrape". (Facilities seen at some other training centres had made some staff a little envious.) Staff generally said they liked the job and saw training centres as, quoting one instructor, "good under today's conditions".

Electrical apprentices also indicated their liking for the training but some expressed reservations about the first six months - they found the time devoted to learning basic hand skills very tedious and would have liked more wiring.

In the end-of-year practical skill tests given in 1984, results of both fitting and machining and electrical apprentice groups belonging to this instrumentality were in about the middle range.

5.10 Centre I - sheetmetal

Centre I presently provides training for nine sheetmetal apprentices.

It has recently been relocated many kilometers from the previous site. It now occupies a small space adjacent to a comparatively large fitting and machining training area. Working space is about half what it was previously. Compared with the fitting and machining area, and the previous sheetmetal location, its situation is shabby and bare - for example, no pictures, charts or models are to be seen. (At the other location, apprentices were surrounded with industry artifacts.)

There are suggestions that such shortcomings are negatively affecting staff and apprentices' attitudes, so compensatory measures are being planned, such as excursions.

Apprentices attend the one TAFE college where they do the sheetmetal course using a self-paced instructional program. As with sheetmetal apprentices attached to training centre (E) discussed above, it seems that this company's apprentices work more slowly than other general industry apprentices, due to the exact nature of the work and the careful approach emphasised in the centre.

5.11 Centre J - various trades (apprentices in sheetmetal were observed)

This centre currently trains 29 apprentices, two of whom are in sheetmetal.

The training approach is "hands on", with an emphasis on practice rather than theory. A projects in progress chart

is kept on each apprentice and work is always checked. Assembly and construction tasks differ widely from job to job - the firm does not belong to a mass production-type industry. The training provided seems to be practically restricted to work for the present employer.

Equipment and job methods are generally old (the obser er considers things have barely changed over the thirty years when he trained within the industry). Lack of up-to-date equipment was seen to be a major concern by the observer. However, the apprentice master indicated that sheetmetal apprentices trained within this centre encountered no difficulty in obtaining employment in the trade if they decided to move out of the firm on completing their training.

The two sheetmetal apprentices attend a particular TAFE college. It is considered that they are "very competitive" in respect of their college performance against other sheetmetal apprentices.

5.12 Some general observations

As indicated by between training centres statistical comparisons in the previous chapter (see Sections 4.9 and 4.16), significant differences between performances of apprentices attached to the various centres were observed.

Evidence suggests that certain desirable characteristics of particular training centres foster better apprentice performance levels and attitudes.

Some of the influential factors are: staffing levels, staff training and development, quality of training facilities, quality of tools, machines and equipment, structure of the training program and testing procedures, program review processes, relationships with TAFE colleges, apprentice satisfaction, social and counselling provisions, quality of supervision and feedback to apprentices, appropriate discipline processes, instructor job satisfaction, and funding levels.

Centres which generally meet the above criteria were found to produce superior results. A single negative factor, e.g. poor training centre-TAFE college liaison, was seen to cause a marked reduction in the apprentice performance results.

A further general observation refers to under-utilisation of training centres by companies for their own and hosted apprentices. Some large undertakings, both government and private, have the training facilities to accommodate many more apprentices. Substantial government grants have been made in some instances to offer additional places for host apprentice training. Small employer response has not fulfilled the purpose of the grants. One national company managed to attract only one hosted apprentice whereas about 20 were expected. Another large government undertaking used to train 75 first year apprentices; now it only has about 40 apprentices in training. In addition, most large companies have markedly reduced their apprentice intakes. The overall result is that excellent facilities are available but they

are grossly under-utilised.

6. CONCLUSIONS

6.1 Fitting and machining apprentices

The findings of the previous study on the 1983 intake of fitting and machining apprentices, regarding their performance and development during the first year of training, were generally confirmed by the data collected on the 1984 intake. With respect to the 1984 fitting and machining apprentice intake, the following specific conclusions were drawn.

6.1.1 Apprentices attached to training centres usually develop higher levels of practical skills than apprentices employed on-the-job during the first calendar year of apprenticeship.

6.1.2 Apprentices attached to training centres and undergoing accelerated training programs usually develop higher levels of practical skills than apprentices attached to training centres and undergoing non-accelerated programs during the first year of apprenticeship.

6.1.3 Insufficient evidence was available due to numerical imbalance between groups to compare the value of accelerated training centre programs with accelerated on-the-job training.

6.1.4 Apprentices undergoing non-accelerated training centre programs were not found to develop statistically significantly higher levels of practical skills than apprentices undergoing non-accelerated on-the-job training. (In 1983, training centre apprentices performed better than on-the-job apprentices.)

6.1.5 Evidence collected, although lean due to the small number of on-the-job accelerated apprentices, tended to suggest that accelerated on-the-job training did not produce higher levels of practical skills than non-accelerated on-the-job training.

6.1.6 Levels of practical skill development vary statistically significantly between training centres, indicating influential variables such as training programs, teaching methods, facilities and equipment.

6.1.7 The performance of 1984 accelerated training centre apprentices was statistically below that of 1983 accelerated training centre apprentices. No significant difference was found for non-accelerated training centre apprentices and non-accelerated on-the-job apprentices between the 1983 and 1984 intakes.

6.1.8 Practical test performances differed significantly between TAFE colleges.

6.1.9 Observations indicate that some TAFE college-training centre combinations produce higher levels of practical skill development than others, and this difference may be attributed to the degree of liaison and collaboration between the respective partnerships.

6.2 Electrical apprentices

6.2.1 Apprentices attached to electrical training centres in 1984 displayed statistically significantly higher levels of ability in arithmetic than apprentices employed on-the-job but no significant difference was found in reading ability between the two groups. In 1983, the training centre apprentices were superior in both arithmetic and reading.

6.2.2 For the 1984 apprentice intake, no correlation was found between end-of-year practical test scores and scores in either arithmetic or reading. This suggests that practical skill development is independent of arithmetic and reading ability for those who are selected as apprentices to the electrical trade. (In general, poor achievers in these cognitive skills do not manage to enter the trade.)

6.2.3 No significant difference was found between the performance of training centre apprentices and on-the-job apprentices in the end-of-year practical test. This suggests that training centre apprentices, who often do additional, company-specific and more advanced work at the training centres during the first year, are at least keeping pace in basic practical skills with on-the-job apprentices and are not being disadvantaged in the development of these skills as a consequence of off-the-job training centre programs. In 1983, training centre apprentices in non-accelerated programs did not perform as well as off-the-job non-accelerated apprentices.

6.2.4 Due to the introduction of the new syllabus, which generally meant that accelerated programs were not run, it was not possible to determine the effects of acceleration for the 1984 electrical apprentices intake. In 1983, acceleration was a significant factor, appearing to enhance electrical apprentice performance.

6.2.5 Practical test performance differed significantly between training centres.

6.2.6 Practical test performance differed significantly between TAFE colleges.

6.2.7 Observations indicate that some TAFE college-training centre combinations produce better practical skill performance levels than others.

6.3 Sheetmetal apprentices

6.3.1 TAFE college "work rate" (average time per module for the year) appears to be affected by the industry to which the apprentice is attached. Apprentices within the aircraft industry and attached to training centres appear to work more slowly on TAFE college modules than apprentices employed on-the-job on general sheetmetal jobs. No evidence emerged to suggest that the aircraft apprentices were less competent - they may be more careful workers (as expected by their training centre instructors). In 1983, the aircraft industry apprentices were also found to be slower than on-the-job general sheetmetal apprentices.

6.4 Motor mechanics apprentices

6.4.1 On the TAFE college data supplied, no valid comparison was possible between the skill level performance of training centre apprentices and on-the-job apprentices. All training centre apprentices were accelerated (attended TAFE college two days per week) and all on-the-job apprentices were non-accelerated (attended TAFE college one day per week).

6.5 General conclusions

6.5.1 On the basis of observations and data collected, it is apparent that the facilities of many training centres are grossly under-utilised even though some are offering training for hosted first year apprentices.

7. SUMMARY OF KEY FINDINGS OF 1983 VERSUS 1984 STUDIES

The following table summarises the key findings of both the original and replication studies.

Fitting and machining

1983	1984
Correlations between entry level test scores and practical test scores on modules 1-8 were very low and not statistically significant.	No mass entry level testing done (see full report for reasons). A large sample of apprentices attached to two major training centres (n=95) were tested in arithmetic and reading. Correlations with practical test scores (modules 1-8) were low and not statistically significant on both measures at one training centre. There was a low (but statistically significant) correlation between practical score and arithmetic in the other centre but no correlation between practical score and reading.
Off-the-job training centre apprentices develop higher levels of practical skills than on-the-job apprentices during the first year of apprenticeship.	Finding for 1983 confirmed for accelerated training centre apprentices. No difference found in practical skill levels for groups of non-accelerated apprentices.
During the first calendar year of training, apprentices in training centres and doing accelerated training develop higher levels of practical skills than non-accelerated apprentices in either on-the-job or training centre situations.	Finding for 1983 confirmed.
Non-accelerated training centre programs produce higher levels of practical skill than non-accelerated on-the-job training.	No statistically significant difference in practical skills found between non-accelerated training centre and non-accelerated on-the-job apprentices.
Between centre comparisons were not attempted.	Levels of practical skill development vary statistically significantly between training centres.
Between TAFE college comparisons were not attempted.	Levels of practical skill development vary statistically significantly between TAFE colleges.
TAFE college-training centre liaisons not compared.	Some training centre-TAFE college liaisons produce better practical skill development than others.

Electrical

1983	1984
Apprentices attached to training centres scored significantly better than on-the-job apprentices on eight out of ten measures of entry level and showed clearly superior scores in mathematics, reading, IQ and mechanical reasoning.	Cognitive ability tests were given in arithmetic and reading. Training centre apprentices scored significantly better than on-the-job apprentices in arithmetic but no significant difference was found in reading ability.
Significant (but low) correlations were found between the end-of-year practical test score and entry level test scores in mathematics and reading.	No significant correlations were found between end-of-year practical test scores and scores in arithmetic and reading.
Non-accelerated training centre apprentices scored significantly worse than non-accelerated on-the-job apprentices on the end-of-year practical test.	No significant difference was found between the scores of training centre apprentices and on-the-job apprentices on the end-of-year practical test. (All apprentices compared in 1984 were non-accelerated due to the new syllabus.)
Accelerated apprentices outperformed non-accelerated apprentices on the end-of-year practical test.	Comparison of accelerated and non-accelerated apprentices was not possible due to the introduction of the new syllabus.
Training centre experience thought to be of no advantage to non-accelerated apprentices with respect to practical skill development.	Training centre experience now thought to be of no disadvantage. Broader range of skills and training centre experiences considered to complement similar levels of skill demonstrated in 1984 practical tests.
Training centre comparisons in levels of practical skill development not attempted.	Practical test performance differed significantly between training centres.
TAFE college comparisons in levels of practical skill development not attempted.	Practical test performance differed significantly between training centres.
TAFE college comparisons in levels of practical skill development not attempted.	Practical test performance differed significantly between TAFE colleges.
No TAFE college-training centre combinations comparisons made.	Some TAFE college-training centre combinations appeared to produce better practical skill performance levels than others.

Sheetmetal (tentative conclusions only)

1983	1984
Training centre apprentices demonstrated slightly higher levels of cognitive ability than on-the-job apprentices. No correlation found between practical performance measure (work rate) used and cognitive test scores.	No cognitive ability level tests given.
Using "work rate" (mean time per module for the year) on-the-job apprentices were found to be superior to training centre apprentices.	"Work rate" now considered to be a function of the industry to which apprentices are attached. Aircraft training centre apprentices generally work more slowly due to more careful work habits than on-the-job general sheetmetal apprentices. This does not mean that aircraft apprentices are less competent.
Independent practical skills tests not possible.	Independent practical skills tests not possible.

Motor mechanics (tentative conclusions only)

1983	1984
Apprentices attached to training centres scored slightly higher on entry level cognitive tests than apprentices employed on-the-job.	No cognitive ability level tests were given. All training centre apprentices for whom data was collected were in acclerated training programs. All on-the-job apprentices were in non-accelerated programs. No common and fair basis on which to draw comparison between groups was found. Individual apprentice programs show wide variations during first year. Observational comparisons between two centres are made in the full report.
Using "work rate" (mean time per module for the year) as the measure of trade skill development no significant difference was found between the TAFE college performance levels of the training centre and on-the-job apprentices.	
Independent, practical skills tests not possible.	Independent practical skills tests not possible.

8. RECOMMENDATIONS

In general, the recommendations made following the previous study on the 1983 intake of apprentices have been endorsed by the replication study. The recommendations of the original study are included as attachment 7.

The following additional comments, based on the 1984 apprentice study, are offered to strengthen particular recommendations made previously.

8.1 In fitting and machining, in particular, development of more accelerated training programs, involving close liaison and co-operation between training centres and TAFE colleges, should be fostered by relevant industry groups and training authorities. Acceleration, in conjunction with training centre experience, appeared to be the most powerful factor influencing fitting and machining apprentice skill development.

8.2 The role and use of in-plant training centres in the training of apprentices need to be further discussed and clarified by training authorities. As a consequence of the findings of this study, it seems unwise to adopt the Kirby Report's recommendations that training centres shift their focus from basic training for first year apprentices to specialised and advanced training. In fact, in at least some training centres, training conducted is not merely basic, but is also more specialised and company-specific, though the main focus is on first year apprentice training. These aspects need to be closely examined and carefully considered.

8.3 The apprentices observed in 1984 in the fitting and machining, electrical, sheetmetal and motor mechanics trades should be followed through to the end of their apprenticeships and monitored in the manner outlined at the end of the previous study along the following lines: skill development; attitudes; on-the-job employment; TAFE college progress; detailed effects of acceleration; and final differences between ex-training centre apprentices and apprentices who worked on-the-job throughout the full term of their apprenticeship.

8.4 The introduction of the new electrical syllabus in 1984 and its deletion in 1985, causing 1984 apprentices to revert to the old syllabus, clouded this study's results. The instability of the electrical training program, and the lack of clear evidence that training centres are producing more skilful apprentices, suggest that the electrical area needs to be studied more closely, and apart from this investigation and its proposed longitudinal studies. The electrical apprentices already observed as part of this study should continue to be monitored (as outlined in 8.3 above) in the anticipated longitudinal investigation following the study. It is further recommended that a separate detailed study of electrical apprentice training programs and methods be carried out by a competent electrical trade-specific research team.

8.5 Training centres should be circularised regarding beneficial features observed in case study venues, such as program features, live work versus exercises, instructor-apprentice rapport, individual instruction, assessment methods, program follow-up arrangements, program review..

8.6 Training centres and TAFE colleges should be circularised concerning beneficial features observed in case study locations of close collaboration with a TAFE college, such as in program development and implementation, accelerated training provision and testing, apprentice assessment, and reporting.

8.7 Attention of appropriate employer and government officers should be directed to the gross under-utilisation of facilities in many training centres and the possibilities that currently exist for the extension of host training.

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ATTACHMENTS

MATHEMATICS TEST

SECTION A

1.

1023 + 462 =

A	B	C	D	E
567	1085	5043	5643	some other answer

2.

2479
+ 8716

A	B	C	D	E	F
11 185	11 395	11 295	0 763	11 195	some other answer

3.

4698 - 327 =

A	B	C	D	E	F
4371	5025	371	1371	1428	some other answer

4.

406 - 208 =

A	B	C	D	E	F	G
108	202	298	614	398	198	some other answer

5.

408 x 6 =

A	B	C	D	E
288	2648	2442	2484	some other answer

6.

211 x 32 =

A	B	C	D
1055	6752	232	some other answer

7.

478 x 79 =

A	B	C	D	E	F	G
37 662	37 862	37 762	36 762	38 762	37 562	some other answer

8.

603 ÷ 3 =

A	B	C	D
21	201	201.1	some other answer

9.

684 ÷ 6 =

A	B	C	D
111	124	114	some other answer

10.

161 ÷ 7 =

A	B	C	D
23	13	203	some other answer

11.

442 ÷ 17 =

A	B	C	D	E	F
16	26	23	206	346	some other answer

12.

6.7 ÷ 3.4 =

A	B	C	D	E	F
1.01	101	10.3	10.1	9.11	some other answer

13.

3.14 + 51.2 =

A	B	C	D	E	F	G
54.16	8.26	82.6	54.34	826	565	some other answer

14.

20.35 + 6.0 + 0.5 =

A	B	C	D	E
26.40	210.0	80.85	26.85	some other answer

15.

5.2 - 3.8 =

A	B	C	D	E	F
14	2.6	1.4	9.0	0.14	some other answer

16.

20 - 5.8 =

A	B	C	D	E	F	G
3.8	0.2	25.8	15.2	38	14.2	some other answer

17.

37.5 - 2.76 =

A	B	C	D	E	F	G
34.86	34.80	35.26	34.74	35.74	35.71	some other answer

18.

0.3 x 10 =

A	B	C	D	E	F	G
0.3	3	30	0.03	3.3	0.6	some other answer

19.

0.5 x 0.5 =

A	B	C	D	E	F
2.5	1.0	0.25	25	2.75	some other answer

20.

120 x 0.04 =

A	B	C	D	E	F	G
480	48.0	0.48	4.8	0	0.048	some other answer

21.

5.7 x 1.73 =

A	B	C	D	E	F	G
9861	98.61	10.861	20.760	9.93	9.861	some other answer

22.

3.65 ÷ 5 =

A	B	C	D	E	F	G
73	7.3	0.75	0.13	71	0.73	some other answer

23.

2 ÷ 10 =

A	B	C	D	E	F
5	0	0.2	0.5	-5	some other answer

24.

1.84 ÷ 2.3 =

A	B	C	D	E
8	0.8	0.08	0.008	some other answer

25.

A calculator shows this figure: 25.634817

What is it expressed correct to 2 decimal places?

A	B	C	D	E
2563.4817	256348.17	25.63	25.634.817	25.64

F	G
0.25634817	some other answer

26.

$23 + 5 \times 4 =$

A	B	C	D	E	F	G
.112	43	7	18.4	32	102	some other answer

27.

$36 \div (6 \div 3) =$

A	B	C	D	E	F	G
2	12	18	72	13	6	some other answer

28.

$15 - 27 + 8 =$

A	B	C	D	E	F
20	-20	0	-4	30	some other answer

29.

$\frac{1}{4} + \frac{1}{2} + \frac{3}{8} =$

A	B	C	D	E	F	G
$\frac{9}{8}$ or $1\frac{1}{8}$	$\frac{5}{14}$	$\frac{5}{8}$	$\frac{9}{4}$ or $2\frac{1}{4}$	$\frac{9}{9}$ or 1	9	some other answer

30.

$3\frac{3}{4} - \frac{7}{8} =$

A	B	C	D	E	F	G
$3\frac{1}{8}$	$\frac{8}{8}$ or 1	$\frac{23}{8}$ or $2\frac{7}{8}$	$4\frac{5}{8}$	4	$2\frac{1}{8}$	some other answer

31.

$5 \times \frac{2}{3} =$

A	B	C	D	E	F	G
$\frac{10}{15}$	$\frac{17}{3}$ or $5\frac{2}{3}$	17	$\frac{10}{3}$ or $3\frac{1}{3}$	$3\frac{1}{10}$	30	some other answer

32.

$2\frac{1}{8} \div \frac{1}{2} =$

A	B	C	D	E	F	G
$\frac{33}{8}$ or $4\frac{1}{8}$	$\frac{18}{8}$, $2\frac{2}{8}$ or $2\frac{1}{4}$	$2\frac{4}{8}$	$\frac{34}{8}$, $4\frac{2}{8}$ or $4\frac{1}{4}$	3	$2\frac{5}{8}$	some other answer

33.

What is $\frac{2}{5}$ as a decimal?

A	B	C	D	E	F	G
2.5	0.25	5.2	0.4	40	4.0	some other answer

34.

What is $\frac{2}{5}$ as a percentage?

A	B	C	D	E	F	G
10%	25%	2.5%	$\frac{4}{10}$%	40%	20%	some other answer

35.

What is 3.5% as a decimal?

A	B	C	D	E	F
3.5	0.035	$\frac{3}{5}$	3.05	35	some other answer

36.

What is 8% of $400?

A	B	C	D	E	F
$50	$320	$32	$3.20	$200	some other answer

37.

What is 18 as a percentage of 144?

A	B	C	D	E	F
12.5%	8%	18%	7%	25.92%	some other answer

38.

$175 is 7% of the cost of a car. What is the total cost of the car?

A	B	C	D	E	F
$25	$1225	$2500	$1750	$12.25	some other answer

39.

A tradesman received a wage of $240 a week and then was given an 8% increase. What is his new wage?

A	B	C	D	E	F	G
$270	$248	$19.20	$1920	$241.92	$259.20	some other answer

40.

The price of bananas has just gone up by 10%, so that they now cost 99¢ per kilogram. What did they cost per kilogram before the increase?

A	B	C	D	E	F	G
99¢	89¢	89.1¢	90¢	88¢	$1.09	some other answer

41.

The ratio 3:5 may also be written in the form

A	B	C	D	E
$\frac{3}{5}$	3.5	$3\frac{1}{2}$	35	some other answer

42.

Divide 30 m into two parts which are in the ratio of 2:3.

A	B	C	D
3 m & 0 m	12 m & 18 m	20 m & 30 m	23 m & 7 m

E	F
15 m & 15 m	some other answer

43.

5 litres of fuel are used by a car in travelling 48 km. How many litres would be used to travel 72 km at the same rate of fuel consumption?

A	B	C	D	E	F	G
8 ℓ	9 ℓ	7 ℓ	12 ℓ	14.4 ℓ	7.5 ℓ	some other answer

44.

What value of x will make the ratios 5:9 and 15:x the same as each other?

A	B	C	D	E	F
19	29	23	18	27	some other answer

45.

A unit used in science is a newton (symbol: N). How many N are there in one kN?

A	B	C	D	E	F	G
1000	10	2	1	100	10 000	some other answer

46.

How many mℓ are there in 20 ℓ?

A	B	C	D	E	F
2000	20 000	200	20	40	some other answer

47.

How many metres are there in 76 450 mm?

A	B	C	D	E	F	G
7645	764.5	76.45	7.645	764	76	some other answer

48.

How many mm^2 are there in one m^2?

A	B	C	D	E	F	G
1000	100	4	100 000	1 000 000	10 000	some other answer

49.

A car has a mass of 1527 kg. How many tonnes is this?

A	B	C	D	E	F	G
15.27	1	15	1.527	152	15 270	some other answer

50.

Which of the following units should readymix concrete be sold in?

A	B	C	I.
mm^3	m^2	metres	m^3

IF YOU HAVE BEEN TOLD TO DO SECTION B OF THE MATHEMATICS TEST, PLEASE CONTINUE.

OTHERWISE, CHECK YOUR ANSWERS AND WAIT FOR FURTHER INSTRUCTIONS.
DO NOT GO ON TO THE READING TEST UNTIL YOU ARE TOLD TO DO SO.

51.

How many mm are there in one km?

A	B	C	D	E	F
1000	10 000	100 000	1 000 000	10 000 000	some other answer

52.

Which of the following is closest to the length of an average car?

A	B	C	D
500 mm	1500 mm	5000 mm	15 000 mm

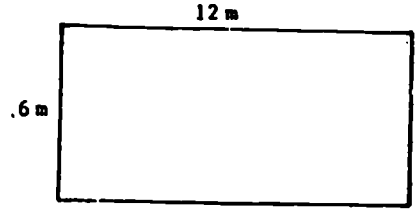
53.

How many km are there in 256.3 m?

A	B	C	D	E	F
0.02563	0.2563	2.563	25.63	25	some other answer

54.

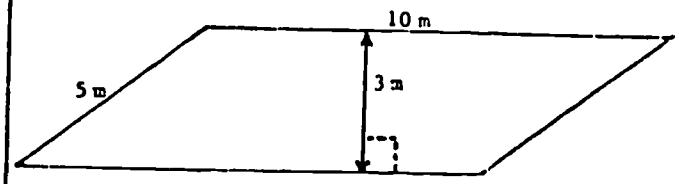
What is the area of this rectangle in m^2?



A	B	C	D	E	F
72	2	18	36	0.5	some other answer

55.

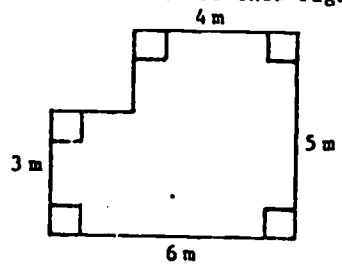
What is the area of this parallelogram in m^2?



A	B	C	D	E	F
15	30	50	150	18	some other answer

56.

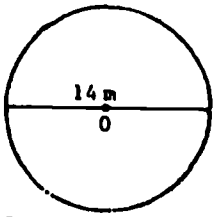
What is the area of this figure in m^2?



A	B	C	D	E	F
38	39	22	26	360	some other answer

57.

What is the circumference of this circle to the nearest whole number of metres? (use $\pi = 3.14$)

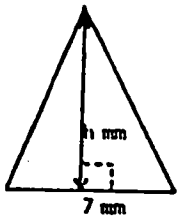


0 is the centre of the circle.

A	B	C	D	E
22	44	77	154	some other answer

58.

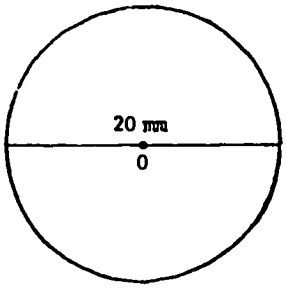
What is the value of "h" in this triangle, which has an area of 28 mm^2?



A	B	C	D	E
4	8	21	35	some other answer

59.

What is the area of this circle in mm^2? (use $\pi = 3.14$)

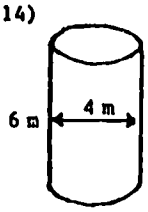


0 is the centre of the circle.

A	B	C	D	E	F
31.4	62.8	98.596	314	1256	some other answer

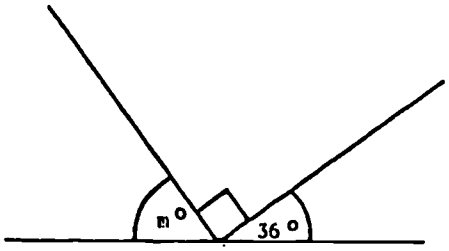
60.

What is the volume of this right cylinder to the nearest m^3? (Volume of cylinder = area of base x vertical height) (use $\pi = 3.14$)



A	B	C	D	E	F
20	24	38	75	301	some other answer

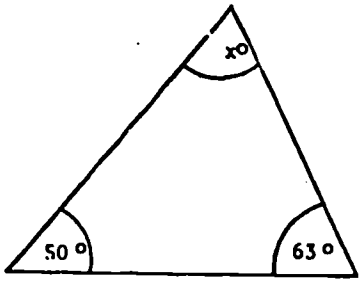
61.



What is the value of m?

A	B	C	D	E	F	G
36	45	64	116	126	54	some other answer

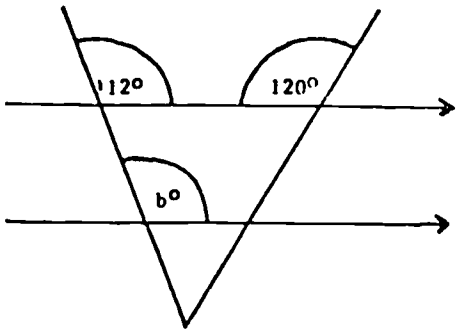
62.



What is the value of x?

A	B	C	D	E
57	60	67	113	some other answer

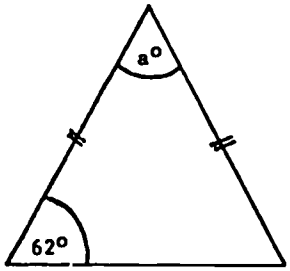
63.



What is the value of b?

A	B	C	D	E	F	G
52	60	68	112	120	128	some other answer

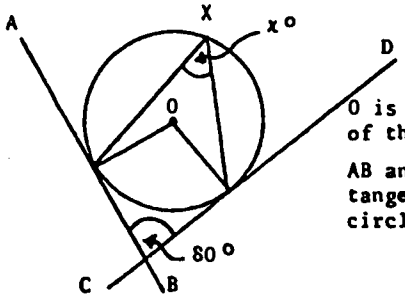
64.



What is the value of a?

A	B	C	D	E
30	31	56	62	some other answer

65.



0 is the centre of the circle.

AB and CD are tangents to the circle.

What is the value of x?

A	B	C	D	E	F
20	40	50	100	110	some other answer

66.

18^2 =

A	B	C	D	E	F
4.24	18	36	316	324	some other answer

67.

A value of $\sqrt{16x^2}$ is

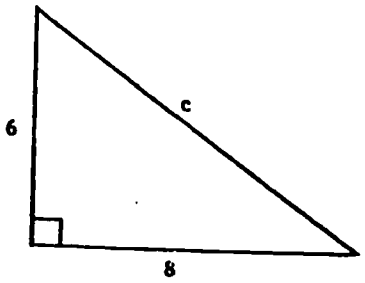
A	B	C	D	E	F
4	4x	$4x^2$	32x	256x	some other answer

68.

$\frac{6^3}{3^3}$ =

A	B	C	D	E	F
2	3	8	24	162	some other answer

69.



What is the value of c?

A	B	C	D	E	F	G
10	14	25	28	19.6	9.8	some other answer

70.

If $F = MA$,
then A =

A	B	C	D	E	F
$\frac{M}{F}$	$\frac{F}{M}$	FM	2FM	F-M	some other answer

71.

If $Y = X - 6$,
then X =

A	B	C	D	E
Y-6	6-Y	Y+6	6Y	some other answer

72.

If $\frac{EC}{1000} = K$,
then C =

A	B	C	D	E	F
$\frac{1000K}{E}$	1000K+E	1000 EK	$\frac{E}{1000K}$	$\frac{EK}{1000}$	some other answer

73.

If $S = CH + CB$,
what is H when
$S = 20$, $C = 4$, $B = 2$?

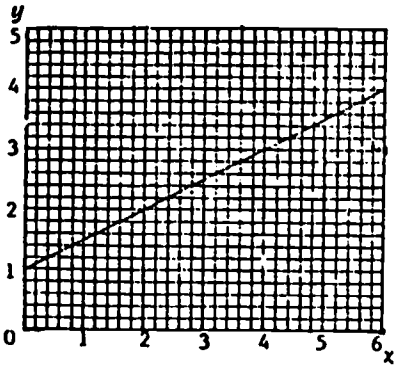
A	B	C	D	E	F
3	8	10	14	26	some other answer

74.

If $b = \frac{c}{a}$,
then a =

A	B	C	D	E	F
bc	$\frac{c}{b}$	$\frac{b}{c}$	c+b	$\frac{1}{bc}$	some other answer

75.



What is y when $x = 3.2$?

A	B	C	D	E	F
2.3	4.4	2.6	2.8	2.7	some other answer

CHECK YOUR ANSWERS AND WAIT FOR FURTHER INSTRUCTIONS.

DO NOT GO ON TO THE READING TEST UNTIL YOU ARE TOLD TO DO SO.

READING TEST

ATTACHMENT 2
P.S.I. READING
TEST

PART I - THE MOOSE

Some deer are no bigger than little dogs. Some are much bigger than that, but the biggest of all is taller than a horse. The biggest deer is called a moose.

All good (1)..... know that they must not kill a mother moose. If the mother moose is (2)..... , there is no-one to look after the baby moose.

One day some men saw a cow moose in the woods. They had never seen such a big moose and they (3)..... their guns and shot her.

A farmer found the moose. It was (4)..... a day old and he took it to his farm. There was a cow that had lost her (5)..... and she took the moose calf and let it have her milk, as if it were her own. She (6)..... not let any of the animals in the barn hurt her new baby.

The little moose grew and grew until he was (7)..... than the cow that looked after him. He grew taller than the horses, and one day he jumped out of the yard and ran into the (8)..... . He never came back to the farm, but sometimes he would (9)..... the farmer when he was hunting and if the farmer was very (10)..... the big moose would come nearer and nearer to him.

A.	still	F.	woods	K.	chalk
B.	beneath	G.	several	L.	calf
C.	only	H.	would	M.	killed
D.	taller	I.	follow	N.	front
E.	hunters	J.	fired	O.	day

PART II - THE VESSEL

One day, after my return, as I went down to where the ships were (11)..... up, I saw a ship which had just pulled in, and was (12)..... her cargo. The (13)..... to whom it belonged were (14)..... directing the removal of the cargo to their (15)..... . Drawing nearer, I (16)..... that my own name was marked upon some of the packages, and after examining them, I (17)..... sure that they were those which I had put on board our ship at Durban. I then saw the captain of the vessel. I was (18)..... that he thought me to be (19)..... so I went up to him and asked who (20)..... the packages I was looking at.

A.	busily	F.	certain	K.	tongue
B.	owned	G.	noticed	L.	substance
C.	terrace	H.	merchants	M.	dead
D.	discharging	I.	tied	N.	stranger
E.	warehouses	J.	felt	O.	packages

PART III - HEAD HUNTING - THE NATIVE VILLAGES

The frequent raids led to the villages being built in safe (21)..... where their inhabitants could not easily be (22)..... . Some were built on high peaks and cliffs where (23)..... alone gave entry to the houses. Others were surrounded by a (24)..... of vegetation which was (25)..... to all but the people of the village. In the swamps of the (26)..... country, other villages were safer still.

The houses were generally built on piles so that they were (27)..... several metres above the ground, from which entrance was made by a rickety ladder. In many villages the whole (28)..... dwelt together in a great communal (29)..... which was also used for (30)..... purposes.

A.	elevated	F.	acquaintance	K.	barrier
B.	surprised	G.	ceremonial	L.	river
C.	gratitude	H.	impassable	M.	positions
D.	population	I.	ladders	N.	conduct
E.	house	J.	anchor	O.	compare

PART IV - THE TARAWERA VOLCANIC EXPLOSION

The Tarawera volcanic zone is one of the most fascinating of the world's thermal (31)..... , but by far the finest (32)..... features were destroyed by the great Tarawera eruption of 1886.

The mountain broke into an (33)..... which extended along a line sixteen kilometres in (34)..... , and explosions of great (35)..... developed the crack into a vast rift. The greatest explosion (36)..... where the lavas of Tarawera met the water - (37)..... rock below Lake Rotomahana. The water burst into steam in seconds. (38)..... gases were released and killed all the (39)..... in that area.

Nothing remained but a (40)..... chasm.

A.	eruption	F.	gaping	K.	distribution
B.	violence	G.	scenic	L.	rebellious
C.	occurred	H.	length	M.	noxious
D.	simplify	I.	saturated	N.	precocious
E.	animals	J.	regions	O.	response

PART V - THE PORTERS

A spontaneous cry of joy (41) ..... from our porters who had reached the top of the hill. They could see the (42) ..... ruins of Tondelayo which were radiant in the (43) ..... of the setting sun. The remains of its ancient (44) ..... were only two (45) ..... away.

Amongst the (46) ..... gear and odds and ends they carried was Mumbo Jumbo, an idol which the (47) ..... fellows believed could (48) ..... anything from (49) ..... to a common cold. The idol was a unique piece of (50) ..... .

A.	picturesque	F.	superstitious	K.	dialogue
B.	expansion	G.	architecture	L.	delusion
C.	rose	H.	glow	M.	chronic
D.	sculpture	I.	miscellaneous	N.	cure
E.	appendicitis	J.	kilometres	O.	torrential

PART VI - REPRODUCTION WITHOUT SEX

In a very large number of lower animals, reproduction is quite (51) ..... of sex. If one takes a little flat worm, such as crawls in abundance about the weeds of any pond, and cuts it in (52) ..... , the worm suffers no (53) ..... or pain. In a (54) ..... time the head half grows a new tail and the tail half a new head. Cut the worm down the central (55) ..... and each half soon makes up its missing (56) ..... , and life goes forward as before. Cut anywhere without detaching a piece, and the exposed surfaces begin to sprout new (57) ..... , so that a very strange (58) ..... , with several heads and tails presents itself.

Some of the more (59) ..... worms multiply by literally (60) ..... themselves. There comes a time when the worm appears to be trying to move two ways at once.

A.	camouflage	F.	line	K.	righteous
B.	half	G.	torrential	L.	individuals
C.	admiration	H.	primitive	M.	bisecting
D.	inconvenience	I.	portion	N.	short
E.	audience	J.	independent	O.	monster

PART VII - AUSTRALIAN SETTLEMENT

Australia's progress might have been much (61)..... but for the attraction of gold. Gold was discovered in Victoria and New South Wales, and at the beginning it was impossible to prevent the gold rush. Farms were abandoned, workshops deserted, sailors left their ships, shepherds left their sheep, shopkeepers (62)..... their shops. The gold fever became a (63)..... . But that early madness soon passed away. People who came to dig for gold found more (64)..... in digging for potatoes.

Australians resent the false (65)..... that they are necessarily descendants of convicts. The vast majority of them are no such thing. It is true that most of the persons in the first fleet were (66)..... prisoners, but there were also soldiers and their wives, and as soon as it was known in England that Australia was a wool growing country, many free (67)..... settled here and some of them brought (68)..... capital. South Australia was colonized entirely by free settlers, and so was Western Australia at first, though it (69)..... became the last refuge of the (70)..... system.

A.	abandoned	F.	convicted	K.	incisive
B.	coherent	G.	components	L.	retarded
C.	transportation	H.	plague	M.	eminent
D.	provocation	I.	emigrants	N.	considerable
E.	ultimately	J.	assumption	O.	prosperity

PART VIII - THE BATTLE

The memorandum gave the underlying reason for Nelson's tactics at Trafalgar, and Nelson himself expressed the same thought more (71)..... in a conversation shortly before he left home.

"No day can be long enough to arrange a couple of fleets, and fight a (72)..... battle according to the old system," he said.

In the open ocean, far from port, there might have been time to (73)..... : the fleets might have stayed in (74)..... through the night, and fought on the following day, broadside to broadside in the traditional manner. But every (75)..... cried out the need for hurry. In the (76)..... breeze, starting ten miles apart, it would take all morning to (77)..... the gap, even if the enemy did not try to run and the breeze might (78)..... or shift as the day advanced. If the enemy stood on towards the strait, it would become a close chase, and the French and Spanish ships, whatever their (79)..... were like, were more sluggish than the (80)..... .

A.	light	F.	concisely	K.	organisation
B.	inquisitive	G.	manoeuvre	L.	jealous
C.	crews	H.	British	M.	contact
D.	predecessor	I.	decisive	N.	fall
E.	stimulus	J.	narrow	O.	circumstance

PART IX - DR KNOX

At No. 10 Surgeon's Square, the famous Edinburgh anatomist, Dr Knox, held his demonstrations in front of (81)..... and enthusiastic classes. Taciturn, (82)..... , and sour, he was intensely (83)..... by his colleagues, but, once inside the classroom, the (84)..... of his lectures and the raciness of his stories made him the idol of his students. He certainly owed nothing of this popularity to his personal appearance, as his biographer and former pupil, Dr Lonsdale, is (85)..... to admit.

"His head was bald and shiny, and the natural (86)..... of his features was accentuated by the coarsening effect of the worst form of (87)..... ."

His only redeeming feature was his eye, (he had but one), which, his admirer tells us, was "perfection itself". But what he lacked in (88)..... charm, he made up in sartorial elegance; he always appeared before his class (89)..... dressed in the very height of (90)..... .

A.	surreptitiously	F.	gloomy	K.	disliked
B.	small-pox	G.	large	L.	fashion
C.	profession	H.	immaculately	M.	physical
D.	accentuated	I.	obliged	N.	dissection
E.	brilliance	J.	ugliness	O.	interfere

FITTING & MACHINING MODULES 1-8 TEST

NOTES TO ACCOMPANY COMPONENT DRAWINGS

1. The following items to be supplied by Hawthorn Institute of Education :-

   a) Test nut for each apprentice (12 x 1.75)

   b) Ø36 bar x 100L for each apprentice

   c) 5 x 50 flat x 80 L for each apprentice

   d) 15 mm square test piece (5/8 sq. supplied - machine to 15 mm)

   e) transparency to check marking out. (Accuracy Tracing).

2. Colleges/schools should supply the following items :-

   a) Grooving tool. (2mm wide)

   b) Tap, drills, reamer.

   c) Screw cutting tool

   NOTE : Some pre-machining is required (see drawing).

OPERATIONS

Spindle : (a) turn all diameters between centres (tool supplied).

(b) screw cut thread (screw cutting tool supplied).

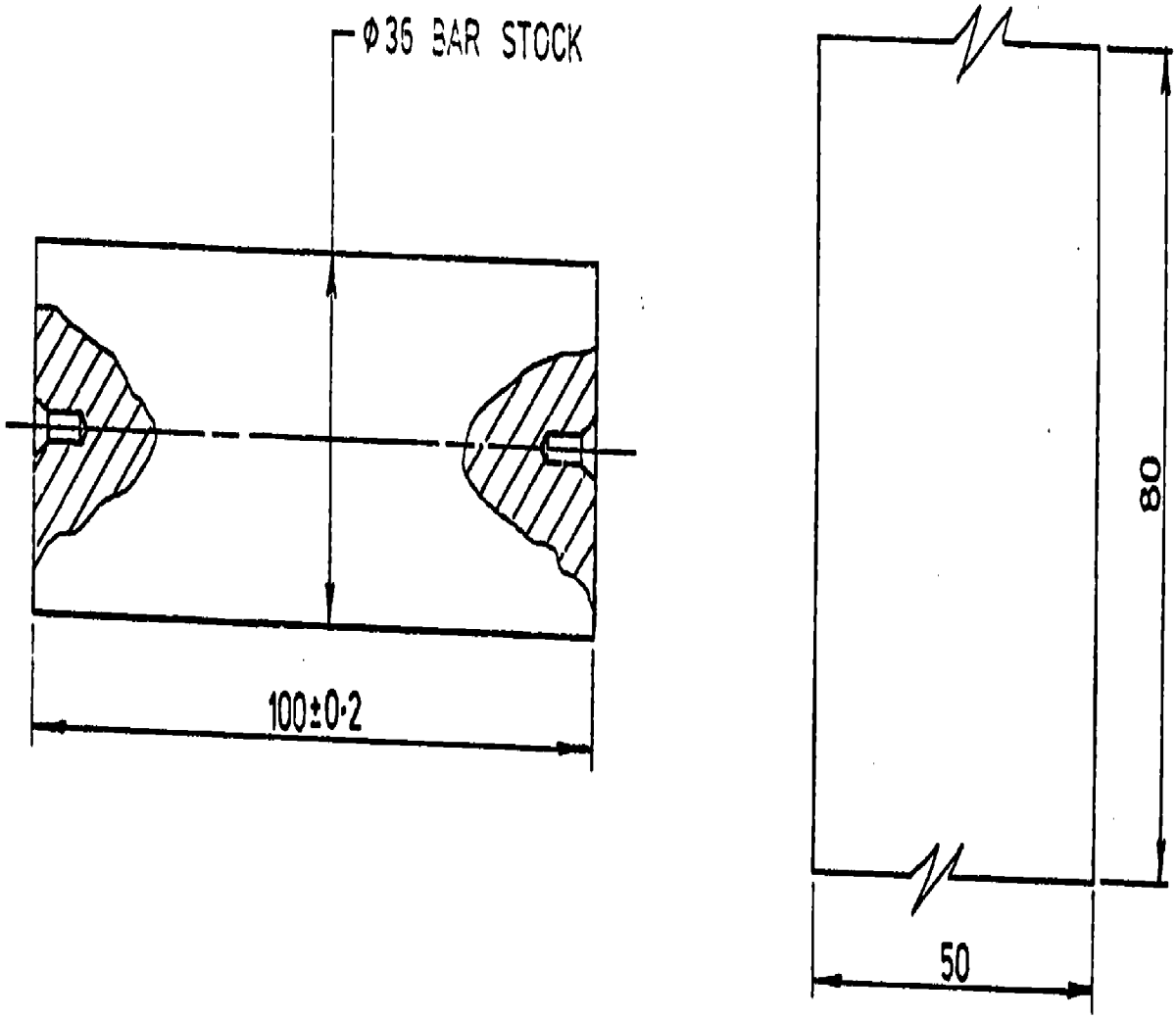
(c) file square.

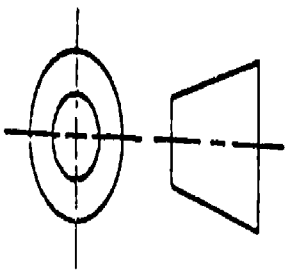
Plate : This is a marking out and filing exercise.
The only machine operations permitted are for drilling.
The rest of the job must be done by hand.

TOTAL WORKING TIME (apart from pre-machining) IS 5 HOURS.

ITEM (1) & (2) MODULE 1-8 PRE-MACHINING DRAWING

PLATE 5 x 50 BAR STOCK
ROUGH SAWN BOTH ENDS





LIMITS WHERE NOT STATED ± 0·5		1 & 2	1 ea.	SHAFT & PLATE	Φ36 & 5 x 50 PL.	BMS	
DECIMAL	± 0·20	ANGULAR ± 15'	ITEM Nº	Nº	DESCRIPTION	STOCK SIZE	MAT'L
DATE	20/9/63	HAWTHORN INSTITUTE OF EDUCATION					
CH'KD							
DIMENSIONS IN MILLIMETRES	SCALE	1:1	JOB NAME MODULE 1-8 EXAM		MODULE Nº 1	SHEET Nº 1 OF 3	
	DRAWN	J.S.S.					

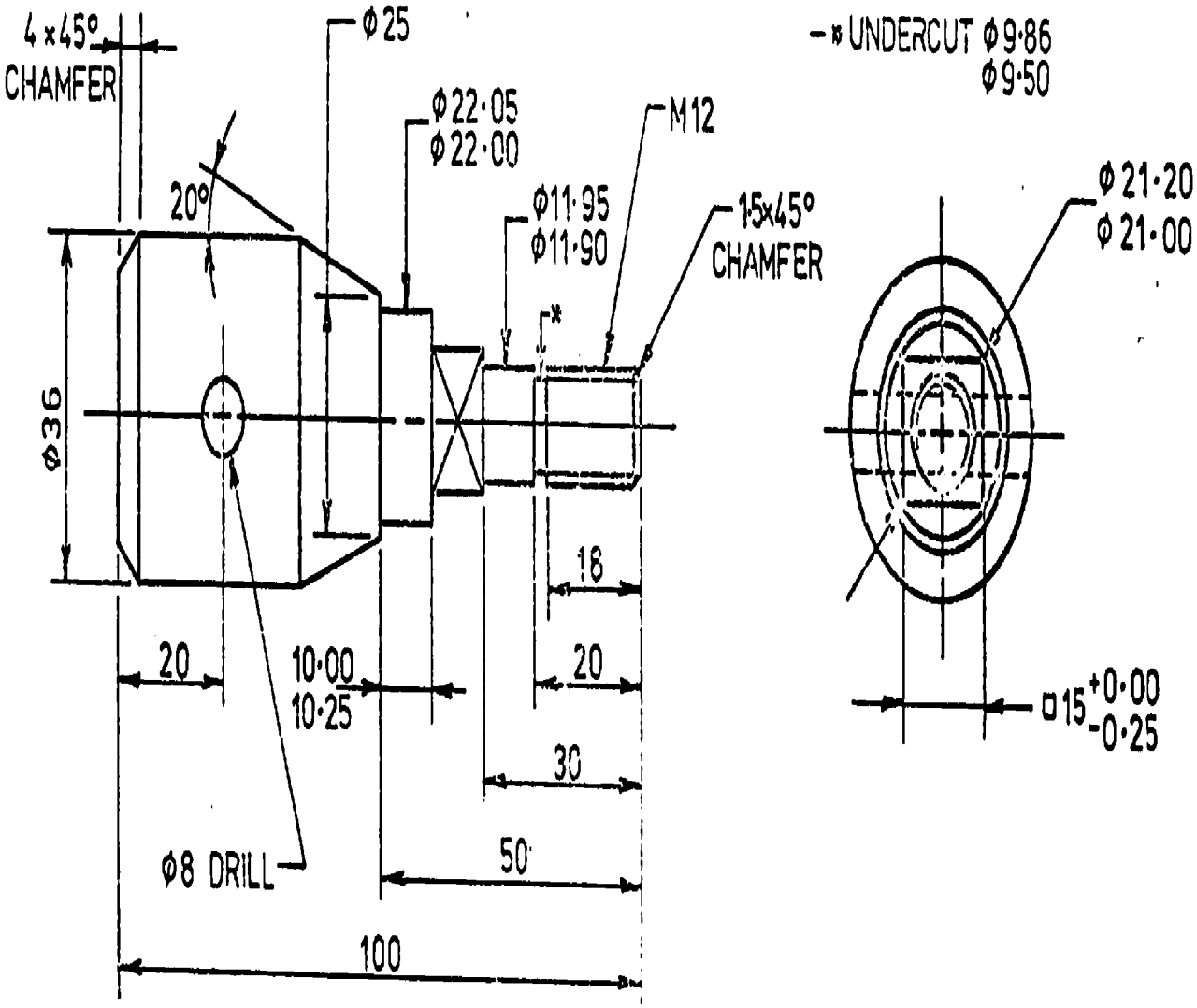
ITEM (1)

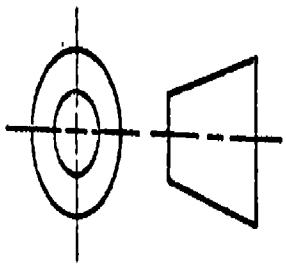
NOTE – APPRENTICES TO SET QUICK-CHANGE GEARBOX

– MACHINE 3.2 FINISH UNLESS OTHERWISE STATED

– REMOVE ALL BURRS AND SHARP EDGES (0·2 x 45° MAX.)

– * UNDERCUT Φ9·86 Φ9·50

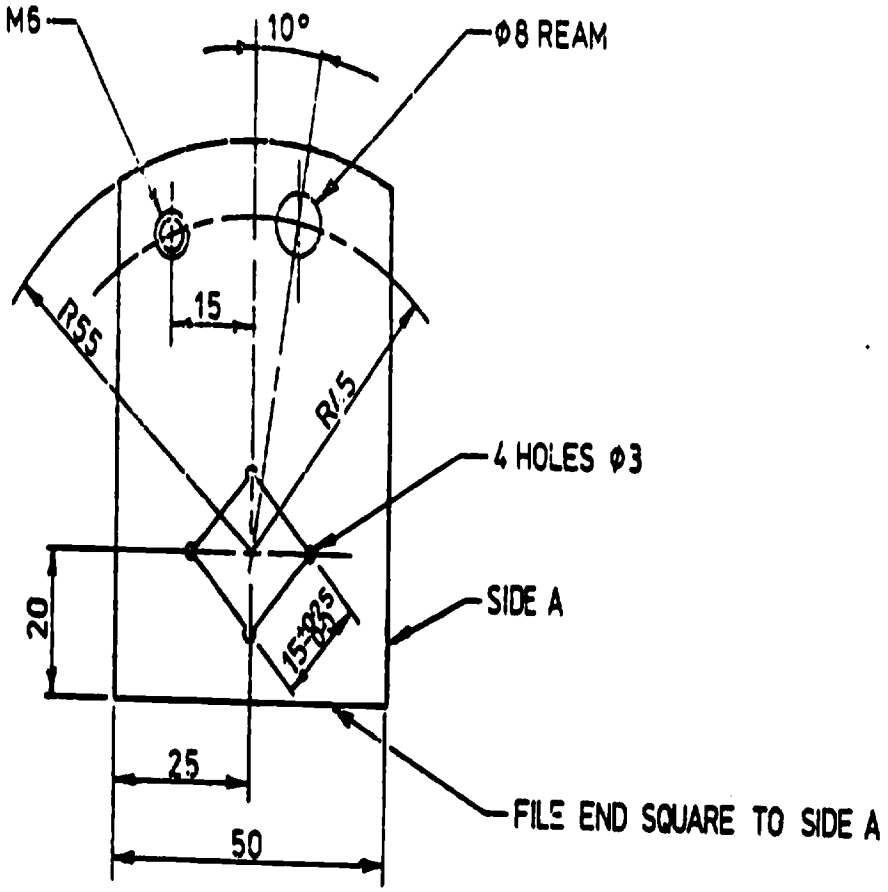




LIMITS WHERE NOT STATED ±0·5			1	1	SHAFT	Φ36x100	BMS
DECIMAL	± 0·20	ANGULAR ±15'	ITEM Nº	Nº	DESCRIPTION	STOCK SIZE	MAT'L
DATE	20/9/83		HAWTHORN INSTITUTE OF EDUCATION				
CH'KD							
SCALE	1:1	JOB NAME				MODULE Nº	SHEET Nº
DRAWN	J.S.S.	MODULE 1–8 EXAM				1	2 OF 3

DIMENSIONS IN MILLIMETRES

(2)



(0·2×45°MAX.)

NOTE-REMOVE ALL BURRS AND SHARP EDGES

LIMITS WHERE NOT STATED ±0·5		2	1	PLATE	50 × 80 × 5	EMS	
DECIMAL	± 0·20	ANGULAR ±15'	ITEM Nº	Nº	DESCRIPTION	STOCK SIZE	MAT'L
DATE	20/9/83	HAWTHORN INSTITUTE OF EDUCATION					
CH'KD							
SCALE	1:1	JOB NAME				MODULE Nº	SHEET Nº
DRAWN	J.S.S.	MODULE 1-8 EXAM				1	3 OF 3

ONS IN MILLIMETRES

FITTING & MACHINING MODULES 1-8 TEST

MARK SHEETS

Please complete the following information using BLOCK CAPITALS :

1. SURNAME _____

2. OTHER NAMES _____

3. TAFE COLLEGE _____

4. EMPLOYER _____

5. DO YOU ATTEND AN "OFF THE JOB" APPRENTICE TRAINING CENTRE? _____

6. TODAY'S DATE _____

FOR FITTING & MACHINING MODULES 1-8. TEST

ITEM 1 - SHAFT

FEATURE	ELEMENT CHECKED	CHECKING METHOD	MARKS Possible	MARKS Actual	COMMENTS
TURN					
Ø 11.90 11.95	Size	Mic	3		
	Finish	Visual	1		
Ø 22.00 22.05	Size	Mic	3		
	Finish	Visual	1		
Ø 21.00 21.20	Size	Mic	1		Check before filing square
	Finish	Visual	1		
Ø 25±0.5 Taper	Size	Vern	2		
	Finish	Visual	1		
Ø U/Cut $^{9.86}_{9.5}$ (Groove)	Size	Vern	1		
	Finish	Visual	1		
20°±15' Taper	Angle	Prot'r	1		
Length 20±0.5	Size	Rule	1		
" 30 "	"	"	1		
" 50 "	"	"	1		
" 10.00 10.25	"	Refer to Filing			
Chamf 4±0.5 x 45°	"	Rule	1		
" Thread End 1.5 x 45°	"	"	1		
Remove Sharp Corners		Discretion	2		Not larger than 0.2 x 45°
			23		
SCREW CUT					
Thread Form		Pitch Gauge	2		
" Fit	(Grade mark according to fit)	Standard Nut	4		To nut supplied
" Finish	(Grade mark according to finish)	Visual	3		
			9		
Ø8 HOLE					
Mark Out 20±0.5 Dim	Size	Rule	1		Mark before Drilling
on b " "	"	"	1		
Witness Mark	Presence	Visual	1		
Relation to 15mm Square	Position	"	1		
Drill 20±0.5 Dim	Size	Rule	1		
Alignment to b	"		1		
" Sq to axis	Position		1		
Deburr Hole		Visual	2		
			9		
FILE SQUARE					
$^{+0}_{-0.25}$ 15 A/F 2 Places	Size	Mic	6		
Sq'ness	Square four sides	Discretion Square	4		
Length to Shoulder	Size (10.25 10.00) sides	Vern	4		
Finish		Visual	2		
			16		
Item 1 - SHAFT - TOTAL MARKS			57		

	FEATURE	ELEMENT CHECKED	CHECKING METHOD	MARKS Possible	MARKS Actual	COMMENT
MARK OUT	Square 20 ± 0.5	Size	TRANSPARENCY	1		
	" on ⌀ 25 ± 0.5	"		1		
	" 15 $^{+0.25}_{-0}$	"		2		
	" Corner Holes	Position		1		
	55 Radius	Size ± 0.5 Tol		1		Marked prior to other operations
	45 " (Holes	" "		1		
	15 Dim (Hole)	" "		1		
	10° " "	" "		1		
	Witness Marks R55	Presence		1		
	2 (Holes)	"		1		
	• Square	"		2		
				13		
FILE	File Sq. End Face	Sq. To Side	Square & Discretion	2		
		" " Face	"	1		
	File R 55	To Line	Visual to Witness Marks	2		
	File Square (2 pls)	Sq. to Face	Small Square Discretion	3		
	15 $^{+0.25}_{-0}$	Size	Gauge	6		Gauge Supplied
	Square hole	Position 45° to side	Protractor or comb. set	6		
		Finish in Hole	Visual	2		
				22		
HOLES	(4) Ø 3 Holes	Position	Transparency	1		
	Ream Ø 8 - Hole	Position	"	1		
		Finish		1		
	M6 - Hole	Position	"	1		
		Squareness	Square	2		
				6		
	Finish Remove Sharp Edges ALL Edges		Discretion	2		
	ITEM 2 - PLATE - TOTAL MARKS			43		
	+ ITEM 1 - SHAFT - TOTAL MARKS			57		
	= ITEMS 1 & 2 - TOTAL MARKS			100		

GENERAL NOTE : - All Sizes within Toleranced Dimensions FULL MARKS

Outside Dimensions NO MARKS

NAME _____

COLLEGE _____

STAGE 1 PRACTICAL TEST (ELECTRICAL)

Read each question carefully then proceed to each question as directed.

1. Using the material supplied make up a 3 core flexible extension cord to comply with S A A wiring rules.

2. (a) Test your 3 core flexible extension cord to determine whether the lead is safe to use

   (b) Name the test instrument used _____

RESULTS

INSULATION RESISTANCE	CIRCUIT CONTINUITY	POLARITY

3. Determine the value of each resistor (1-10) and record results in the table below using the meter supplied.

	RESISTANCE VALUE		RESISTANCE VALUE
R1		R6	
R2		R7	
R3		R8	
R4		R9	
R5		R10	

4. (a) Neatly sketch a circuit incorporating a radiator bar (load), an ammeter, voltmeter and wattmeter.

(b) When directed connect your circuit to a 25 volt AC supply and take accurate readings from each meter.

(c) From your results calculate the resistive value of the element.

CIRCUIT

TABLE

AMMETER	VOLTMETER	WATTMETER

CALCULATION

5. Complete the following questions on the Wiring Regulations -

(a) Is knotting of a flexible cord an acceptable method of removing stress on terminals, joints and connections when terminating cables and conductors?

_____

Wiring Rules No(s) _____

Wiring Rules Table No(s) _____

Regulation No(s) _____

(b) Name a device permitted by the S A A wiring rules for making joints between flexible cords or flexible cord and other conductors.

_____

Wiring Rules No(s) _____

Wiring Rules Table No(s) _____

Regulation No(s) _____

(c) Is it permitted by the S A A Wiring rules to use $0.5mm^2$ conductors with Heavy duty PVC flexible cord?

_____

Wiring Rules No(s) _____

Wiring Rules Table No(s) _____

Regulation No(s) _____

(d) The size of fuse-element wire in relation to current rating of 16 amps shall be _____ mm diameter

_____

Wiring Rules No(s) _____

Wiring Rules Table No(s) _____

Regulation No(s) _____

(e) Is it permissable for a resistor to be embodied in a flexible cord for use as a means of reducing voltage to an appliance?

_____

Wiring Rules No(s) _____

Wiring Rules Table No(s) _____

Regulation No(s) _____

(f) The fall in voltage from the consumers terminals to any point of the installation shall not exceed _____ of the nominal voltage at the consumers terminals.

_____

Wiring Rules No(s) _____

Wiring Rules Table No(s) _____

Wiring Regulations No(s) _____

(g) When selecting type and size of cables and conductors, those cables and conductors shall be used having due regard to three considerations, these are.

_____

_____

_____

Wiring Rules No(s) _____

Wiring Rules Table No(s) _____

Wiring Regulation No(s) _____

(h) What are the approved methods of connection of portable appliances?

_____

_____

_____

Wiring Rules No(s) _____

Wiring Rules Table No(s) _____

Wiring Regulations No(s) _____

(i) Name that part of a fuse which is designed to melt and thus open the circuit it protects.

_____

Wiring Rules No(s) _____

Wiring Rules Table No(s) _____

Wiring Regulations No(s) _____

(j) Where a connection is to be made at the end of a cable the S A A wiring rules require that insulating material damaged by heat during the process of soldering shall be _____

_____

_____

Wiring Rules No(s) _____

Wiring Rules Table No(s) _____

Wiring Regulation No(s) _____

HAWTHORN INSTITUTE OF EDUCATION

LEARNING IN IN-PLANT TRAINING CENTRES PROJECT

The items on the interview/observation schedule are to be used for the collection of data on existing arrangements for the training of first year apprentices. If felt necessary, additional comments, on any features you feel have been overlooked, may be appended. If you have any queries please contact me.

Thank you for your help and co-operation.

Bob Hayes (Project Officer)
March 1985

INTERVIEW/OBSERVATION SCHEDULE

1. Trade .....

2. Observer .....

3. Date .....

4. Establishment visited .....

5. Training centre or on-the-job employment (delete one)

6. Apprentice supervisor (or contact person)

.....

7. Total number of first year apprentices .....

8. Number of "own" first year aprentices .....

9. Number of "hosted" first year apprentices .....

10. Number of instructional (teaching) staff involved in first year apprentice training

.....

11. Number of "non" teaching (administration, clerical, maintenance etc.) staff involved in first year apprentice training

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12. How are instructional staff selected? (briefly describe)

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13. Do instructional staff receive any special training? (if yes, briefly describe)

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14. How are "own" apprentices selected? (brief comment, with mention of tests used and selection strategies used)

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15. How are "hosted" apprentices selected? (comment as in previous item if possible and applicable)

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16. What "feedback" is given to apprentice employers? (i.e. host apprentice employers, and/or divisional employers where applicable)

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17. How are disciplinary standards/measures applied?

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18. Which TAFE colleges do the apprentices attend? (list colleges with present numbers of first year apprentices from each in brackets. e.g. RMIT (15))

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19. What feedback is provided to TAFE colleges regarding each apprentice's training centre (or on-the-job) level of performance?

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20. What feedback is provided by TAFE colleges regarding each apprentice's TAFE college level of performance?

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21. What level of co-operation exists between the training centre and the TAFE college(s) for sharing teaching/instructional/ training? (also provide description of how collaboration is facilitated)

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22. What patterns of apprentice attendance at training centre (or on-the-job)/TAFE college are used?

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23. Is the training program accelerated? For all? For some? (if so, state how acceleration is facilitated)

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24. Is there a "pastoral care" program operating? (if so, briefly describe)

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25. Is there a social and/or recreational facility and/or club attached to the firm in which apprentices do or are encouraged to participate? (if so, briefly describe)

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26. **Facilities**

(a) Workshops and practical work areas. Report on suitability for the purpose - machines, tools, equipment, etc. (Modern and up to date or old and obsolete? Level of upkeep and maintenance etc. Organisation, general arrangements, size, shape, lighting, storage, etc.)

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27. (b) Teaching/instruction areas (classrooms, etc.) Report on suitability and adequacy for the purpose. (Furniture and equipment, size, arrangement and organisation, provision for use of aids, types of aids and resources used and available, etc.)

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28. Teaching/instruction/supervision methods

(a) In classrooms

Teaching methods. Report on the "style" of teaching used (e.g. lecture (chalk and talk), "assignment" method (work from books, etc.), self-paced, slide/tape, computer terminals, etc. Comment on instructional competency (e.g. knowledge of material, ability to communicate, maintenance of interest, efforts to "motivate" and "inspire". Comment on aids you see used (e.g. OHP, chalkboard, charts, photographs, slides, films, video, audio. Comment on the classroom "behaviour" of the apprentices (e.g. level of interest, "active" or "passive" learners, responsiveness, and comment on any other "feature" not covered by the above that you feel is worth mentioning.

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(b) In workshops

Observe the apprentices working. Comment on their behaviour and work habits, interaction with supervisors and instructors, interaction with each other, overall level of "industry" and interest in the work displayed.

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29. Testing and correction of work

(a) What testing is done in practical areas? How often? How are marks allotted? What feedback is given to apprentices? Is there facility for remediation?

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(b) What testing is done on theory? (similar questions to (a) above)

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30. Details of the overall training centre program

Gather information available on the nature of the program being conducted- syllabus and curriculum statements, aims and objectives, etc. If not available to take away examine and make notes of impressions with respect to quality, applicability and relevance, etc.

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31. Finance

What is the total annual budget for the centre?

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How is this broken down?

Salaries .....

Equipment and maintenance .....

General upkeep and maintenance .....

Other .....

Where does the money come from? (give brief details if possible)

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32. Interview (chat to) as many staff as possible.

Endeavour to find out how they feel about the job they are doing. Expectations? Participation in decision making? What they think of apprentices?, the training centre (if applicable)?, methods used?, shortcomings of the scheme?, possible improvements? etc.etc.

33. Interview (chat to) some apprentices (say 5-6).

How do they like the trade at this stage? The type of trainng they are receiving? Morale level? Aspirations and expectations? Whether or not they are "hosted"? General attitudes? etc.etc.

FITTING AND MACHINING

TWO WAY ANALYSIS OF VARIANCE

Independent variables

Training Location (off-the-job training centre vs. on-the-job employment)

Training Mode (Accelerated training vs. non-accelerated training)

Dependent variable

End-of-year module 1-8 practical test score

* * * * * * * * * A N A L Y S I S O F V A R I A N C E * * * * * * * * *

SCORE TEST SCORE
BY LOC LOCATION
MODE MODE

* *

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	4553.956	2	2276.978	11.630	0.000
LOC	2365.958	1	2365.958	12.084	0.001
MODE	2187.999	1	2187.999	11.175	0.001
2-WAY INTERACTIONS	96.841	1	96.841	0.495	0.483
LOC MODE	96.840	1	96.840	0.495	0.483
EXPLAINED	4650.797	3	1550.266	7.918	0.000
RESIDUAL	45814.508	234	195.788		
TOTAL	50465.305	237	212.934		

238 CASES WERE PROCESSED.
0 CASES (0.0 PCT) WERE MISSING.

8. RECOMMENDATIONS

8.1 Selected elements of this study should be replicated in 1984 along the following lines:

8.1.1 Each of the four trades should be included in the replication study.

8.1.2 Practical skill tests developed in 1983 (Fitting and Machining, Electrical) should be re-administered in 1984. Some accelerated groups may be given these tests in the middle of the year. This is to confirm that any differences apparent in the 1983 group persist from year to year.

8.1.3 The problems of practical testing and assessment of Sheetmetal and Motor Mechanics apprentices should be re-addressed in an effort to devise more useful measures than those used tentatively in this study.

8.1.4 The number of TAFE colleges involved should be increased. This could rectify the present imbalance of numbers with a greater proportion of on-the-job apprentices involved. In Fitting and Machining, in particular, the number of training centre apprentices involved far exceeded the number of on-the-job apprentices. (Possibilities: Yallourn, Box Hill, Bendigo, Swinburne, Holmesglen, Dandenong.)

8.1.5 Data gathering procedures should be broadened to include observation and interviewing of relevant participants, with a view to discovering reasons for the apparent differences that develop between the comparison groups as a result of training mode and environment during the first year of apprenticeship.

8.1.6 More effort should be made to measure apprentice attitudes at various times during the year. On the results of the 1983 study, no conclusions were possible with respect to respective group attitudes of the training centre and on-the-job groups. (Results of beginning of year work attitude measures were inconclusive.)

8.1.7 Employer/training centre/TAFE college relationships and levels of co-operation need close monitoring and analysis.

8.1.8 Particular attention should be given to gathering data to test hypotheses 2, 3, 4, 6, 7, 8, 9 (see pages 29-33) in 1984. Time involved in organising the practical skills tests diverted attention from these in 1983 and so no attempt has been made to test these hypotheses, or draw any conclusion on these issues.

8.2 The apprentices observed in 1983 should be followed through to the end of their apprenticeships and their progress and characteristics monitored along the following lines.

8.2.1 Skill development.

8.2.2 Attitudes.

8.2.3 On-the-job deployment.

8.2.4 TAFE college progress, including the number who do additional studies that have been facilitated by acceleration during first year.

8.2.5 Detailed effects of acceleration, that is, comparison of accelerated apprentices with non-accelerated apprentices with respect to both the workplace and the respective TAFE colleges (for example, to what extent do accelerated apprentices catch up with non-accelerated apprentices who started a year ahead; do the effects of acceleration persist and are the effects evident at the end of apprenticeship?)

8.2.6 The final differences between the apprentices who had training centre experience in their first year and the apprentices who worked on-the-job throughout the full period of their apprenticeship.

8.3 That a wider use of accelerated programs be considered by relevant industry groups and training authorities, in the light of the above average level of cognitive attainment of young people currently entering apprenticeships in the trades investigated.

8.4 That information regarding the implementation of practical skills tests for first year apprentices be brought to the attention of TAFE officers and groups, suggesting implications for monitoring of apprentices' performance and apprenticeship courses.

8.5 That all non-accelerated training centres consider acceleration, in the light of the benefits identified in the Fitting and Machining trade in particular.

8.6 That data regarding the benefits of acceleration when it is associated with learning in in-plant training centres be brought to the attention of appropriate industry, government and TAFE officers and groups.

8.7 That information regarding beneficial results occuring where there is close training centre and TAFE college liaison be brought to the attention of relevant training and education groups such as the Apprentice Training Officers Association (Victoria) and TAFE trade teachers.