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Research and national debate on Australian schooling

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This paper is a response to the paper prepared by Masters that is titled 'The case for an Australian Certificate of Education'. It argues that a national debate is needed urgently on the many issues that have arisen in Australian education. These issues include not only the curriculum provided for students at the final stages of secondary schooling, and the certification of attainment of educational outcomes on completion of 12 years of schooling, but also the curriculum of schools across Australia, particularly at the lower and middle secondary school levels. In addition, there are related issues associated with participation in higher education and the completion of a first degree at an Australian university. All too often, decisions are made at all levels of education on ideological grounds and without consideration of the body of research findings that are available to guide the making of decisions and the monitoring of development and change. This paper draws on readily available research to show the similarities and differences between the state education systems to argue a case for informed debate that draws on the large body of evidence that is available.

Retention rates, participation rates, educational research, research-based evidence, school curriculum, senior secondary schooling, secondary school curriculum

Professor Masters has prepared a timely statement on a step forward towards development of a curriculum for Australian schools together with appropriate certification and selection procedures that would have portability not only across the states of Australia, but also across the highly developed and developing countries of the world. In response to Professor Masters' paper we draw on published research findings from ACER's and other Australian research studies in an endorsement of the need for national debate on Australian schooling based on the findings of research into educational issues. A national newspaper has been deliberately stimulating such a debate during 2005 and 2006, but the newspaper articles that have been written and published have been largely devoid of important ideas about the nature of school learning and the findings of research into the success or otherwise of learning programs in schools and the attainment of identifiable outcomes of school learning.

It is clearly time for a national debate on what Australian students should be learning in all years of schooling and not just the final two years of secondary schooling regardless of where they live, as well as on what students should be learning during the terminal years. The newspapers have focused debate on the curriculum of Australian schools, not only in history and literature, but also in mathematics and science during the years of secondary schooling. However, this debate does not draw on the findings of research that show that outcomes of education are greatly influenced by the learning that occurs in homes, in the peer group and through the media, and more recently through information and communication technology, that is increasingly controlled not by educational bodies but by international commercial media organisations. Consequently, because

of their growing role informal and non-informal education it is highly appropriate that the media should be critically involved in the debate about the outcomes of schooling. Moreover, the media should be examining in a critical way their recently assumed roles, functions and responsibilities of providing educational opportunities throughout all stages of education from early childhood through to lifelong and recurrent education.

The OECD, building upon its considerable experience with Adult Lifelong Testing programs, its pioneering work on international educational statistics in the *Education at a Glance* publications and its more recent Programme for International Student Assessment (PISA), is proposing the introduction of a testing program to compare internationally the competencies and cognitive skills of students on entry into higher education. It is widely recognised that entrance standards, course requirements and student populations vary widely between disciplines and universities within Australia, and with respect to students drawn to Australia from overseas and going overseas to study. Moreover, the Australian Universities Quality Agency is seeking to make it compulsory for Australian universities to compare themselves on several measures with their international counterparts. Such a program if introduced within the foreseeable future could change many aspects of how both upper secondary schools and universities operate. The critical issues are concerned with what should be measured in such a program, at what stage, and how testing should take place.

In the current debate about education across Australia research has been largely ignored because educational administrators and, in particular curriculum developers and these involved in the assessment and evaluation of educational outcomes, are rarely trained to examine the research that is available and is published in accessible form for all to read. Consequently, research findings are rarely discussed, or sought to inform debate and guide decision making in educational planning and curriculum development. Over the past 75 years the Australian Council for Educational Research has systematically assembled a large body of research findings about Australian education. Moreover, the ACER has strong international links that enable it to contribute to and draw upon research conducted in a world context, particularly with its links to the OECD in Paris.

We in Australia are indeed fortunate that the six Australian states and the Australian Capital Territory form a natural laboratory to provide research findings for the Australian education system. While the Northern Territory is also part of that system, it has unique problems, which are not only of great interest, but also of importance, that continue to confound the evidence and the findings derived from that Territory. Clearly, the Australian states can learn from each other about reform that would lift the quality of Australian education. However, Australian education can also learn from and contribute to developments and change that occur in other countries

Professor Masters' paper about future developments in Australian education at the senior secondary school level is presented in a South Australian setting at a time when radical change is being proposed for education not only at the terminal stage, but also involves all other stages of education within the state. Consequently, it is necessary to ask, when the available research evidence is examined and ideology does not dominate the debate, three important questions.

- How well does South Australia fare when the outcomes of education are examined?
- What can the South Australian education system learn from other school systems when set within a world context?
- Can South Australia join with other state education systems to share the necessarily limited resources available for Australian education?

In the sections that follow, evidence is presented on selected educational outcomes. The evidence is drawn from cross-national achievement tests, Australian data on school retention and Australian data on participation in higher education. Achievement and attainment data are presented for the cohort of young people who were born in 1985. This group is referred to as the 1985 Birth Cohort.

EVIDENCE FROM RESEARCH RELATED TO READING, MATHEMATICS AND SCIENCE LITERACY

Australia has been a very active participant in the Programme for International Student Assessment (PISA) studies of 15-year-old students conducted under the auspices of the OECD into performance in reading, mathematics and science literacy in the Years 2000, 2003 and more recently in 2006. In PISA 2000, reading literacy was the main domain and mathematics and science were minor domains. In PISA 2003, mathematics literacy was the main domain and science and reading literacy were minor domains, while in 2006, science literacy is the main domain. Figure 1 records the profile in the Australian states and territories in comparison with other countries in reading literacy in the PISA 2000 testing program. Australia does extremely well along side other English-speaking countries. Moreover, South Australia performs in the top bracket of the Australia states. Three other Australian states achieve at a lower level among mainly European countries, and the Northern Territory performs among countries with a sizeable immigrant population.

Figures 2 and 3 present the performance profiles of the Australian states and the ACT in PISA 2000 and PISA 2003 respectively, and record the mean levels of achievement not only in reading literacy but also in mathematics and science literacy. The graphs shown in Figures 2 and 3 indicate the stability of the performance in reading, mathematics and scientific literacy of the samples of 15-year-old students drawn in the studies on the two occasions. The achievement of South Australian students is satisfactorily high not only in a cross-national setting, but also in comparison with the other Australian states and territories. In reading the graphs the sizes of the standard errors (SE) and the estimated magnitude of a 'year of learning' should be noted, since there are sizeable differences between the states in levels of achievement on these international tests, that contain a substantial proportion of constructed response items together with both simple and complex multiple choice items.

It can be argued that the differences between the Australian states are largely dependent on the distribution of students across the years or grades of schooling that result from the different policies and ages for entry to school and grade progression that operate in the different states.

Table 1 records the percentages of 15-year-old students in the three relevant school grade levels.

While there are age and grade effects between the states, these effects do not account for the differences in performance on the reading, mathematics and science literacy tests, nor is there a clear relationship between the immigrant populations of the states and their levels of achievement. In all Australian states, the modal school year for students in the PISA 2003 sample was Year 10. The average achievement results for Year 10 students only are shown in Figure 4. This figure shows state profile comparisons without any confounding effects of age and grade differences. It reveals that there are substantial differences in achievement, amounting to more than six months of schooling, between states, excluding the high figure for the ACT. The recorded differences are too large to be attributable to chance and show a consistency between occasions that suggest that they are related to curriculum differences between the states.

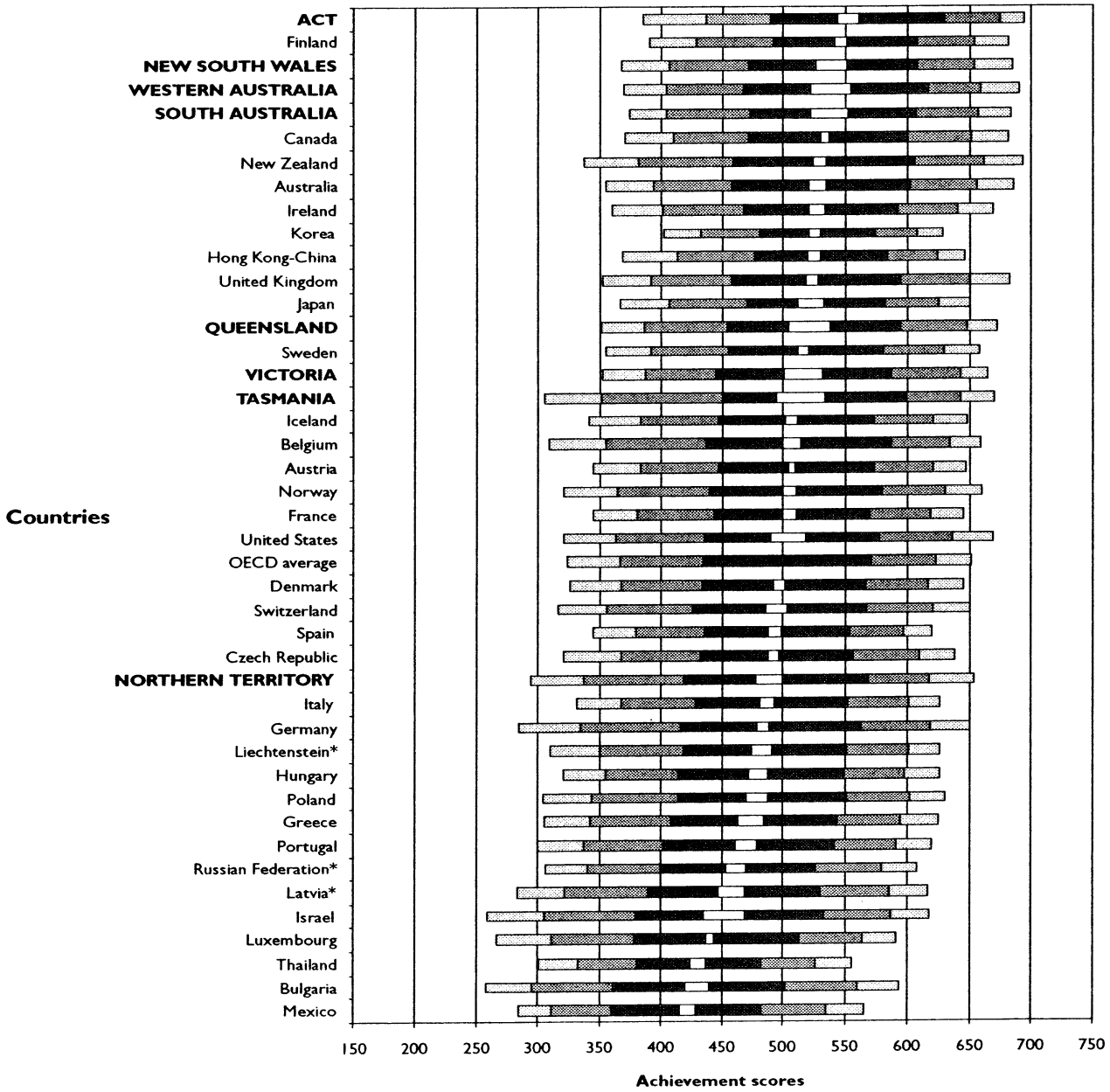

Figure 1. National performance in reading literacy in PISA 2000 (Source: Marks and Cresswell, 2005, p. 143)

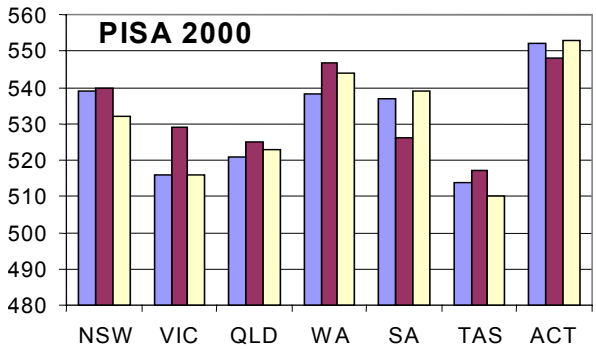

Figure 2. Comparison profiles of reading, mathematics, and science literacy for 15-year-old students in Australian states, (PISA, 2000) (Estimates 7.5 units = SE, 35 units = Year of Learning) (Source: OECD, 2001)

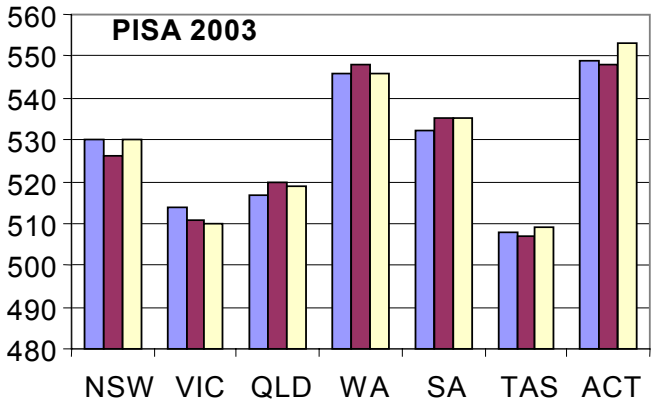

Figure 3. Comparison profiles of reading, mathematics, and science literacy for 15-year-old students in Australian states, (PISA, 2003) (Estimates 5.0 units = SE, 35 units = Year of Learning) (Source: OECD, 2004)

Table 1. Percentages of 15 year-old students in different grades in Australian states (PISA, 2000)

State	Year level (%)		
	9	**10**	**11**
New South Wales	8	86	5
Victoria	13	81	5
Queensland	1	57	42
South Australia	3	79	17
Western Australia	1	49	49
Tasmania	7	84	8
Australian Capital Territory	7	92	0
TOTAL	7	76	17

(Source: Marks and Cresswell, 2005, p. 145)

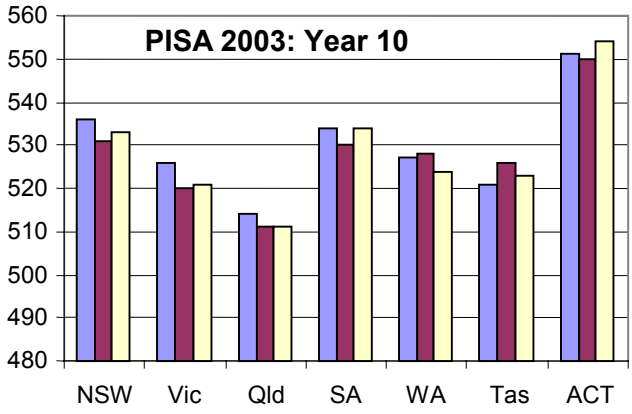

Figure 4. Comparison profiles of reading, mathematics, and science literacy for 15-year-old students in Year 10 in Australian states, (PISA, 2003) (Source: OECD, 2004)

EDUCATIONAL ATTAINMENT OF THE 1985 BIRTH COHORT

The students who were tested in the PISA 2000 study at the age of 15 years were born in 1985, and although they commenced school at different ages in the different states this would appear not to explain the observed differences in reading achievement by the age of 15 years. These students could leave school in general after attaining the age of 16 years, with marked differences between states in their retention to Year 12 at school as well as their levels of literacy.

The students under survey in PISA 2000 were Year 8 students in 1998 and formed the modal grade cohort for the calculation of retention rates to Year 12 in 2002. The widely accepted index

for the calculation of retention and participation rates is relative to the size of this Year 8 cohort, although an age cohort at the age of 14 years is also widely used. Both these student groups are formed immediately prior to any dropping out from school in most developed countries that have an age level at 15 years for compulsory schooling. These indexes have enabled cross-world and cross-state comparisons over the past 40 years when these comparisons were first made through testing conducted by the International Association for the Evaluation of Educational Achievement (IEA).

These apparent retention rates in 2002 based on the size of the Year 8 cohort in 1998 for the Australian states are presented in Figure 5, and it should be noted that the rate recorded for South Australia is noticeably lower than in other states. This type of evidence would appear to have been of considerable concern to the SACE Review Panel (Crafter, Crook and Reid, 2006).

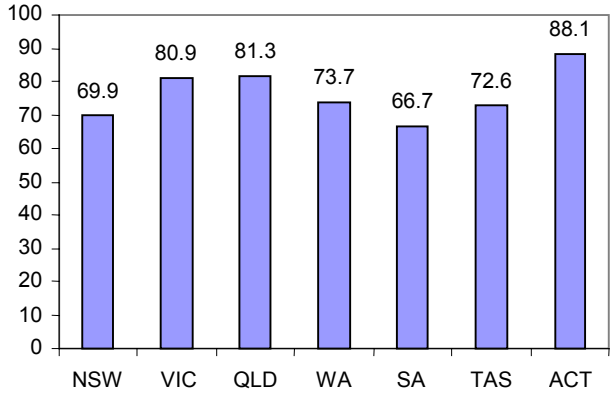

Figure 5. Apparent retention rates for Australian States in 2002. Source: ABS, *Schools Australia*. Cat. No. 4221.0

The emerging concern for retention rates has interested several educational research scholars including Lamb and Bain (2004) and Ryan and Watson (2006). There is general agreement that several measurement factors beside the choice of a base cohort of age or grade influence apparent retention rates and serve to confuse and confound the making of comparison between states and over time. These factors include (a) population changes involving internal and external migration, (b) Year 12 repetition, (c) participation in TAFE study, both while at school and after leaving school prior to completing Year 12 study, (d) part-time study and part-time employment, (e) differences in age-grade structure involving grade repetition and age of commencing school, and (f) share of Indigenous youth in the school-aged population. Ryan and Watson (2006) examined the fluctuations in retention rates over the period 1989 to 2002 that included an Australia-wide peak in 1992. They made adjustments for these factors where meaningful adjustments could be made. Figure 6 presents their graphs of both the unadjusted (official) and the adjusted retention rates for Australia from 1989 to 2002.

The adjustments largely eliminated the anomalous peak that occurred in 1992 and indicate that after marked growth in the late 1980s there was a relatively stable situation for the following decade. However, in 2002 there were differences between the Australian states in both Year 12 retention rates and age 17 years participation rates both for the unadjusted and the adjusted estimates. The estimates made by Ryan and Watson (2006) are plotted in Figures 7 and 8 for retention and participation rates respectively for the Australian states since both grade and age cohorts are widely employed and show slightly different patterns.

Figure 6. Official and adjusted retention rate estimates 1989-2002 (Source, Ryan and Watson, 2006, p. 213)

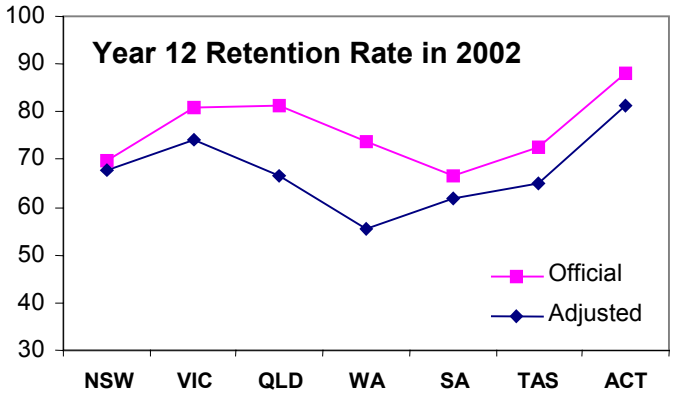

Figure 7. Year 12 retention rate estimates for 2002 by Australian state (Source, Ryan and Watson, 2006, p. 214)

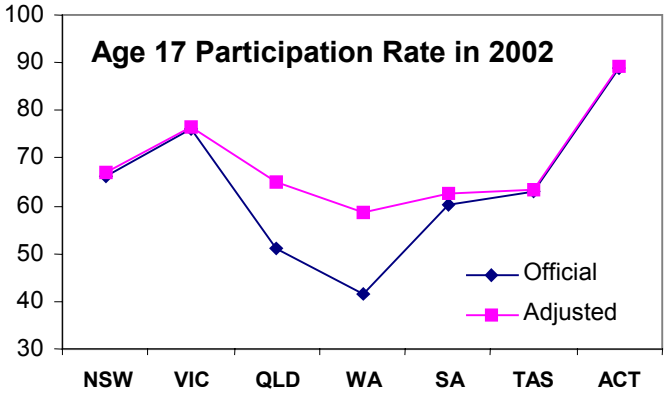

Figure 8. Age 17 participation rate estimates for 2002 by Australian state (Source, Ryan and Watson, 2006, p. 214)

While South Australia has a relatively low adjusted retention and participation rates, Ryan and Watson (2006, p. 203) warn that:

> Governments should be cautious in using official year twelve retention rates as a measure of the performance of Australian school systems.

This warning was issued because non-school factors such as the availability of work for teenagers varied considerably between states.

Moreover, the differences are of sufficient magnitude to indicate that the procedures purportedly being used at the present time for equating Tertiary Entrance Rankings between states for admission to universities are flawed. This suggests that it is not just Year 12 certification procedures that should be examined critically, but attention should also be given to the procedures employed for the allocation of university places as well as the procedures used by universities for the selection of entrants to bachelor degree courses.

SCHOOL ACHIEVEMENT OF THE 1985 BIRTH COHORT

The PISA 2002 students in the cohort under examination in this paper were mainly in Year 10 in 2000, Year 8 in 1998 and in Year 4 in 1994. Data are available on the achievement a sample of this cohort of students in Year 4 in 1994, as well as a Year 8 sample of students in the same year for an IEA testing program, but no evidence was obtained on meaningful state samples from the IEA testing program in 1998 in the TIMSS and TIMSSR studies. However, evidence is available for Year 4 and Year 8 samples four years later in 2002 from the TIMSSR studies. Unfortunately equating of the scales of achievement has never been accurately carried out within Australia nor adequately presented in the international TIMSS reports. The monitoring of change over time in educational achievement no longer appears to interest those conducting IEA studies although it was originally argued to be an aspect of considerable interest and importance in the original IEA work and was taken into consideration in the Second IEA Science Study (Keeves, 1990) and the Reading Literacy Study (Lietz, 1995).

Under these circumstances, the most appropriate way to examine change in performance by state from 1994 to 2002 in both mathematics and science of students at the Year 4 and the Year 8 levels, is to choose the level of achievement of the two New South Wales (NSW) samples on the two occasions as the base line for the comparisons. It is recognised that the NSW mean is close to the Australian mean and acts as a surrogate for the Australian mean that cannot be estimated.

Figures 9 and 10 record the changes in achievement over an eight year period for the Year 4 and Year 8 grade samples, for cohorts of students of interest in this paper, that are estimated relative to the New South Wales base-lines. However, some caution must be expressed in examining these graphs.

These graphs indicate that over the eight year period there has been a decline in achievement relative to New South Wales in the following situations:

- Year 4 Mathematics Australian Capital Territory and Western Australia
- Year 4 Science Western Australia
- Year 8 Mathematics Australian Capital Territory, Tasmania, Queensland, Western Australia
- Year 8 Science Australian Capital Territory, Tasmania and Western Australia.

South Australia shows declines in performance in all four graphs that are estimated to be less than half a year of learning. Moreover, South Australia is not among the higher performing states in achievement in these domains of content knowledge. It should be noted, however, that the IEA tests and PISA tests are assessing very different outcomes of education. The IEA tests assess achievement in content areas and the PISA tests assess aspects of literacy, primarily reading literacy. Consequently, while there is a consistent pattern over time on literacy performance, there

is a decline in content knowledge in mathematics and science that would appear to be related to curriculum changes in the intervening years.

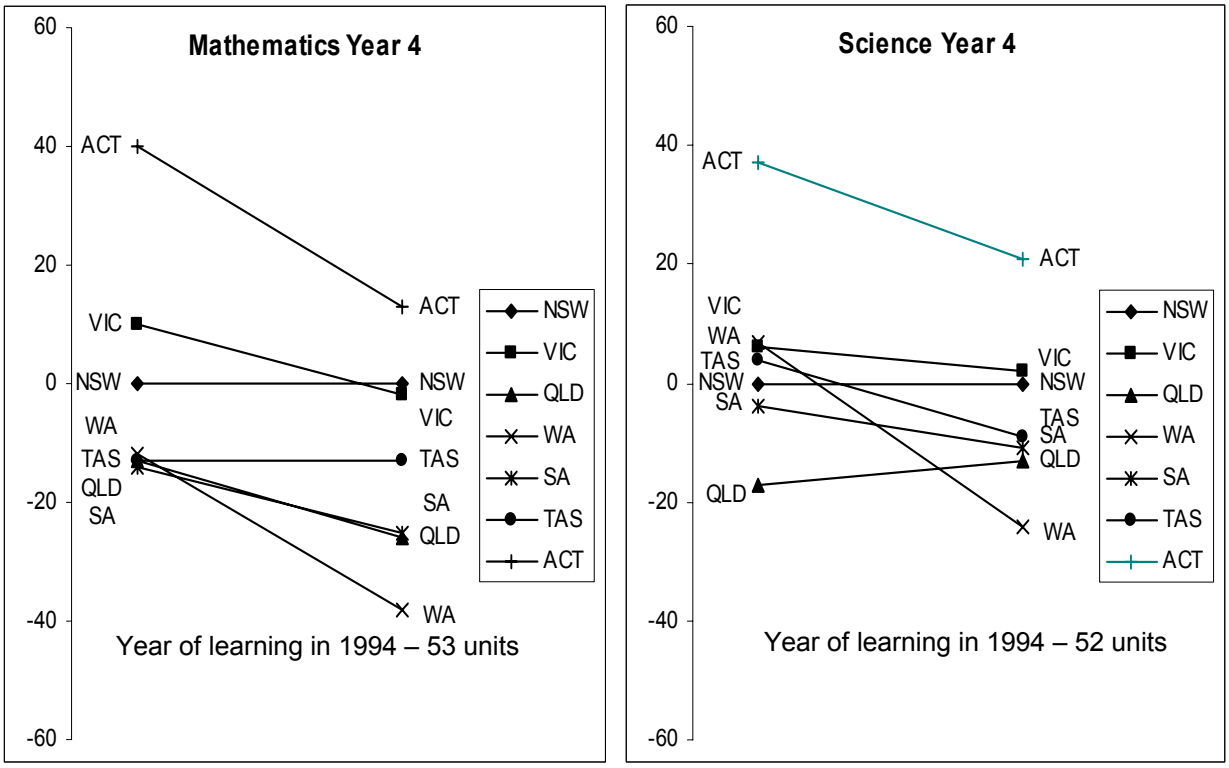

Figure 9. Change in achievement in mathematics and science from 1994 to 2002 relative to New South Wales (Year 4) (Sources of data, TIMSS Reports)

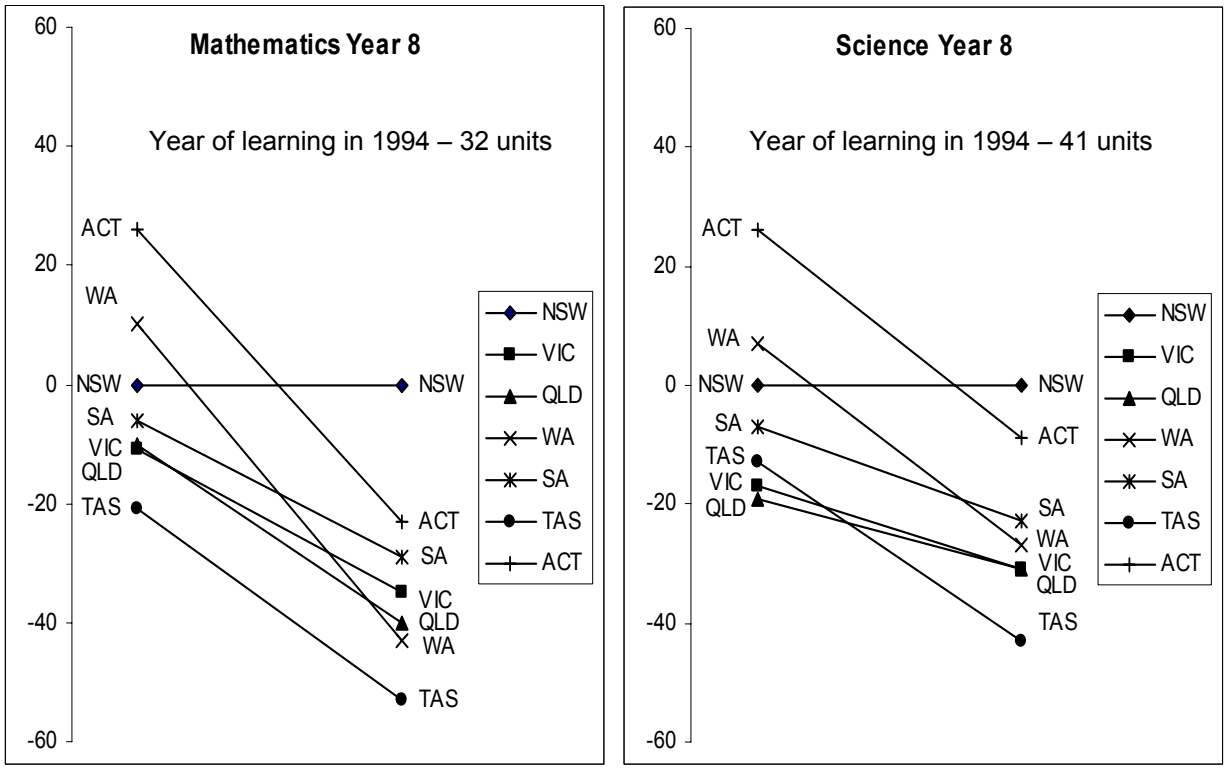

Figure 10. Change in achievement in mathematics and science from 1994 to 2002 relative to New South Wales (Year 8) (Sources of data, TIMSS Reports)

PARTICIPATION IN HIGHER EDUCATION

After the completion of schooling at the Year 12 level in 2002, the PISA 2000 cohort that is under survey in this paper might be expected to have continued into higher education at an Australian university. Initially, the size of the cohort under consideration was based on the number of 14-year-old students at school in 1999, and formed an age cohort rather than a grade cohort. The information of interest is not the precise career paths taken by the students, whether it involved proceeding directly to university, or taking a gap of one or more years or initially taking a TAFE course and converting across to university study. Rather, it is the number of university places made available for bachelor degree courses for domestic students in the year 2003, for which these students might be expected to apply. The participation rates estimated in this paper are the number of places in bachelor degree courses held by domestic students divided by the sizes of the age cohort that becomes available who seek a university education in the given year within each state or territory and across Australia as a whole. It should be noted that in these calculations, rates are under consideration, which involve the ratio of two increments and not the actual size of a potential pool. This definition requires that cross-state universities such as the Australian Catholic University, the Australian Maritime College and the Australian Defence Force Academy must be excluded from consideration at the state level but not at the Australian level. Moreover, the private universities, such as Bond University, the Christian Heritage College and Tabor College must be excluded because at that time they did not receive the necessary support for their students to take bachelor degree programs on the same basis as did the public universities. Nevertheless, there is a further group that can be said to have come on 'on-stream' in 2003 and that contributed to an increase in the pool of persons who might in time have sought to study at a university and who needed to be taken into consideration in planning. The size of this group is taken to be the number of immigrants to Australia in the financial year 2000-2001 who were aged between 15 and 39 years old and who, as a consequence, would not be included in a grade or age educational cohort, but who might over time become eligible for university study. This group is then partitioned to each state in proportion to the immigration intake in that state, and is subsequently added to the age cohort to provide the base incremental figure for persons who were available to take part in higher education and to increase the number of university-educated persons in Australia.

Table 2 records the participation rates by state and Australia overall for domestic students for whom places were available in 2003 for entry as new students into bachelor degree programs for (a) the age cohort, and (b) the age plus immigration cohort.

Table 2. Participation rates for domestic students in bachelor degree programs in 2003

State	Age cohort	Age plus immigration cohort
New South Wales	56	43
Victoria	60	50
Queensland	67	55
Western Australia	60	48
South Australia	59	54
Tasmania	52	50
Australian Capital Territory	95	84
AUSTRALIA	62	50

Sources, ABS (1998-2006), ABS (2003-2006)

Table 3 records the expected graduation rates from bachelor degree courses at universities at time of entry into those courses in 2003, with expectations based on the number of bachelor degree graduates in 2002. The base line data are (a) the size of the age cohort in 1999, and (b) the size of the age cohort together with the increase in size of the population through immigration, as is used in Table 2.

The graduation rate is the percentage of the cohort who might be expected to graduate with a bachelor degree in due course with expectations based in the number of bachelor-degree graduates in 2002.

Table 3. Graduation rates for domestic students in bachelor degree programs in 2002

State	Age cohort	Age plus immigration cohort
New South Wales	36	28
Victoria	42	35
Queensland	38	31
Western Australia	37	30
South Australia	38	35
Tasmania	31	30
Australian Capital Territory	61	54
AUSTRALIA	39	32

Sources, DEST (2002-2006)

Table 4 records the participation rates for entry into all tertiary level courses in 2003 for domestic students at universities. The participation rates are the percentages of the age cohort and the age plus immigration cohort for whom there were entry places taken in tertiary level courses in 2003 by domestic students.

Table 4. Participation rates for domestic students in tertiary level courses at universities in 2003

State	Age cohort			Age plus immigration cohort		
	All courses	Straight from school	Completed Year 12[1]	All courses	Straight from school	Completed Year 12 [a]
New South Wales	68	22	36	52	17	28
Victoria	64	28	44	53	23	44
Queensland	77	25	42	64	21	35
Western Australia	65	21	36	53	17	29
South Australia	63	25	37	58	23	34
Tasmania	57	20	37	55	19	36
Australian Capital Territory	100	21	60	88	18	58
AUSTRALIA	70	25	41	57	20	33

Sources, ABS (2003-2006), ABS (2002-2006)

CONCLUSIONS

Several issues arise from these data. There are differences in achievement between the states in reading, mathematics and scientific literacy. These differences cannot be explained by differences in school starting ages or progression through the early years of schooling. There are differences in the content knowledge of students between states and differences in these domains that have varied over time. This suggests that some differences between states reflect changes in curriculum specification and or pedagogical practices. In addition, there are noticeable differences between the states and territories in both the number of university places available and the proportion of school leavers entering higher education straight from school. The Australian Capital Territory and Queensland have relatively more university places available while Tasmania has fewer. Victoria has a high proportion of young people entering university directly from school while Tasmania, Western Australia and the Australian Capital Territory have fewer. Furthermore, there are substantial differences in the proportions of university entrants who are admitted to university

[1] Columns headed 'Completed Year 12' shows the percentage of people admitted specifically on the basis of their Year 12 results. People admitted following other qualifications may also have completed Year 12, so the proportion of school completers is likely to be substantially higher than the figures presented indicate.

on bases other than Year 12 results. The differences in the bases upon which different universities in the different states admit students to bachelor degree courses, particularly with respect to mature age applicants, warrant investigation.

With the marked shortage of persons with advanced technical skills, is too high a proportion of the limited resources provided by the Commonwealth Government for education at all levels being assigned to universities and too little to vocational and technical education programs? While information is available by university and by state as well as by course type at all levels of the higher education, little information is readily accessible by state or by institute in the field of vocational and technical education. Nevertheless, it is in these fields that Australia, it would seem, has to recruit extensively from overseas. Birrell and Rapson (2006), however, argue that the changing nature of Australia's economy demands more rather than fewer places in higher education.

In this commentary on Professor Masters' paper that appeals for consideration to be given to strengthening and perhaps building an Australian education system, we have drawn attention to substantial differences between the states in the provision of and participation and performance in education at different levels across Australia. We believe that it is clearly time to engage in national debate on these issues that is based on the scattered findings of research that has been undertaken into Australian education, all too often with little thought given to the major policy issues that demand attention.

The current proposed changes, particularly those in South Australia, Queensland and Western Australia at the senior secondary school stage, have repercussions both at the lower and middle secondary schooling levels as well at the university and technical and further education levels. These proposed changes, if implemented, would give rise to greater divergence between the states at a time when greater movement between the Australian states and increasing globalisation would seem to suggest that convergence towards an Australian system is required. Furthermore, if Australia decides to participate in the OECD testing program of all university entrants, the need for informed debate on the disparities between states in the education they provide and between universities prior to making the decision to participate becomes increasingly necessary and of considerable urgency.

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