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The Parliament of the Commonwealth of Australia

# Review of the Department of Education, Science and Training Annual Report 2006-07

House of Representatives  
Standing Committee on Education and Training

May 2009  
Canberra

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# Contents

Membership of the Committee .....	v
Terms of reference .....	vii
List of abbreviations .....	ix
List of recommendations .....	xi

## THE REPORT

<b>1 The Committee's Review.....</b>	<b>1</b>
Purpose and scope of review .....	1
Timeliness in responding to requests for further information.....	2
<b>2 National vocational education and training system .....</b>	<b>5</b>
Vocational education and training governance arrangements .....	6
Skills Australia.....	8
National training packages.....	9
<b>Key themes.....</b>	<b>10</b>
Consistent national implementation of training packages.....	11
Inconsistency in delivery and assessment of skills qualifications .....	12
Rationalisation and portability of training packages .....	15
Green skills and sustainability principles.....	17
Shortage of trade teachers.....	19
Apprenticeships.....	20
Data collection on private VET .....	22
Committee comment and recommendation.....	23

<b>3</b>	<b>Decline in Enrolments in Enabling Sciences .....</b>	<b>27</b>
	Statistical data on participation trends in 'enabling sciences' .....	27
	Aggregation of data .....	27
	Timeframe for participation trends.....	30
	Committee comment and recommendation.....	32
	<b>Influences on student choices.....</b>	<b>32</b>
	Secondary school enrolments in sciences .....	33
	Availability of quality science teachers .....	34
	Strategies to encourage young people into 'enabling sciences' .....	36
	Committee Comment .....	38

## **APPENDICES**

	<b>Appendix A – List of submissions.....</b>	<b>39</b>
	<b>Appendix B – List of exhibits.....</b>	<b>41</b>
	<b>Appendix C – List of hearings and witnesses.....</b>	<b>43</b>



## Membership of the Committee

Chair Ms Sharon Bird MP

Deputy Chair Dr Dennis Jensen MP

Members Mr Jason Clare MP

Ms Julie Collins MP

Mrs Yvette D' Ath MP

Mr Steve Irons MP

Mr Robert Oakeshott MP (from 10/11/08)

Mr Sid Sidebottom MP

Hon Tony Smith MP (until 10/11/08)

Dr Andrew Southcott MP

Mr Tony Zappia MP

## Committee Secretariat

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## Terms of reference

The Standing Committee on Education and Training being empowered to inquire into and report any annual reports referred to it by the House of Representatives, has agreed to undertake an inquiry into the 2006-07 Annual Report of the Department of Education, Science and Training.

The Committee nominated the following areas that were of particular interest:

- Decline in enrolments in enabling sciences at universities;
- Issues concerning mature age apprenticeships;
- The education of children with special needs;
- Skills training to meet emerging trade demands; and
- The Australian Qualification Framework.







## List of abbreviations

ACDS	Australian Council of Deans of Science
ACER	Australian Council of Educational Research
AIG	Australian Industry Group
ANSTO	Australian Nuclear Science and Technology Organisation
AQTF	Australian Quality Training Framework
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEEWR	Department of Education, Employment and Workplace Relations
DEST	Department of Education, Science and Training
FASTS	Federation of Australian Scientific and Technological Societies
ISC	Industry Skills Council
MCTVE	Ministerial Council for Vocational and Technical Education
OECD	Organisation for Economic Co-operation and Development
NCVER	National Centre for Vocational Education Research
RTO	Registered Training Organisation
SET	Science, Engineering and Technology
TIMSS	Trends in International Mathematics and Science Study

VET      Vocational Education and Training



# List of recommendations

## 1 The Committee's Review

### Recommendation 1 (para 1.17)

That the Department of Education, Employment and Workplace Relations include information in its Annual Report on the number and timeliness of responses to questions taken from committees of the Parliament outside of questions taken in Senate Estimates sessions.

## 2 National vocational education and training system

### Recommendation 2 (para 2.90)

That the Department of Education, Employment and Workplace Relations, in consultation with the National Centre for Vocational Education Research (NCVER) and stakeholders, ensure that provision is made to capture and incorporate private sector vocational education and training data into NCVER analysis.

## 3 Decline in Enrolments in Enabling Sciences

### Recommendation 3 (para 3.16)

That the Department of Education, Employment and Workplace Relations consult with the Australian Council of Deans of Science, the Australian Academy of Science, the Australian Council of Educational Research and other relevant stakeholders in relation to improving collection and aggregation of data on university enrolments and completions that will provide trend information for narrow areas of enabling sciences such as physical, mathematical and chemical sciences.



## The Committee's Review

- 1.1 On 20 March 2008, the House of Representatives Standing Committee on Education and Training resolved to review the 2006-07 Annual Report of the Department of Education, Science and Training (DEST).<sup>1</sup>
- 1.2 DEST's 2006-07 Annual Report was tabled in Parliament on 13 February 2008. The report contains information on the Department's role and performance, corporate governance arrangements, and management accountability framework.<sup>2</sup>
- 1.3 Following the 2007 election, DEST was disbanded and the portfolio responsibility was transferred to the new Department of Education, Employment and Workplace Relations (DEEWR).

### Purpose and scope of review

- 1.4 The Committee undertook the review to familiarise itself with portfolio issues and establish a dialogue with the Department and other stakeholders.
- 1.5 The Committee pursued issues relating to the following portfolio areas:

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1 House of Representatives Standing Order 215(c) empowers standing committees to inquire into the annual reports of government departments and authorities that have been tabled in the House of Representatives subject to a number of conditions.

2 The report is available online at:  
[http://www.dest.gov.au/portfolio\\_department/dest\\_information/publications\\_resources/profiles/dest\\_annual\\_report\\_2006\\_2007.htm](http://www.dest.gov.au/portfolio_department/dest_information/publications_resources/profiles/dest_annual_report_2006_2007.htm).

- the adequacy of skills training to meet emerging demands;
  - the effectiveness of the Australian Qualifications Framework;
  - recruitment levels of mature age apprentices;
  - the decline in enrolments in enabling sciences at universities; and
  - support for the education of children with special needs.
- 1.6 The report is divided into three chapters. Chapter two discusses some vocational education and training issues that arose in relation to the first three areas of interest identified by the Committee. Chapter three canvasses matters related to levels of participation in tertiary level education in the 'enabling sciences'.
- 1.7 As noted above, the Committee also inquired into support for children with special needs. While the Commonwealth provides some support in this area, it is a responsibility that falls largely under state and territory jurisdiction. Issues related to Commonwealth support for special needs students were not pursued beyond the first public hearing.
- 1.8 The review was advertised through a recurring advertisement in *The Australian*. The inquiry received four submissions, listed at Appendix A, and five exhibits, listed at Appendix B.
- 1.9 The Committee held eight public hearings between June 2008 and February 2009 in Canberra, Adelaide and Sydney. The list of witnesses is set out at Appendix C.
- 1.10 Following the Adelaide hearing, the Committee made a site visit to University Senior College as part of the review and is grateful to those staff who participated.

### **Timeliness in responding to requests for further information**

- 1.11 Representatives of DEEWR were invited to public hearings in Canberra on 6 June 2008 and 5 February 2009. At these hearings several requests for further information were taken on notice.
- 1.12 Information requested at the hearing of 6 June 2008 was not received until 20 October 2008. Information requested at the hearing of 5 February 2009 was not received until 2 April 2009.

- 1.13 While DEEWR kept the Committee informed of delays in providing responses to its requests for additional information, the period of time taken to provide these responses is not satisfactory.
- 1.14 In the first instance, the Committee proceeded with public hearings in July, August, September and October before receiving requested information. In the second instance, the period of time taken to respond delayed the completion of drafting this report.
- 1.15 The Committee is concerned that departments of the Australian Government understand that they are ultimately accountable to the Commonwealth Parliament. A principal accountability mechanism is responsiveness to requests for information from all committees of the Parliament.
- 1.16 Under 'Services to ministers and the Parliament', the 2006-07 Annual Report indicated numbers of parliamentary questions and Senate Estimates questions responded to by DEST. The Report states that 'During the year, the department met the target for timeliness in ... responding to parliamentary questions.'<sup>3</sup> However, the criterion of what constitutes a timely response is not specified.

### **Recommendation 1**

- 1.17 **That the Department of Education, Employment and Workplace Relations include information in its Annual Report on the number and timeliness of responses to questions taken from committees of the Parliament outside of questions taken in Senate Estimates sessions.**

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3 DEST, *Annual Report 2006-07*, p. 256.





## National vocational education and training system

- 2.1 The national vocational education and training (VET) system plays a central role in ensuring Australia has a skilled workforce available to meet the needs of industry. The VET system also contributes significantly to achieving social equity and inclusion and a better standard of living for Australians.
- 2.2 The environment in which the VET system functions has changed significantly. Australian businesses operate in an increasingly competitive globalised economy, where the application of new technologies, the capacity to 'value add' and efficient use of existing resources is imperative. Australia's capacity to transition to a low carbon economy will also be significantly effected by the availability of 'green skills' and the ability to apply sustainability principles.
- 2.3 These challenges are faced at a time of existing skills shortage and declining rates of workforce participation as the workforce ages over the next 10 to 40 years.<sup>1</sup> Although the demand for skilled labour may contract in the current economic slow down, these longer term trends remain unaltered.
- 2.4 The findings of key research bodies suggest supporting long term prosperity and social inclusion requires the national VET system to increase the proportion of higher level qualifications and improve workforce participation by reaching a wider range of people. In A

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1 Treasury, *Intergenerational Report 2007*, <http://www.treasury.gov.au/igr/IGR2007.asp>

*Well Skilled Future* the National Centre for Vocational Education Research (NCVER) concluded that the future strategic direction in vocational education and training requires the VET system to be geared toward providing higher level qualifications.<sup>2</sup>

- 2.5 The Centre for the Economics of Education and Training at Monash University:

found that the challenge for the sector over the next decade will be to maintain the effort at the Certificate III and Certificate IV levels, grow higher level qualifications and respond to the ageing of the workforce by meeting the expected shortfall in qualified people to support Australian industry.<sup>3</sup>

- 2.6 The Queensland Department of Employment and Training argued that Australia will need to double, from 30 per cent to 62 per cent, the proportion of workers with vocational and technical qualifications to meet future industry demand.<sup>4</sup> The transition to a low carbon economy will also require significant upgrading of the skills of existing workers and training in sustainability principles across a range of sectors. One estimate suggested that three million workers will need some form of up skilling if Australia is to achieve a transition to a low carbon sustainable economy.<sup>5</sup>

## **Vocational education and training governance arrangements**

- 2.7 In Australia, 'state and territory governments have primary responsibility for managing their training systems'.<sup>6</sup> The Australian Government drives VET policy through funding for the national training system and for specific programmes and incentives.<sup>7</sup>
- 2.8 National VET policy is developed under the auspices of the Council of Australian Governments, by the Ministerial Council for Vocational

2 NCVER, *A Well Skilled Future*, 2008.

3 DEST, *Annual Report 2006-2007*, p. 113.

4 DEEWR, *Submission 1*, p. 11; DEST, *Annual Report 2006-2007*, p. 113.

5 CSIRO, *Growing the Green Collar Economy: Skills and labour challenges in reducing our greenhouse emissions and national environmental footprint*, June 2008, p. 29.

6 DEEWR, *Annual Report 2007-08*, p. 98.

7 DEST, *Annual Report 2006-07*, p. 95; DEEWR, *Annual Report 2007-08*, p. 98.

and Technical Education (MCVTE) within the framework of the *Skilling Australia's Workforce Act 2005* and the *2005-2008 Commonwealth-State Agreement for Skilling Australia's Workforce*. This overarching framework is supplemented by a series of State and Territory Bilateral Agreements and VET Plans.<sup>8</sup>

2.9 The DEST 2006-07 Annual Report explains that:

The MCVTE provides the national focus for vocational education and training through the following mechanisms:

- National Governance and Accountability Framework, which established the decision making processes and bodies responsible for training, as well as planning and performance monitoring arrangements;
- National Skills Framework, which sets out the system's requirements for quality and national consistency in terms of qualifications and the delivery of training;
- Australian Quality Training Framework, which contains the requirements for registration and audit of training organisations and national qualifications.<sup>9</sup>

2.10 In addition, the National Quality Council was 'established to ensure national consistency in the sector, [and] includes representatives from industry, the states and territories, client groups and training providers'.<sup>10</sup> The functions of the National Quality Council are:

- reporting to the Ministerial Council on the operation of the National Skills Framework, including training packages, Australian Quality Training Framework standards and other quality assurance arrangements;
- advising Ministers on the endorsement of training packages;
- recommending approaches to improve national consistency within the operation of the National Skills Framework; and
- fulfilling accountability requirements through providing an annual report on its operations to the Ministerial Council.<sup>11</sup>

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8 See, 2005-2008 Commonwealth- State Agreement for Skilling Australia's Workforce; State and Territory Bilateral Agreements, and VET Plans:  
[http://www.dest.gov.au/sectors/training\\_skills/publications\\_resources/agreement/2008.htm](http://www.dest.gov.au/sectors/training_skills/publications_resources/agreement/2008.htm)

9 DEST, *Annual Report 2006-07*, p. 105.

10 DEST, *Annual Report 2006-07*, p. 106.

11 DEST, *Skilling Australia, 2005-2008 Commonwealth State Agreement for Skilling Australia's Workforce*, p. 47.

- 2.11 The National Industry Skills Committee provides the MCVTE with 'advice on workforce planning, future training priorities and other critical issues facing the training sector'.<sup>12</sup> Ten Industry Skills Councils (ISC), provide the mechanism for industry involvement as a conduit for industry intelligence to government.
- 2.12 The ISCs, in consultation with their sector partners, develop national training packages, which reflect standards and competencies agreed to by industry. Training packages are endorsed by the National Quality Council, and then lodged on the National Training Information System, which provides a single entry point to national training packages. The National Training Information System is designed for training sector users, not for the general public, and contains information about qualifications, courses, units of competency and registered training organisations licensed to provide training.<sup>13</sup>

## Skills Australia

- 2.13 Skills Australia was established in 2008 to advise government on current and future demands for skills and future directions in VET policy.
- 2.14 Skills Australia is undertaking a consultation on the governance arrangements of the national VET system.<sup>14</sup> That review will examine options for simplifying governance infrastructure and regulatory arrangements. Specifically the review will target barriers to building a national VET system, with greater consistency in implementation, accreditation and quality control.<sup>15</sup>
- 2.15 The Strategic Industry Forum hosted by Skills Australia on 20 February 2009, brought together the ISCs, industry and peak body representatives, and State Training Authorities. The Forum identified four areas for action:
- strategic industry leadership;
  - quality;

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12 DEST, *Skilling Australia, 2005-2008 Commonwealth State Agreement for Skilling Australia's Workforce*, p. 38.

13 <http://www.ntis.gov.au/Default.aspx>

14 See, Skills Australia, *Discussion Paper: Future Governance of the National Vocational Education and Training System*, 2008, p. 2.

15 Skills Australia, *Discussion Paper: Future Governance of the National Vocational Education and Training System*, 2008, p. 13.

- funding and equity; and
  - evidence based policy and planning.
- 2.16 A joint working group will coordinate work on these areas and provide a mechanism for consultation with wider industry and community stakeholders.

## National training packages

2.17 The national training packages are central to achieving a national VET system and have been the focus of recent debate and reform. In 2007, the Department participated in an international benchmarking study initiated by the Organisation for Economic Co-operation and Development (OECD) to review VET policy and practice in thirteen countries.<sup>16</sup> The results of the study were published in November 2008. The OECD review provided positive feedback on many aspects of Australia's VET system, however, it also expressed a number of concerns, including:

- the extensive breadth, complexity and number of training packages;
- the need for skills training to respond quickly to rapidly evolving industrial sectors;
- the emphasis on training for certain jobs rather than generic tasks;
- the limited use of many training packages;<sup>17</sup>
- the absence of national assessment, which means there is no national standard to ensure that a particular set of skills has in fact been acquired.

2.18 DEEWR advised that a new process for the development and endorsement of training packages was agreed by the National Quality Council for implementation from January 2008 onwards. A 'continuous improvement model' has replaced the system of three yearly review and:

will enable better responsiveness to industry priorities for new and updated skills, and give Industry Skills Councils

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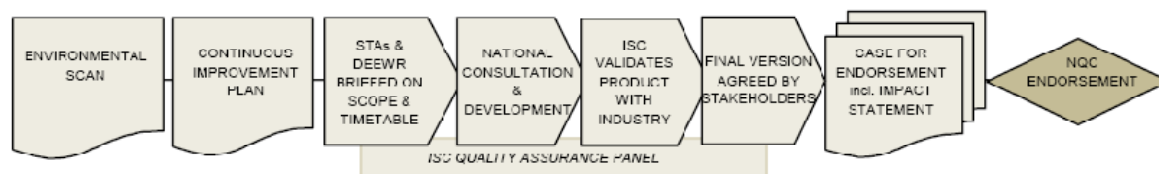
16 DEEWR, *Annual Report 2007-08*, p. 100.

17 In 2006, about eighty per cent of all publicly recorded enrolments in training packages were in just 180 of the 1 709 available. Around 70 qualifications were not used at all in 2006 (NSOC, 2008, pp. 16-17); as reported in OECD, *Learning for Jobs: OECD Reviews of Vocational Education and Training: Australia*, November 2008, p. 36.

greater responsibility and accountability for the final product.<sup>18</sup>

- 2.19 The process (see Figure 1) includes an Environmental Scan, Continuous Improvement Plan, Impact Statement and the establishment of an Industry Skills Council Quality Assurance Panel.

Figure 1 Processes for Development and Endorsement of Training Packages 2008



Source: Training Package Development and Endorsement Process 2008

- 2.20 DEEWR stated that:

The new process aims to strengthen quality assurance arrangements ... and also provides some streamlining of the endorsement process.<sup>19</sup>

## Key themes

- 2.21 The Committee inquired into the three specific issues relating to the VET sector:
- skills training to meet emerging demands;
  - the Australian Qualifications Framework; and
  - support for mature age apprentices.
- 2.22 Three areas of attention emerged relating to the capacity of the national VET system to:
- improve national consistency in delivery, quality and assessment of training outcomes;

18 Department of Education, Employment and Workplace Relations website: [http://www.dest.gov.au/sectors/training\\_skills/policy\\_issues\\_reviews/training\\_package\\_development\\_endorsement\\_process\\_2008.htm](http://www.dest.gov.au/sectors/training_skills/policy_issues_reviews/training_package_development_endorsement_process_2008.htm).

19 DEEWR, *Submission 1*, p. 12.

- increase labour force mobility through better acknowledging portability of skill sets in qualifications; and
  - close skills shortages and raise sustainability skills.
- 2.23 In attending to these areas, industry stakeholders agreed with the Department that the national VET system must be flexible and responsive to changing economic conditions and the demands for new and higher level skills.
- 2.24 Among specific concerns commented on by industry stakeholders were:
- obstacles to achieving nationally consistent implementation of training packages;
  - inconsistency in delivery, skills assessment and industry acceptance of qualifications;
  - rationalisation and portability of training packages;
  - barriers to meeting skills shortages and training for 'green' skills; and
  - lack of comprehensiveness of data on private sector VET providers.
- 2.25 The Committee also heard evidence on measures to support mature age apprenticeships.

## Consistent national implementation of training packages

- 2.26 DEEWR clarified that a training package:
- does not prescribe how the training should be delivered, or the time taken to deliver it. It is the responsibility of the registered training organisations to develop teaching strategies and assessment methods to meet the needs, abilities and circumstances of the students and industry.<sup>20</sup>
- 2.27 However, the Construction and Property Services Industry Skills Council stated that inconsistencies in the implementation of national training packages could arise after their endorsement:
- After the training packages have been endorsed by the National Quality Council and the ministers, the training package goes on the national training information system. The registered training organisations can then elect whether

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20 DEEWR, *Transcript of Evidence*, 5 February 2009, p. 3.

or not to deliver those qualifications and the state training authorities can then elect whether or not to fund the delivery of those qualifications through public funding ... They can also get delivered by fee for service.<sup>21</sup>

2.28 Furthermore, state training authorities may refuse to implement a nationally endorsed training package, despite its development and endorsement under the national framework. The problem was illustrated with reference to the construction industry:

the state of Victoria is still using the 1998 construction training package. They chose not to implement the 2003 package, for very minor reasons; other states certainly did implement that package. We have just revised the construction package ... It has been endorsed by the National Quality Council, and the state of Victoria is not allowing us to put that on the National Training Information Service.<sup>22</sup>

2.29 The Dusseldorp Skills Forum described as 'ridiculous' the current situation where the system for plumbers with environmental qualifications is different in New South Wales from that which exists in Victoria and Queensland.<sup>23</sup>

## Inconsistency in delivery and assessment of skills qualifications

2.30 The 2006-07 DEST Annual Report related collaboration between DEST and the National Quality Council 'to develop a new outcomes based Australian Quality Training Framework, which came into effect on 1 July 2007'.<sup>24</sup> The Annual Report states that:

AQTF 2007 has a stronger focus on the quality of services and outcomes being achieved for clients, rather than on the inputs used to get there. Registered bodies have worked together to develop national guidelines to ensure consistent interpretation and implementation of AQTF 2007. AQTF 2007 places the focus on quality assurance squarely on training and assessment, client services and management systems.<sup>25</sup>

2.31 The OECD review noted that:

21 DEEWR, *Transcript of Evidence*, 5 February 2009, p. 4.

22 Construction and Property Services Industry Skills Council, *Transcript of Evidence*, 13 November 2008, p. 2.

23 Dusseldorp Skills Forum, *Transcript of Evidence*, 14 November 2008, p. 4.

24 DEST, *Annual Report 2006-07*, p. 106.

25 DEST, *Annual Report 2006-07*, p. 106.



Despite a common national qualification system, there are wide variations in the assessments standards which are applied.<sup>26</sup>

- 2.32 ISCs expressed concern about inconsistency in the quality of VET training and assessment undertaken by some Registered Training Organisations (RTOs). The ElectroComms and Energy Utilities Industry Skills Council stated:

Under the AQTF system, through the states, registered training organisations supposedly adhere to policy and guidelines and a quality framework. The fault in the system has probably been that they are being process driven rather than outcomes driven.<sup>27</sup>

- 2.33 DEEWR confirmed that state registration bodies are responsible for registering the training organisations and for monitoring the quality of delivery. The AQTF, 'is a national training framework, and it is against that framework that the state registration bodies assess the training providers.'<sup>28</sup>

- 2.34 The Department reported that there are:

slightly different arrangements in each different state and territory around the formal issuing of a statement of attainment or the issuing of a full qualification by the RTO certified by the state, but, ultimately, acceptance of the quality or standard of that qualification will be tested by the industry or the employer and the clients who are using those services.<sup>29</sup>

- 2.35 The Australian Industry Group (AIG), a member of the National Quality Council, stated that 'industry does have some confidence issues in the assessment of the system.' AIG claimed assessors often suffer a lack of professional development and there are insufficient assessment benchmarks in the system.<sup>30</sup>

- 2.36 In 2006, NCVET research showed that 77 per cent of employers reported satisfaction with vocational qualifications as a way of

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26 OECD, *Learning for Jobs; OECD Reviews of Vocational Education and Training: Australia*, November, 2008, p. 13.

27 ElectroComms and Energy Utilities Industry Skills Council, *Transcript of Evidence*, 13 November 2008, p. 3.

28 DEEWR, *Transcript of Evidence*, 5 February 2009, p. 4.

29 DEEWR, *Transcript of Evidence*, 6 June 2008, p. 47.

30 AIG, *Transcript of Evidence*, 14 November 2008, p. 21.

meeting skills needs.<sup>31</sup> NCVER's 2007 Survey of Employer Use suggested that employers' satisfaction with the VET system remains relatively high, with 80.8 per cent of employers with jobs requiring vocational qualifications reporting satisfaction.<sup>32</sup>

- 2.37 TAFE Directors Australia reported an international consequence of the failure to sustain the satisfactory service delivery levels by some RTOs:

A number of TAFE institutions have established partnerships with Chinese institutions; they deliver the first year of a course and then the students come to Australia to do the second or the second and third year of a course ... The activities of private providers in China have led the Chinese Government now to banning any further partnerships between Australian institutions and Chinese counterparts ... they have done massive damage to a very lucrative and important Chinese market.<sup>33</sup>

- 2.38 In response to this claim, DEEWR stated:

Under the [Education Services for Overseas Students] legislative framework, the federal, state and territory governments share responsibility for monitoring providers who offer courses to international students. DEEWR and designated authorities both carry out site and other audits of providers to ensure compliance with the Standards National Code 2007.<sup>34</sup>

- 2.39 The OECD review of VET policy and practice argued that increased competition in the VET sector requires more rigorous quality reporting on the outcomes. AIG stated:

There is a lot merit in having more rigorous publication of quality indicators. They would have to be nationally consistent and they would have to be a set of indicators that genuinely captured the breadth and depth of what you are looking at or else you could skew the information quite badly. You also need to be able to acknowledge providers

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31 NCVER, *Survey of Employer Use and Views of Vocational Education and Training* (2005), as reported in DEST, *Annual Report*, p. 107.

32 NCVER, *Survey of Employer Use and Views of Vocational Education and Training* (2007); available at <http://www.ncver.edu.au/statistics/surveys/seuv07/highlights.html>

33 TAFE Directors Australia, *Transcript of Evidence*, 18 September 2008, p. 3.

34 DEEWR, *Supplementary Submission 1.2*, p. 7.

that deal with significant cohorts of disadvantaged people, and reward and acknowledge that. The indicators have to be right.<sup>35</sup>

2.40 However, AIG did not support additional assessment because:

It would be a duplication of assessments, so it would come at great cost ... It would only have any efficacy if it happened in the workplace.<sup>36</sup>

2.41 DEEWR stated that the AQTF was subject to further review by the Quality Standing Committee under the National Quality Council, which is responsible for looking at national consistency.<sup>37</sup>

## Rationalisation and portability of training packages

2.42 Group Training Australia, expressed reservation at whether current training packages had the required level of flexibility:

given the big push for skill sets, a big push for competency based training, a big push for fast-tracking of apprentices ... skills training packages are going to have to be very agile and nimble in responding to the demands of this so called industry driven system. You would have to question the current agility of some of the packages to respond in an appropriately quick manner.<sup>38</sup>

2.43 The ElectroComms and Energy Utilities Industry Skills Council indicated the importance of flexibility of packages in terms of their portability:

Portability is a real issue, particularly when the emphasis on construction has fallen away, or when energy management, gas generation or electricity are in an upturn, which is going to happen, particularly with gas and with the mining industry. With the boom in mining, we are going to transfer people across from each of those sectors into where the boom times are. We will be using line workers in the electro technology industry.<sup>39</sup>

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35 AIG, *Transcript of Evidence*, 14 November 2008, p. 20.

36 AIG, *Transcript of Evidence*, 14 November 2008, p. 20.

37 DEEWR, *Transcript of Evidence*, 5 February 2009, p. 4.

38 Group Training Australia *Transcript of Evidence*, 14 November 2008, p. 43.

39 ElectroComms and Energy Utilities Industry Skills Council, *Transcript of Evidence*, 13 November 2008, p. 6.

- 2.44 Manufacturing Skills Australia, stated that it drew together separate parts of industry training arrangements including, metal and engineering aerospace, light manufacturing (textile, clothing, footwear, furnishing) and process manufacturing. The amalgamation created a 'great opportunity for a more unified approach to training for the manufacturing industry':

The key goals ... are things like national consistency ... and providing opportunities for people to move between enterprises and across sectors if they are displaced.<sup>40</sup>

- 2.45 In a similar vein, the Resources and Infrastructure Industry Skills Council, stated that it is combining nine different training packages, into one 'warehouse bank':

we are rationalising right across all our units of competency and qualifications so that the skills that are developed by people can be recognised in not unfamiliar territory for them ... training providers are a bit reluctant to take some of that change on board ... but it has great support from major industry players and most enterprises...<sup>41</sup>

- 2.46 The energy sector also identified a common training stream across all four industries of generation, gas, TDR<sup>42</sup> and electro technology:

if somebody is a line worker and decides to be an electrician, they can transfer. It is the same for those wanting to go into gas and generation. So we have made a basic Certificate II level where people can go across all of those sectors. They can change sectors whenever they want and take the credits with them.<sup>43</sup>

- 2.47 The construction industry reported similar progress on rationalisation. The Construction and Property Industry Skills Council advised:

We have just rationalised the construction packages. There were three separate packages: general construction, offsite and plumbing and services packages. We have just collapsed

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40 Manufacturing Skills Australia, *Transcript of Evidence*, 14 November 2008, p. 23.

41 Resources and Infrastructure Industry Skills Council, *Transcript of Evidence*, 14 November 2008, p. 26.

42 Time domain reflectometry.

43 ElectroComms and Energy Utilities Industry Skills Council, *Transcript of Evidence*, 13 November 2008, p. 6.

those down to one and we have tried to pick up common core units in the qualifications wherever possible...<sup>44</sup>

## Green skills and sustainability principles

2.48 CSIRO appeared following the release of its report to the Dusseldorp Skills Forum, *Growing the green collar economy*. In its evidence, CSIRO presented claims that:

- If Australia takes significant action to cut greenhouse gas emissions national employment will still increase by between 2.6 million and 3.3 million over the next two decades.
- Jobs in sectors that are currently high carbon emitters, like transport, construction, agriculture, manufacturing and mining are forecast to grow strongly in the next decade.
- It will be essential to identify and provide the green skills needed by the 3.25 million workers in industries that currently have 'high environmental impacts'.<sup>45</sup>

2.49 The ElectroComms and Energy Utilities Industry Skills Council predicted that virtually all of Australia's 150,000 electricians would need some form of retraining in sustainability principles and audit.<sup>46</sup>

2.50 CSIRO argued for a broader understanding of 'green skills' than the upgrading of trade skills:

what is required ... is actually a transition – something which fundamentally changes the circumstances under which things are done in the economy, in businesses and in households. In order to achieve this there will be flow-on effects which will affect the whole economy and which will create opportunities in ... sectors, which in the first take we would not identify as green skills...<sup>47</sup>

2.51 ISCs agreed that a cultural change in work activity, around issues such as energy conservation, will bring significant new opportunities to lift the skill level of the work force. Manufacturing Skills Australia likened the anticipated new wave of activity in green skills and sustainability to the major reforms in occupational health and safety

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44 Construction and Property Industry Skills Council, *Transcript of Evidence*, 13 November 2008, p. 6.

45 [http://www.dsf.org.au//papers/204/GreenSkillsMEDIARELEASE\\_2.pdf](http://www.dsf.org.au//papers/204/GreenSkillsMEDIARELEASE_2.pdf)

46 ElectroComms and Energy Utilities Industry Skills Council, *Transcript of Evidence*, 13 November 2008, p. 10.

47 CSIRO, *Transcript of Evidence*, 28 August, 2008, p. 3.

in the 1980s, where workplaces required a significant change in mindset.<sup>48</sup>

2.52 NCVER stated that, while VET has:

a central role to play in the adoption and promotion of practices which encourage sustainability, the incorporation of 'sustainability skills' in vocational training is an existing gap.<sup>49</sup>

2.53 Dusseldorp Skills Forum stated that consumer demand for greater sustainability, has been slow to date but could be expected to increase with the introduction of a Carbon Pollution Reduction Scheme.<sup>50</sup>

2.54 DEEWR advised that the Ministerial Council has commissioned an 'action group' to consider ways the VET system can respond to the demand for training in 'green skills'.<sup>51</sup> The Department stated that, as a matter of course, some trades would require participants to upskill:

In terms of the regulated occupations ... [tradespeople] have to have a licence which is renewed either annually or for some other period. Where there is a regulatory requirement, for example in relation to grey water or to cabling for web based things and so on, that is actually a change in the regulation. As part of [a tradesperson] getting their licence for the ensuing period they have to undertake some of that sort of training.<sup>52</sup>

2.55 AIG suggested that 'green skill sets or skill sets around sustainability' required existing skills to be applied in new ways:

All plumbers need to be green plumbers now, but a lot of the green plumbing skills are not different from existing plumbing skills; it is the application that is altered, not the skill ... we get confused between skill and application.<sup>53</sup>

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48 Manufacturing Skills Australia, *Transcript of Evidence*, 14 November 2008, p. 25.

49 NCVER, *Finding Common Ground: is there a place for sustainability education in VET?*, 2007.

50 Dusseldorp Skills Forum, *Transcript of Evidence*, 14 November 2008, p. 7.

Cf. ElectroComms and Energy Utilities Industry Skills Council, *Transcript of Evidence*, 13 November 2008, p. 10: 'In the past there were electives that actually picked that up but nobody took them. We had them available but nobody took them.'

51 DEEWR, *Transcript of Evidence*, 5 February 2009, p. 6.

52 DEEWR *Transcript of Evidence*, 6 June 2008, p. 41.

53 AIG, *Transcript of Evidence*, 14 November 2008, p. 11.

- 2.56 AIG expressed concern that apprenticeships should not be 'turned into endless things ... it is not this bolt-on thing that you have to keep adding and adding to...' <sup>54</sup>
- 2.57 DEEWR stated that the existing system for delivering training in, for example, the installation of photovoltaic systems, or the conversion of cars to LPG, is sufficiently flexible:

The training and delivery system ... has that flexibility to deliver just certain modules or skills points. So an individual plumber could say, 'I'm going to try and pursue a course in TAFE,' identify just a couple of key components and pay on a fee basis for the hours of delivery for those components of a qualification. <sup>55</sup>

## Shortage of trade teachers

- 2.58 Concerns were raised about the impact of a shortage of trade teachers on the capacity of the national VET system to deliver the level and quality of training needed. The Construction and Property Industry Skills Council argued that it was difficult for TAFE and private RTOs to attract tradespeople away from good wages in their industry into training roles:

the TAFE area is simply not competitive in terms of the wages that are offered. People can earn a lot more very quickly, without having the constraints applied to them that they would have working in a TAFE. <sup>56</sup>

- 2.59 The ElectroComms and Energy Utilities Industry Skills Council stated that:

There is a massive shortage of trade teachers, and that is going to be the biggest issue that faces us in the next six or seven years. We have a giant roll-out of smart metering and photovoltaic renewable sources so that, unless we get people who can train people, we are going to have not just a massive skill shortage but a massive quality problem down the track. <sup>57</sup>

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54 AIG, *Transcript of Evidence*, 14 November 2008, p. 11.

55 DEEWR, *Transcript of Evidence*, 6 June 2008, pp. 40-41.

56 Construction and Property Industry Skills Council, *Transcript of Evidence*, 13 November 2008, p. 4.

57 ElectroComms and Energy Utilities Industry Skills Council, *Transcript of Evidence*, 13 November 2008, p. 3.

- 2.60 The ElectroComms and Energy Utilities Industry Skills Council advised that state training authorities would not accept proposals from the ISC to provide refresher training to trades teachers on, for example, maths and physics, because it was considered a duplication of the Diploma of Teaching. It was suggested that there is a case for trade specific teacher training to give tradespeople the confidence to teach and that a teaching qualification is too generic to meet the need.<sup>58</sup>

## Apprenticeships

### Pre-apprenticeships

- 2.61 The Committee inquired into the adequacy of school-industry engagement and pre-apprenticeships as a pathway to further post school training and employment. In general, witnesses agreed that industry is more positive about employing a young person who has already had the opportunity to understand the nature of the work.
- 2.62 NCVER stated that:
- It is very difficult to get proper data on how successful [pre-apprenticeships] are, but all of the feedback ... collected, both from the employers and from the apprentices, was very positive, for the reason that ... they essentially act as a filter to find out those people who are really suited to that occupation.<sup>59</sup>
- 2.63 AIG confirmed the absence of data but referred to anecdotal feedback from members that indicated employers preference for someone who has already made a choice because the person is more likely to complete their apprenticeship.<sup>60</sup>
- 2.64 TAFE Directors Australia also endorsed pre-apprenticeships as providing good value from the perspective of the student:
- They give the students confidence that they have some capability in terms of going out into the workplace. They get

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58 ElectroComms and Energy Utilities Industry Skills Council, *Transcript of Evidence*, 13 November 2008, p. 8.

59 NCVER, *Transcript of Evidence*, 22 July 2008, p. 4.

60 AIG, *Transcript of Evidence*, 14 November 2008, p. 17.



a good orientation, before getting out on to the job, towards what the work will be like.<sup>61</sup>

## Mature age apprentices

- 2.65 DEEWR provided information on the Support for Mid-Career Apprentices programme that provides financial assistance to employers (as a wage subsidy) or to Australian Apprentices (as income support) depending upon industrial arrangements. The programme provides \$150 per week in the first year and \$100 per week in the second year.<sup>62</sup>
- 2.66 The programme was introduced in 2006 following analysis showing that commencement of Australian Apprenticeships had significantly lower levels for persons aged 30 and over in trades experiencing strong skill shortages.<sup>63</sup>
- 2.67 Group Training Australia stated that the higher wage rate for a 21 year old apprentice is an issue for smaller employers.<sup>64</sup>
- 2.68 The programme targets apprentices commencing an apprenticeship after the age of 30 years at the Certificate III or IV in a trade experiencing a skill shortage.
- 2.69 DEEWR reported that by 8 July 2008 there were 7,494 Support for Mid Career recipients:
- 5,188 are new Australian Apprenticeship commencements but were not necessarily unemployed prior to commencing; and
  - 2,306 were existing workers upgrading their skills.<sup>65</sup>
- 2.70 A further update showed that at 22 February 2009 there were 10,989 Mid-Career recipients:
- 7,364 are new Australian Apprenticeships commencements but were not necessarily unemployed prior to commencing; and
  - 3,625 were existing workers upgrading their skills.<sup>66</sup>

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61 TAFE Directors Australia, *Transcript of Evidence*, 18 September 2008, p. 10.

62 DEEWR, *Submission 1*, p. 4.

63 DEEWR, *Submission 1*, p. 4.

64 Group Training Australia, *Transcript of Evidence*, 14 November 2008, p. 54.

65 DEEWR, *Supplementary Submission 1.1*, p. 4.

66 DEEWR, *Supplementary Submission 1.2*, p. 7.

## Data collection on private VET

2.71 The OECD recently acknowledged that:

Australia invests heavily in data collection and research on VET through core funding of the National Centre for Vocational Education Research and the statistical and analytical tasks contracted to it and to other research agencies.<sup>67</sup>

2.72 The OECD report recommended extending data collection to support more informed student choice and incorporating statistical indicators routinely into policy development at all levels of government.<sup>68</sup>

2.73 NCVER expressed concern at the lack of data on vocational education and training conducted by private RTOs. NCVER claimed that vocational education and training in new technologies is mainly market driven and takes place in the private sector.<sup>69</sup> As private RTOs have no obligation to provide course or student data, NCVER is unable to provide comprehensive data to government.<sup>70</sup>

2.74 DEEWR estimated that about 85 per cent of all vocational education and training is delivered through publicly funded organisations, with the remainder through private RTOs.<sup>71</sup> NCVER speculated that private RTOs could account one half to two thirds of all vocational education and training, but could not provide firm statistics on this matter.<sup>72</sup>

2.75 The Resources and Infrastructure Industry Skills Council stated that its industry is not engaged with the publicly funded training providers.<sup>73</sup> Similarly, Manufacturing Skills Australia identified lack of data collection on enterprise funded fee for service training as an issue of concern in their recent *Environmental Scan 2008*:

There is a significant component of training provision using various manufacturing Training Packages that is not captured

67 OECD, *Learning for Jobs OECD Reviews of Vocational Education and training: Australia*, November 2008, p. 28.

68 OECD, *Learning for Jobs OECD Reviews of Vocational Education and training: Australia*, November 2008, p. 29.

69 NCVER, *Transcript of Evidence*, 22 July 2008, p. 7

70 NCVER, *Transcript of Evidence*, 22 July 2008, p. 7.

71 DEEWR, *Transcript of Evidence*, 5 February 2009, p. 9.

72 NCVER, *Transcript of Evidence*, 22 July 2008, p. 7.

73 Resources and Infrastructure Industry Skills Council, *Transcript of Evidence*, 14 November 2009, p. 22.

in AVETMISS data. This activity is entirely enterprise funded...<sup>74</sup>

- 2.76 The OECD report noted NCVER's limited coverage in the private sector in the context of the Student Outcomes Survey:

The Student Outcomes Survey, a national survey conducted annually since 1999, obtains information on students one year after they leave the VET System. Its scope has recently been extended, but it still provides only partial coverage of private and community providers and fee-for-service VET schools.<sup>75</sup>

- 2.77 The Strategic Industry Forum held on 20 February 2009, identified evidence based policy and planning as an area requiring attention. In a preparatory paper for the Forum, Skills Australia said that employers spend 1.3 per cent of payroll on formal structured training, which is above the average expenditure by employers in the European Union countries but:

Inadequate data on employer investment in training creates difficulties in examining the respective roles of government and industry in the purchase of training.<sup>76</sup>

- 2.78 NCVER suggested that there should be a mutual obligation on private RTOs to provide a minimum set of data in return for endorsement under the Australian Quality Training Framework.<sup>77</sup>

## Committee comment and recommendation

- 2.79 VET policy is a priority for government, and is undergoing a period of intense review and significant reform. The following comments should be taken in the context of the climate of change prevailing in the sector.
- 2.80 Underpinning many of the concerns raised by stakeholders about inconsistency in implementation, delivery, quality and assessment of training outcomes, is a complex set of governance arrangements. The regulation of the VET sector is fragmented between jurisdictions, with

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74 Manufacturing Skills Australia, *Exhibit 1*, p. 14.

75 OECD, *Learning for Jobs OECD Reviews of Vocational Education and training: Australia*, November 2008, p. 28.

76 Skills Australia, *Industry leadership: the next steps* (preparatory paper for Strategic Industry Forum, 20 February, 2009), p. 10.

77 NCVER, *Transcript of Evidence*, 22 July 2008, p. 7.

- variations between states on registration, accreditation, auditing and monitoring of performance standards.
- 2.81 The Government has announced its intention to build a national system of 'qualifications, fees, income support and regulatory oversight'.<sup>78</sup> As noted above, Skills Australia is currently considering advice to government on VET governance.<sup>79</sup> The outcome of the Skills Australia review should provide options to reduce the complexity in the current arrangements and address inconsistencies in implementation, accreditation, and quality.
- 2.82 On 20 February 2009, the Strategic Industry Forum, identified strategic industry leadership, quality, funding and equity, and evidence based policy and planning as four areas that require collaborative and focused attention. As a result of the Forum, further work on these four themes will be coordinated by a Working Group, under the auspices of Skills Australia.<sup>80</sup> It is notable that, among other things, the lack of data on industry investment in VET was raised as one of the shortcomings of the existing system.<sup>81</sup>
- 2.83 In the interim, on 5 March 2009, the Minister for Education announced the formation of a single tertiary education sector ministerial council.<sup>82</sup> This is intended to achieve better alignment and inter-connectivity between VET and higher education. The Minister also announced an Australian Qualifications Framework Council commission to improve the articulation and connectivity between the university and VET sectors to enable competency-based and merit-based systems to become more student focused.<sup>83</sup>
- 2.84 Industry Skills Councils are providing input from industry stakeholders to Skills Australia and rationalising training packages to improve portability. It is too soon to evaluate the success of these reforms.

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78 The Hon Julia Gillard MP, *Speech*, Big Skills Conference, Sydney, 5 March 2009.

79 Skills Australia, *Discussion Paper: Future Governance of the National Vocational Education and Training System*, 2008.

80 See, *Skills Australia, Industry leadership: the next steps* (preparatory paper for Strategic Industry Forum, 20 February, 2009); *Strengthening our skills base in uncertain times*, (Communiqué issued following Strategic Industry Forum, 20 February 2009)

81 *Skills Australia, Industry leadership: the next steps* (preparatory paper for Strategic Industry Forum, 20 February, 2009, p.10.

82 The Hon Julia Gillard MP, *Speech*, Big Skills Conference, Sydney, 5 March 2009.

83 The Hon Julia Gillard MP, *Speech*, Big Skills Conference, Sydney, 5 March 2009.

- 2.85 Review and reform of the VET sector should take account of a gap in statistical data that appears in monitoring the overseas and domestic activities of private sector providers of VET.
- 2.86 However, two areas appear to require attention. First, a serious allegation has been made in relation to the overseas activities of some private RTOs. Second, there appears to be a statistical gap in the monitoring of the domestic activities of private RTOs.
- 2.87 In relation to the first matter, it remains unclear whether difficulties forming partnerships between TAFEs and their Chinese counterparts, referred to by TAFE Directors Australia, resulted from insufficient standards required of VET providers to overseas students, insufficient monitoring of service delivery against these standards or both.
- 2.88 **It is of concern that export opportunities for the VET sector may have been compromised by the activities of some providers. As a matter of urgency, DEEWR should ensure sufficient standards and monitoring of providers will identify any future activities of both public and private Australian exporters of VET services that could reflect adversely on the quality of the sector.**
- 2.89 On the second matter, while the OECD has commented positively on the range and depth of VET research and analysis, services from private providers are not reflected in NCVER data. This is a potentially significant gap in information available to government and consideration should be given to requiring that private RTOs provide relevant data to NCVER as a condition of registration. This issue could be taken up by the Working Group established by the Strategic Industry Forum, however, it is also open to the Government to act to overcome this gap in data collection.

## **Recommendation 2**

- 2.90 **That the Department of Education, Employment and Workplace Relations, in consultation with the National Centre for Vocational Education Research (NCVER) and stakeholders, ensure that provision is made to capture and incorporate private sector vocational education and training data into NCVER analysis.**
- 2.91 The Committee supports pre apprenticeships, which provide a valuable experience for young people choosing a future career path and assist industry by preparing young people for work. Mature age

apprenticeships also help to fill skills shortages and increase workforce participation.

## Decline in Enrolments in Enabling Sciences

- 3.1 The Committee inquired into:
- whether there has been a decline in university enrolments in the study of ‘enabling sciences’, namely, physics, chemistry and mathematics; and
  - possible strategies to encourage greater participation in these disciplines.

### **Statistical data on participation trends in ‘enabling sciences’**

- 3.2 Two issues emerged in relation to tracking trends in participation rates in the enabling sciences at tertiary levels:
- the definition of an enabling science used to aggregate data; and
  - the timeframe chosen to establish the trend in participation.

### **Aggregation of data**

- 3.3 DEEWR provided data sets describing enabling science enrolments (see Table 3.1).<sup>1</sup> The Department suggested, that the decline in

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<sup>1</sup> DEEWR, *Supplementary Submission 1.2*, p. 5.

proportion of students participating in 'hard sciences' should be understood in the wider context of higher levels of participation in tertiary education overall and the increase and diversity in available courses.<sup>2</sup>

3.4 The data provided by DEEWR supports the contention that:

the overall context ... in enabling science enrolments is probably something pretty flat which wobbles up and down by a few percentage points.<sup>3</sup>

3.5 Some factors identified as contributing to fluctuations in participation rates included:

- movements in numbers of school leaver entrants to higher education;
- natural movements in population; and
- fluctuations in continuers.<sup>4</sup>

3.6 DEEWR provided further details on this matter:

The number of Science, Engineering and Technology enrolments as a percentage of total domestic undergraduate enrolments has decreased by four percentage points [from] 2001 [to 2006]. This decline is mainly due to a significant decline in Information Technology enrolments, though there has also been a slight decline in the Natural and Physical Sciences.<sup>5</sup>

3.7 Dr John Ridd pointed to a number of the features of the official data sets that obscure the trends in 'hard sciences'. In relation to information provided in DEEWR's submission, Dr Ridd stated:

it is important to note that the Department decided to use the disciplines listed in the Table as being the 'enabling' subjects. That was not the original definition proposed by the former Chief Scientist Batterham who defined 'enabling' as being hard maths, Physics and Chemistry ... I cannot see Astronomy as being 'enabling' at all, and hence should not be included.<sup>6</sup>

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2 DEEWR, *Transcript of Evidence*, 6 June 2008, p. 2.

3 DEEWR, *Transcript of Evidence*, 6 June 2008, p. 3.

4 DEEWR, *Transcript of Evidence*, 6 June 2008, p. 2.

5 DEEWR, *Supplementary Submission 1.1*, p. 3.

6 Dr Ridd, *Submission 2*, p. 2.



Table 3.1 Enabling Science Enrolments

	2001	2002	2003	2004	2005	2006	2007	Change 01-07	Change 06-07
Domestic Undergraduate									
0101 Mathematical Sciences	2,215	2,347	2,316	2,393	2,282	2,177	2,024	-8.6%	-7.0%
0103 Physics and Astronomy	784	880	937	989	957	898	796	1.5%	-11.4%
0105 Chemical Sciences	1,209	1,143	1,214	1,558	1,143	1,145	1,142	-5.5%	-0.3%
0109 Biological Sciences	10,198	11,011	11,133	11,512	10,952	10,839	10,761	5.5%	-0.7%
Total Enabling Sciences	14,406	15,381	15,600	16,452	15,334	15,059	14,723	2.2%	-2.2%
Total Natural and Physical Sciences*	51,826	52,476	53,311	54,500	53,951	53,939	54,313	4.8%	0.7%

\*The data takes into account of Combined Courses to two field of education. As a consequence, counting both fields of education for Combined Courses means that the totals may be less than the sum of narrow fields of education.

	2001	2002	2003	2004	2005	2006	2007	Change 01-07	Change 06-07
Domestic Postgraduate									
0101 Mathematical Sciences	749	907	919	1,011	959	1,005	1,111	48.3%	10.5%
0103 Physics and Astronomy	833	894	957	1,039	1,010	1,042	1,040	24.8%	-0.2%
0105 Chemical Sciences	1,016	868	888	910	871	933	922	-9.3%	-1.2%
0109 Biological Sciences	3,238	3,502	3,703	3,891	3,523	3,580	3,723	15.0%	4.0%
Total Enabling Sciences	5,836	6,171	6,467	6,851	6,363	6,560	6,796	16.4%	3.6%
Total Natural and Physical Sciences*	8,361	9,014	9,503	10,020	10,094	10,444	10,846	29.7%	3.8%

\*The data takes into account of Combined Courses to two field of education. As a consequence, counting both fields of education for Combined Courses means that the totals may be less than the sum of narrow fields of education.

Source: DEEWR, Submission 1.2, p. 5.

- 3.8 DEEWR stated that enabling sciences made up 62.8 per cent of domestic enrolments in natural and physical sciences. It agreed that interpretation of enrolment data in narrow areas (such as physics, mathematics and chemistry) is determined by the definition of 'enabling sciences'.<sup>7</sup>
- 3.9 The Department advised that:
- a majority of enrolments in the broad field of natural and physical sciences ... are not coded to any particular narrow field. This could reflect the structure of many university science courses where study of different narrow fields is incorporated within broad level science courses.<sup>8</sup>

### Timeframe for participation trends

- 3.10 Dr Ridd argued against the suggestion that enrolment trends are subject only to marginal fluctuations by referring to a longer term drop that has been identified since the early 1990s.<sup>9</sup>
- 3.11 A large body of research and analysis published by the Australian Council of Deans of Science (ACDS), and other researchers attests to the downward trend in the longer term.<sup>10</sup>
- 3.12 In 2007, ACDS released the third in a series of reports. The report supports DEEWR's position that based on 2002-05 enrolment data in Natural and Physical Sciences, there is no cause for concern.<sup>11</sup> However, since 1989 there is a long term absolute decline in chemistry, physics and mathematics, which 'ought to ring alarm bells'.<sup>12</sup>

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7 DEEWR, *Transcript of Evidence*, 6 June 2008, p. 13.

8 DEEWR, *Supplementary Submission 1.2*, p. 4.

9 Dr Ridd, *Submission 2*, p. 2.

10 See for example, ACDS, *Trends in Science Education* (1998); I Dobson, *Science at the Crossroads? A study of trends in university science from Dawkins to now 1989 -2003*, ACDS, October, 2003; *Is the Study of Science in Decline*, ACDS Occasional Paper No.3, November, 2003; Ian Dobson, *Sustaining Science: University Science in the Twenty-First Century*, ACDS, February, 2007.

11 Ian Dobson, *Sustaining Science: University Science in the Twenty-First Century*, ACDS, February, 2007, p. 71.

12 Ian Dobson, *Sustaining Science: University Science in the Twenty-First Century*, ACDS, February, 2007, p. 71.

Table 3.2 Student Load 1989 - 2005: Teaching to students enrolled in Natural and Physical Sciences Courses by Discipline Group

All students	1989	1997	2005	Variation 2005 – 1989	
				No.	Per cent
Mathematical sciences	7520	6512	4988	-2532	-33.7%
Physical sciences	3612	3351	2911	-701	-19.4%
Chemical sciences	5932	6753	5617	-315	-5.3%
Earth sciences	2173	3106	2195	22	1.0%
Biological sciences	10648	18658	18624	7976	74.9%
Other	1617	3375	4007	2390	147.8%
Total science disciplines	31502	41755	38342	6840	21.7%

Source: Table 78 Australian Council of Deans of Science (2007), *Sustaining Science: University Science in the Twenty-First Century*.

### 3.13 Dr Ian Dobson of the Centre for Population and Urban Research at Monash University has argued that:

The 'steady as she goes' pattern of 2002-2005 hides the fact that the 1990s saw sharp declines in enabling sciences participation by students enrolled in courses in the Natural and Physical Sciences. The number of enrolments has roughly doubled since 1989, with some uncertainty due to the changes in counting methodology, yet during such a spectacular growth in the system the number of equivalent full-time science students taking chemistry declined by 315 or 5.3 per cent. For physics the decline was 701 about 19 per cent. In 1989 there were 7,520 FTE [Full Time Equivalent] science students enrolled in mathematics; in 2005 this number had dropped to 4,988. This is a decline of 2,532 FTE students, or about one-third.<sup>13</sup>

### 3.14 The trend among students away from the 'hard sciences' at the secondary school and tertiary level has been observed to be an international phenomenon. The Australian Council for Educational Research (ACER) stated that:

For the past 20 years most OECD economies have witnessed an increased level of participation in senior secondary and

13 Ian Dobson, *Sustaining Science: University Science in the Twenty-First Century*, ACDS, February, 2007, p. 71.

university education but a declining percentage of students studying science, technology, engineering and mathematics.<sup>14</sup>

## Committee comment and recommendation

- 3.15 Statistics provided by DEEWR conveyed a very different version of the trend in tertiary enrolments in enabling sciences from other stakeholders. One reason for the difference is the limited timeframe for which the Department provided data. Of greater concern is the apparent difficulty of tracing enrolment trends in narrow areas of enabling sciences caused by the aggregations used to compile the Department's data sets.

### Recommendation 3

- 3.16 **That the Department of Education, Employment and Workplace Relations consult with the Australian Council of Deans of Science, the Australian Academy of Science, the Australian Council of Educational Research and other relevant stakeholders in relation to improving collection and aggregation of data on university enrolments and completions that will provide trend information for narrow areas of enabling sciences such as physical, mathematical and chemical sciences.**

## Influences on student choices

- 3.17 A DEST Audit of Science, Engineering and Technology (SET) Skills in 2006, found that the shortage of higher education SET graduates was partly attributed to:
- the lack of SET skills of high school leavers,
  - poor careers advice to students and the community in general on SET;
  - and the low profile of SET careers.<sup>15</sup>

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14 J Ainley, J Kos, M Nicholas, *Participation in Science, Mathematics and Technology in Australian Education*, ACER Research Monograph No.63, August, 2008., p. 1.

15 DEEWR, *Submission 1*, p. 2.

## Secondary school enrolments in sciences

3.18 Dr Terry Lyons, Chair of the International Organization for Science and Technology Education, has observed that over the last two decades, science educators have:

watched with growing concern the steady decline in the proportion of high school students choosing senior science courses...

Between 1990 and 2001, for example, Year 12 (final year) enrolments in physics, chemistry and biology courses decreased by 23, 25 and 29% respectively ... prompting questions about future levels of scientific literacy and technological expertise.<sup>16</sup>

3.19 ACDS referred to a DEST commissioned ACER analysis of enrolment, retention and completion rates in senior secondary school science between 1976 and 2007 that showed participation had declined over the 30 year period.<sup>17</sup>

3.20 The ACER research concluded that:

- since the mid 1990s year 12 retention has stabilised but science participation has continued to decline;
- there is evidence from every state and territory of declines since the mid 1990s of participation in advanced levels of studies in mathematics (these trends continue the declines from earlier periods);
- longitudinal data show that uptake of science related studies at university is stronger amongst those who specialise in science studies in the final year of school; and
- subject choices are influenced by teacher proficiency in mathematics during middle secondary school.<sup>18</sup>

3.21 ACDS stated:

there can no longer be any doubt that these trends are real, that they are entrenched and that no action taken thus far shows any sign of turning it around ... it is very important for

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16 Terry Lyons, 'The Puzzle of falling Enrolments in Physics and Chemistry Courses: Putting Some Pieces Together', *Research in Science Education* (2006) 36 285.

17 ACDS, *Transcript of Evidence*, 14 November 2008, p. 71.

18 J Ainley, J Kos, M Nicholas, *Participation in Science, Mathematics and Technology in Australian Education*, ACER Research Monograph No.63, August, 2008, p. 82.

people to finally get that message, and turn back and start to think about what they are actually going to do.<sup>19</sup>

## Availability of quality science teachers

3.22 The Federation of Australian Scientific and Technological Societies (FASTS) stated that lack of high quality science teachers is a significant factor in the overall decline of enabling science education.<sup>20</sup>

3.23 Dr Ridd specified:

The problem of the lack of knowledgeable Maths/Science teachers, especially in Years 8/9/10 has dreadful consequences, because it is student performance over those three years that is the biggest determinant of enrolments in STEM in Year 11/12.<sup>21</sup>

3.24 ACDS referred to its own studies that showed 'one in twelve [secondary school] mathematics teachers studied no mathematics at university level' and, 'one in five studied no mathematics beyond first year'. One in four year 11 and 12 mathematics teachers had not done a third year level maths subject of any kind at university. Forty per cent of the teachers surveyed were dissatisfied with their mathematics preparation as mathematics teachers.<sup>22</sup>

3.25 The 2007 Trends in International Mathematics and Science Study (TIMSS), found that although there was no significant change in Australia's Year 8 score between 2003 and 2007, there has been a significant drop of 13 score points from that of TIMSS 1995.<sup>23</sup>

3.26 DEEWR agreed that the shortage of qualified science school teachers is a significant factor in tertiary enrolments in enabling sciences:

in the school sector it certainly is the case that there is a shortage of maths and science teachers. There has been research done on the percentage of teachers who are teaching out of field – teaching in areas they do not have university qualifications in. There is a particular issue, certainly in maths and science, with people who do not have qualifications in

19 ACDS, *Transcript of Evidence*, 14 November 2008, p. 71.

20 FASTS, *Transcript of Evidence*, 16 October 2008, p. 5.

21 Dr Ridd, *Submission 2 Attachment D - STEM Discussion Paper Response*, p. 28.

22 ACDS, *Transcript of Evidence*, 14 November 2008, pp. 71-72.

23 ACER, *Highlights from TIMSS 2007 from Australia's Perspective* (2008), p. 8.

the area. That is a significant issue and will be a significant issue going forward.<sup>24</sup>

- 3.27 ACER research has concluded that strengthening school science education depends on deepening teacher expertise in science:

Deepening teacher expertise depends on recruiting into teaching a greater proportion of people with backgrounds in science, enhancing the science base of practising teachers in science and giving consideration to having specialist science teachers in primary schools. Specialist science teachers in primary schools could provide a core of expertise in those schools.<sup>25</sup>

- 3.28 ACDS expanded upon the extent of the potential problem:

At the time of the survey in 2006, 38 per cent of the teachers were aged 49 or over; 15 per cent were aged over 54. Fewer than half of the teachers surveyed were confident that they would be teaching mathematics in five years time. Three in four schools reported difficulty in recruiting suitably qualified mathematics teachers.<sup>26</sup>

- 3.29 FASTS argued that higher quality teachers with knowledge and networks in the scientific community will be able to provide more stimulating classroom experience. These teachers can also provide informed advice to students choosing university courses and considering a future career in science.<sup>27</sup> FASTS advocated rewarding teachers with higher degrees to encourage high quality teachers to go into the profession.<sup>28</sup>

- 3.30 ACDS agreed and advocated a fundamental change in the way secondary science education is taught. It is important to:

get into the schools and show students where this science is applied to generate some excitement ... that cannot be at the level where it is happening now, where it becomes an add on ... it has to be part of the real curriculum. It also has to be part of teachers' professional lives that they are engaged in those networks and it is part of their job to bring those people in...<sup>29</sup>

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24 DEEWR, *Transcript of Evidence*, 6 June 2008, p. 3.

25 J Ainley, J Kos, M Nicholas, *Participation in Science, Mathematics and Technology in Australian Education*, ACER Research Monograph No.63, August, 2008, p. 83.

26 ACDS, *Transcript of Evidence*, 14 November 2008, p.72.

27 FASTS, *Transcript of Evidence*, 16 October 2008, p. 5.

28 FASTS, *Transcript of Evidence*, 16 October 2008, p. 5.

29 ACDS, *Transcript of Evidence*, 14 November 2008, p. 72.

## Strategies to encourage young people into 'enabling sciences'

- 3.31 DEEWR identified two responses to the issue of declining tertiary enrolments in enabling sciences:
- the removal of obstacles at the tertiary entrance level; and
  - the active promotion of teaching and learning science and mathematics in primary and secondary schools.
- 3.32 The Department is implementing the following strategies to remove obstacles to studying science and mathematics subjects at tertiary levels:
- reducing the student contribution for maths and science from \$7,402 to the lowest national priority rate of \$4,162 (commencing 2009 but not applicable to students currently enrolled in science or mathematics subjects<sup>30</sup>),
  - reducing the compulsory repayments by up to \$1,500 per annum over five years for eligible maths and science graduates who take up related occupations; and
  - doubling the number of scholarships available for low income students, from 44,000 to 88,000 by 2012.<sup>31</sup>
- 3.33 DEEWR identified the following programmes that focus specifically on the promotion of teaching and learning science and mathematics subjects in primary and secondary school:
- The *Scientists in Schools* project involves [CSIRO] scientists establishing ongoing partnerships with primary and secondary schools...
  - The *Science by Doing* project, led by the Australian Academy of Science, is developing a new approach to science teaching and learning for the junior secondary years...
  - The *Primary Connections* program, also led by the Australian Academy of Science, is developing curriculum units and professional learning programs for teachers aimed at improving primary students' knowledge of science...
  - Provision of \$1 billion as a long term investment for Science and Language Centres for 21<sup>st</sup> Century Secondary

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30 DEEWR, *Supplementary Submission 1.2*, p. 1.

31 DEEWR, *Transcript of Evidence*, 6 June 2008, p. 3.



Schools to build around 500 new science laboratories and language learning centres...<sup>32</sup>

- 3.34 Besides the Scientists in Schools Program, CSIRO referred to other initiatives at the school level, including:
- the Discovery Centre, with 30,000 to 40,000 children visiting a year; and
  - education centres that go into schools.<sup>33</sup>
- 3.35 The Australian Nuclear Science and Technology Organisation (ANSTO) advised that education and training is a designated function under the *Australian Nuclear Science and Technology Organisation Act 1987* (ANSTO Act). It forms one of the six outputs under ANSTO's funding framework.<sup>34</sup> ANSTO has a role in contributing to science and mathematics education generally, as well as specifically in relation to nuclear science and technology at both school and tertiary level.
- 3.36 ANSTO has a full time education specialist and a team of tour guides. In the last financial year ANSTO hosted 145 school tours and 4,662 school visitors. School tours are integrated into school curricula, and may be tailored to specific needs. For senior students, a senior chemistry workbook and senior physics workbook provide structured questions that are part of the curriculum studies.<sup>35</sup> ANSTO also provides education resources for junior science curricula and for senior level physics and chemistry, which are freely available from the website. Professional development days are hosted for teachers and principals.
- 3.37 ANSTO facilities are used by science academics and students:
- Last year we co-supervised about 100 students. Typically, a main supervisor will be from a university and an ANSTO staff member will be a co-supervisor helping that student when they use our facilities and providing our particular expertise.<sup>36</sup>
- 3.38 ANSTO stated that one in seven of its own staff hold positions at universities, an honorary, adjunct or similar position from professorial to lecturing roles. ANSTO also works with postdoctoral

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32 DEEWR, *Submission 1.2*, p. 2.

33 CSIRO, *Transcript of Evidence*, 16 October 2008, p. 5.

34 ANSTO, *Transcript of Evidence*, 14 November 2008, p. 56

35 ANSTO, *Transcript of Evidence*, 14 November 2008, p. 56.

36 ANSTO, *Transcript of Evidence*, 14 November 2008, 2008, p. 57.

fellows at Cooperative Research Centres as well as providing support for its own postdoctoral fellows.<sup>37</sup>

## Committee Comment

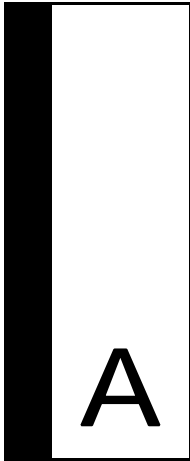
- 3.39 Reference was made to a large body of published research on science education at secondary and tertiary level. Much of this evidence suggests that, while science has expanded as a category of university study, there has been a decline in enrolments in 'enabling sciences'. There is evidence of a long term decline in participation in mathematics, physics and chemistry and this is an international phenomena affecting developed economies. It is the subject of ongoing study by the OECD and policy discussion in major developed western countries.
- 3.40 Despite some disagreement over interpretation of data, there is a strong consensus on the importance of encouraging young people into science education. Organisations like ANSTO and CSIRO promote knowledge and understanding at all levels of the education system and build future research capacity. Peak representative bodies also provided high quality evidence, with informed analysis and clear ideas about the future directions necessary to raise participation levels.
- 3.41 Stakeholders agreed that a more integrated approach across secondary, tertiary, academic and industry sectors would promote tertiary enrolments in enabling science. Furthermore, there needs to be an emphasis on making science more exciting, demonstrating its practical application to every day life at school level.
- 3.42 There was consistent evidence on the need to improve secondary science teaching and opportunities to engage students in the enabling sciences. This should be considered as part of the debate on the national science curriculum.

Sharon Bird MP  
Chair

20 May 2009

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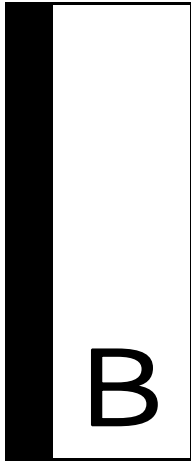
37 ANSTO, *Transcript of Evidence*, 14 November 2008, 2008, p. 57.



## Appendix A – List of submissions

- 1 Department of Education, Employment and Workplace Relations
- 1.1 Department of Education, Employment and Workplace Relations (Supplementary to Submission No. 1)
- 1.2 Department of Education, Employment and Workplace Relations (Supplementary to Submission No. 1)
- 2 Dr John Ridd
- 3 Australasian Institute of Mining & Metallurgy
- 4 Australian Nuclear Science and Technology Organisation

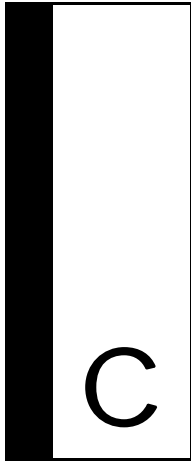




## Appendix B – List of exhibits

- 1            Manufacturing Skills Australia  
*Manufacturing Skilling for the Future: Developing Australia's Workforce.*
  
- 2            Manufacturing Skills Australia  
*Sustainable Manufacturing: Manufacturing for Sustainability.*
  
- 3            Australian Council of Deans of Science  
*Dobson I. R., Sustaining Science: University Science in the Twenty-First Century, February 2007.*
  
- 4            Australian Council of Deans of Science  
*Dobson, I. R., Science at the Crossroads? A study of trends in university science from Dawkins to now 1989 – 2002, October 2003.*
  
- 5            Australian Council of Deans of Science  
*Harris, K. & Jenz, F., The Preparation of Mathematics Teachers in Australia.*





## Appendix C – List of hearings and witnesses

**Friday, 6 June 2008 - Canberra**

**Department of Education, Employment and Workplace Relations**

Dr Evan Arthur, Group Manager, Schools Teaching, Students & Digital Education Revolution Group

Mr Russell Ayres, Branch Manager, Early Childhood Education Reforms

Mr Ben Johnson, Group Manager, National Training Directions Group

Mr Murray Judd, Director, VET Quality Branch

Ms Helen McDevitt, Branch Manager, Student Access & Equity Branch

Mr Colin Walters, Group Manager, Higher Education Group

**Tuesday, 22 July 2008 - Adelaide**

**National Centre for Vocational Education Research**

Ms Francesca Beddie, Manager, Research Management

Mr Mark Cully, General Manager, Research

Dr Tom Karmel, Managing Director

**Thursday, 28 August 2008 - Canberra****CSIRO**

Mr Peter King, Adviser, Government Relations

Dr Heinz Schandl, Senior Research Scientist

**Thursday, 18 September 2008 - Canberra****TAFE Directors Australia**

Mr Wayne Collyer, Board Member

Ms Deb Daly, Chair, TDA Board

Mr Bruce Mackenzie, Board Member

Mr Martin Riordan, Chief Executive Officer

**Thursday, 16 October 2008 - Canberra****Australian Academy of Science**

Professor Peter Hall, Secretary (Physical Sciences)

Professor Philip Kuchel, Secretary, Science Policy

Professor Kurt Lambeck, President

**CSIRO**

Dr Jim Peacock, Fellow

Dr Alastair Robertson, Chief Executive, Science Strategy & Investment

**Federation of Australian Scientific and Technological Societies**

Professor Kenneth Baldwin, President

Mr Bradley Smith, Executive Director

**Thursday, 13 November 2008 - Canberra****Agri-food Industry Skills Council**

Mr Arthur Blewitt, Chief Executive Officer



**Construction and Property Services Industry Skills Council**

Miss Danielle Calcutt, Office Manager

Mr Alan Ross, Chief Executive Officer

**ElectroComms and Energy Utilities ISC**

Mr Robert Taylor, Chief Executive Officer

**Friday, 14 November 2008 - Sydney****Australian Council of Deans of Science**

Prof John Rice, Executive Director

**Australian Industry Group**

Ms Megan Lilly, Associate Director, Education & Training

**Australian Nuclear Science and Technology Organisation**

Dr Miriam Goodwin, Senior Adviser Research Management and Policy

Mr Steven McIntosh, Senior Adviser, Government Liaison

**Community Services - Health Industry Skills Council**

Ms Di Lawson, Chief Executive Officer

**Dusseldorp Skills Forum**

Ms Oona Nielssen, Executive Director

Dr John Spierings, Senior Strategist

**Group Training Australia**

Mr James Barron, Chief Executive Officer

Mr Jeff Friday, National Project Manager

**Manufacturing Skills Australia**

Mr Bob Paton, Chief Executive Officer

**Resources and Infrastructure Industry Skills Council**

Mr Desmond Caulfield, Chief Executive Officer

**Thursday, 5 February 2009 - Canberra**

**Department of Education, Employment and Workplace Relations**

Ms Donna Griffin, Branch Manager, Australian Apprenticeships  
Branch

Ms Susan Hewlett, Branch Manager, Industry Engagement Branch

Mr Rod Manns, Branch Manager, Funding and Student Support  
Branch

Mr Neil McAuslan, Branch Manager, Policy, Funding and  
Performance Branch