Chapter 5

Matriculation standards and an Australian Certificate of Education

5.1 The final two years of secondary school should provide students with a quality education that equips them for further education, training and employment. This chapter of the report looks at the wide variation in assessment instruments for Higher School Certificate (and equivalent) qualifications across the country.

Variations in standards

5.2 At present, there are no nationally agreed standards for a certificate of attainment for senior secondary students at the end of Year 12. Each state and territory sets its own curriculum and assesses the achievement of its students in its own way. This makes it difficult, if not impossible, to compare Year 12 achievement levels across the jurisdictions. In New South Wales, for instance, the Higher School Certificate (HSC) provides detailed information about students' levels of achievement in relation to explicit standards and the cohort taking each subject. The HSC mark is based on 50 per cent external examination and 50 per cent internal (or school-based) assessment. In Queensland, standards descriptors for each exit level of achievement are published in the corresponding syllabus document. The final marks are arrived at by school-based assessment only. External moderation is used in place of common state-wide exams.

5.3 In 2007, the Australian Council for Educational Research (ACER) conducted a review of Australia's Year 12 curricula and achievement standards in five subjects. The Year 12 Curriculum Content and Achievement Standards report (The Year 12 Report) concluded that there either was, or appeared to be, standards variation across most subjects. In some subject areas, such as high-level mathematics, these differences were considered significant.[1]

5.4 By way of example, Professor Garth Gaudry from the International Centre of Excellence for Education in Mathematics cited his examination of one Queensland school's Year 12 mathematics examination:

> I had a look at the examination questions themselves, and I think it was two questions that formed the other 20 per cent. They are called indicator questions or something like that, because the higher grades are based on those particular questions. By New South Wales standards, they were abysmal. Probably the highest level question would be considered a routine

1 Australian Council for Educational Research, *Year 12 Curriculum Content and Achievement Standards*, 31 January 2007.

> question, essentially theory, in three-unit mathematics in New South Wales.[2]

5.5 In Queensland, this lack of comparability makes it difficult to determine matriculating students' actual knowledge, skills and understandings, as distinct from what may be set down as syllabus outcomes. This has a wide range of implications for universities as there is no other way to compare student performance. The committee notes that this problem would exist also for employers who may have particular expectations of a student's level of achievement.

5.6 At present, students completing Year 12 gain entry into university according to a national Tertiary Entrance Rank (TER). Some submissions argued that this arrangement allows for broad consistency and comparability of standards across Australia. The committee notes claims that current matriculation arrangements appear to be working well, including those which see students applying to study interstate. But as a DEST official explained, statistical methods are used by universities in an attempt to equalise entry scores: this really amounts to data manipulation that is done independently in each of the states. Moreover, the committee has doubts, as does the government, that current arrangements provide an understanding of the relative performance of systems. This would give some guidance as to the quality of outcomes. As a DEST official advised the committee:

> The important thing to bear in mind, though, is that the government's proposal relates to moderation of the subjects the student is studying rather than just moderation of the student body, which the ACT and the Queensland government systems attempt to do. They do some degree of moderation, but it does not go to the knowledge or assessment of individual students in particular subjects. [3]

5.7 As noted elsewhere in this report, we currently have no evidence, for instance, that the challenge of top-level physics in one state is equal to that in others, and that the same test of difficulty is applied. The findings of this inquiry, and the methods by which jurisdictions calculate TERs and negotiate interstate credit transfers, leave the issue open to doubt.[4]

Assessment

5.8 Across the country assessment methods vary, as noted earlier, as to proportion of school-based assessment and external exams. External common examinations assess student achievement in a particular subject where all the examination questions

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2 Professor Garth Gaudry, International Centre of Excellence for Education in Mathematics, *Committee Hansard*, Melbourne, 26 June 2007, p. 28.

3 Mr Bill Burmester, DEST, *Committee Hansard*, Canberra, 11 July 2007, p. 34.

4 Ibid. Also, Queensland Catholic Education Commission, *Submission 45*, p. 4; Queensland Department of Education, Training and the Arts, *Submission 54*, p. 23; Newcastle Students' Association, *Submission 30*.

are based on a common state syllabus. School-based assessment is devised, constructed and implemented by schools, not necessarily based on an official syllabus. With school-based assessment, teachers have to be trained to become consistent judges of the quality of student work, and there has to be a quality assurance process in place to guarantee comparability of results. To achieve this moderation, teachers need to engage in professional conversations about curriculum, pedagogy and standards.

5.9 The Year 12 Report identified nationwide differences in key assessment practices. The differences were primarily evidenced in the balance between external examinations and school-based assessments. For example, there are no external examinations in Queensland and the ACT. A system of externally moderated school-based assessment has operated in Queensland since 1973 on which the ACT system was modelled in 1976. The other six states and territories have combinations of external examinations and internal assessments which have varied in proportion over time.

Queensland assessment

5.10 The committee noted the zealous way in which witnesses from Queensland championed their school-based system of Year 12 assessment. This system is based on recommendations contained in the 1973 Radford report. Professor Claire Wyatt-Smith from Griffith University told the committee,

> If you want to see innovative quality assessment practices, look to Queensland…It is a well kept secret. To people who do not understand how the system works it could look a rather suspicious practice to be having high-stakes assessment in the hands of teachers, but the systems checks and balances are certainly in place and the quality considerations around how teachers work with standards with students are there as well.[5]

5.11 The Queensland Department of Education, Training and the Arts, as chief custodians of the system, told the committee:

> The continuous assessment does mean that classroom teachers on a regular basis are constantly diagnosing, assessing and having a look at how students are going, [and are] able to set assessment items that enable students to…demonstrate that they have deep thinking and deep knowledge.[6]

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5 Professor Claire Wyatt-Smith, Griffith University, *Committee Hansard*, Brisbane, 5 June 2007, p. 91. Also, Mr Ian Ferguson, Queensland Secondary Principals' Association, *Committee Hansard*, Brisbane, 5 June 2007, p. 31.

6 Ms Lesley Englert, Queensland Department of Education, Training and the Arts, *Committee Hansard*, Brisbane, 5 June 2007, p. 77. Also, Mr Ian Ferguson, Queensland Secondary Principals' Association, *Committee Hansard*, Brisbane, 5 June 2007, p. 25; Mrs Diane Anderson, Queensland Catholic Education Commission, *Committee Hansard*, Brisbane, 5 June 2007, pp 64-65; Ms Joy Schultz, *Committee Hansard*, Brisbane, 5 June 2007, p. 99.

5.12 The committee notes that other states have come to accept that a proportion of school-based assessment is important in giving due recognition to continuing achievement over a period of time. However, a significant number of criticisms were made of the school-based externally moderated system.

5.13 One of the most forthright comments was heard from Professor Kenneth Wiltshire, who argued that the end of external Year 12 exams has resulted in declining standards. Professor Wiltshire told the committee:

> The argument advanced at the time that this was all too draconian, that measuring people's performance on one day is not fair and how can it all be done in one day. You have heard all of these arguments…Also the inquiry said let us trust the teachers. Why do we need external checks; a good teacher knows what they are doing. Like a lot of these reforms for the first five to 10 years maybe it worked pretty well.[7]

5.14 Professor Wiltshire did not elaborate, but the committee assumes that for several years into the new assessment system, teachers experienced with the old ways were consciously or unconsciously benchmarking students against what went before. This was certainly the case in the ACT where the original courses for the Year 12 Certificate owed much to NSW Years 11 and 12 syllabus standards. Teachers in Canberra who had, initially, taught HSC courses had the same expectations of their students under the new assessment arrangements.

5.15 The McGaw Report, which investigated reforming the HSC, looked at school-based assessment. It was never seriously considered as an alternative to the HSC. Professor Barry McGaw reported a number of objectionable elements to school-based assessment, including that it put too much onus on teachers, was inimical to student-teacher relationships, and lacked the necessary degree of objectivity which is the outstanding characteristic of external public examinations. It is significant that while some academics have noted praiseworthy aspects of the Queensland system, only the ACT has emulated this model.[8]

5.16 Others are also critical of what they see in Queensland. Professor Gaudry questioned the accountability and rigour within the Queensland system.[9] Professor Bill Louden from the University of Western Australia pointed out that notwithstanding its defenders:

> Nobody who runs a certification authority in any of the other states is rushing to do what Queensland does…There is a powerful effect of external

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7 Professor Kenneth Wiltshire, *Committee Hansard*, Brisbane, 5 June 2007, p. 13. Also, Dr Thelma Perso, Australian Association of Mathematics Teachers Inc, *Committee Hansard*, Brisbane, 5 June 2007, p. 60.

8 Professor Barry McGaw, *Shaping Their Future: recommendations for reform of the Higher School Certificate*, Department of Education and Training, New South Wales, 1997, p. 85.

9 Professor Garth Gaudry, International Centre of Excellence for Education in Mathematics, *Committee Hansard*, Melbourne, 26 June 2007, p. 28.

> examinations on kids, the intensity of effort….If you have an assessment at school in a non-examination system you do not have to be automatic, you can take your time and polish it up. Examinations are important.[10]

5.17 Professor Alan Reid from the Australian Curriculum Studies Association told the committee he admired the professional judgement element of the Queensland system but conceded that the South Australian review of its Certificate of Education would not be recommending emulating the Queensland model.[11]

5.18 The committee notes that Queensland and the ACT are under pressure from the Commonwealth to re-introduce an external examination as part of the Year 12 assessment. The committee is sympathetic to this idea. It rejects arguments that public examinations place undue pressure and stress on students. The experience of external exams is one of life's rituals for most young people in Australia, a 'rite of passage' into the real world of competitive stress. Nonetheless, the committee anticipates that Queensland's regard for its method of assessing its Year 12 Certificate is likely to result in strenuous resistance to Commonwealth demands.

Western Australia reporting

5.19 The generally high performance of schools in Western Australia, as indicated by national benchmark and international comparative tests, is remarkable in view of the fact that, by most accounts, Western Australia has recently suffered from prolonged disruption to its education program (and progress). This arose from an unusually doctrinaire adherence to outcomes-based education, strongly championed by the Curriculum Council. Soon after the introduction of a new curriculum framework in 1998, it became clear that subject specific outcomes were causing problems for teachers and that it was difficult to convert outcomes to traditional assessment. Thus, Western Australia has had more difficulty than other states in conforming to the Commonwealth's directive to report student progress on an A-E scale.

5.20 The problem was compounded when the Curriculum Council decided that outcomes would replace the entire syllabus in each subject, and that traditional marks would be replaced by other achievement indicators consistent with outcomes-based learning theory. The effect on Years 11 and 12 curriculum and assessment has been serious enough to provoke opposition to outcomes-based learning, at that level, in both government and independent schools. The practicalities of implementing a learning theory characterised by nebulous jargon in reams of documents, but without a syllabus, resulted in a demoralised teacher workforce. There was considerable public controversy stirred by the *West Australian*, culminating in the resignation of a minister, a director-general of education, and head of the Curriculum Council. The

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10 Professor Bill Louden, *Submission 73*, p. 12.

11 Professor Alan Reid, Australian Curriculum Studies Association, *Committee Hansard*, Melbourne, 25 July 2007, p. 14.

committee understands that the process of cleaning up after this debacle has now commenced.[12] The Director-General of the Western Australia Department of Education explained the rationale for earlier decisions, and the outcomes of those decisions:

> In allowing schools to determine their curriculum as based on the needs and contexts of students and their communities, there arose the perception that what students should learn was becoming increasingly subjective and less clearly defined. The new courses were structured with a shift of emphasis away from specific content that should be taught toward a clearer definition of what students should know and understand as a result of their learning. A consequence of this was less explicit reference to the traditional canon of the subject disciplines in the course documentation. Together, these two factors were interpreted as "dumbing down" the curriculum. This view was strongly reinforced through media coverage of new courses.[13]

5.21 A new curriculum framework and outcomes and standards framework is to be implemented in 2008. Syllabuses are being reintroduced, with more explicit content and in a format that closely reflects the design of previous matriculation subjects. New assessment policy includes the introduction of intelligible grades and marks.[14] The committee was pleased to note that the Department is using 'teacher juries' to inform additional course refinements and ensure that the voice of the profession is heard.

Curriculum

5.22 The committee received evidence regarding the curriculum for the final years of schooling which the committee has chosen to include in this chapter.

English and literacy

5.23 The English curriculum for Years 11 and 12 has been subject to considerable criticism, much of it, as indicated in an earlier chapter, based on 'culture wars' beliefs, and betraying an ignorance of the needs and interests of contemporary students, including the most academically able.

5.24 Some criticisms seem founded on a belief that syllabuses require a post-modernist approach to the study of literature. This accusation is based on revelations of some notorious exam questions. The committee notes from anecdotal evidence that the study of literature in some schools and jurisdictions has been affected by this accusation. There is almost certainly some basis of truth in complaints made about new fashions in the teaching of literature. Whether such influences come from academic fashions in English faculties, which are taught to aspiring English teachers,

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12 Professor Stephen Kessell, 'Changes have not solved OBE problem', *West Australian*, 14 July 2006, p. 18 and WA, Department of Education and Training, *Submission 70*, pp 2-3.

13 Ms Sharyn O'Neill, Answers to Questions on Notice, Report Tabled Papers.

14 Ibid.

is not for this inquiry to consider. It is probably more likely to originate there than from a particular emphasis in a curriculum document. According to one submission, there is no real evidence, or academic consensus, to suggest that senior school English curricula have 'succumbed' to an overtly post-modern approach in either their creation or implementation.[15]

5.25 However, the committee also notes comment from the president of the Australian Academy of the Humanities, and a highly experienced curriculum expert in English. Professor Graeme Turner commented that the literary component in English is being reduced in importance because syllabus writers regard literature as useful only in reflecting social developments and tensions. Professor Turner believes this has happened because the study of literature in English has been weakened by the power of vocationalism and cultural studies. The way has been cleared for multiliteracies and media literacy.[16] The committee takes this claim to mean that English literature has been transformed into a social science, and the elements which once defined it as a humanity—character, art, literary style and moral purpose—are no longer considered important.

5.26 Dissatisfaction with the direction in which the study of literature is being taken are reported from time to time. Most recently a group of former senior education leaders in New South Wales described the English curriculum as 'compromised'. Their concern is that English curricula increasingly focus on basic literacy test skills to the detriment of the broader scope, aims and aspirations of the subject, an echo of Professor Turner's comments above. Dr Graham Little, who wrote the 1972 NSW English syllabus for Years 7 to 10, further criticised the current English syllabus for its surfeit of information about how to set a test that is compatible with computer marking.[17]

5.27 The committee has no comment to make on this controversy other than to suggest that university departments of English become more involved in defending traditional literary values at the school level. The emergence of 'new media' and 'new literacies' in no way diminishes the value and importance of students developing their minds and sensibilities through reading literature of enduring value.

5.28 The Year 12 Report found that senior school English curricula across the country have very little in common. Over 18 TE (matriculation level) English courses are on offer There are no specific texts that all students are required to study, and there is a mere 25 per cent commonality in the study of ‘text types’. There is only a 30 per cent degree of commonality in the essential skills, understandings and objectives that Year 12 students are expected to develop. These range from ‘using correct spelling, punctuation and grammar’ to ‘making meaning through texts’.

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15 Australian Council of State School Organisations, *Submission 12*, p. 4.

16 Professor Graeme Turner, *The Australian*, 30 May 2007, p. 25.

17 Anna Patty, 'Educators round on English syllabus', *The Sydney Morning Herald*, 1 September 2007.

5.29 Year 12 students do not participate in any national or international benchmark testing. There is no statistical data on which to make a judgement about the validity of criticisms that many students finishing high school have low levels of literacy skill. The evidence provided to the committee was purely anecdotal, and provided by academics observing the calibre of matriculating students. A representative comment was that from Dr Kerry Hempenstall:

> I find myself correcting fundamental errors…The problems are evident in spelling and in basic grammar mistakes: inappropriate use of commas, colons and semi-colons, conjunctions; producing run-on sentences, or overly long sentences; and a lack of understanding of how best to join sentence fragments. Other problems include subject-object agreement, tenses, and singular/plural confusions. When university post-graduate students need help with spelling and punctuation, it appears that we have a significant problem with the teaching of literacy generally.[18]

5.30 While some academics do not see the correction, or the teaching, of basic literacy as their role, the committee tends to agree with those academics who perceive of all educators as teachers of literacy. Professor Wyatt-Smith unequivocally told the committee:

> The reported deterioration in students' literacy levels in university is a bit like the blame culture going up the next rung of the ladder. The secondaries blame the primaries, the primaries blame the parents, and the universities blame the teachers…The notion that teachers at any levels, indeed university levels, can abrogate their responsibility for teaching the literacy demands of economics, physics and so on is also a myth of the past and it is high time university educators took it onboard that they are responsible for literacy education and numeracy education as well.[19]

5.31 For Professor Wyatt-Smith there is a real problem with the teaching of literacy, and implicitly the results of that teaching. The Queensland Department of Education, Training and the Arts advised that as matriculating students are not required to study English to qualify for a TER, their literacy levels might be less than ordinary. The committee notes that this does not explain any failure to acquire basic literacy skills in Years 1-10 when the study of English is compulsory in all curricula.

5.32 The committee believes that the neglect of literacy at Year 12 may have much to do with the 'strategic thinking' which students have to engage in to maximise their chances of being accepted into university. This was confirmed by the Executive Officer of the Council of Professional Teaching Associations of Victoria who told the committee:

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18 Dr Kerry Hempenstall, *Submission 5*, p. 2. Also, Professor James Allan, *Committee Hansard*, Brisbane, 5 June 2007, pp 2-5; Professor Stephen Kessell, *Committee Hansard*, Perth, 2 July 2007, p. 60.

19 Professor Claire Wyatt- Smith, Griffith University, *Committee Hansard*, Brisbane, 5 June 2007, p. 87.

> In terms of senior subjects often, in order to get a high tertiary entrance score, students will take the easier options or the options that are scaled up…Students are doing this but…there are schools that encourage their students to do that so that when the league tables are published schools X, Y and Z come out looking very good…This is not across the board but …it happens. That is a concern...Students say, 'Why should I when I can probably do something much easier and it will probably still get me into first-year science or whatever?'[20]

5.33 Regardless of whether senior students matriculate, or engage in other forms of further education, training or employment, the committee believes that all Year 11 and 12 students should be assessed as having reached a certain standard of literacy, and in the case of matriculants, that standard should be sufficiently high as not to impede their chances of success in further study.

Mathematics

5.34 The committee was told that enrolments in mathematics are declining in senior secondary school. The nationwide statistics, as a percentage of Year 12 students, are shown in the following tables.

National participation by Year 12 students in advanced and intermediate mathematics in 1995 and 2004.

Advanced mathematics students, as a percentage of Year 12

	NSW	***VIC***	***QLD***	***WA***	***SA***	***TAS***	***ACT***	***NT***	***(AUS)***
1995	18.9	11.4	12.6	12.6	11.8	4.6	12.2	5.8	(14.1)
2004	15.0	12.6	8.4	8.2	9.1	5.5	11.9	3.2	(11.7)

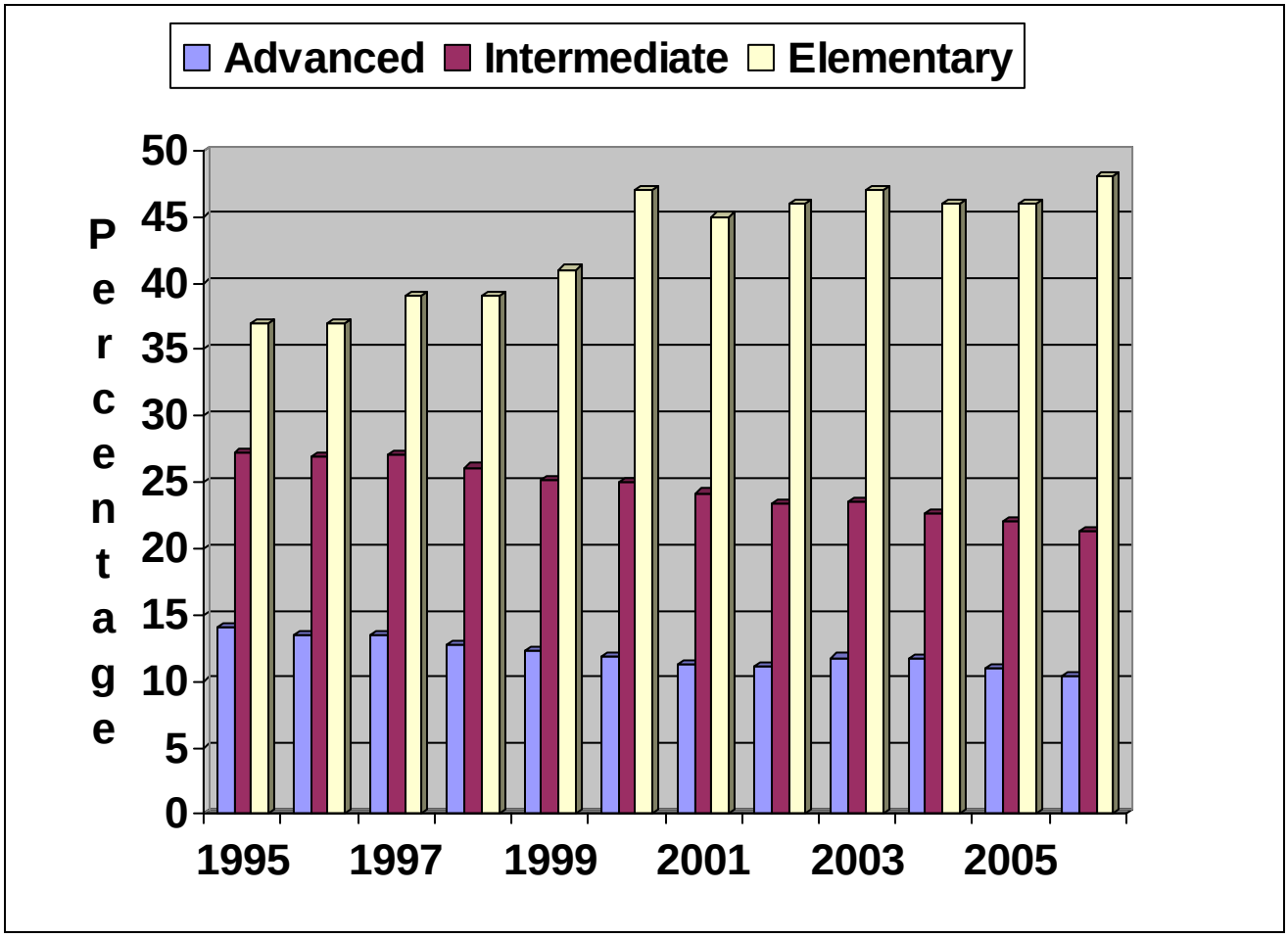
Intermediate mathematics students, as a percentage of Year 12

	NSW	***VIC***	***QLD***	***WA***	***SA***	***TAS***	***ACT***	***NT***	***(AUS)***
1995	30.0	24.4	33.7	18.8	23.6	15.3	27.6	9.7	(27.2)
2004	20.1	24.2	31.7	13.4	16.0	14.3	28.0	9.9	(22.6)

Source: Australian Academy of Science, *Mathematics and Statistics: Critical Skills for Australia's Future: The National Strategic Review of Mathematical Sciences Research in Australia*, December 2006, p. 54.

20 Mrs Olwyn Gray, Council of Professional Teaching Associations of Victoria, *Committee Hansard*, Melbourne, 25 June 2007, p. 64. Also, Ms Lesley Englert, Queensland Department of Education, Training and the Arts, *Committee Hansard*, Brisbane, 5 June 2007, p. 84.

Year 12 Mathematics Students in Australia 1995-2006



Source: Professor Hyam Rubinstein and Jan Thomas, *National Numeracy Review – Draft Submission*, AMSI, 18 July 2007, Attachment 1 p. 12.

5.35 There are various reasons for the decline in mathematics enrolments: poor career advice, a plethora of subject choice, inadequate maths options, and the need to maximise university entrance scores. One witness estimated that only 64 per cent of secondary schools were actually in a position to offer the most advanced Year 12 mathematics subjects.

> The decline in the number of students taking advanced and intermediate level courses at Year 12 shows that many students are not equipped with the mathematics they need for further study.[21]

5.36 Inadequate teaching in the early years of secondary school prevents some students from attaining their full potential in mathematics. This means that students disengage from mathematics because their experiences are disappointing.

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21 Australian Mathematical Sciences Institute, *Submission 42*, pp 4-5. Also, Australian Association of Mathematics Teachers, *Submission 21*, p. 2; Dr John Ridd, *Submission 4*, pp 3, 5-6.

5.37 Another factor is often a disincentive to study the subject at the highest level because it is not required by the university in the course which the student is aiming to enter following matriculation. The committee regards this policy on the part of university faculties of engineering and science to be perverse, but it is explained by the competition that exists between universities for engineering and science enrolments. Academics and teachers alike told the committee that universities must share a significant part of the blame for the demise of school mathematics.

> A particularly damaging action by the universities has been to remove the higher-level high school mathematics courses [Maths C in Queensland] from the list of prerequisites especially in engineering...This was done mainly because maintaining student numbers is central to the very survival of university faculties and lowering prerequisites is one way to get more students…With the removal of Maths C as a prerequisite subject for any university subject, there was no longer any compelling reason for students to do this subject in the schools and the numbers dropped rapidly.[22]

5.38 The Australian Mathematical Sciences Institute agreed:

> If universities drop pre-requisites as they have done universally, and accept students into engineering who have not even studied calculus, who can blame schools for dropping advanced courses and permitting their students to hunt for TER points by taking soft options? Failure to reward students for taking more advanced subjects in TER calculations often exacerbates this.[23]

5.39 The committee believes that this is likely to have a serious effect on quality teaching over time. Universities are taking a very short-sighted view of their responsibility to achieve the highest standards. This is one instance where market forces are having an adverse effect on both efficiency and quality.

5.40 In the committee's view, the elimination of university course prerequisites, coupled with students' concern to maximise their university entry scores, has substantially contributed to the weakening of senior school mathematics. The effects on university courses must also be considerable, with a great deal of remedial work required to be done, and possibly the elimination of some of the more challenging material that was once offered in the first two years of the degree.

5.41 Some would respond by arguing that there is only a very small need for pure mathematics courses, and senior secondary schools need to cater for the majority rather than the minority. The committee notes that the anecdotal and unequivocal

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22 Assoc Professor Wayne Read, *Submission 48*, pp 2-3. Also, Dr John Ridd, *Submission 4*, p. 3; Mr Robert Aikenhead, *Committee Hansard*, Melbourne, 25 June 2007, p. 64; Professor Igor Bray, *Committee Hansard*, Perth, 2 July 2007, p. 25; Mr Bill Burmester, DEST, *Committee Hansard*, Canberra, 11 July 2007, p. 27.

23 Australian Mathematical Sciences Institute, *Submission 42*, p. 5.

evidence presented from academics was that there is a high-end need, which is not being satisfied. As the committee heard:

> During the period 1987-96, we saw a significant reduction in the preparation of our undergraduate students to undertake a science or engineering degree. This occurred despite a progressive increase in our TER cut-off scores during that period.[24]
>
> We are seeing a substantial reduction in the mathematical ability of students entering universities relative to a decade ago, and that this weakness has implications both to the individuals betrayed by the education system and to the development of Australia's scientific capabilities.[25]

5.42 It is vital that Australian students' mathematical needs are met. While there is no benchmark testing to support Professor Stephen Kessell and Dr Richard Rowe's comments, the committee notes the Trends in International Mathematics and Science Study (TIMSS) results in lower levels of schooling, and the evidence that students do not always undertake further mathematics, much less pure mathematics studies in senior school. On balance, the committee believes that there is a serious problem with senior school standards in mathematics. Part of the problem is the curriculum.

Senior school curricula

5.43 The Australian Mathematical Sciences' Institute (AMSI) submitted that senior school mathematics courses vary significantly across the country. It found that the mathematical content and assessment variations were so wide that no two Year 12 courses could be described as equivalent.[26] According to the International Centre of Excellence for Education in Mathematics (ICEEM), the current content and assessment differences stem from separate perceptions of the mathematical topics and skills developed by the various boards of studies. The differences that have developed are striking and cannot be explained by the geographical location of the states and territories.[27]

5.44 This was contrary to the views expressed in the Year 12 Report. That report concluded that there was very high consistency in the 27 tertiary level mathematics courses: approximately 90 per cent consistency in high level (pure) mathematics and about 75 per cent consistency in social mathematics or mathematics for living (applied mathematics).

5.45 AMSI argued that the Year 12 Report did not include any contribution from academics who dealt with first year undergraduate students, nor data collected by the

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24 Professor Stephen Kessell, *Submission 13*, p. 1.

25 Dr Richard Rowe et al, *Submission 20*, p. 3. Also, Dr Peter Ridd, James Cook University, *Committee Hansard*, Brisbane, 6 June 2007, p. 15.

26 Australian Mathematical Sciences Institute, *Submission 42*, p. 4.

27 Frank Barrington and Peter Brown, *Comparison of Year 12 pre-tertiary mathematics subjects in Australia*, October 2005, p. iv.

ICEEM. ICEEM described various jurisdictions as having considerable deficiencies in their senior curricula but admired the outstanding New South Wales curriculum, whose four-unit mathematics course was the best in the country, being both demanding and of extremely high quality.

5.46 The Australian Association of Mathematics Teachers (AAMT) also had concerns about mathematics curricula and standards in senior secondary school, though probably from a quite different perspective, being less concerned with standards and more concerned with whether it meets the needs of average students:

> Standards at this level should include more than content standards, in particular, employability skills, meta-cognitive skills, skills in application and transference of mathematics to problem-solving and real-life contexts, including in the workplace.[28]

5.47 The committee finds the discrepancy between information provided in the Year 12 Report and by AMSI interesting. It suggests that the difference may lie in the fact that the apparent degree of commonality in maths curricula across states is based on a reading of the documents alone. The AMSI information puts emphasis on assessment. As the committee makes clear elsewhere in this report, what is set down in a curriculum document may not necessarily be taught, and if it is the assessment results may vary significantly, depending on the degree of difficulty in tests.

Consultation and collaboration

5.48 There appear to be clear differences of opinion between educators in the field of mathematics in regard to curriculum philosophy. Some flavour of it is picked up in the Hansard transcripts for this inquiry. This should not be a matter of any concern: rather, it is a measure of the intellectual engagement in the profession. But there are real concerns. It is also clear that there appears to be a lack of consultation within universities regarding mathematics knowledge needed by trainee teachers. There is also a concern that collaboration between universities and state curriculum agencies, which was so strong and productive in the past, may now be weakening. As one academic noted in regard to the English curriculum:

> Curriculum councils and their counterparts in other states, who would not be known to a single bureaucrat in the Department of Education because they do their own thing and interact with their own little clique, see

28 Australian Association of Mathematics Teachers, *Submission 21*, p. 1. Also, Professor Garth Gaudry, International Centre of Excellence for Education in Mathematics, *Committee Hansard*, Melbourne, 26 June 2007, pp 30-32.

> university input as the dean of the faculty of education from four or five universities, full stop.[29]

5.49 These problems should be relatively easy to fix with the application of some firm leadership and goodwill. The committee encourages a more serious climate of co-operation in the common interest of mathematics teaching and learning. There are some encouraging signs that this need is recognised. As Professor Margaret Britz of Queensland University of Technology told the committee:

> It is time to stop pretending and it is time to actually look at the interface between the secondary education system and the tertiary system in a very complex matrix which varies across each State.[30]

5.50 And later:

> Closer links between the tertiary and secondary sectors, and a concurrent review of what universities can deliver, and how, is needed in the short-term while the issues of curriculum design across the primary and secondary sectors are in focus.[31]

Science

5.51 The Year 12 Report found that physics and chemistry curricula have a very high degree of national consistency, estimated at 85 per cent and 95 per cent, respectively. Unlike mathematics, science appears to be relatively untouched by any standards debate.[32] However, there was evidence provided to the committee about the decline in science enrolments. It suggests that weaknesses in both teaching and in the curriculum are disengaging students in the middle to senior school years.

5.52 According to Megan Motto of the Association of Consulting Engineers Australia:

> Learning about science is a matter of experiencing its effects, doing rather than reading and listening. Encouraging science, engineering and technology (SET) skills at a young age in primary school provides the impetus for interest in the enabling sciences. For most secondary school students science involves learning facts for an exam, remembering

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29 Professor Stephen Kessell, *Committee Hansard*, Perth, 2 July 2007, p. 64. Also, Assoc Professor Wayne Read & Dr Peter Ridd, James Cook University, *Committee Hansard*, Brisbane, 6 June 2007, pp 14-15. Also, Professor Igor Bray, *Committee Hansard*, Perth, 2 July 2007, p. 27; Ms Jan Thomas, Australian Mathematical Sciences Institute and International Centre of Excellence for Education in Mathematics, *Committee Hansard*, Melbourne, 26 June 2007, p. 32; Professor Margaret Britz, Queensland University of Technology, *Committee Hansard*, Brisbane, 6 June 2007, p. 26.

30 Professor Margaret Britz, Queensland University of Technology, *Committee Hansard*, Brisbane 6 June 2007, p. 31.

31 Professor Margaret Britz et al, *Submission 61*, p. 2. Also, Professor Stephen Kessell, *Submission 13*, pp 1-2.

32 Dr Richard Rowe et al, *Submission 20*, p. 2; Professor Margaret Britz et al, *Submission 61*, p. 1.

> formulae, plugging the right number in to get the correct answer, and the need to perform some short experiments that hopefully produce the result required by the teacher. Many, if not most, students who spend four or six years going through this system become both somewhat naive and disenchanted about the role and process of science.[33]

5.53 Professor Bray also told the committee that the experiential nature of science requires the kind of teacher who is 'a little bit out there' and who loves the discipline: many students are attracted to science when they pick up on a teacher's passion for the discipline. For Ms Motto, this clearly involved an element of quality teaching:

> If you are not fully conversant with your subject area, you are very unlikely to teach it with confidence, much less passion and enthusiasm. This is what translates into students liking the subjects, therefore trying in the subjects and wanting to go further in those subject areas.[34]

5.54 Science qualifications, as in other specialist discipline areas, were another relevant factor in the quality of science teaching. The committee noted statistics quoted from a recent study conducted by the Australian Council of Deans of Science that:

> • Nearly 43 per cent of senior school physics teachers lacked physics majors, and 1 in 4 had not studied the subject beyond the first year at university.
>
> • Among senior school chemistry teachers, 1 in 4 lacked a chemistry major.
>
> • Geology teachers had the lowest levels of discipline specific qualifications. More than half of these teachers had not studied any geology at a tertiary level.[35]

5.55 If boring curricula and uninspired, unqualified teaching are turning students off the study of the enabling sciences, the committee is alarmed. Not only will students fail to realise all available study opportunities, it would also endow them with a weak foundation for further education, training and employment in scientific areas. This could be remedied at university, as it is with mathematics, but the committee's comments applying there apply equally here.[36]

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33 Association of Consulting Engineers Australia, *Submission 71*, p. 5. Also, Australian Council for Educational Research, *Submission 38*, p. 3.

34 Ms Megan Motto, Association of Consulting Engineers Australia, *Committee Hansard*, Canberra, 11 July 2007, p. 38. Also, Professor Margaret Britz, Queensland University of Technology, *Committee Hansard*, Brisbane 6 June 2007, pp 27-9; Professor Igor Bray, *Committee Hansard*, Perth, 2 July 2007, p. 27.

35 Australian Council of Deans of Science, *'Who's Teaching Science? Meeting the demand for qualified science teachers in Australian secondary schools'*, January 2005, Centre for the Study of Higher Education, University of Melbourne quoted in Association of Consulting Engineers Australia, *Submission 71*, p. 8. Also, Professor Bill Louden, *Submission 73*, p. 10.

36 Dr Richard Rowe et al, *Submission 20*, p. 2.

University expectations

5.56 The committee notes that while senior school science enrolments were said to be in decline, there does not appear to be a crisis of the same magnitude as in mathematics. This was certainly apparent in the smaller number of submissions. Nonetheless, the issues were remarkably similar, with minor variations.[37]

5.57 Dr Rowe and his colleagues from James Cook University put forward a case for 'competence' in the enabling sciences in first year undergraduate students. Without such critical competence, university training is a difficult, inefficient and frustrating process.[38]

5.58 The submission from Professor Britz and her colleagues was one of the few which directly addressed the issue of whether there is an actual decline in academic standards for senior school science:

> The tertiary science sector is expected to deliver many outcomes building on the knowledge, skills and experience of high school graduates who are increasingly recognised as poorly prepared to acquire the professional and generic attributes during a three- or four-year degree.[39]

5.59 At the committee's Brisbane hearing, Professor Britz elaborated:

> We have problems in both a lack of hard wiring in the basic knowledge of the disciplines and a diversity of experience that students walk in with—sometimes with subjects that we may call ‘soft science’ and often with minimum qualifications in English and one form of mathematics. That means that we face the challenge of remedial action in the first year in trying to catch students up.[40]

5.60 This is not to say that all science undergraduates, or even mathematics, law or education undergraduates, are inadequately prepared for further education by the senior school system. In fact, academics were keen to note that they do teach some brilliant and enthusiastic young people.

5.61 The committee is concerned about the serious skills shortages in the areas of mathematics, the sciences, and engineering. It is in Australia's economic interests to encourage all students, but most especially those at senior secondary level, to maintain an interest in, choose to study and reach their full potential in these areas.

5.62 There is increasing discussion about the need for more innovative curriculum in science. The Chief Scientist is lending weight to this argument, although it probably

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37 Mr Robert Aikenhead, *Committee Hansard*, Melbourne, 25 June 2007, p. 63.

38 Dr Richard Rowe et al, *Submission 20*, p. 1.

39 Professor Margaret Britz et al, *Submission 60*, p. 1.

40 Professor Margaret Britz, Queensland University of Technology, *Committee Hansard*, Brisbane 6 June 2007, p. 27.

has more relevance to science teaching in the lower secondary school. This issue was referred to earlier in this report. In Year 12 the committee considers the challenge to be to encourage students to undertake and perform at high levels in mathematics. That requires having teachers with degrees in subjects like physics and chemistry, and such graduates are now hard to recruit into the teaching profession. Thus the issue of standards and examination performance, and certification are closely tied up with factors that are less under the control—if at all—of governments or regulatory bodies.

An Australian Certificate of Education

5.63 The committee considered the idea of students across the country being issued with a common senior school certificate at the end of Year 12 and believes that the principle has some attraction.

5.64 In 2007, the Australian Council for Educational Research (ACER) reported on possible models and implementation arrangements for a single national senior school certificate. The proposed Australian Certificate of Education (ACE) would replace the existing nine senior school certificates. The ACE report noted the many jurisdictional differences, which, in its view, were difficult to explain or justify, and which did not reflect students' needs or best interests. In some instances, such as the reporting of students' results, ACER believed that the differences actually disadvantaged students. The jurisdictional differences also resulted in significant duplication of effort, and expense, across bodies responsible for senior secondary curricula and assessment.[41]

5.65 In regard to HSC-type qualifications, all state and territory education systems were satisfied either with what they had in place or what reforms were anticipated. Where they were not, education departments pointed to extensive and expensive initiatives aimed at correcting any deficiencies. Tasmania, South Australia and Western Australia are currently revising their Year 12 certification, with particular emphasis on how final achievement gradings are to be arrived at. A chart showing the variations in assessments across states and territories is below.

Proportions of external and internal Year 12 assessment for matriculation

	NSW	QLD	VIC	WA	SA	TAS	ACT	NT
External exam	50	0	50-66*	50	0-50	40-60	0	0-50
School-based assessment	50	100	34-50	50	50-100	40-60	100	50-100

* this range is for core subjects only, some non-core subjects can have as little as 30 per cent or as much as 75 percent externally examined

41 Australian Council for Educational Research, *Year 12 Curriculum Content and Achievement Standards*, DEST, 31 January 2007.

5.66 As discussed earlier in this chapter, the lack of external assessment in Queensland has made it difficult to be confident that there can be any reliable comparison made with achievement levels in other states. The committee believes that there is a strong justification for external examinations. The most obvious advantage is in ensuring that the curriculum or the syllabus is covered as intended. It also ensures that there is comparability in the level of difficulty in the questions that are asked across states and territories. It is not necessary to have a standardised national examination paper to ensure this, but a year-by-year moderation of exam papers across states will achieve this purpose. Finally, the committee believes that there are important learning benefits to be gained from external examinations. They provide an extra incentive or motivation to learn, and give students an insight into a wider world of learning.

5.67 The committee **recommends** that all Australian states and territories adopt and implement a substantial proportion of Year 12 assessment to an external examination.

5.68 The committee also understands, as earlier discussed, that any proposal for an ACE would not require a national test, but would be awarded by states on the basis of agreed curriculum and assessment instruments. Each awarding body could continue to offer or accredit a variety of subjects and courses that would count toward the ACE, including vocational studies. There would continue to be diversity and responsiveness to local needs under the umbrella of the single national qualification.

5.69 Education unions argued that the need for an ACE has been overstated. While conceding that an ACE might have some advantages, the Independent Education Union of Australia agued that this is not a policy issue created by educators, state or territory ministers, parent organisations, or the community. Education unions regarded the certificate as another Commonwealth initiative inappropriately linked to funding conditions.[42]

5.70 A few schools and systems expressed concern with the proposal for an ACE. The Australian Association of Christian Schools specifically feared for the autonomy of independent schools:

> Whatever advantages there might be in defining uniform standards for senior school certification across Australia, these must be carefully weighed against the disadvantages of destroying effective school-based practices that have produced strong outcomes at the senior school level. This particularly applies in the non-government sector where, for philosophical and religious reasons, learning is not necessarily pragmatic and utilitarian in its focus.[43]

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42 Independent Education Union of Australia, *Submission 55*, p. 27 and Australian Education Union, *Submission 14*, p. 30.

43 Australian Association of Christian Schools, *Submission 34*, p. 7. Also, Lutheran Education Australia, *Submission 41*, p. 5.

5.71 With that view in mind, the committee noted that the Association of Consulting Engineers supported a national Year 12 certificate for what could be described as utilitarian reasons. These included: comparability of results across the country; nationally high and consistent curriculum standards; and more efficient use of limited resources. For instance, rather than developing seven separate syllabuses or curriculum frameworks for a particular subject, awarding bodies could share some syllabus and assessment materials.[44] In relation to these points, the committee notes that, in subjects which particularly concern consulting engineers, there is already a high degree of commonality in curricula, and some evidence of national collaboration in curriculum construction. However, this does not guarantee comparability of standards and results.

Setting national standards

5.72 All curriculum documents should specify the standards to be reached, and indicating what might be considered minimal level rising to outstanding achievement level. The ACE Report recommended that nationally agreed standards be developed in those subjects for which core curriculum is identified. The committee agrees that this is essential.

5.73 At the April 2007 MCEETYA meeting in Darwin, the states agreed to work collaboratively, and with other relevant educational bodies, to develop nationally consistent curricula setting core content and achievement standards expected of students at the end of Year 12, and at key junctures up to that point. The focus is on three subject areas: English, Maths and Science. The committee welcomes these efforts to determine minimum levels of achievement for all students, and strongly supports the process of extensive consultation.

5.74 The previous year, MCEETYA had also agreed to work toward improved consistency of reporting for senior secondary students' achievement levels. A working party has been established to investigate a common scale for reporting all senior secondary subject results, and a quality assurance process. This includes reporting on options for common scale reporting and an indicative timeline for the development of comparative procedures. The committee believes that MCEETYA's April 2007 announcement should assist the June 2006 commitment, but a year has now passed and the working party has not even announced its own investigative timeline. The committee hopes that the project commitment remains strong. In the meantime, the ACE Report has been delivered and presents one specific option which might also assist the MCEETYA working party.

5.75 The ACE Report proposed five nationally agreed standards in each subject. Standards labelled A to E were stated to be the preferred option with each standard representing a defined and illustrated level of achievement in the subject. The committee notes that this should anticipate some of the objections to that method of

44 Association of Consulting Engineers Australia, *Submission 71*, p. 7.

reporting. In states and territories which also report results on numerical scales, there would be a need for a process to interpret students' scores in terms of the nationally agreed standards.

5.76 One of the key features of the ACE Report was a recommendation for the creation of a national standards body, including a 'subject panel'. The 'subject panel' would comprise assessment specialists and incorporate international benchmarking standards. It was argued that a single national body would be appropriate to ensure the necessary co-ordination in senior secondary arrangements, and for setting standards for the certificate.[45]

5.77 Responsibility for setting standards will be a matter for delicate negotiation. The committee agrees that a national standards body, or national subject panel, must go beyond heeding the prevailing ideology or philosophy of state and territory authorities of the day. There must be genuine consultation and consideration of the views of all stakeholders, including academics, subject associations, professional bodies and community or parent representatives. According to one parent:

> Consultation does not extend to parents. One of the problems we have is that in many instances parents are used as justification for decisions, yet there has not been the consultation. In the state situation we do have that consultation. We would hope that it would occur at the federal level as well.[46]

5.78 From an academic perspective, Associate Professor Wayne Read remarked on the need to have discipline or subject experts involved in setting standards:

> The first and foremost thing is that this really is a quality assurance thing. We have to be involved. Universities and genuine end users have to be involved in the process of defining the level, the quality, of these students…We have to start adopting Australia-wide, worldwide standards. There has to be some common set of core skills that everyone understands and represents…Assessment has to be independent of education faculties and basically of education departments. If you produce a fine ball bearing you can throw it out there into the marketplace and anyone can measure it.[47]

5.79 The committee notes that objections to what some see as the excessive influence of academics on curriculum content is a long-standing tradition. It appears to the committee that for a number of years academics have been in retreat from their

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45 Australian Council for Educational Research, *Year 12 Curriculum Content and Achievement Standards*, DEST, 31 January 2007, pp 75-76.

46 Mr Paul Dickie, Parents and Friends Federation of Catholic Schools, Queensland, *Committee Hansard*, Brisbane, 5 June 2007, p. 64. Also, Ms Yvonne Meyer, *Committee Hansard*, Melbourne, 25 June 2007, p. 57; Professor Stephen Kessell, *Committee Hansard*, Perth, 2 July 2007, p. 65.

47 Assoc Professor Wayne Read, James Cook University, *Committee Hansard*, Brisbane, 6 June 2007, p. 14.

responsibilities to advise school curriculum agencies on standards issues, in part because of work pressures. This has been an unfortunate development. Universities are a community resource and their usefulness should be seen to rise above petty jealousies, especially in education.

Conclusion

5.80 While the committee believes that the development and implementation of an Australian Certificate of Education should be further investigated by MCEETYA there are more important priorities. A national certificate has lesser claims for priority than the negotiation of comparable assessment practices. Without that agreement, consulting engineers and all similar occupational associations with a scientific or engineering basis, or relevant university faculties, will not be certain that matriculants will have a proper foundation of school knowledge to engage in higher education. Elsewhere in this report is recorded the experiences of academics who regularly encounter this problem. It is the principal justification for a large component of external assessment by examination.

Recommendation 6

The committee therefore recommends the Government and MCEETYA work expeditiously toward the negotiation of a comparable Year 12 curriculum that will embrace the principle of common standards and expectations of achievement at designated levels of study, and agreed common standards of assessment, including a significant component of external examination.