A Shared Challenge

Improving Literacy, Numeracy and Science Learning in Queensland Primary Schools

Geoff N Masters

Australian Council *for* Educational Research

ACER

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Executive Summary

Following the release of Queensland results in the 2008 National Assessment Program – Literacy and Numeracy (NAPLAN) and the 2007 Trends in International Mathematics and Science Study (TIMSS) late in 2008, the Premier, Anna Bligh, requested an independent review of literacy, numeracy and science standards in Queensland primary schools. The review was asked to examine available data on the performances of Queensland students and, drawing on international research evidence, to provide advice in the areas of curriculum, assessment and teacher quality. In particular, the review was asked to identify existing effective practices, to propose ways in which these could be scaled up, and to make recommendations for new strategies or initiatives for improving levels of literacy, numeracy and science achievement in Queensland primary schools.

The review was conducted between December 2008 and April 2009 and included analyses of the performances of Queensland students in national and international achievement surveys; a review of international research into the characteristics of highly effective teachers, schools and education systems; consultations with a range of stakeholders; and visits to a small number of selected primary schools. A Steering Committee (see Appendix 1) was established to oversee the work of the review and met several times between December and April. A brief preliminary report was provided at the end of January 2009 (see Appendix 2).

National and International Comparisons

Students in the middle primary years (Years 3, 4 and 5) in Queensland tend to have literacy, numeracy and science achievement levels below those of students in all other states and territories with the exception of the Northern Territory. Part of the explanation for these lower performances is no doubt the fact that, currently, Queensland students in these year levels have had one less year of school than students in other parts of Australia.[1]

By the middle years of school (Years 7 to 10), Queensland students often are ranked ahead of, or are not statistically different from, students in one or more of Tasmania, Western Australia and South Australia. In other words, Queensland students appear to make more rapid progress than students in these three states in the intervening years. Nevertheless, the performances of Queensland students in Years 7 to 10 are, on average, significantly below those of students in New South Wales, Victoria and the Australian Capital Territory.

International studies show that relatively few Australian primary school students reach high standards of mathematics and science achievement. Only three per cent of Queensland Year 4 students reach an 'advanced' standard in mathematics, compared with 40 per cent of students in Hong Kong. Only four per cent of Queensland Year 4 students reach an 'advanced' standard in science, compared with 36 per cent of students in Singapore. Performances in

[1] Queensland introduced a Preparatory year of school after these students commenced school.

other countries demonstrate that much higher levels of primary school achievement are possible.

International studies also reveal a long-term decline in the absolute mathematics (and possibly science) achievements of Queensland students. In the mid-1960s, Queensland junior secondary students outperformed students in all other Australian states in mathematics. Observers have attributed this high performance to the 'very strong emphasis on mathematics' in the Queensland curriculum at that time. From the late 1970s, there was a significant decline in levels of junior secondary mathematics performance in Queensland. The decline in the government system between 1964 and 1995 was larger than in any other state and has been estimated as the equivalent of 'more than two years of learning'.

Since 1995, absolute levels of mathematics and science achievement among Queensland primary and junior secondary students have remained static. However, the same period has seen significant improvements in Year 4 mathematics levels in New South Wales, Victoria and Tasmania, and smaller gains in these states in Year 4 science.

When Australian 15-year-olds were asked in the 2006 Programme for International Student Assessment (PISA) about their interest in various science subjects (physics, chemistry, plant biology, human biology, astronomy, geology), they expressed very low average levels of interest – among the lowest in the world. Students in Queensland had levels of interest below the Australian average for each of the six science subjects, placing their interest in science below the average for each of the 41 participating countries.

The 2007 Trends in International Mathematics and Science Study (TIMSS) also surveyed teachers about their classroom teaching practices and their access to, and use of, classroom resources. Across Australia, Year 4 teachers reported spending only five per cent of available class time teaching science – about half the time specified in Australian curriculum guidelines and one of the lowest levels among the participating countries. Australia stood out among the countries surveyed for teachers' limited use of textbooks. Almost 24 per cent of Year 4 teachers reported that they did not use a mathematics textbook; 78 per cent reported that they did not use a science textbook. Among Queensland Year 4 teachers, only 44 per cent said they felt 'very well' prepared to teach Year 4 science.

Achievement Disparities

In each year of school there is very significant variability in students' literacy and numeracy levels. This is true throughout Australia. By Year 5, the gap between the top and bottom 20 per cent of students is the equivalent of about 2.5 years of school, and between the top and bottom 5 per cent of students, about five years of school. By Year 9, 25 per cent of students perform below the average Year 7 student, with 5 per cent performing below the average Year 5 student. By this stage of their schooling, and given the average rate of literacy and numeracy progress in the junior secondary years, the gap between the top and bottom 20 per cent of students represents about 5.5 years of school,

and between the top and bottom 5 per cent of students, perhaps 10 years of school. This suggests that Australian students who slip behind in their literacy and numeracy learning during their primary years often never catch up.

It is well established, nationally, that Indigenous students have lower average levels of school achievement than non-Indigenous students; students living in remote locations have lower average levels of achievement than students living in metropolitan and provincial centres; and students from lower socioeconomic backgrounds have lower average levels of achievement than students from higher socioeconomic backgrounds. Not surprisingly, these observations also are made for Queensland primary students. An attempt has been made in this review to quantify differences in the achievement levels of students living in metropolitan, provincial and remote parts of Queensland, and in the achievement levels of Indigenous and non-Indigenous students, and to interpret these differences in terms of the number of years of learning they represent.

Queensland students living in metropolitan areas have higher average levels of literacy and numeracy than students living in provincial centres, although these differences are not always statistically significant. Students living in metropolitan and provincial centres significantly outperform students living in remote (and especially very remote) parts of the state. The gap at Year 9 between metropolitan students and students living in very remote locations is, on average, equivalent to about 3.5 years of school in reading and 4.5 years of school in numeracy. There usually are factors beyond remoteness underlying these achievement gaps, including higher proportions of students from lower socioeconomic backgrounds and higher proportions of Indigenous students (sometimes speaking English as a second language).

Indigenous students in Queensland primary schools, on average, have significantly lower levels of literacy and numeracy than non-Indigenous students. Approximately 25 to 35 per cent fail to reach national minimum standards at each of Years 3, 5, 7 and 9 (compared with 5 to 10 per cent of non-Indigenous students). Indigenous students in remote parts of the state perform in the bottom ten per cent of all students nationally; Indigenous students in very remote parts of the state perform in the bottom five per cent of all students nationally. By Year 9, the gap between non-Indigenous Queensland students and Indigenous students living in very remote parts of the state is, on average, equivalent to six to seven years of school.

Raising Achievement Levels

Consultations with stakeholders, visits to a number of schools and a review of relevant research literature have led this review to the general conclusion that the way to raise achievement levels in primary schools is to increase the resources and support available to schools. Individual schools will be best placed to determine the details of the resources and support they require to improve student outcomes and to meet targets. The objective of this review has been to identify forms of support that are likely to be of general benefit to schools in their efforts to improve literacy, numeracy and science learning.

The review has concluded that improved outcomes in literacy, numeracy and science are likely to be facilitated by:

1. *access to a workforce that is very well prepared through pre-service teacher education programs*

   The quality of literacy, numeracy and science learning in primary schools depends in part on how well teachers are prepared through pre-service teacher education programs to teach these subjects. Beginning teachers should be familiar with, and be beginning to develop, a repertoire of evidence-based teaching strategies (e.g., for the teaching of reading). They also require sound levels of literacy, numeracy and science knowledge themselves, strong interpersonal and communication skills, a willingness to learn and a strong motivation to teach.

2. *access to high quality professional learning for teachers*

   Opportunities for professional learning need to be available in a range of areas relevant to the work of schools. If primary schools are to lift achievement levels in literacy, numeracy and science, then they require access to high quality professional development focused on the teaching of these subjects. Professional development must be firmly grounded in evidence-based research and practice, and be designed to build teachers' levels of expertise, including their own content knowledge (e.g., their own knowledge and understandings of science) and their knowledge of effective ways to teach these subjects. High quality professional development also must be available in ways that allow it to be tailored to local teacher and school requirements.

3. *access to ongoing expert advice and support for the teaching of literacy, numeracy and science*

   Within education systems, this support sometimes is provided by specialist staff working from district offices. Schools of sufficient size also sometimes have specialist literacy, numeracy and science teachers on staff. The roles of these 'specialist' teachers include coaching other teachers, team teaching and the provision of curriculum leadership and advice on teaching methods and resources within their areas of specialisation. Ensuring that all schools have access to specialist advice and support in the teaching of literacy, numeracy and science is likely to be a key to raising achievement levels across the state.

4. *clarity about what teachers are expected to teach and students are expected to learn by particular stages of schooling and support in monitoring the extent to which this is occurring*

   Classroom curriculum and assessment resources aligned with teaching and learning expectations assist teachers in developing teaching programs and monitoring student achievement and progress. The Queensland Curriculum, Assessment and Reporting (QCAR) framework identifies essential learnings in key curriculum areas at key stages of schooling. The National Assessment Program - Literacy and Numeracy (NAPLAN) makes explicit

the levels of literacy (reading, writing, spelling, grammar and punctuation) and numeracy that all students are expected to reach as a minimum by Years 3, 5, 7 and 9. NAPLAN also provides schools with a basis for monitoring individual growth across these years of school, identifying areas in which the school is performing well or poorly and monitoring trends in school performance over time.

5. *access to high quality professional learning and support for school leaders*

   A conclusion of this review is that increased support for school leaders will be important in improving outcomes across the state. School leaders are likely to benefit from increased opportunities to share experiences and to learn from best practice in driving school improvement, including in the areas of setting targets and high expectations, analysing and monitoring school performances, building staff capacity and effectively allocating physical and human resources to improve learning. Most principals also would benefit from additional support (e.g., with school administration tasks) to enable them to spend more time leading teaching and learning within their schools.

The review's five main recommendations address these five areas of support for schools. A number of other issues are identified in the report as matters for further consideration.

Well-Prepared Teachers

Although a great deal of teacher learning occurs in a teacher's first few years in the classroom, it is important that every generalist primary teacher begins their career with at least threshold levels of knowledge about the teaching of literacy, numeracy and science. This 'pedagogical content' knowledge includes knowing how students' understandings in a subject typically develop, how to engage students and sequence subject matter, the kinds of misconceptions that students commonly develop, and effective ways to teach a subject. For example, all beginning teachers should have some understanding of how students learn to read, knowledge of how to assess reading ability and growth, as well as knowledge of how to use assessment information to diagnose difficulties and decide on effective teaching strategies. The National Inquiry into the Teaching of Literacy (2005) further recommended that the preparation of primary teachers include a strong focus on evidence-based findings, including the use of integrated approaches to the teaching of phonemic awareness, phonics, fluency, vocabulary knowledge and text comprehension.

As well as meeting threshold levels of pedagogical content knowledge in literacy, numeracy and science, it is important that beginning teachers have sound levels of knowledge themselves in these areas. Concerns have been expressed to this review about some beginning teachers' own levels of competence and confidence in mathematics and science, and to a lesser extent, some teachers' literacy skills. Similar concerns were expressed to the National Numeracy Review (2008) and to the National Inquiry into the Teaching of Literacy (2005).

The purpose of the following recommendation is first to clarify the threshold levels of content knowledge and pedagogical content knowledge that all graduating primary teachers should be expected to meet, and then to put in place a process for ensuring that all beginning teachers meet these standards.

RECOMMENDATION 1

That all aspiring primary teachers be required to demonstrate through test performances, as a condition of registration, that they meet threshold levels of knowledge about the teaching of literacy, numeracy and science and have sound levels of content knowledge in these areas.

Tests of the kind envisaged already are used in a number of countries. For example, all beginning teachers in England are required to meet threshold levels of performance in Qualified Teacher Status (QTS) skills tests in literacy, numeracy and ICT literacy. Teachers in the United States are required to demonstrate at least minimal proficiency in subject knowledge and subject-specific teaching skills and knowledge, usually through the Praxis II tests for teacher registration.

The tasks of setting threshold requirements and developing and administering the proposed proficiency tests could be assigned to the Queensland College of Teachers (QCT). Satisfactory performance on these tests is envisaged as a requirement for full registration to practise for aspiring generalist primary teachers in Queensland schools.

Professional Learning for Teachers

To raise overall levels of achievement and narrow achievement gaps in primary schools, attention must be paid to ways of building the expertise of *all* teachers. A variety of types of professional development is required to meet the varying local needs of teachers and schools. Within these professional development offerings, it would be useful for schools to have access to a core of high quality, evidence-based professional development focused on building teachers' skills in teaching literacy, numeracy and science.

A challenge in the provision of professional development is to strike a balance between central prescription in an attempt to ensure high quality, evidence-based learning on one hand, and local choice to meet school needs on the other (Luke & McArdle, 2009). The approach being recommended here envisages the specification and development of a number of professional learning *modules* in literacy, numeracy and science. This modular approach would allow the broad specification of high quality module content while allowing schools and teachers to select modules appropriate to their particular needs.

RECOMMENDATION 2

That the Queensland Government introduces a new structure and program of advanced professional learning in literacy, numeracy and science for primary school teachers.

Modules would be designed to extend teachers' content knowledge and pedagogical content knowledge; to draw on, and familiarise participants with, evidence from research and best practice; and to have a significant practice-based component requiring teachers to apply and explore the content of the module in their own classrooms. Key features of the proposed modules are that they would be undertaken over a period of time, be delivered by multiple providers and have an associated assessment requirement (usually involving a classroom application). Providers would be expected to make provision for the delivery of modules by distance education.

It is envisaged that a central agency – possibly the Queensland College of Teachers – would develop broad specifications for the set of modules, with the exact content and assessment requirements of each module being developed by providers. The responsible agency would review how providers proposed to develop and deliver the modules and accredit proposed offerings. The agency also would keep a record of teachers' successful completion of modules.

Where a provider is a university or a consortium involving a university, consideration should be given to the possibility of successfully completed modules being credited towards a postgraduate qualification (graduate certificate, graduate diploma or master's degree).

The successful completion of modules would not have direct implications for teacher remuneration or status, although schools and education systems may choose to link the successful completion of a program of learning to curriculum leadership positions. For example, the completion of a defined combination of advanced literacy, numeracy and science modules might be treated as an expectation for appointment to a general curriculum leadership position in a school, or the completion of a specific sequence of in-depth modules in a particular curriculum area (e.g., science) might be an expectation for appointment to a specialist teaching position in that area.

Specialist Support in Literacy, Numeracy and Science

An issue raised with the review was the need for greater support to schools in the form of access to specialist advice in the areas of literacy, numeracy and science teaching and learning. For many government schools, this advice is probably best located in district offices. The review visited one district office in which capacity of this kind had been built. Staff of that office ran professional development sessions for teachers and school leaders, attended and led in-school staff discussions of curriculum issues and coached teachers individually as required. The review also visited schools in which specialist teachers (e.g.,

in mathematics and science) were involved in team teaching, led extra-curricular activities such as the school's participation in science projects and competitions, and in one case, maintained a special science room/laboratory. The use of 'specialist' teachers may be more common in private schools, in P-12 schools, and in schools that have established close relationships with local secondary schools.

Specialist literacy and numeracy teachers have been trained and appointed in Western Australia under the 'Getting it Right' program to work alongside classroom teachers to assist in diagnosing and addressing the needs of students who are at risk, including Aboriginal students, boys, students with a language background other than English, and students in rural and remote locations. These specialist teachers share their expertise with other teachers and are expected to assist in building the capacity of the entire school to improve literacy and numeracy learning.

It is recommended that consideration be given to increasing the number of 'specialist' teachers with advanced training and expertise in literacy, numeracy and science.

RECOMMENDATION 3

That additional funding be made available for the advanced training and employment of a number of 'specialist' literacy, numeracy and science teachers to work in schools (and/or district offices) most in need of support.

The intention of this recommendation is not to relieve other teachers of the need to continue to develop their own expertise in these curriculum areas. Rather, it seeks to expand the capacity already in the Queensland system and to give schools greater access to specialist advice and support. The Bligh Government's 2009 election commitment to employ 100 new science teachers in primary schools to work with students in Years 4 to 7 under the 'Science Spark' program appears to be consistent with the intentions of this recommendation.

Clear Expectations and Measures of Learning

Input to the review suggests that teachers and schools generally value clarity about what teachers are expected to teach and students are expected to learn by particular stages of their schooling. The Essential Learnings of the Queensland Curriculum, Assessment and Reporting (QCAR) Framework identify what science teachers are expected to teach and students should have opportunities to learn by the end of Years 3, 5, 7 and 9. The planned national curriculum also will provide clarity about expectations of teaching and learning, initially in English, mathematics, science and history.

There is also strong research evidence for the value of clear expectations and the close monitoring of student learning and progress. At any point in a

student's learning it is important that teachers have a good understanding of where the student is up to, including an understanding of the student's current strengths and weaknesses, so that learning needs can be addressed through targeted teaching.

The National Assessment Program – Literacy and Numeracy (NAPLAN) tests make explicit the literacy and numeracy skills that all students are expected to develop by Years 3, 5, 7 and 9. For each of these years, a 'national minimum standard' is identified, which all students are expected to reach. The NAPLAN tests also make it possible to measure and plot the literacy and numeracy growth of individual students across these years of school, making it possible to identify students who are making slow progress or slipping behind in their learning.

Given the relatively poor performance of Queensland primary students in science (Queensland Year 4 students were ranked last among the Australian states and territories in science in TIMSS 2007), there is likely to be value in providing teachers with greater clarity about the science knowledge and understandings that students should be developing in particular years of school and in setting minimum standards that all students should meet. Tests similar to NAPLAN literacy and numeracy tests could be provided as a resource for school use in assessing whether these standards are being met and for monitoring the science progress of students across the years of school.

RECOMMENDATION 4

That standard science tests be introduced at Years 4, 6, 8 and 10 for school use in identifying students who are not meeting year-level expectations and for monitoring student progress over time.

Tests are proposed at Years 4, 6, 8 and 10 to minimise the testing load in Years 3, 5, 7 and 9 and because the testing of samples of students in science already occurs every four years at Years 4 and 8 as part of TIMSS, every three years at Year 6 through the national assessment program, and every three years at Year 10 as part of the OECD PISA program (providing a basis for making national and international comparisons at these year levels).

It is envisaged that these tests of science knowledge and understanding would be made available to all schools, possibly in computer-based format. Results would be reported on a scale similar to the NAPLAN scales, enabling individual progress to be tracked across the years of school and trends in performance to be monitored over time. Described and illustrated levels of science achievement could be developed and minimally acceptable standards should be set at each of the four year levels.

Professional Learning for Leaders

The high-performing schools visited as part of this review were characterised by strong school leadership. In a number of these schools the principal had driven change over an extended period of time, setting high expectations for student behaviour and achievement and building a school leadership team with shared values and objectives.

Many education systems now recognise that excellent school leadership is a key to improving outcomes for students and are giving significantly increased attention to the development and support of school leaders. This support takes many forms, including: the development of standards and frameworks that identify the roles and functions of school leaders, specify what leaders need to know and be able to do, and set levels of performance competence; induction programs for newly appointed principals; mentoring and coaching programs; and in-service professional development for school leaders. The Victorian leadership development strategy provides nineteen programs for aspiring leaders, assistant principals and principals, including a Master in School Leadership qualification for teachers who demonstrate high leadership potential. Since 2001 Singapore has provided six months full-time paid training for potential school leaders through its Leaders in Education program. Participants are identified by the Ministry of Education and trained at the National Institute of Education.

Other education systems have introduced specialised institutions focused on leadership development and support. These include the National College for School Leadership in England, the Austrian Leadership Academy and the Victorian Institute of Educational Leadership to be opened in 2010.

A conclusion of this review is that school leadership is a key to turning around under-performing schools and increasing levels of literacy, numeracy and science achievement in Queensland primary schools. The first challenge is to get all school leaders doing what the best leaders already do. Beyond that, the challenge is to develop new approaches to school leadership for the future.

The recommendation of this review is that, drawing on international experience and best practice, a more structured approach be taken to leadership development and support. This recommendation stops short of proposing a specific approach (e.g., the establishment of a leadership institute of the kind being developed in Victoria or intensive training for potential leaders of the kind being delivered in Singapore), and instead identifies this as a topic for further work. It is proposed that an expert review be initiated to undertake this work.

Whatever approaches are adopted, if programs of leadership development are to be effective in raising achievement levels in primary schools, it is important that they build leaders' capacities to lead teaching and learning and to drive school improvement. This will include support and guidance in building a school culture of high expectations, setting targets for improvement, analysing and monitoring school performances, recruiting and retaining outstanding teachers, building existing staff and leadership capacity, managing multiple

demands on leaders' time, and effectively allocating physical and human resources to improve learning.

RECOMMENDATION 5

That the Queensland Government initiates an expert review of international best practice in school leadership development with a view to introducing a new structure and program of advanced professional learning for primary school leaders focused on effective strategies for driving improved school performances in literacy, numeracy and science.

Consideration also should be given to ways of supporting school leaders to spend more time leading teaching and learning in primary schools, including through additional staffing to support other aspects of their role, such as day-to-day school administration and behaviour management.

General Conclusions

A common response of governments concerned about achievement levels in schools is to impose greater central prescription. Attempts are made to specify in more detail the curriculum that teachers are to teach, including the amount of time that should be spent teaching each subject and, in some cases, the specific methods that all teachers should use. For example, in England a national curriculum has been specified in considerable detail and teachers are expected to use specific teaching approaches (e.g., synthetic phonics in the teaching of reading). This level of central prescription sometimes is accompanied by strong accountability mechanisms that include inspections of schools, the construction of 'measures' of school performance and the public reporting and comparison of school performances (Masters et al., 2008).

Disadvantages of this approach are that it can lead to the de-skilling and de-professionalising of teachers as they take on roles as deliverers of centrally prescribed curricula and teaching methods, increasing bureaucratisation, reduced incentives for innovation in schools, and less opportunity to tailor educational provision to student and community needs. Some countries, such as England, that once prescribed detailed curricula have moved in recent years to reduce the level of central specification and to place more curriculum decision making under local school control.

At the other extreme are education systems that have adopted much less prescriptive approaches to schools and school curricula. In these systems, expectations of teachers and students are expressed only in very general terms; weak processes exist for evaluating how teachers, students and schools are performing; and there are much lower levels of interaction between individual schools and central authorities. This more *laissez faire* approach may be effective in systems with low levels of school diversity and uniformly high levels of teacher expertise, but in other contexts, the absence of clear

expectations, effective central support and access to quality information about student achievement and progress can itself be isolating and fail to contribute to the building of teacher professionalism.

The general approach recommended by this review is to:

1. set clear achievement standards in the core areas of literacy, numeracy and science that all students in particular year levels are expected to achieve;
2. provide schools with standardised tests for diagnosing and monitoring student achievement and progress in these core learning areas;
3. provide teachers and school leaders with access to high quality, evidence-based professional development, advice and support in promoting successful learning in these core areas; and
4. allow teachers and school leaders to decide on the best local strategies for improving student achievement.

This review has recommended that, as in other professions, aspiring primary teachers be expected to demonstrate that they meet threshold standards of readiness for practice – in this case, readiness to teach literacy, numeracy and science. Clear standards also are proposed for students' literacy, numeracy and science achievements, with standardised testing every two years. Tests already exist for literacy and numeracy at Years 3, 5, 7 and 9, enabling teachers and parents to monitor individual progress against year level expectations and over time. The intention of the proposed science tests is to provide parallel information for science learning, enabling students' needs to be better identified and addressed – including those of already high-achieving students.

Increased support for the professional work of teachers and school leaders will be a key to raising achievement levels in primary schools. The support proposed here includes better access to high-quality professional development in the teaching of literacy, numeracy and science; more specialist support staff in these areas of the curriculum both in schools and in district offices; better support for the professional learning and work of school leaders; and improved methods of promulgating and sharing effective innovations and learning across schools.

Part I. The Primary Years

The primary years are a crucial phase in every child's schooling. It is during the primary years that foundations are laid and directions are set. Students who complete primary school with well developed literacy and numeracy skills, a positive view of themselves as learners and a positive attitude to school itself are more likely to go on to complete secondary school, to engage in further education or training and to be productively employed as young adults. At the other extreme, students who complete primary school with limited literacy and numeracy skills tend to struggle in secondary school and, if their basic skills remain under-developed, to have poorer outcomes as adults in areas such as employment, lifetime earnings, health and crime.

Although all students in Australia now complete primary school, there are large disparities in students' literacy and numeracy skills by the completion of this phase of schooling. In the final year of primary school in Queensland, the gap between the highest- and lowest-achieving 20 per cent of students represents about three to four years of school.[2] The gap between the top and bottom five per cent of children is equivalent to between six and seven years of school – in other words, equivalent to the total length of time these children have been in school. As a consequence, many students begin secondary school with the twin handicaps of inadequate literacy and numeracy skills to cope with secondary curricula and a number of years of experience of limited school success.

Throughout Australia these disparities are correlated with student characteristics such as Indigenous status, socioeconomic background and geographical location. Indigenous students, students from low income families and students living in remote parts of Australia are over-represented among students who fail to reach acceptable standards of achievement in literacy, numeracy and science by the completion of primary school. Worse, there is evidence of some gaps increasing across the years of school as students who slip behind in areas such as mathematics become increasingly disengaged, disenchanted and fall further behind with each passing year. And, given the generally slower rates of literacy and numeracy development during the secondary years, disparities that exist at the end of primary school are likely to become increasingly solidified in the years that follow.

These observations are made at a time when knowledge-based economies are demanding more highly skilled and knowledgeable workers and global developments are demanding more informed citizens who can engage with, and make positive contributions to, the complex environmental, financial, political and social challenges of the 21st century. In preparing students for these future challenges, schools must do more than develop basic skills in reading, writing and numeracy and fundamental understandings of science, but progress in other areas of the school curriculum and the development of higher-order skills of analysis and problem solving generally depend on mastery of these basic enabling skills.

[2] based on the average annual rates of literacy and numeracy growth between Years 5 and 7.

A challenge confronting every school system in the world is to ensure that *every* child completes the primary years of school with the levels of reading, writing, numeracy and science necessary for successful further learning; an appreciation of the role and importance of these areas of learning to everyday life; and confidence in their own ability to continue to learn successfully. Education systems face particular challenges in ensuring that children from disadvantaged populations meet acceptable standards of achievement and are not further disadvantaged by their school experiences. In other words, the challenges faced by school systems are both to raise the bar on the overall quality of educational provision to ensure that all students are well prepared for life in the 21st century and to reduce disparities in achievement resulting from circumstances beyond the control of schools.

These are challenges that must be addressed at all levels of an education system: from classroom teacher to school leaders to system managers. International research suggests that some countries and education systems are more effective than others in addressing these challenges. Experience also suggests that education systems that address these challenges in a concerted and systematic way can produce significant improvements in relatively short periods of time (a matter of several years).

Chapter 1 provides a brief summary of the findings of international research into the characteristics and practices of highly effective teachers, highly effective schools and highly effective school systems in improving both quality and equity in school education. This summary is not intended to be comprehensive; it focuses instead on a small number of characteristics and practices that have been demonstrated to be important in improving learning outcomes and is provided as a backdrop to the later review and analysis of performances in Queensland primary schools.

1 Research Evidence

Although there are many influences on how well students perform in school – some of them largely outside the control of schools – it is clear from research that the most effective way for education systems to improve achievement levels in primary schools is to improve the quality of *classroom teaching*. Much is now known about the characteristics of highly effective primary school teaching.

It also is clear from research that school leaders can have a profound influence on the quality of teaching and learning that takes place in classrooms. School leadership teams find various ways to do this, but high-performing schools tend to adopt a number of practices in common.

There is also much that school systems and governments can do to raise the quality of teaching across a jurisdiction. Once again, research suggests that, while systems and governments have developed various strategies for doing this, high-performing systems have a number of features in common.

In brief, improved levels of achievement in primary schools depend on the development of a culture of continuous improvement across all parts of a system: from classroom teachers to school leaders to system managers and governments. Central to a continuous improvement culture is an understanding that the key to improving student performance is to improve *classroom teaching*. All parts of the system are then focused on the pursuit of this central objective.

> Top-performing systems are relentless in their focus on improving the quality of classroom instruction. (Barber & Mourshed, 2007)

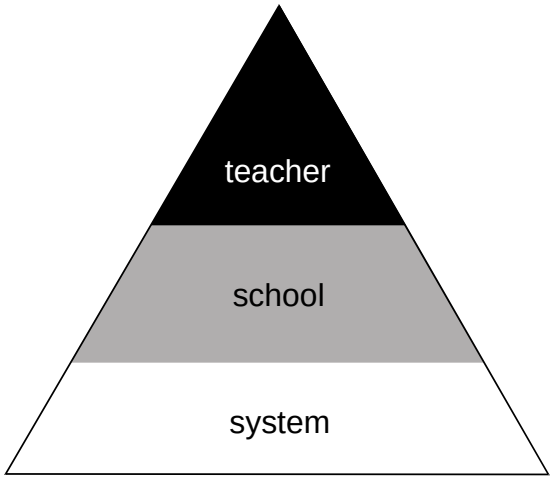

Figure 1.1 Continuous improvement in student performance depends on the implementation of highly effective teaching practices *supported and driven by aligned school and system policies and practices*

1.1 Highly Effective Teachers

> Studies that take into account all of the available evidence on teacher effectiveness suggest that students placed with high-performing teachers will progress three times as fast as those placed with low-performing teachers. (Barber & Mourshed, 2007)

There is now a large body of educational research into the factors underpinning highly effective teaching. Meta-analyses of this research (e.g., Walberg, 1984; Bransford, Brown & Cocking, 2000; Hattie, 2003) reveal a number of teaching practices associated with significantly improved student outcomes. Four broad characteristics of highly effective teaching are summarised briefly here.

High Expectations
Highly effective teachers create classroom environments in which all students are expected to learn successfully. They set high expectations for student learning and create orderly classrooms in which students feel safe and supported to learn. They are driven by a belief that, although individuals are at different stages in their learning, every student is capable of learning and making progress beyond their current level of attainment if motivated and given appropriate learning opportunities and support. Highly effective teachers understand the importance of developing students' own beliefs in their abilities to learn successfully and work to promote students' understandings of the relationship between effort and success.

As part of this process, highly effective teachers make clear what students are *expected* to learn. They communicate clear and high expectations of individual students and are clear about the standards expected of students in each grade of school. They set learning goals for individuals couched in terms of the knowledge, skills and understandings that they are expected to develop (not simply in terms of classroom activities to be completed). They set high expectations for individual progress and are focused on ensuring that all students achieve grade-level proficiency in foundational skills such as reading, writing and numeracy.

Deep Knowledge
Highly effective teachers have a deep understanding of the subjects they teach. These teachers have studied the content they teach in considerably greater depth than the level at which they currently teach and they have high levels of confidence in the subjects they teach. Their deep content knowledge allows them to focus on teaching underlying methods, concepts, principles and big ideas in a subject, rather than on factual and procedural knowledge alone.

Highly effective teachers not only have deep knowledge of the subjects they teach, they also have deep understandings of how students learn those subjects (that is, pedagogical content knowledge). They understand how learning typically progresses in a subject: for example, the skills and understandings that are pre-requisites for progress, and common paths of student learning. They are familiar with the kinds of learning difficulties that some students experience and with appropriate interventions and available professional

support for those difficulties. And they are aware of common student misunderstandings and errors and know how to diagnose and address obstacles to further learning.

Targeted Teaching

> The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly. (Ausubel, 1968)

Highly effective teachers establish where students are up to in their learning. They understand the importance of first ascertaining students' current levels of knowledge, skill and understanding and they see teaching not so much as the delivery of one-size-fits-all, grade-appropriate curriculum content to a classroom of students, as the design of learning opportunities tailored to students' current levels of readiness and need. They use 'starting point' assessments and diagnoses of individual difficulties and misunderstandings to design effective interventions and teaching.

Having established where students are up to in their learning, these teachers then direct their teaching to student needs and readiness. They maximise student engagement – and hence learning – by differentiating teaching according to student needs (i.e., not teaching to the middle of the class, but personalising teaching and learning as required). They use evidence-based teaching methods (such as *direct instruction*) that are known to be effective in promoting student learning and they use intrinsic factors (such as curiosity) to engage students and to motivate learning. Highly effective teachers work to ensure that all students are appropriately engaged, challenged and extended, including high-achieving students who already are working well beyond grade expectations.

Continuous Monitoring

A consistent and strong research finding is that highly effective teachers provide continuous *feedback* to learning. They continually monitor the progress of individual students and provide feedback to support further learning. The provision of feedback is a key to effective classroom teaching. Highly effective teachers provide feedback in forms that guide student action and provide encouragement that further progress is possible with further effort. They assist students and parents to see and to monitor individual progress over time – including across the years of school – and they provide feedback to parents on what they can do to support their children's learning.

Beyond this, highly effective teachers reflect on their own practice and strive for continuous improvement. They use feedback about student learning to reflect on the effectiveness of their teaching efforts. They recognise that improvement in teaching is always possible and are eager to find ways to improve outcomes for students. They place a high priority on their own professional learning and usually work with colleagues in pursuit of improved teaching practices and enhanced student learning.

1.2 Highly Effective Schools

> There is increasing evidence that, within each individual school, school leaders can contribute to improved student learning by shaping the conditions and climate in which teaching and learning occur… School leaders influence the motivations, capacities and working conditions of teachers who in turn shape classroom practice and student learning.
>
> (Pont, Nusche & Moorman, 2008)

School leadership teams are in a strong position to drive and support the highly effective teaching practices outlined above. Research shows that schools that deliver unusually high outcomes for their students given their circumstances (that is, 'high-performing' schools) are unusually effective in influencing classroom teaching practices and identifies some of the ways in which they do this.

High Expectations

Highly effective schools promote high expectations. Invariably, they have strong and effective school leadership teams whose primary focus is on establishing a culture of successful learning for all students. In high-performing schools, learning is seen as the central purpose of school and takes precedence over everything else. Class time is used as learning time, classrooms are calm and busy, and interruptions to learning are discouraged. The school is organised, and school resources are allocated, in pursuit of improved student learning. The school provides an environment that is safe and caring (usually with a pastoral care program focused on supporting all aspects of a student's learning and development), and values of respect, tolerance and inclusion are promoted throughout the school.

There is evidence that highly effective schools are more likely to set, communicate and monitor school-wide targets for improvement. In high-performing schools, the principal, with the support of the school leadership team, drives an agenda of high expectations and continuous improvement. School leaders systematically monitor the performance of the school against an agreed set of indicators and targets for improvement. High expectations are set for both teachers and students and unusual efforts are made to acknowledge and celebrate success. In high-performing schools there is a strong commitment to a culture of continuous improvement and an ongoing search for ways of improving on current practice (Leithwood & Jantzi, 2006; Leithwood, Louis, Anderson & Wahlstrom, 2004).

Deep Knowledge

Highly effective schools understand the importance of recruiting, developing and retaining teachers who are highly knowledgeable, creative, highly intelligent, and eager to continue to learn. They also find ways to ensure that subjects are taught by the teachers best qualified to teach them (e.g., using specialist science teachers in primary schools) and to minimise out-of-field teaching.

These schools place a high priority on continuous professional learning. They work to create strong professional learning cultures in which teachers collaborate to improve teaching practices across the school. The focus of professional learning is on improving teaching and learning, and the analysis and discussion of student work is a central activity in professional learning of this kind. In some schools, teachers also work together to plan, deliver and review the effectiveness of individual lessons. Systematic efforts are made to learn from best practice in other schools and attention is paid to emerging research evidence on effective teaching methodologies.

Targeted Teaching

In highly effective schools, systems, resources and processes are put in place to assist teachers to diagnose specific learning needs and to establish starting points for their teaching. School leaders ensure that teachers have access to diagnostic tools, assessment instruments and professional support to assist them in this process. Efforts also are made to ensure that teachers have access to (and use) past records of student progress and learning difficulties. In some schools, individual learning records are kept in forms that make it easy for teachers to study a child's progress across the years of school.

Highly effective schools find ways to support teachers to address individual needs and readiness. Accelerated learning programs, remedial reading programs, personal learning plans, and individualised and small group teaching are examples of strategies that schools use to tailor learning experiences to the needs and readiness of individual students. High-performing schools understand that, in any given year group, students' literacy and numeracy skills may differ by as much as five or six years of schooling, and they work to ensure that all students are engaged and challenged by learning opportunities appropriate to their current levels of attainment.

Continuous Monitoring

In high-performing schools there are strong accountability and performance monitoring systems. School-level decision making, interventions and initiatives are informed and driven by reliable data. The school promotes a culture of self-evaluation and reflection among school staff and collects and uses data to inform decision making at all levels. High-performing schools share performance information across the school and with a range of stakeholders, including parents and local communities. These schools also build in-school capacity to collect, analyse and interpret performance data.

Finally, highly effective schools have effective ways of engaging parents and local communities in the improvement of student outcomes. In high-performing schools, parents and other caregivers are encouraged to take an active part in discussing, monitoring and supporting their children's learning. Parents and caregivers are assisted in monitoring the progress that individuals make across the years of school and receive reports that include guidance on what they can do to assist further learning. High-performing schools also form strong partnerships with other agencies (e.g., health, community services) and community organisations that can assist in their efforts to address individual needs and to improve outcomes for all students.

There is broad consensus emerging from research into high-performing schools about the pivotal role of effective school leadership:

> Scholars (Elmore, 2008; Mulford, 2003) are now suggesting that an essential function of school leadership is to foster 'organisational learning', that is, to build the capacity of the school for high performance and continuous improvement through the development of staff, creating the climate and conditions for collective learning and thoughtful use of data to improve curriculum and instruction.
>
> (Pont, Nusche & Moorman, 2008)

1.3 Highly Effective Systems

System managers, education policy makers and governments also are in positions to promote and support the effective teaching practices outlined in Section 1.1. Although system managers act at a distance from classrooms, research into the practices and policies of the world's best-performing school systems is shedding light on how high-performing systems influence the quality of classroom teaching. This research also is demonstrating that, while substantial improvements are possible in a relatively short period of time, many system initiatives to improve outcomes (e.g., smaller class sizes, greater school autonomy, increased expenditure, structural and governance reforms) have minimal impact alone.

Research by Barber and Mourshed (2007) concludes that the world's best performing school systems do three things well. They:

- get the right people to become teachers;
- develop these people into highly effective teachers; and
- put in place targeted support so that every student has access to excellent teaching.

Beyond this, these systems 'put in place the necessary foundational conditions, such as rigorous standards and assessments, clear expectations, differentiated support for teachers and students, and sufficient funding, facilities and other core resources'.

High Expectations

> All of the top-performing and rapidly improving systems have curriculum standards which set clear and high expectations for what students should achieve. (Barber & Mourshed, 2007)

Highly effective systems create a culture of high expectations throughout the system. In high-performing systems, high expectations are set for all schools and all students and there is low tolerance of ongoing poor performance. Underpinning these high expectations is a belief that every school is capable of improving on its current performance and every student is capable of successful progress in their learning. Factors such as low socioeconomic status, rurality and Indigenous status are not seen as acceptable explanations for low

performance or lack of progress. In pursuit of these high expectations, high-performing systems put in place targeted support for schools and students with special needs and work to ensure that students throughout the system have access to excellent teaching.

In high-performing systems, explicit system-wide targets are set for improved student outcomes and schools are encouraged to set their own targets for improvement and to monitor progress in achieving them. For example, system-wide targets may be set to reduce, over a specified period of time, the percentage of students in the system achieving below a minimally acceptable standard for their grade. Other system-wide targets may be set to reduce achievement gaps between particular groups of students (e.g., students from low and high socioeconomic backgrounds; Indigenous and non-Indigenous students; rural and urban students). Programs and initiatives are then developed, and system resources are allocated to achieve these targets.

Deep Knowledge

In high-performing education systems, a priority is placed on recruiting highly able people into the teaching profession. In very high-performing systems such as Finland and South Korea, entrants to teaching are drawn from the top 10 per cent of high school graduates. Research suggests that government policies can have a significant influence on the calibre of entrants to teaching and on the status of the teaching profession itself. Finland and Singapore place a strong emphasis on academic achievement, communication skills and motivation for teaching in their selection of teachers. Finland requires all teachers to have a master's degree and tests applicants' levels of literacy, numeracy and problem solving. Some high-performing systems also have found alternative pathways into teaching for highly able university graduates.

Studies of very high-performing education systems reveal that these systems put considerable effort into clarifying what excellent teaching looks like – including what excellent teachers know and do – and into supporting teachers to become highly effective practitioners. Singapore provides teachers with 100 hours of professional development each year, delivered through its Institute of Education. England provides literacy and numeracy coaches in every primary school, an initiative that has seen marked improvements in student skill levels. Japan and Finland arrange for teachers to collaborate, planning lessons together and observing each other's lessons. Most high-performing systems recognise the importance of promoting one-on-one coaching in teachers' own classrooms and of encouraging principals to take on instructional leadership roles.

Targeted Teaching

> The very best systems intervene at the level of the individual student, developing processes and structures within schools that are able to identify whenever a student is starting to fall behind, and then intervening to improve that child's performance. (Barber & Mourshed, 2007)

Highly effective school systems assist schools and teachers to identify students who are starting to fall behind in their learning. Many systems provide diagnostic tools that can be used to identify children who are struggling early

in their schooling and to diagnose specific learning difficulties. Some provide regular system-wide assessments of literacy and numeracy to provide schools and parents with an objective basis for identifying individuals who are performing below minimally acceptable standards for their grade.

The McKinsey study (Barber & Mourshed, 2007) concluded that high-performing education systems have developed systematic ways of intervening to support students who are slipping behind their age peers in their learning. For example, in high-performing Asian countries, classroom teachers spend additional time, sometimes after school, working with students who need additional assistance. Singapore provides extra classes for the bottom 20 per cent of students in the first and second grades. Finland provides special education teachers who work with students who are falling behind. There is one such teacher for every seven classroom teachers, and special education teachers support up to 30 per cent of students each year.

Continuous Monitoring

> All top-performing systems recognise that they cannot improve what they do not measure. (Barber & Mourshed, 2007)

High-performing education systems put in place processes to monitor the performances of individual schools. By monitoring schools in this way, they are able to identify and promulgate best practices, identify underperforming schools, and hold schools accountable for their results. Some high-performing systems use test and examination results as objective measures of student outcomes. Others conduct external reviews or inspections to monitor school processes as well as outcomes. External school reviews usually are conducted by bodies separate from the agencies responsible for delivering school education (e.g., Hong Kong, England, and New Zealand). Schools performing less well generally are subjected to closer monitoring.

Highly effective systems also monitor progress of the system itself. Some high-performing countries use system-wide assessment programs for this purpose; most use results from international achievement surveys such as the OECD's Programme for International Student Assessment (PISA) and the International Association for the Evaluation of Educational Achievement's (IEA) Trends in International Mathematics and Science Study (TIMSS). Participation in these studies allows systems to benchmark themselves against international best practice and to monitor trends over time, including trends in the performances of subgroups of the student population (e.g., low socioeconomic, Indigenous, and rural students). Performances also are monitored for the purposes of evaluating the effectiveness of system programs and initiatives aimed at increasing the quality and equity of educational provision.

Table 1.1

Highly Effective Practices for Continuous Improvement in Student Learning

	Highly Effective Teachers	Highly Effective Schools	Highly Effective Systems
High Expectations	• Set high expectations for student learning • Create safe and supportive classroom environments • Believe every student is capable of improvement • Encourage students to believe in their own capacity to learn • Clearly communicate expectations and standards • Set learning goals for individual students • Ensure that every student achieves proficiency in the basics appropriate to that year level	• See learning as the central and key purpose of the school • Ensure classrooms are calm and busy, with minimal interruptions • Design school structures and allocate resources in pursuit of improved student learning • Have a safe and caring environment, including pastoral care • Promote values of respect, tolerance and inclusion • Follow an agenda of continual improvement and high expectations, driven by school leaders • Monitor school performance against an agreed set of targets or indicators • Celebrate and acknowledge teaching and student success	• Establish high expectations for all schools and students, with low tolerance for ongoing poor performance • Believe that every school and student is capable of improvement • Do not accept factors such as low-socioeconomic status, rurality or Indigeneity as acceptable explanations for low performance or progress • Provide targeted support for students with special needs • Strive to ensure students throughout the system have access to excellent teaching • Set explicit system-wide targets for student outcomes and allocate resources to achieve those targets • Encourage schools to set their own targets and monitor progress
Deep Knowledge	• Possess deep understandings and confidence in teaching subjects • Have studied to considerably greater depth than the level being taught • Possess deep understandings of how students learn subjects, including pre-requisite skills and knowledge for progress • Are aware of common student misunderstandings and errors • Are familiar with learning difficulties and appropriate interventions	• Consist of teachers who have studied subjects at an advanced level, are creative, highly intelligent and eager to learn • Find ways to recruit and retain teachers of this calibre, and to ensure subjects are taught by the most appropriately qualified teachers. • Expect ongoing teacher learning • Encourage a collaborative professional learning culture, with a focus on improved teaching and learning • Create opportunities for teachers to discuss and analyse student work • Provide opportunities for teachers to collaboratively plan, deliver and review the effectiveness of lessons • Are attentive to emerging research on effective teaching	• Prioritise the recruitment of highly able people into teaching • Select teachers based on factors such as academic achievement, communication skills and motivation • Clarify what excellent teaching looks like, and work to promote those practices in all schools • Recognise the importance of one-on-one coaching in teachers' classrooms • Encourage principals to take on instructional leadership roles
Targeted Teaching	• Understand the importance of ascertaining students' current levels of attainment • Design learning opportunities appropriate to students' current levels of readiness and need • Maximise student engagement through personalised teaching and learning • Use effective teaching methods such as direct instruction • Use intrinsic factors to motivate student learning • Ensure that all students are appropriately engaged, challenged and extended, including those at the top of the class	• Encourage and support teachers to identify individual learning needs and difficulties • Make diagnostic tools, assessment instruments and professional support available to teachers • Make past records of students' performances and difficulties available to teachers • Maintain individual learning records to share across year levels • Design programs and school structures around student needs • Understand that students' literacy and numeracy skills may differ significantly, and ensure that all students are engaged and challenged	• Support schools to identify students who are starting to fall behind in their learning, (e.g., state-wide testing to identify students below minimum standards and/or diagnostic tools) • Provide sufficient support for students who are slipping behind, such as classroom teacher time, special education teachers, or extra classes for some students
Continuous Monitoring	• Continually monitor individual student progress and provide feedback to guide student action and to provide encouragement • Assist students and parents to monitor progress over time, including across year levels • Provide feedback to parents on ways to support learning • Use feedback on student learning to monitor the effectiveness of teaching practices • Recognise that improvements in teaching practice are always possible • Prioritise professional learning and collaboration with colleagues in pursuit of improved teaching practices	• Have strong accountability and performance monitoring systems • Use reliable data to drive school-level decisions, interventions and initiatives • Promote a culture of self-evaluation and reflection at all levels of the school • Share performance information across the school and school community, including parents • Build the in-school capacity to collect, analyse and interpret data • Encourage parents and caregivers to discuss, monitor and support their children's learning • Provide guidance to parents on ways to assist further learning • Build partnerships with community organisations and agencies to assist in addressing individual needs	• Monitor performance of individual schools to identify and share best practice, identify underperformance and hold schools accountable for their results (through either test results or external review) • Monitor student achievement over time to improve quality and equity in the system (e.g., through benchmarking against national and international surveys)

Part II. Performances of Queensland Students

There are various sources of systematically collected evidence about the academic performances of Queensland students in the primary and junior secondary years of school. These sources include the National Assessment Program – Literacy and Numeracy (NAPLAN) and sample-based surveys in Science, ICT Literacy and Civics and Citizenship, as well as international achievement surveys including the Trends in International Mathematics and Science Study (TIMSS) and the OECD Programme for International Student Assessment (PISA). Together, these surveys enable the performances of Queensland students to be compared with performances in other Australian states and territories and with performances in other countries. The NAPLAN assessments, because they are administered to all students in Years 3, 5, 7 and 9, also permit comparisons across Queensland schools and of sub-groups of the student population.

The analyses in Chapters 2 and 3 are based on the following specific data collection exercises:

- the *National Assessment Program – Literacy and Numeracy* (NAPLAN 2008) which provided information about the literacy and numeracy achievements of all students in Years 3, 5, 7 and 9;
- earlier state-based literacy and numeracy tests which provided a level of comparability across states through a national test 'equating' exercise;
- the *Trends in International Mathematics and Science Study* (TIMSS 2007) which provided information about the mathematics and science achievements of students in Year 4 and Year 8;
- earlier international mathematics and science studies conducted by the International Association for the Evaluation of Educational Achievement (IEA);
- the OECD *Programme for International Student Assessment* (PISA 2000, 2003, 2006) which provided information about the reading literacy, mathematical literacy and scientific literacy skills of 15-year-old students; and
- the *National Assessment Program – Sample Assessments* which to date have provided information about
  - -- the Science achievements of Year 6 students in 2003 and 2006,
  - -- the ICT Literacy skills of Year 6 and Year 10 students in 2005,
  - -- the Civics and Citizenship skills and understandings of Year 6 and Year 10 students in 2004.

Chapter 2 reviews the available evidence on the performances of Queensland students in comparison with students in other Australian states and territories and, to a lesser extent, other countries. Chapter 3 analyses the performances of sub-groups of the Queensland student population on the NAPLAN 2008 literacy and numeracy assessments. The purpose is to develop a better picture and understanding of patterns of student performance across the state and over time.

2 National Comparisons

The decision to establish the current review followed the release of results from the 2008 National Assessment Program – Literacy and Numeracy (NAPLAN) and the IEA's 2007 Trends in International Mathematics and Science Study (TIMSS). These two assessments, together with the OECD Programme for International Student Assessment (PISA), enable the literacy, numeracy and science performances of Queensland students to be compared with the performances of students in other Australian states and territories and, in the case of TIMSS and PISA, with students in other participating countries. NAPLAN assesses all students in Years 3, 5, 7 and 9. TIMSS and PISA assess scientifically drawn samples of students from defined student populations in each state and territory. Queensland has participated in the IEA's international achievement surveys since 1964, making it possible to compare the relative standing of Queensland students over a number of decades.

2.1 Interpreting Differences

Although it is possible to compare directly the academic performances of students in one Australian state or territory with performances in any other state or territory, caution must be exercised in *interpreting* differences across the states and territories. This is because of differences in the educational arrangements that operate in different jurisdictions and differences in the social compositions and circumstances of students in different parts of Australia. Simple inferences about the relative quality of educational provision based on observed differences in student performance often are not valid.

Structural Differences

The interpretation of achievement levels across the Australian states and territories is complicated at present by the different structures of schooling in different jurisdictions. In particular, states and territories have different school starting ages and different transition points from secondary to primary school. These differences are likely to influence students' relative achievement levels. For example:

- Students currently in Year 3 in Queensland entered school prior to the introduction of a Preparatory year (Prep) and so have been in school for a full twelve months less than students in all other states and territories. This might be expected to have an impact on their levels of reading proficiency when compared with students in other states.
- Students in Year 8 in Queensland are in their first year of secondary school, while Year 8 students in a number of other Australian states are in their second year of secondary school. This might be expected to have a particular impact on their levels of science achievement when compared with students in other states.

Grade-Based versus Age-Based Assessments

One consequence of these different structural arrangements is that the relative performance of Queensland students is likely to depend on which student populations are compared.

The national and international assessments listed above generally assess students in a particular year of school (e.g., Year 8) in each jurisdiction. In other words, they are *grade-based*. They compare students in a particular year without regard to between-state differences in how long these students have been in school, differences in average age, or differences in transition points from primary to secondary school.

Some of the ways in which students differ across states and territories are shown in Tables 2.1 and 2.2. It can be seen from Table 2.1 that, at the time of the 2008 NAPLAN assessments, students in Queensland had been in school for twelve months less than students in other states and territories (WA changed its school entry arrangements about six years earlier). Table 2.2 shows that, at the time of the 2008 NAPLAN assessments, students in Queensland were younger than students in the corresponding year level in almost all other states and territories.

Table 2.1

Average Years of Schooling (in years:months) at the Time of NAPLAN Testing

	QLD	WA	Other States/Territories
Year 3	2:4	3:4	3:4
Year 5	4:4	5:4	5:4
Year 7	6:4	6:4	7:4
Year 9	8:4	8:4	9:4

Table 2.2

Average Age (in years:months) at the Time of NAPLAN Testing

	QLD	WA	NT	NSW	SA	ACT	VIC	TAS
Year 3	8:1	8:5	8:6	8:7	8:7	8:8	8:9	8:11
Year 5	10:1	10:4	10:6	10:7	10:7	10:8	10:9	10:11
Year 7	12:1	12:0	12:6	12:7	12:6	12:8	12:9	12:10
Year 9	14:1	14:0	14:5	14:7	14:6	14:8	14:9	14:10

The implications of these differences are that when comparing the performances of, say, Year 9 students in Queensland with Year 9 students in Tasmania, it would be important to recognise that Queensland students, on average:

- have had twelve months less total schooling;
- are in their second, rather than third, year of secondary school; and
- are nine months younger than Tasmanian Year 9 students.

Other assessment programs assess students of the same age, regardless of how long those students have been in school, which year level they are in, or when

they made the transition to secondary school. In other words, they are *age-based*. Examples of age-based assessments are PISA and some of the earlier international IEA mathematics and science studies.

When students are sampled according to age, because of the different age structures in different states and territories, different proportions of students are drawn from different year levels. For example, in PISA 2006, more than half of the sampled 15-year-olds in Queensland and Western Australia were in Year 11 (see Table 2.3), while most sampled 15-year-olds in the other jurisdictions were in Year 10. Because students in Queensland and Western Australia would more often have been studying senior secondary English, mathematics and science than students in other jurisdictions, they might be expected to perform relatively well in PISA.

Table 2.3

Percentage of Sampled 15-year-olds in each Year Level in each State, PISA 2006

	QLD	WA	NT	NSW	SA	ACT	VIC	TAS
Year 8	≤ 1		≤ 1	≤ 1			≤ 1	≤ 1
Year 9	2	≤ 1	7	17	4	10	10	28
Year 10	46	44	**74**	**80**	**79**	**84**	**84**	**72**
Year 11	**52**	**55**	18	2	17	6	6	≤ 1
Year 12	≤ 1	≤ 1	≤ 1		≤ 1			

Demographic Differences

The interpretation of achievement differences across the Australian states and territories also must take into account demographic differences. Census data from the Australian Bureau of Statistics show significant differences between states and territories in the percentage of the population which is Indigenous, living in remote or very remote locations, and from language backgrounds other than English (Table 2.4). There are also significant differences in levels of socioeconomic advantage across the Australian states (Table 2.5). Research shows that these demographic features are all correlated with levels of literacy and numeracy achievement.

Table 2.4

Percentage of State and Territory Populations in Selected Categories

	QLD	WA	NT	NSW	SA	ACT	VIC	TAS
Indig.	3.3	1.7	27.8	2.1	3.0	1.2	0.6	3.5
Remote	4.1	7.4	45.9	0.7	4.0	0.0	0.1	2.4
LBOTE	13.6	16.6	34.0	26.0	18.2	19.0	25.6	8.0

Table 2.5

ABS Index of Relative Socioeconomic Advantage

QLD	WA	NSW	SA	VIC	TAS
984.6	1006.8	1015.3	975.7	1012.0	947.9

As the above discussion illustrates, caution is required in drawing inferences based on differences in student achievement levels from one jurisdiction to another. The problem is not that direct comparisons cannot be made, but that *interpretations* of differences must be made carefully. In particular, it would be a mistake to draw an inference about the relative quality of education being provided in different jurisdictions on the basis of simple comparisons of state and territory means (whether grade-based or age-based).

In summary, although direct comparisons can be made of students' performances across the Australian states and territories, caution must be exercised in interpreting differences between jurisdictions. In particular, it would be a mistake to draw an inference about the relative quality of education being provided in different jurisdictions on the basis of simple comparisons of state and territory means (whether grade-based or age-based). This is because of differences in structural arrangements in different states and territories, including differences in starting ages and transition points from primary to secondary school, and differences in student demographics, including the proportion of students from Indigenous, rural/remote and low socioeconomic backgrounds.

2.2 State and Territory Rankings

Having observed the need for caution in interpreting differences in achievement levels across jurisdictions, Table 2.6 now presents the rankings of states and territories in a number of recent assessment programs. The purpose here is simply to examine *broad patterns* of rankings. No attempt has been made to indicate statistically significant differences between states. Many differences between states and territories, particularly in the middle years of school and in the sample-based assessment programs, are not statistically significant.

From Table 2.6 it can be seen that, in the earlier years of school (Years 3, 4 and 5) Queensland students, on average, perform below students in all states and territories except the Northern Territory. In almost all cases, Queensland students in these year levels perform at significantly lower levels than students in other Australian states. This might be expected given that Queensland students have had one less year of schooling than students in all other states and territories and are younger than students in other jurisdictions.

Table 2.6 also shows that, in the middle years of school (Years 7 to 10), Queensland students often are ranked ahead of students in Tasmania and Western Australia. The performances of Queensland students in these years of school are sometimes not statistically different from performances in one or more of Tasmania, Western Australia and South Australia, but tend to be statistically below mean levels of performance in New South Wales, Victoria and the Australian Capital Territory.

Table 2.6

Rankings of Australian States and Territories in Recent Assessment Programs
8 = lowest ranking; 1 = highest ranking

READING	8	7	6	5	4	3	2	1
Yr 3, NAPLAN 2008	NT	QLD	WA	SA	TAS	NSW	VIC	ACT
Yr 5, NAPLAN 2008	NT	QLD	WA	TAS	SA	NSW	VIC	ACT
Yr 7, NAPLAN 2008	NT	WA	QLD	SA	TAS	NSW	VIC	ACT
Yr 9, NAPLAN 2008	NT	QLD	WA	SA	TAS	NSW	VIC	ACT
15-y-olds, PISA 2007	NT	TAS	VIC	QLD	SA	NSW	WA	ACT

WRITING	8	7	6	5	4	3	2	1
Yr 3, NAPLAN 2008	NT	QLD	WA	SA	TAS	ACT	VIC	NSW
Yr 5, NAPLAN 2008	NT	QLD	WA	TAS	SA	ACT	NSW	VIC
Yr 7, NAPLAN 2008	NT	TAS	WA	QLD	ACT	NSW	SA	VIC
Yr 9, NAPLAN 2008	NT	QLD	TAS	WA	NSW	ACT	SA	VIC

SPELLING	8	7	6	5	4	3	2	1
Yr 3, NAPLAN 2008	NT	QLD	WA	TAS	SA	ACT	VIC	NSW
Yr 5, NAPLAN 2008	NT	QLD	WA	TAS	SA	ACT	VIC	NSW
Yr 7, NAPLAN 2008	NT	TAS	WA	QLD	SA	VIC	ACT	NSW
Yr 9, NAPLAN 2008	NT	WA	TAS	QLD	SA	VIC	NSW	ACT

GRAMMAR & P.	8	7	6	5	4	3	2	1
Yr 3, NAPLAN 2008	NT	QLD	WA	SA	TAS	NSW	ACT	VIC
Yr 5, NAPLAN 2008	NT	QLD	WA	SA	TAS	NSW	ACT	VIC
Yr 7, NAPLAN 2008	NT	WA	QLD	TAS	SA	NSW	VIC	ACT
Yr 9, NAPLAN 2008	NT	WA	TAS	QLD	SA	VIC	NSW	ACT

NUM./MATHS	8	7	6	5	4	3	2	1
Yr 3, NAPLAN 2008	NT	QLD	WA	SA	TAS	NSW	ACT	VIC
Yr 4, TIMSS 2007	NT	QLD	SA	WA	TAS	ACT	VIC	NSW
Yr 5, NAPLAN 2008	NT	QLD	SA	WA	TAS	ACT	NSW	VIC
Yr 7, NAPLAN 2008	NT	WA	TAS	SA	QLD	NSW	VIC	ACT
Yr 8, TIMSS 2007	NT	WA	TAS	SA	QLD	NSW	VIC	ACT
Yr 9, NAPLAN 2008	NT	TAS	QLD	WA	SA	VIC	NSW	ACT
15-y-olds,PISA 2007	NT	TAS	VIC	QLD	SA	NSW	WA	ACT

SCIENCE	8	7	6	5	4	3	2	1
Yr 4, TIMSS 2007	QLD	NT	SA	WA	ACT	TAS	NSW	VIC
Yr 6, NAP 2006	NT	WA	QLD	SA	TAS	VIC	NSW	ACT
Yr 8, TIMSS 2007	NT	WA	TAS	SA	QLD	VIC	NSW	ACT
15-y-olds, PISA 2007	NT	TAS	VIC	QLD	SA	NSW	WA	ACT

Table 2.6
(cont.)

CIVICS & CIT.	8	7	6	5	4	3	2	1
Yr 6, NAP 2004	NT	QLD	WA	SA	TAS	VIC	NSW	ACT
Yr 10, NAP 2004	SA	QLD	WA	TAS	NT	VIC	ACT	NSW

ICT LITERACY	8	7	6	5	4	3	2	1
Yr 6, NAP 2005	NT	QLD	WA	TAS	NSW	SA	VIC	ACT
Yr 10, NAP 2005	NT	WA	TAS	QLD	SA	NSW	VIC	ACT

These rankings suggest that, while Queensland students currently perform at significantly lower levels than students in states and territories other than NT in the earlier years of school, they have begun to catch up by the middle years of school. In other words, growth in these years is faster in Queensland than in some other states and territories. By the middle years of school, the impact of having had one less year of school appears to have been reduced.

This 'catching up' also can be seen in Figures 2.1 and 2.2 which show NAPLAN 2008 Reading and Numeracy mean scores for students in Year 3 and Year 9. Both figures show that Queensland students perform at lower levels at Year 3, but at levels similar to Western Australia, South Australia and Tasmania at Year 9. The relationship between age and performance which is evident at Year 3 appears to be less evident by Year 9.

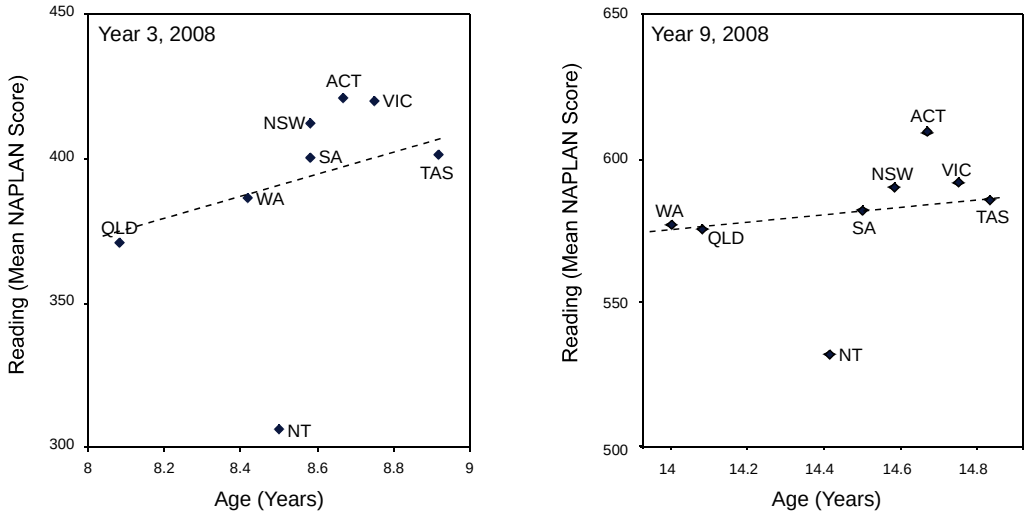

Figure 2.1 Relationship between mean reading performance and age, Year 3 and Year 9

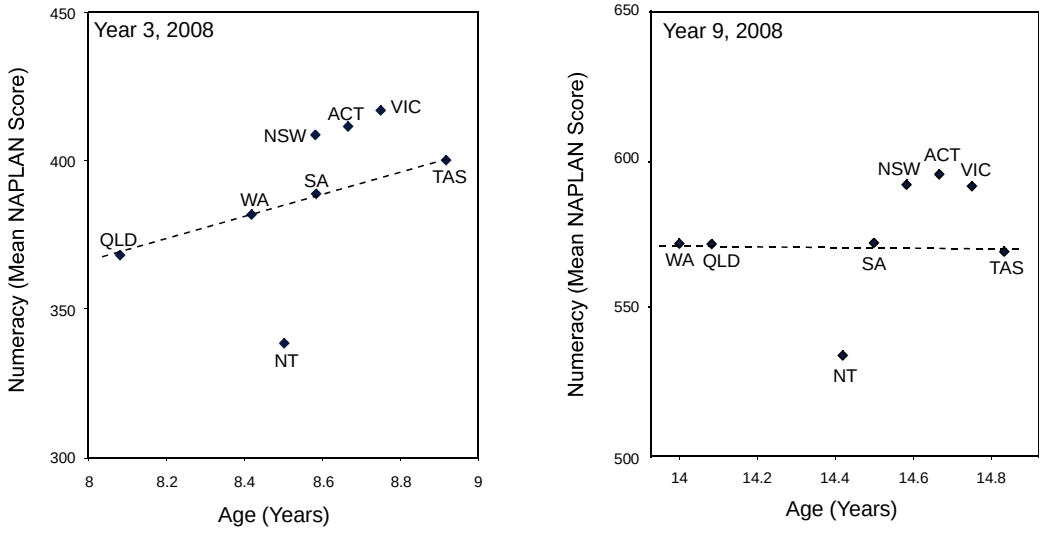

Figure 2.2. Relationship between mean numeracy performance and age, Year 3 and Year 9

Greater relative growth also is apparent in Figures 2.3 and 2.4, which show mean mathematics and science scores from TIMSS 2007 and mean ICT Literacy scores from the 2005 National Assessment Program. In the primary years, Queensland students are ranked below all states and territories other than NT. By the time of the secondary school assessments, Queensland students perform above students in NT, TAS and WA, and at the same level as students in SA.

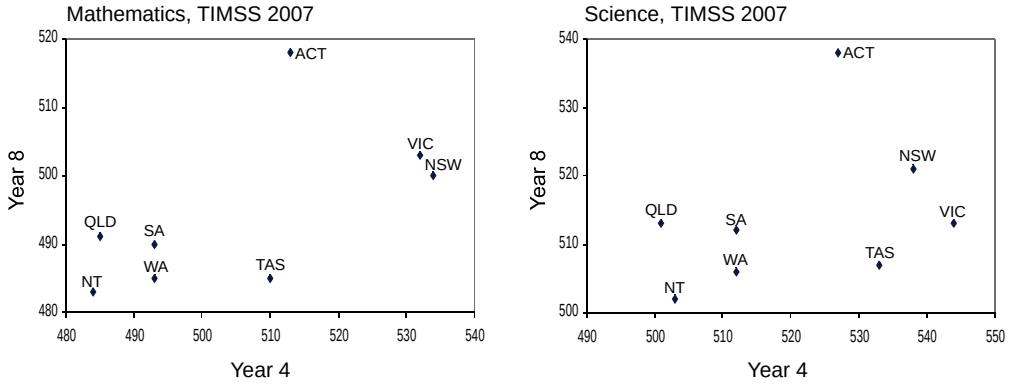

Figure 2.3. Mean mathematics and science performance, Year 4 and Year 8, TIMSS 2007

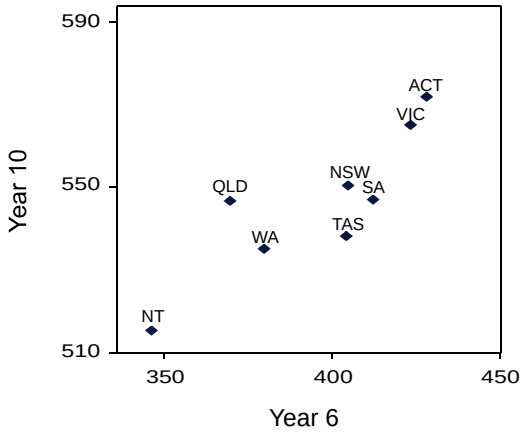

Figure 2.4. Mean ICT literacy performance, Year 6 and Year 10, NAP 2005

High Achievers

In the above discussion, states and territories were compared on students' mean scores. Another useful comparison considers the percentage of students in each state and territory achieving a minimally acceptable standard (sometimes called a 'benchmark') or an advanced standard of achievement. For example, the Trends in International Mathematics and Science Study (2007) reports the percentage of students achieving 'advanced' benchmarks in mathematics and science. Figure 2.5 shows the percentage of Year 4 students in each Australian state and territory and in the highest performing country (Hong Kong) achieving the advanced benchmark in mathematics. Figure 2.6 shows the parallel picture for science, with Singapore being the highest performing country in that subject.

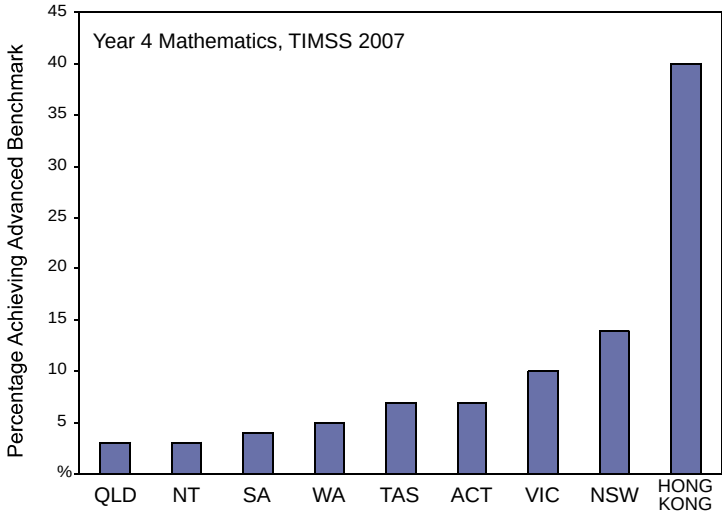

Figure 2.5 Percentage of Year 4 students achieving the advanced benchmark in mathematics

Figures 2.5 and 2.6 show that Australian primary school students, and particularly students in Queensland, perform well below world-best standards in mathematics and science. It is clear from performances in some other

countries that much higher levels of mathematics and science achievement are possible in primary schools.

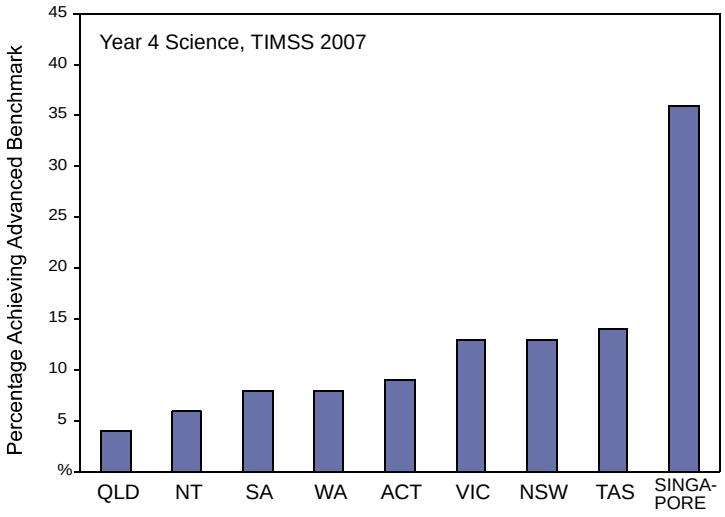

Figure 2.6 Percentage of Year 4 students achieving the advanced benchmark in science

In summary, although Queensland students perform at significantly lower levels than students in all jurisdictions other than NT in Years 3, 4 and 5, they tend to perform at similar levels to students in Western Australia, South Australia and Tasmania by the middle years of school. In other words, growth in this period tends to be greater in Queensland than in these other states. Students in NSW, VIC and ACT generally outperform Queensland students at all Year levels. It also is clear that current levels of mathematics and science achievement in primary schools fall well short of those in some other countries.

2.3 Trends over Time

The data considered in Section 2.2 were based on the most recent cycles of national and international assessment programs. Data from earlier cycles, including earlier IEA international surveys and earlier state-based literacy and numeracy programs, provide a basis for exploring possible changes in the performances of Queensland students over time. These changes could be changes in the relative standing of Queensland students vis-à-vis students in other states and territories or changes in absolute levels of achievement over time.

Literacy and Numeracy

NAPLAN assessments were introduced for the first time in 2008. Prior to the introduction of NAPLAN, each state and territory conducted its own literacy and numeracy tests and attempts were made to compare performances across these different tests. Direct comparisons of students' 2008 NAPLAN results

with results on earlier Queensland literacy and numeracy assessments are somewhat problematic because of changes in the assessments themselves. More meaningful may be comparisons of the *relative* performances of states and territories over time.

Table 2.7 shows the states and territories ranked by the percentage of students in each of Years 3, 5 and 7 achieving the relevant national benchmark in literacy. Table 2.8 shows the corresponding rankings for numeracy. These tables show that Queensland has not consistently been ranked at the low levels of 2008. One possible inference is that there has been some slippage in the performance of Queensland students in comparison with students in other states and territories over the past five years. However, this observation is based on the lowest achieving students (below benchmark) only, and the evidence for a relative decline (except perhaps in Year 3 reading) is not strong.

Evidence from Queensland's state-based literacy and numeracy testing between 1998 and 2007 suggests that an absolute decline in literacy and numeracy levels occurred in government schools in the period 2004 to 2007. This is evident in literacy (Figure 2.7) but is even more marked in numeracy (Figure 2.8). These data suggest that the decline in Queensland's relative performance during this period (Tables 2.7 and 2.8) was due to a real decline in the state's literacy and numeracy levels over these years.

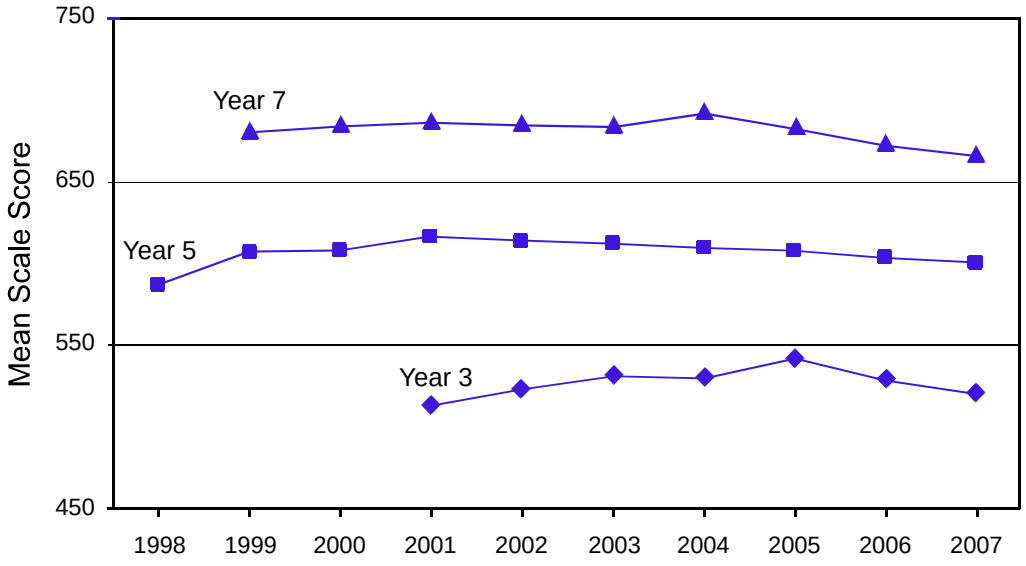

Figure 2.7 Trends in mean reading scores in state schools 1998 to 2007

Table 2.7

Rankings of Australian States and Territories on Percentage Achieving Reading Benchmark 2004 – 2008

YEAR 3	8	7	6	5	4	3	2	1
2004	NT	VIC	SA	NSW	ACT	WA	TAS	QLD
2005	NT	SA	VIC	NSW	WA	QLD	TAS	ACT
2006	NT	VIC	SA	NSW	WA	TAS	QLD	ACT
2007	NT	SA	VIC	NSW	QLD	WA	TAS	ACT
2008	NT	QLD	WA	SA	TAS	ACT	NSW	ACT

YEAR 5	8	7	6	5	4	3	2	1
2004	NT	QLD	VIC	SA	NSW	WA	TAS	ACT
2005	NT	QLD	VIC	SA	NSW	WA	TAS	ACT
2006	NT	QLD	SA	VIC	NSW	WA	TAS	ACT
2007	NT	QLD	SA	VIC	NSW	WA	ACT	TAS
2008	NT	QLD	WA	TAS	SA	NSW	VIC	ACT

YEAR 7	8	7	6	5	4	3	2	1
2004	NT	NSW	WA	TAS	SA	VIC	QLD	ACT
2005	NT	WA	QLD	NSW	TAS	ACT	SA	VIC
2006	NT	WA	QLD	TAS	NSW	SA	ACT	VIC
2007	NT	WA	QLD	TAS	NSW	VIC	SA	ACT
2008	NT	WA	QLD	SA	TAS	NSW	VIC	ACT

Table 2.8

Rankings of Australian States and Territories on Percentage Achieving Numeracy Benchmark 2004 – 2008

YEAR 3	8	7	6	5	4	3	2	1
2004	NT	WA	QLD	SA	TAS	ACT	NSW	VIC
2005	NT	WA	TAS	SA	QLD	ACT	NSW	VIC
2006	NT	WA	TAS	QLD	SA	ACT	NSW	VIC
2007	NT	SA	QLD	WA	TAS	ACT	VIC	NSW
2008	NT	QLD	SA	WA	ACT	VIC	TAS	NSW

YEAR 5	8	7	6	5	4	3	2	1
2004	NT	WA	TAS	QLD	SA	ACT	NSW	VIC
2005	NT	WA	QLD	TAS	SA	NSW	ACT	VIC
2006	NT	QLD	WA	SA	TAS	NSW	ACT	VIC
2007	NT	QLD	WA	TAS	SA	NSW	VIC	ACT
2008	NT	QLD	SA	WA	TAS	NSW	VIC	ACT

YEAR 7	8	7	6	5	4	3	2	1
2004	NT	NSW	TAS	WA	QLD	VIC	SA	ACT
2005	NT	NSW	TAS	QLD	WA	SA	VIC	ACT
2006	NT	NSW	QLD	TAS	WA	VIC	SA	ACT
2007	NT	NSW	QLD	TAS	WA	SA	ACT	VIC
2008	NT	SA	WA	QLD	TAS	NSW	VIC	ACT

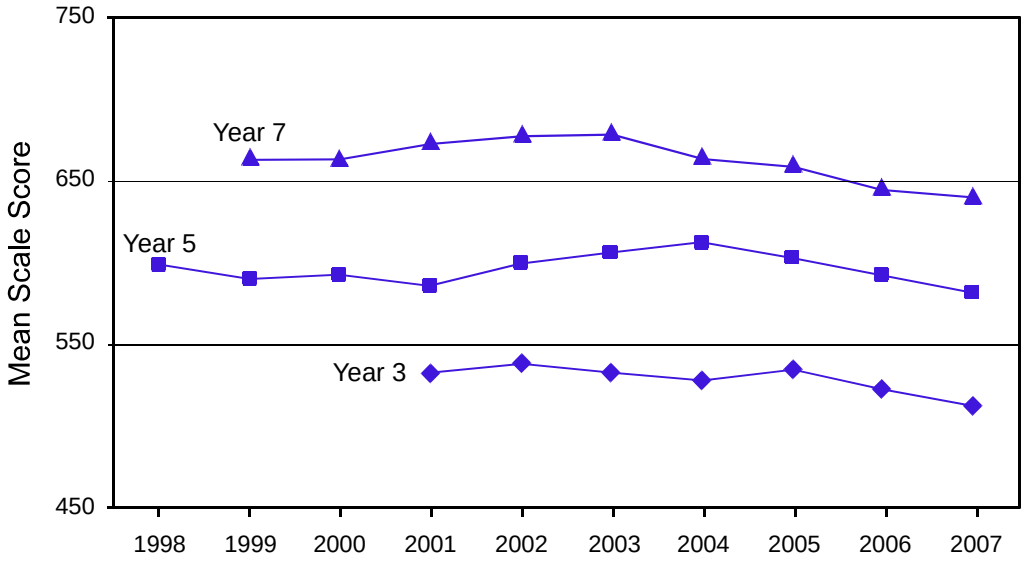

Figure 2.8 Trends in mean numeracy scores in state schools 1998 to 2007

Mathematics and Science

Some of the best available long-term data on the mathematics and science achievements of Queensland primary and secondary students are provided by the surveys of the International Association for the Evaluation of Educational Achievement (IEA). Queensland has participated in IEA surveys since 1964. In most of these surveys, student samples have been large enough to enable reliable results to be reported for each of the Australian states and territories.

The IEA mathematics and science surveys assess students at about 9 years of age in primary schools and at about 13 years of age in secondary schools. The mathematics surveys in 1964 (conducted in government schools only) and 1978 assessed aged-based samples of 13-year-olds. The science survey in 1983 assessed aged-based samples of 10- and 14-year-olds. From 1995, grade-based samples have been drawn. Year 4 and Year 8 students are assessed because these are the grades internationally that contain the largest numbers of 9- and 13-year-olds respectively. The change from age-based to grade-based sampling in 1995 complicates between-state comparisons over time in Australia because of state/territory differences in school starting ages and differences in transition points to secondary school.

Table 2.9 shows the rankings of Australian states and territories in various IEA surveys. Rankings are by mean score.[3] Many of the differences in mean scores are not statistically significant. (For example, in 2007 the mean mathematics and science scores of Queensland Year 4 students were not significantly different from the mean scores of Northern Territory Year 4 students.) Once again, the purpose here is simply to look for broad patterns in the data.

[3] Although two grade levels were assessed in 1995, only the results for Year 8 students are shown here.

Table 2.9

State/Territory Rankings in International Mathematics and Science Surveys

Primary Maths	8	7	6	5	4	3	2	1
1995	NT	SA	TAS	QLD	WA	NSW	VIC	ACT
2003	WA	NT	QLD	SA	TAS	VIC	NSW	ACT
2007	NT	QLD	SA	WA	TAS	ACT	VIC	NSW

Secondary Maths	8	7	6	5	4	3	2	1
1964				TAS	WA	NSW	VIC	QLD
1978		TAS	VIC	NSW	SA	WA	ACT	QLD
1995	NT	TAS	VIC	QLD	SA	NSW	WA	ACT
2003	NT	TAS	WA	QLD	VIC	SA	ACT	NSW
2007	NT	WA	TAS	SA	QLD	NSW	VIC	ACT

Primary Science	8	7	6	5	4	3	2	1
1983	TAS	VIC	SA	WA	NSW	QLD	NT	ACT
1995	NT	QLD	SA	NSW	TAS	VIC	WA	ACT
2003	WA	NT	QLD	SA	TAS	NSW	VIC	ACT
2007	QLD	NT	SA	WA	ACT	TAS	NSW	VIC

Secondary Science	8	7	6	5	4	3	2	1
1983	VIC	NT	NSW	TAS	SA	WA	QLD	ACT
1995	NT	QLD	VIC	TAS	SA	NSW	WA	ACT
2003	NT	TAS	QLD	VIC	WA	SA	ACT	NSW
2007	NT	WA	TAS	SA	QLD	VIC	NSW	ACT

In 1964, Queensland significantly outperformed the other participating jurisdictions, including Victoria and New South Wales, in secondary mathematics. In 1978, Queensland significantly outperformed all jurisdictions other than the ACT (which performed at a statistically similar level). Rosier (1980) attributed the relatively high performance of Queensland students in the 1960s and 1970s to the 'very strong emphasis on mathematics in the primary school in Queensland'. Queensland also significantly outperformed most other states and territories in primary and secondary science in 1983.

The above tables show changes in relativities, but not changes in absolute levels of achievement. To demonstrate changes in absolute levels of achievement, it is necessary to convert test scores on different tests and in different years to the same metric. This was done by Afrassa and Keeves (1999) who compared the performances of 13-year-olds in government schools in 1964 and 1978, and Year 8 students in government schools in 1964 and 1995. They concluded that, in Queensland, there was a small but not statistically significant decline from 1964 to 1978, but a very significant

decline between 1964 and 1995. Afrassa and Keeves described the decline in Queensland government schools – which was larger than in any other jurisdiction – as representing 'more than two years of learning'.

The IEA also has converted results on the TIMSS 1995, 2003 and 2007 tests to a common scale, enabling absolute changes in students' mathematics and science achievement levels to be compared across these three studies. Figure 2.9 shows changes in mean scores in Year 4 mathematics from 1995 to 2007 for each of the Australian states and territories.[4] In mathematics, mean scores in VIC and NSW increased by 24 points between 2003 and 2007. In the case of NSW, this continued an earlier increase, with the mean increasing 38 points between 1995 and 2007. There was also a significant gain in TAS between 1995 and 2007. The mean score in QLD remained unchanged across this twelve-year period.

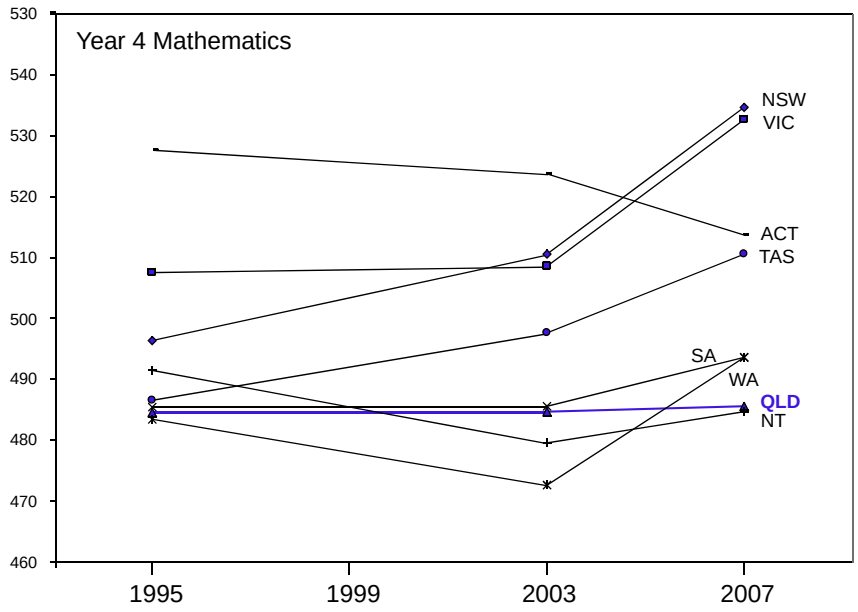

Figure 2.9 Trends in Year 4 mean scores in mathematics TIMSS 1995 to 2007

Figure 2.10 shows the corresponding trend lines for science. With the exception of the decline in ACT over this twelve-year period, the trends are less marked for science, although some gains occurred between 2003 and 2007 in TAS, VIC, NSW and WA. The mean score in QLD was lower in 2007 than in 2003 (and also slightly lower than in 1995), although these declines were not statistically significant.

Not shown here are the trend lines for Year 8 mathematics and science. At this level also, the absolute performances of Queensland students were unchanged or declined non-significantly between 1995 and 2007.

[4] The 1995 rank ordering of Australian states and territories is slightly different here from that reported in Table 2.9. The difference is believed to be due to the IEA's re-analysis of the 1995 data using a different statistical method at the time of developing these trend lines.

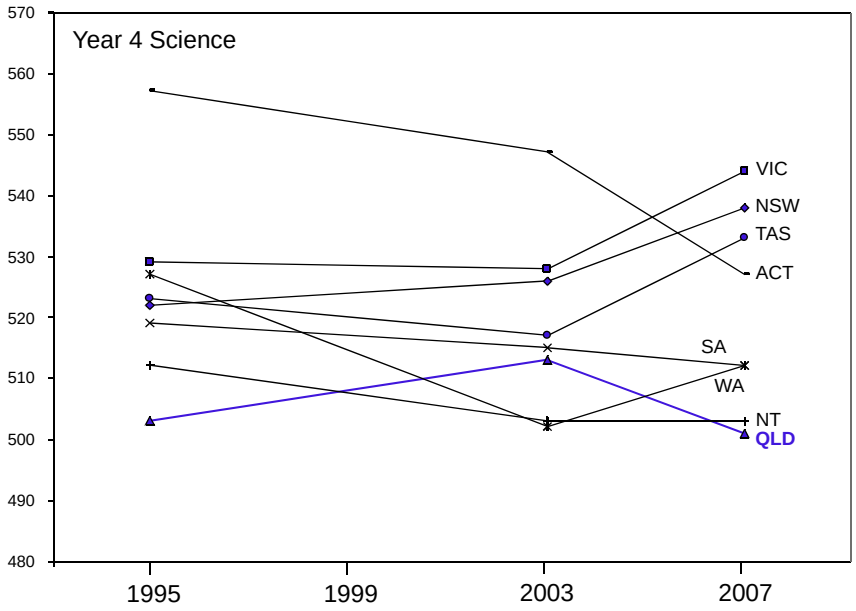

Figure 2.10 Trends in Year 4 mean scores in science TIMSS 1995 to 2007

In summary, there appears to have been a decline in the relative performance of Queensland students in mathematics and science over a period of several decades. In the period 1964 to 1995, the absolute decline in lower secondary mathematics achievement appears to have been greater than in any other state, and to have been the equivalent of about two years of schooling. In recent years, significant achievement gains have been made in some states (especially New South Wales and Victoria), but results in Queensland have flat-lined.

2.4 Interests and Attitudes

International achievement surveys also provide information about students' interests in, and attitudes towards, the school subjects being assessed. This information is collected through student questionnaires administered at the time of testing. In PISA 2006, 15-year-olds were asked to indicate their interest in each of six science topics. Figure 2.11 is based on the percentage of students expressing a 'medium' or 'high' level of interest in each topic and shows deviations from the Australian mean. It can be seen that Queensland was the only state or territory in which interest in learning science was below the national mean for all six topics. The average interest of Australian 15-year-olds in learning science is well below the OECD average and among the lowest in the world. The average level of interest in Queensland is below the level recorded in all of the 41 countries participating in PISA 2006.

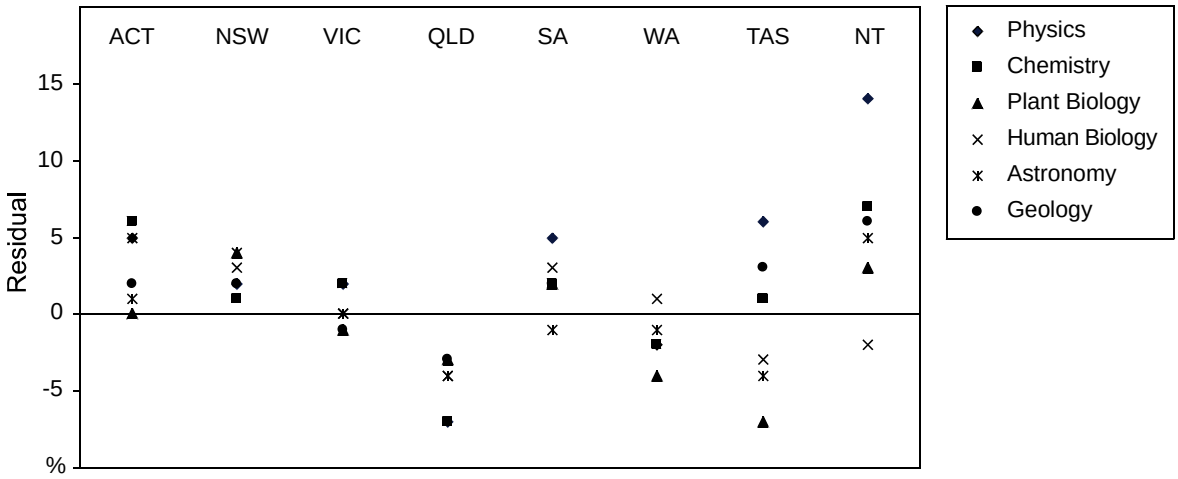

Figure 2.11 Interest in science at 15 years of age, PISA 2006

In summary, the average interest of Australian 15-year-olds in learning science is well below the OECD average and among the lowest levels of interest in the world. Queensland students' interest in science is below the Australian mean for each of the six science topics (physics, chemistry, plant biology, human biology, astronomy and geology) and lower than in any of the 41 countries participating in PISA 2006.

2.5 Teachers and Teaching

Questionnaires also are administered to the teachers of students participating in international achievement surveys to collect information about their professional qualifications, professional development, classroom practices, and access to and use of resources. Table 2.10 shows the percentage of Year 4 teachers who reported feeling 'very well' prepared to teach mathematics and science.

Table 2.10

Percentage of Year 4 Students with Teachers who Feel 'Very Well' Prepared to Teach Year 4 Mathematics and Science, TIMSS 2007

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
mathematics	87	78	**71**	82	82	80	68	88
science	47	43	**44**	48	53	47	55	39

Teachers responding to the TIMSS 2007 questionnaires were asked to indicate the extent of opportunities for, and participation in, professional development activities. The percentages of Australian Year 4 teachers who reported

participating in various forms of professional development are summarised in Table 2.11. The table shows that relatively small percentages of Australian Year 4 teachers participated in professional development in science teaching and assessment.

Table 2.11

Percentage of Australian Year 4 Teachers Participating in Various Forms of Professional Development (TIMSS, 2007)

Mathematics	%	Science	%
Mathematics content	71	Science content	22
Mathematics pedagogy/ instruction	63	Science pedagogy/instruction	16
Mathematics curriculum	73	Science curriculum	24
Integrating IT into mathematics	35	Integrating IT into science	20
Improving students' critical thinking or problem solving skills	53	Improving students' critical thinking or problem solving skills	36
Mathematics assessment	52	Science assessment	15

Other observations made from the TIMSS 2007 questionnaires include:

- Across Australia, Year 4 students spend, on average, about 18 per cent of their weekly class time learning mathematics and about five per cent of weekly class time learning science.
- Australia stands out among the countries surveyed at Year 4 as having almost 24 per cent of classes *not* using a textbook for mathematics. In countries other than Australia, England, Kuwait and Qatar, more than 85 per cent of classes use a textbook, either as a primary or supplementary resource.
- Australia and New Zealand are among a small number of countries where around 80 per cent of Year 4 classes do *not* use a textbook for science. In all other countries more than 85 per cent of classes use a textbook, either as a primary or supplementary resource. Only four per cent of Australian Year 4 teachers use a science textbook as their primary resource (the lowest percentage in the world, with the exception of New Zealand).
- Countries differ significantly in their use of homework. In Year 4 mathematics, five per cent of Australian teachers place a high emphasis on homework, but 78 per cent report assigning little homework infrequently. In Year 4 science, no Australian teachers report a high emphasis on homework and 98 per cent report assigning little homework infrequently.

In summary, only 44 per cent of Queensland Year 4 teachers report feeling 'very well' prepared to teach science. Very few (15-16 per cent) Australian teachers report having had professional development in the teaching and assessment of science. Australian teachers also stand out internationally for their limited use of textbooks (24 per cent do not use a mathematics textbook; 78 per cent do not use a science textbook).

3 Within-State Comparisons

Unlike the international surveys of the IEA and OECD, which assess scientifically drawn samples of students in particular year levels or of a particular age, the National Assessment Program – Literacy and Numeracy (NAPLAN) assesses the literacy and numeracy skills of *all* students in Years 3, 5, 7 and 9 on the same assessment tasks throughout Australia. This makes it possible to compare the performances of groups of Queensland students, including the performances of students in individual schools, geographical regions and identified sub-groups of the student population (e.g., males, females, Indigenous students and students from language backgrounds other than English). The comparisons in this chapter are based on readily-available data on sub-populations identified in the national report of NAPLAN 2008 and in subsequent analyses of the Queensland Studies Authority. The timeline and scope of the project have not allowed more detailed statistical analyses of the available data to be conducted.

NAPLAN assesses students separately in reading, writing, spelling, grammar and punctuation and numeracy. This chapter focuses on students' reading and numeracy performances, but the general observations made in this chapter also are made for writing, spelling, and grammar and punctuation. The total numbers of Queensland students assessed in these various aspects of NAPLAN 2008 are shown in Table 3.1.

Table 3.1

Numbers of Queensland Students Assessed in each Skill Area
NAPLAN 2008

Year	Reading	Writing	Spelling	Grm&Punct	Numeracy
3	55770	55671	55861	55861	55507
5	55459	55400	55535	55535	55284
7	56296	56271	56389	56389	56191
9	56133	56218	56292	56292	55952

It is now well established that, throughout Australia, Indigenous students have lower average levels of school achievement than non-Indigenous students; students living in remote locations have lower average levels of achievement than students living in metropolitan and provincial centres; and students from lower socioeconomic backgrounds have lower average levels of achievement than students from higher socioeconomic backgrounds. It is also well understood that, within these student groupings, there can be enormous variability in student achievement, and that these groupings are not mutually exclusive (e.g., many Indigenous students live in remote locations and come from low socioeconomic backgrounds). The purpose of this chapter is not to establish what is already known, but to attempt to quantify disparities in achievement across Queensland using the most recently available data.

3.1 Overall Variability

In any given year of school, there is very significant variability in students' levels of literacy and numeracy achievement. For example, many Year 3 students already read at the level of an average Year 7 student; some Year 7 students have numeracy skills at the level of an average Year 3 child. This variability is evident in the national 'growth charts' for reading and numeracy shown in Figures 3.1 and 3.2. These charts show the fifth, twentieth, fiftieth, eightieth and ninety-fifth percentiles nationally at each of Years 3, 5, 7 and 9 based on NAPLAN 2008. The charts make clear the wide spread of literacy and numeracy achievements at each of these year levels, and the considerable overlap in distributions across these years of school.

It can be seen from Figure 3.1 that, between Year 3 and Year 5, average growth in reading is relatively rapid (almost 50 points per year). Between Year 5 and Year 7, reading progress slows to about 30 points per year, and then slows again to about 20 points per year between Year 7 and Year 9. These observations make it possible to interpret differences in students' reading levels in terms of the approximate years of average reading growth that they represent. For example, the gap between the top 20 per cent of Australian Year 5 students and the bottom 20 per cent of students is 126 points (128 points for students in Queensland), or about 2.5 years of reading progress at the average rate of progress between Years 3 and 5. The gap between the top and bottom five per cent of Year 5 students is about 250 points (251 points for students in Queensland) equivalent to about five years of reading progress.

By Year 9, the gap between the top 20 per cent and bottom 20 per cent of Australian students in reading is 113 points (and 113 points in Queensland) which, at the average rate of reading progress between Year 7 and Year 9 is equivalent to about 5.6 years of school. The gap between the top and bottom five per cent of students is 217 points (and 217 points in Queensland), equivalent to more than ten years of progress at the average rate of progress between Years 7 and 9.[5]

Parallel interpretations of the gap between the highest and lowest achieving students in numeracy are shown in Table 3.2.

Table 3.2

Gap between Top and Bottom 5 per cent (and 20 per cent) of Students in Numeracy, Expressed in NAPLAN Points and Equivalent Years of School

	Year 5			Year 9		
	Gap (points)		Gap	Gap (points)		Gap
	Aust	Qld	(Years)	Aust	Qld	(Years)
Top 5% - Bottom 5%	225	201	>5	227	210	>11
Top 20% - Bottom 20%	114	104	>2.5	118	110	>6

[5] In the remainder of this chapter, gaps expressed in years of schooling are based on average rates of growth in the years immediately prior to the measurement of the gap.

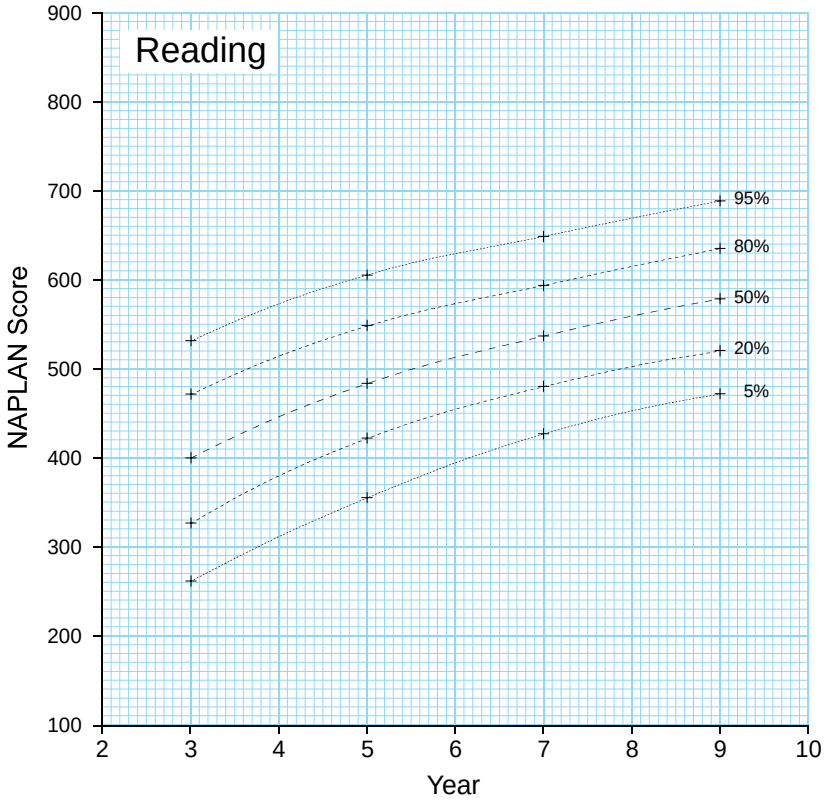

Figure 3.1 Growth chart for reading

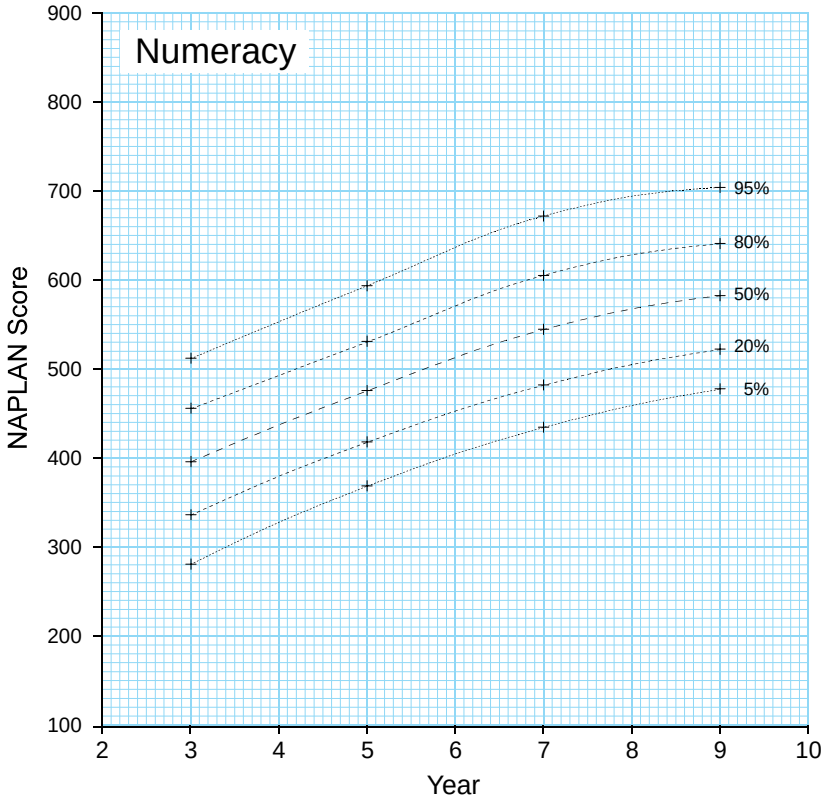

Figure 3.2 Growth chart for numeracy

The growth charts in Figures 3.1 and 3.2 can be used to plot the reading and numeracy progress of individual students or groups of students across these years of school. In this chapter, the charts are used to plot the performances of sub-groups of the Queensland student population against national norms.

In summary, in each year of school there is very significant variability in students' levels of literacy and numeracy achievement. By Year 5, the gap between the top and bottom 20 per cent of students is the equivalent of about 2.5 years of school, and between the top and bottom 5 per cent of students, about five years of school. By Year 9, 25 per cent of students perform below the average Year 7 student, with 5 per cent performing below the average Year 5 student. In Year 9 the gap between the top and bottom 20 per cent of students represents about 5.5 years of school, and between the top and bottom 5 per cent of students, perhaps 10 years of school.

3.2 Metropolitan, Provincial and Remote Students

The national report for NAPLAN 2008 identifies four categories of geo-location: Metropolitan, Provincial, Remote and Very Remote.

Reading
Figure 3.3 shows average reading levels for students in the four identified categories of geo-location. At the rate of reading growth observed in the middle primary years, the average reading levels of metropolitan students are about 1.7 years ahead of the reading levels of students in very remote parts of the state. In the early secondary years, although the gap between metropolitan and very remote students remains about the same (75 points), it now represents about 3.7 years of learning at the reduced rate of average reading progress in these years.

Numeracy
Figure 3.4 shows average numeracy levels for the four identified categories of geo-location. Once again, between Year 3 and Year 5, average growth in numeracy is relatively rapid (almost 50 points per year). Between Year 7 and Year 9, average numeracy growth slows to about 18 points per year. At the average rate of numeracy progress in the middle primary years, the numeracy levels of metropolitan students are about 1.4 years ahead of the numeracy levels of students in very remote parts of the state. By the early secondary years, the gap between metropolitan and very remote students increases to about 75 points, representing some 4.5 years of growth at the reduced rate of progress in these years.

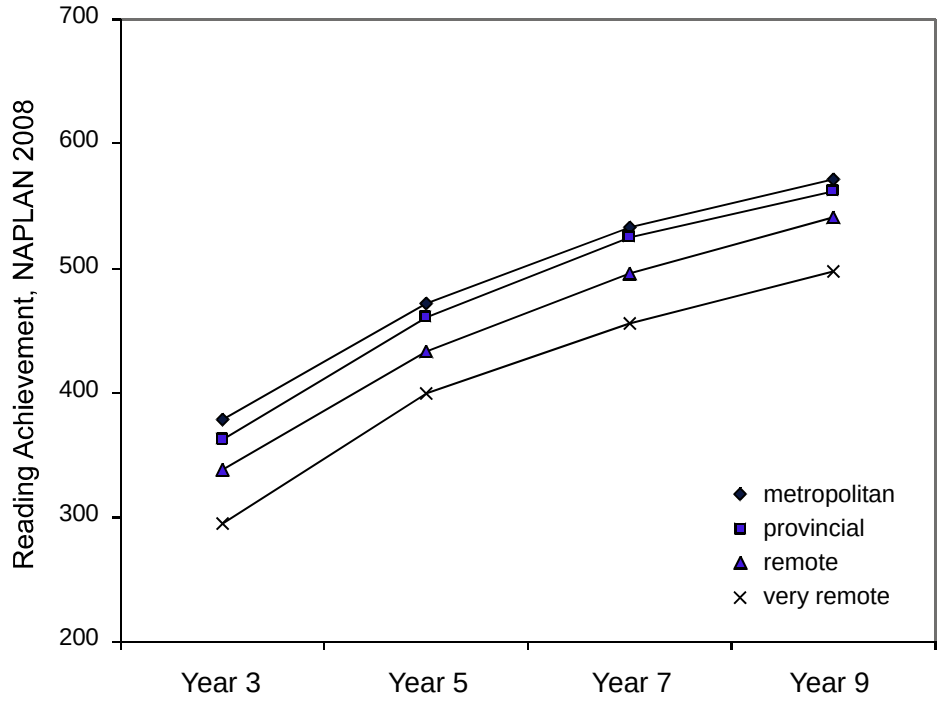

Figure 3.3 Mean reading scores of students living in metropolitan, provincial, remote and very remote parts of the state, NAPLAN 2008

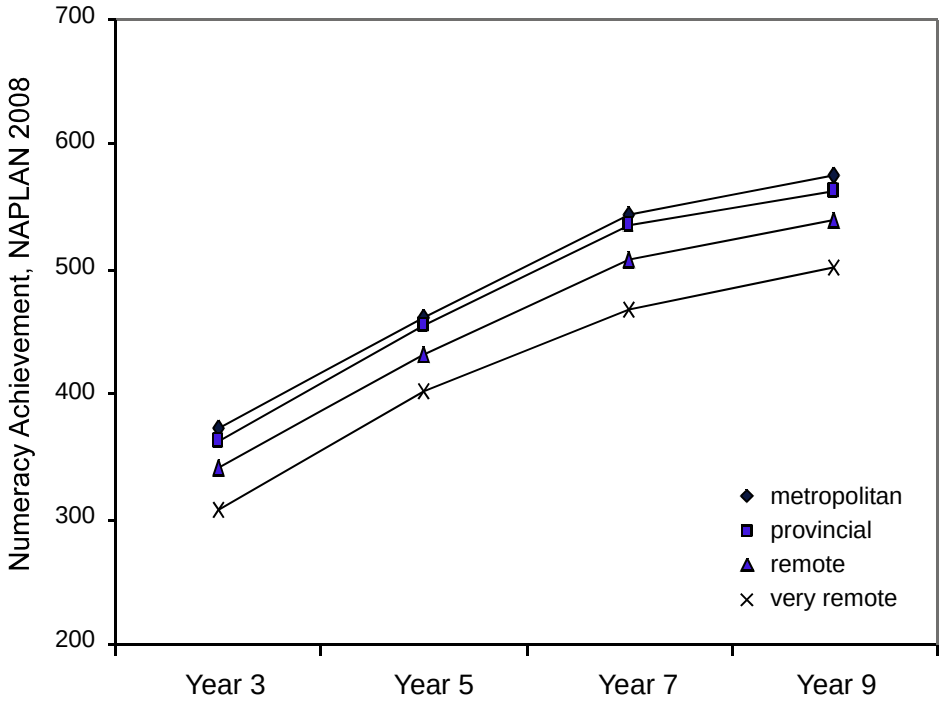

Figure 3.4 Mean numeracy scores of students living in metropolitan, provincial, remote and very remote parts of the state, NAPLAN 2008

In summary, Queensland students living in metropolitan areas have higher average levels of literacy and numeracy than students living in provincial centres, although these differences are not always statistically significant. Students living in metropolitan and provincial centres significantly outperform students living in remote (and especially very remote) parts of the state. The gap at Year 9 between metropolitan students and students living in very remote locations is, on average, equivalent to about 3.5 years of school in reading and 4.5 years of school in numeracy.

3.3 Indigenous Students

Reading

Figure 3.5 shows average levels of reading achievement for all non-Indigenous students in Queensland and for Indigenous students living in metropolitan, provincial, remote and very remote parts of the state. On average, all non-Indigenous students perform at higher levels than Indigenous students in each geographical category. The gap between non-Indigenous students and Indigenous students living in very remote locations is large (about 120 points) and remains large throughout these years of school. Indigenous students in Year 9 living in very remote locations are about six years behind non-Indigenous students.

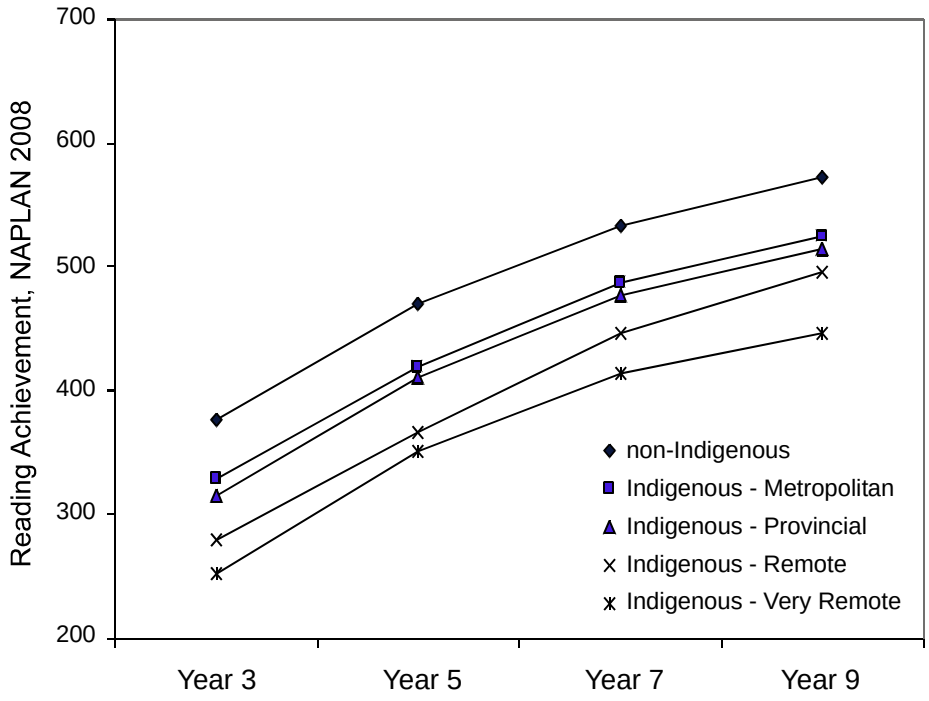

Figure 3.5 Mean reading scores of Indigenous and non-Indigenous students

Figure 3.6 re-displays the mean reading scores of Indigenous students living in remote and very remote parts of Queensland against the national growth chart in reading. This display shows that Indigenous students in remote parts of the state perform, on average, in the bottom ten per cent of all students nationally. Students in very remote locations perform in the bottom five per cent.

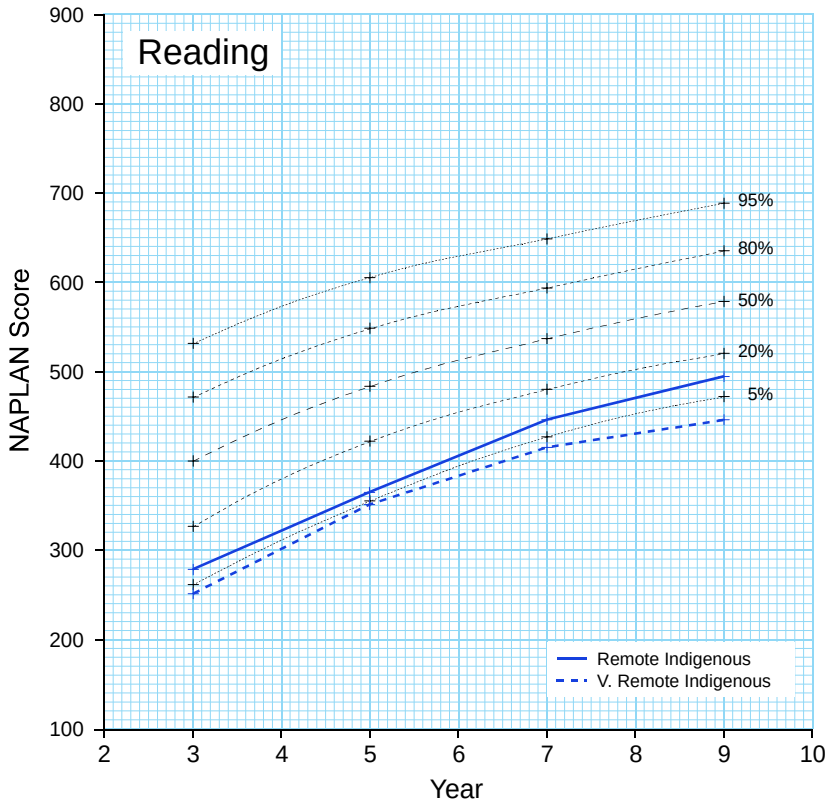

Figure 3.6 Mean reading scores of remote and very remote Indigenous students in a national context

NAPLAN also identifies a 'national minimum standard' in reading at each of Years 3, 5, 7 and 9. This is the minimum level of reading proficiency expected of every student in each of these years of school. Figure 3.7 shows the percentage of Queensland students (Indigenous and non-Indigenous) performing below the national minimum standard in reading. Among non-Indigenous students, roughly five to ten per cent of students perform below the relevant minimum standard. Among Indigenous students, roughly 25 to 35 per cent of students perform below that minimum standard.

As noted at the beginning of this chapter, student achievement levels are known to be correlated with a range of inter-related non-school factors such as geo-location, Indigenous status, language background and socioeconomic background. It has been beyond the scope of this report to attempt to untangle these factors, but it is interesting to observe differences in the Indigenous–non-Indigenous gap in different parts of the state. For example, Figure 3.8 shows that non-Indigenous students in the Brisbane Central and West District have reading levels above the Queensland mean and also above the national mean. Indigenous students in this district have average reading levels similar to the

levels of non-Indigenous students in the Torres Strait and Cape District, while Indigenous students from the Torres Strait and Cape District perform among the lowest five per cent of students nationally.

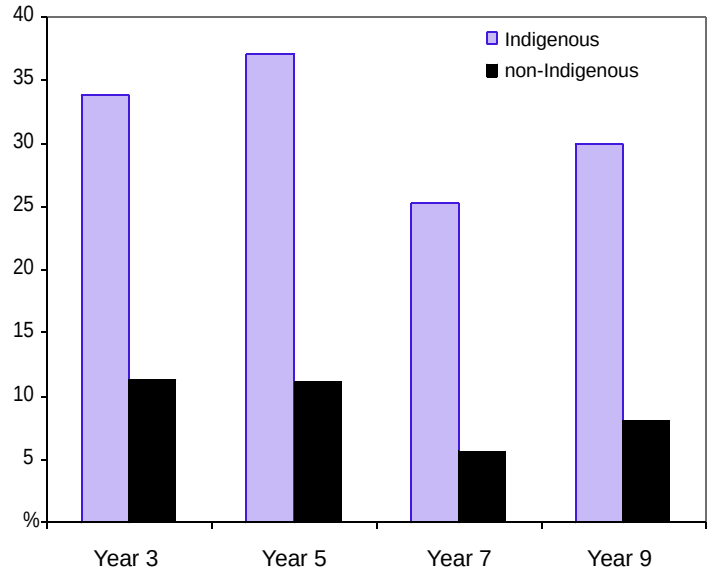

Figure 3.7 Percentage of Indigenous and non-Indigenous students performing below the national minimum standard in reading

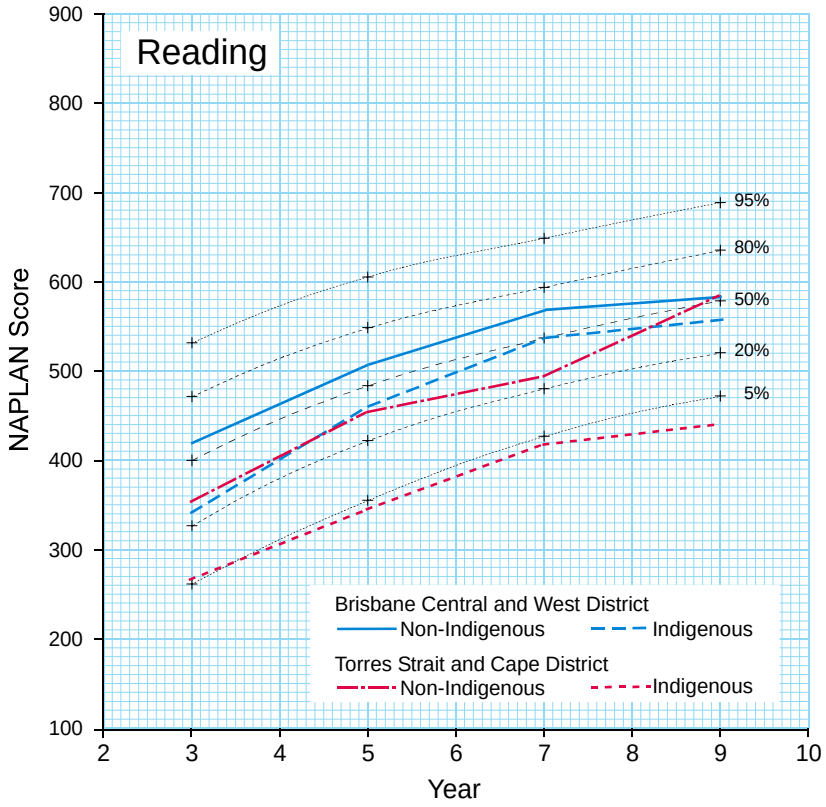

Figure 3.8 Mean reading scores of Indigenous and non-Indigenous students in two school education Districts

Numeracy

Very similar observations to those made above for reading are made from comparisons of the performances of Indigenous and non-Indigenous students in numeracy. Figure 3.9 shows average levels of numeracy achievement for all non-Indigenous students in Queensland and for Indigenous students living in metropolitan, provincial, remote and very remote parts of the state. The gap between non-Indigenous students and Indigenous students living in very remote locations is large (about 100 points) in Year 3 and increases to about 115 points in the junior secondary school. By Year 9, this gap is equivalent to about seven years of school.

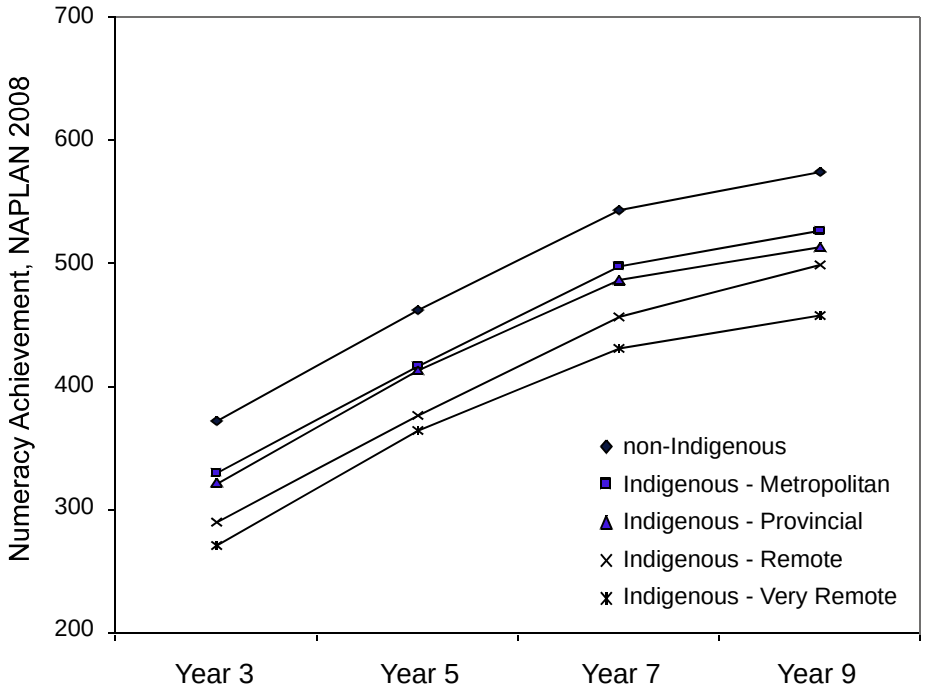

Figure 3.9 Mean numeracy scores of Indigenous and non-Indigenous students

From Figure 3.10 it can be seen that Indigenous students living in remote parts of Queensland perform in the bottom ten per cent of students nationally, and Indigenous students living in very remote locations perform in the bottom five per cent of student nationally. Figure 3.11 shows that, while around five per cent of non-Indigenous students perform below the national minimum standard in numeracy, roughly 20 to 30 per cent of Indigenous students perform below this standard.

In summary, 25 to 35 per cent of Indigenous students in Queensland perform below national minimal standards in literacy and numeracy (compared with 5 to 10 per cent of non-Indigenous students). Indigenous students in remote parts of the state perform in the bottom ten per cent of students nationally. Indigenous students in very remote parts of the state perform in the bottom five per cent of students nationally. By Year 9, the gap between non-Indigenous Queensland students and Indigenous students living in very remote locations is, on average, equivalent to six to seven years of school.

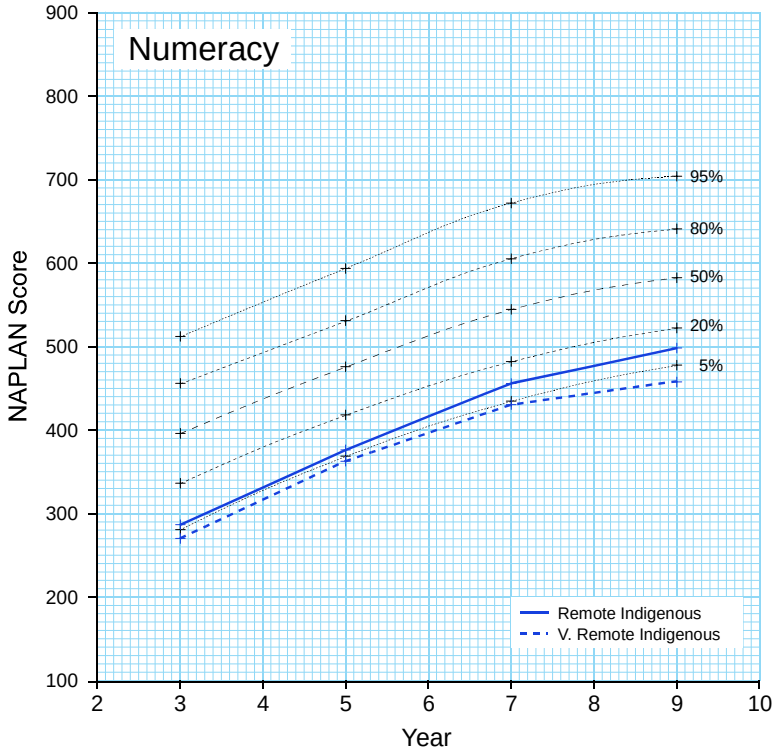

Figure 3.10 Mean numeracy scores of remote and very remote Indigenous students in a national context

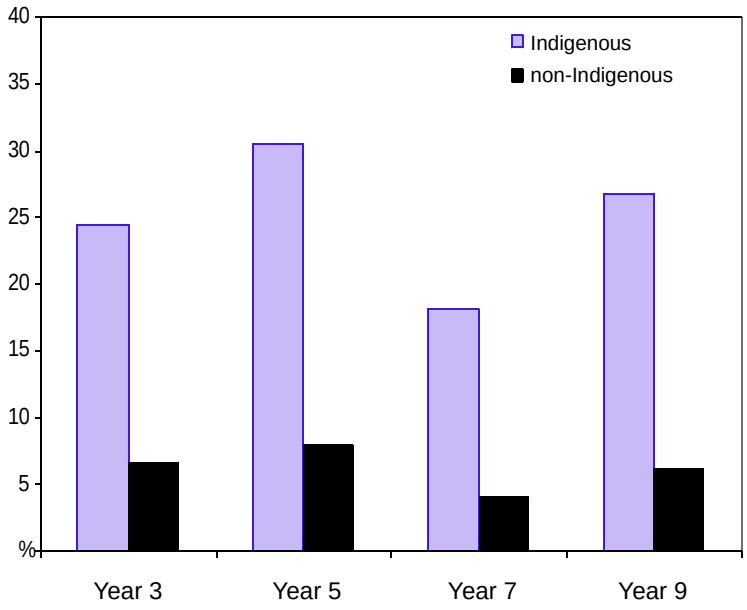

Figure 3.11 Percentage of Indigenous and non-Indigenous students performing below the national minimum standard in numeracy

Part III. Queensland Curriculum History

From the abolition of the Scholarship examination in 1962 until the late 1980s, primary school curriculum in Queensland was the responsibility of the Department of Education, the school sectors and schools themselves. During the 1980s the Department attempted to coordinate a state school P-10 curriculum across its organisational divisions, consistent with the then Board of Secondary School Studies' responsibility for the Junior Certificate (Logan, 1991) [6]. The approach of the non-government sectors at this time was to 'adopt or adapt' the state- school curriculum (*Shaping the Future*, 1994).

In 1988, government legislation saw the temporary location of the Junior Certificate with the new Board of *Senior* Secondary School Studies (BSSSS), and the creation of the Ministerial Consultative Council on Curriculum (MCCC). The MCCC was to bring curriculum coordination across the school sectors in Years 1 to 10. This coordination was to be achieved by the MCCC's advice and leadership based on consultation, research, investigations into practice and the identification of emerging trends (Ministerial Consultative Council on Curriculum, 1989).

Since the early 1990s, the framework of Queensland primary school curriculum has moved from a traditional public service model based on a government department with centralised functions, to one that includes a statutory authority with cross-sectoral ambit and more explicit roles for the school sectors. Over the last ten years, these developments in governance have been complemented by changes in system approaches to syllabus design.

Chapter 4 charts developments relating to the Queensland primary school curriculum over these past two decades.

[6] 'P' in P-10 at that time referred to Pre-School.

4 Recent Developments

Wiltshire Review 1994

In November 1992 the Government commissioned the Review of Queensland School Curriculum, chaired by Professor Kenneth Wiltshire. Among other things, the report of the review (*Shaping the Future*, 1994) recommended:

- the abolition of the BSSSS, the Department's relinquishing of its mandate for curriculum, and the establishment of a statutory authority to take cross-sectoral responsibility for the development of syllabuses and for accreditation, assessment and reporting
- that curriculum (i.e., syllabuses)
  - be planned over the P–12 range
  - be organised around the Key Learning Areas, consistent with national directions, in Years 1-10
  - include a core curriculum
  - be futures-focused
  - be knowledge-based
- a focus on literacy and numeracy and early intervention facilitated by a Year 2 'net' diagnostic assessment
- a standardised Year 6 test in literacy, numeracy and general skills.

The review's vision of cross-sectoral, end-to-end curriculum planning with aligned curriculum, assessment and reporting was not fully realised. The system that was to result included features consistent with Wiltshire recommendations, such as Key Learning Areas as organisers of the common curriculum and syllabus outcomes that specified knowledge. However, the new statutory body covered only P-10, not P-12, and while its scope was across the school sectors, its syllabuses were mandatory only for the state sector. Assessment was left outside its scope, remaining as the province of the school sectors.

Outcomes-Based Syllabuses 1998-2006

The Queensland School Curriculum Council (QSCC) was established by the *Education (School Curriculum P-10) Act 1996*. The QSCC became responsible for the development of Years 1–10 syllabuses, and adopted the eight Key Learning Areas (KLAs) as the basis for organising the common curriculum in those syllabuses, explicitly in Years 1-8 and as a background to school subjects in Years 9 and 10.

The Key Learning Areas for Years 1-8 were (and are):

1. The Arts
2. English
3. Health and Physical Education
4. Languages other than English
5. Mathematics
6. Science
7. Studies of Society and Environment
8. Technology.

The *Hobart Declaration on Schooling* of April 1989 had previously identified the nationally agreed goals for schooling and indicated that national collaborative curriculum development would be undertaken in eight KLAs. *Shaping the Future* followed this national direction in endorsing the eight national KLAs as the broad framework for core curriculum in Years 1-8. This direction was confirmed in 1999 when all State and Territory Ministers signed the *Adelaide Declaration on National Goals for Schooling in the Twenty-First Century*, which states that '...students should have attained high standards of knowledge, skills and understanding through a comprehensive and balanced curriculum in the compulsory years of schooling encompassing the agreed eight key learning areas'.

Shaping the Future had endorsed a move to an outcomes approach (Dudley & Luxton, 2008). At the same time, the review had emphasised the essential place of knowledge content in curriculum.

> Recommendation 4.3: The new syllabuses be knowledge-referenced and there be recognition that content is not subordinate to process, that content and process are complementary and are, in their turn, domain-specific.
>
> (*Shaping the Future*, 1994)

With the development of the KLA syllabuses there was a deliberate move by QSCC, endorsed by Education Queensland, to embrace the notion of outcomes-based education in curriculum design (*Key Learning Areas and New Basics*, 2001). Thus KLAs and an outcomes approach converged in the system that evolved from the review's recommendations.

The QSCC gave the following description of syllabus outcomes.

> The outcomes in the new syllabuses state in clear terms what students are expected to know and to be able to do with that they know (that is, learning outcomes) at well-defined stages during the compulsory years of schooling. [They] provide an effective starting point for school-based planning and assessment in the compulsory years of schooling. Outcomes describe observable changes in students' learning. They outline understandings and behaviours that can be demonstrated by students.
>
> (*Key Learning Areas and New Basics*, 2001)

The syllabuses related outcomes to each KLA in the following way. All KLAs shared Overall Learning Outcomes. Each KLA had General Learning Outcomes that highlighted the uniqueness of the KLA and explained its contribution to the P–10 curriculum. Further, each KLA was divided into strands, and within each of these strands were topics or sequences of learning. Each sequence was staged through six levels across Years 1-10, to indicate how far a student had progressed. Core Learning Outcomes (CLOs) would be identified at each of these levels for each strand.

For example, the Mathematics syllabus, as one of eight KLAs, contributed to seven lifelong learning attributes which were disaggregated into 27 overall learning outcomes. The Mathematics KLA itself had eight general learning outcomes. It also had five strands, each with two or three topics: eleven topics in all. Each of the eleven topics had six levels, and thus the KLA involved 66

CLOs across Years 1-10. Particular outcomes were typically associated with particular year levels, but within a year level or class group, students would reach varying outcome levels, though most likely not the full range.

For primary teachers, this would be repeated across the eight KLAs: eleven sequences in Mathematics, nine in English, and so on – providing 99 sequences in all. All 99 sequences had six levels, leading to a total of almost 600 CLOs (*Key Learning Areas and New Basics*, 2001; *Mathematics: Years 1 to 10 Syllabus*, 2004; *Mathematics: Core Learning Outcomes*, 2004; Maxwell 2001).

In addition, at each level of each sequence, teachers would plan to ensure discretionary learning outcomes that described learning beyond that considered necessary for all students. They were 'intended to broaden understandings and provide opportunities for students to pursue interests and challenges beyond the requirements of the core learning outcomes at the level' (*Mathematics: Core Learning Outcomes*, 2004).

Assessment was based on teachers' judgements of students' demonstration of learning outcomes or aspects of learning outcomes (*Mathematics: Years 1 to 10 Syllabus*, 2004).

Implementation of the KLA syllabuses developed by QSCC was mandatory for state schools and optional for non-state schools, but the syllabuses were taken up in all sectors.

In July 2002, the Queensland School Curriculum Council merged with the Board of Senior Secondary School Studies and the Tertiary Entrance Procedures Authority to form the Queensland Studies Authority (QSA). The QSCC KLA syllabuses continued under the QSA for several years.

Evaluation of Outcomes-Based Syllabuses

Queensland's outcomes-based syllabuses have been subject to evaluation and criticism in a range of forums and publications. In their implementation there was some variation across the school sectors, and this is reflected in varying assessments of their effectiveness and success. For example, in consultations for this review, some stakeholders held the view that the Catholic sector invested heavily in teacher professional development, which resulted in relatively successful implementation of curriculum and assessment based on learning outcomes. As well, evaluations often embraced both the syllabuses and teaching and learning practice.

Common criticisms of the outcomes-based syllabuses (*Report of the Assessment and Reporting Taskforce*, 2002) are summarised below.

The complexity of the outcomes-based approach, plus some delays and practical difficulties in developing the syllabuses meant that outcomes-based syllabus documents did not underpin school-based planning. Teachers had a less than satisfactory understanding of the outcomes approach that underpinned the syllabuses, and drew little curriculum coherence or knowledge from them.

- Reliance on and use of individual CLOs to organise curriculum resulted in a crowded curriculum and fragmentation of the areas of study. Two opposite problems occurred as a result of the large number of CLOs: covering all outcomes resulted in loss of cognitive depth and growth; and many educators resorted to 'sampling' the curriculum. This was even though 'QSCC took significant steps to avoid the degree of atomisation that has occurred in other places such as the USA', as an Education Queensland document conceded at the time (*Key Learning Areas and New Basics*, 2001).
- Assessment remained the province of the school sectors, and within the outcomes framework there were difficulties in aligning pedagogy, assessment and reporting. It appears teachers were confused by the conjunction of the requirement that all CLOs be taught, and the concessions that assessment items could assess clusters of CLOs and that schools would not be required to report to the system about every individual student against every single CLO.
- Limited focus on assessment in syllabus outcomes and diversity and uncertainty in the practices of assessment led to a realisation of the need to encourage an assessment culture in all schools. School-based moderation was not occurring, and development of school-based authentic assessment tasks was difficult.

QCAR 2005

The Queensland Curriculum, Assessment and Reporting (QCAR) Framework arose out of the perceived weaknesses in the KLA outcomes-based syllabuses. In a partial reiteration of the criticisms levelled against the outcomes-based syllabuses, the expert report that provided 'Background, rationale and specifications' to the development of the QCAR Framework noted as 'candidate findings for attention':

> 1. Many Queensland educators are 'sampling' the curriculum as a way of uncluttering the curriculum
> 2. There is diversity and uncertainty in the practices of assessment
> 3. Standards-based assessment can bring school change
> 4. The competence and commitment of teachers can be and needs to be supported. (Freebody, 2005)

The resulting and still current QCAR Framework aligns curriculum, assessment and reporting in Years 1 to 9 across all Queensland schools. The QSA developed and administers the Framework in partnership with the state and non-state school sectors. The Framework (Queensland Studies Authority 2009; *Smarter Learning*, 2005) has five components to satisfy identified policy objectives:

1. *Essential Learnings* – define what is essential curriculum for all students in Years P-9
2. *Standards* – set standards of student achievement in the essential curriculum
3. *Assessment Bank* – provide a bank of assessment resources for teachers that link to the essential curriculum and standards

4. *Queensland Comparable Assessment Tasks (QCATs)* – establish rigorous comparable assessment against the defined standards at three key points (Years 4, 6 and 9), to support consistent teacher judgements of student achievement over time
5. *Guidelines for reporting* – specify a common framework for reporting student achievement against standards.

The Essential Learnings do not make up the whole curriculum offered by schools. Schools retain the flexibility to develop their own learning programs in response to student and community needs. The intention is that schools will continue to organise their curriculum in various ways, grouped around KLAs, subject areas or topics (*Queensland Curriculum, Assessment and Reporting Framework,* 2005).

While the transition to QCAR is sometimes described as a move from outcomes-based to standards-based education, it has been argued (e.g., Maxwell, 2002) that the outcomes-based syllabuses did provide standards. Certainly, under the QCAR Framework, standards are given an explicit place. The objective is to provide clarity about what students must be given multiple opportunities to learn and be able to do (content standards), and how well students demonstrate what they know, understand and can do (achievement standards).

The alignment of curriculum pedagogy, assessment and reporting is fundamental to the QCAR Framework. Assessment has a critical role in this, and the objective is to develop the assessment capacity of Queensland teachers in Years 1 to 9 through assessment tasks, school-based assessments, social moderation and the Assessment Bank.

Initiatives in the State School Sector

The current review has not sought to investigate the full range of curriculum initiatives across the school sectors. A cursory survey of relevant initiatives in the state sector, which serves more than 70 per cent of Queensland primary school students, reveals a great deal of activity in the past decade. A summary of the most prominent of these illustrates the activity and perhaps volatility of issues concerning curriculum and assessment, and literacy, numeracy and science education in the period.

1999: The Queensland School Reform Longitudinal Study (QSRLS) found that pedagogy and assessment lacked intellectual quality, and that teachers rated basic skills as the highest of their priorities, and intellectual engagement as the lowest.

2000: *Queensland State Education – 2010* set out a ten-year vision for state schools in which a futures-oriented education was central.

2000: The New Basics, an alternative approach to the KLA curriculum design, highlighted holistic and connected learning, and alignment of curriculum, pedagogy and assessment. New Basics were trialled in 38 state schools over four years.

2001: *Literate Futures: Whole-School Literacy Planning Guidelines* provided a strategic plan for literacy involving 20 key strategies focused on four

priority action areas and focused on developing whole school literacy strategies.

2002: The report of the Assessment and Reporting Taskforce was endorsed with the intention to produce over five years a robust assessment and reporting framework for Years 1-10 and to 'grow an assessment culture'. Development of the framework was overtaken by the onset of QCAR.

2002: Productive Pedagogies, deriving from the QSRLS and part of the New Basics framework, were extended to all state schools. They remain as a principle in the current P-12 Curriculum Framework.

2002: The Education and Training Reforms for the Future (across all school sectors) embedded the three phases of learning, introduced Prep, and laid the groundwork for the Middle Phase of Learning initiatives in state schools.

2003: Queensland participated in the national Primary Science and Literacy Project which resulted in *Primary Connections: linking science with literacy*, a comprehensive professional development program with complementary curriculum resources.

2003: *Spotlight on Science* (2003-2006) sought to improve scientific literacy and mandated Science to Year 10 in state schools.

2006: The *Literacy – the Key to Learning: Framework for Action 2006–2008*, underpinned by findings from the *Literate Futures Report*, identified 17 areas for focused action under four key priorities: Literacy teaching; Literacy learning; Literacy in the curriculum; and Literacy leadership. The strategy is continuing to roll out until 2010.

2006: Science Education Strategy (2006-2009) extended *Spotlight on Science* with a principal emphasis on the professional development of teachers.

2007: The *Numeracy – Lifelong Confidence with Mathematics – Framework for Action 2007-2010* followed the model of the Literacy Framework to identify actions under key priorities: Understanding numeracy; Teacher knowledge and pedagogy; Numeracy across the curriculum; Numeracy leadership.

2007: The discussion paper *Towards a 10-year plan for science, technology, engineering and mathematics (STEM) education and skills in Queensland* was released, providing a broad environmental scan of factors impacting on science education in Queensland.

P–12 Frameworks 2008-09

Both Education Queensland and the QSA have recently sought to synthesise the array of current requirements into whole-of-schooling P-12 frameworks. In late 2008, Education Queensland released the *P-12 Curriculum Framework* to replace the *Years 1-10 Curriculum Framework for Education Queensland Schools* released in 2001.

The new framework explicitly positions itself as a response to significant changes in curriculum expectations and accountabilities since 2001, including:

- the move from outcomes-based education to the QCAR Framework and in particular the use of QCAR Essential Learnings and Standards as the core of all students' learning program in Years 1-9
- implementation of the Prep Year as part of the early phase of learning
- the changed position of Year 10 as the foundation year of the Senior Phase of Learning
- the introduction of the Queensland Certificate of Education in the Senior Phase of Learning
- a renewed focus on literacy and numeracy
- reporting to parents using a common five-point scale.

The framework covers the whole of schooling, capturing all curriculum requirements for state schools from Prep to Year 12.

In April 2009, the QSA released *P-12 Learning*, a document that integrates and gives continuity to teaching, learning and assessment over the P-12 span, including the QCAR elements in Years 1-9. *P-12 Learning* argues that 'low-definition' syllabus design can bring improvements in student outcomes if based on the principles of 'informed prescription' of coverage, standards and mandates, setting conditions and supporting the 'informed professionalism' of teacher curriculum judgment.

Table 4.1 provides a summary and indicative chronology reflecting impacts on Queensland primary school curriculum over the last two decades. The chronology includes initiatives in the state school sector over the last decade as an indicator of continuing activity and change.

Table 4.1

A Chronology of the Queensland Primary School Curriculum

<table>
<tr><th colspan="2"></th><th>All sectors</th><th colspan="2">State sector (Education Queensland)</th></tr>
<tr><td rowspan="4">1980s</td><td rowspan="8">1988 Legislation
1989 MCCC

1994 Wiltshire review
1996 Legislation QSCC established

2002
QSA established
ETRF

2007 Prep introduced</td><td>1980s-90s

School sector ownership of primary curriculum, assessment and reporting.

Department development of curriculum;
non-state sectors ‘adopt or adapt’.</td><td colspan="2"></td></tr>
<tr><td rowspan="3">1990s</td><td></td><td colspan="2"></td></tr>
<tr><td rowspan="2">1998-2006

Outcomes-based Key Learning Area syllabuses</td><td>Curriculum, Assessment and Reporting

1999
Queensland School Reform Longitudinal study

2000-04
New Basics trial

2001-03
Assessment and Reporting Taskforce
2001-08
Years 1-10 Curriculum Framework

2002 Productive Pedagogies</td><td>Literacy Numeracy and Science

1999
QSCC Science syllabus

2000-05
Literate Futures

2003
Primary Science and Literacy Project

2003-06
Spotlight on Science

2006-08
Literacy Framework
2006-09
Science Ed Strategy

2007-10
Numeracy Framework</td></tr>
<tr><td>2000s</td><td>2005 ongoing

Queensland Curriculum, Assessment and Reporting (QCAR) Framework

2009 Learning P-12</td><td>2008 ongoing
P-12 Curriculum Framework</td><td>2009 ongoing
Science Spark</td></tr>
</table>

Part IV. Consultations and School Visits

Three formal consultations were held in 2009 as part of this review. Discussions were held with principal associations and selected academics (23 January), parent associations (23 January) and teacher unions (22 January). In addition to these formal consultations, a number of informal discussions were held, including with the Regional Executive Directors and Executive Directors Schools in the government system (16 January), and with senior executives from the non-government sector (9 April).

Following are some opinions expressed in these consultations and discussions, organised under various headings. Some of these opinions were expressed in formal consultations; some were expressed informally. All were expressed on more than one occasion by more than one person, but no attempt has been made to infer how widely these views are held. They are listed here simply to indicate the range of matters raised with the review.

Teacher Preparation

- There has been a decline in the quality of entrants to teaching.
- Some graduate teachers are inadequately prepared by pre-service teacher education programs.
- There has been a decline in the status of teaching.
- There is a need to attract more men into primary teaching.

Teacher Professional Learning

- There are inadequacies in the extent and quality of current teacher professional development.
- Professional development needs to focus on building teachers' content knowledge and pedagogical content knowledge and repertoires.
- A greater focus is required on learning *in situ* (in the classroom).
- There is insufficient focus on professional sharing of knowledge and experience within and between schools (too much reinvention).

Support for Teaching

- There is a lack of local expert subject knowledge and coaching available to teachers.

Curriculum

- There has been too much curriculum 'churn' in recent years, with schools having to respond to too many changes.
- The school curriculum is overcrowded and the tasks teachers perform often detract from their professional work.
- There has been a loss of focus on the basics with teachers being required to spend time on a wide range of other topics and issues.

Social Support

- Teachers spend too much time dealing with a range of dysfunctional issues at the expense of teaching and learning.
- There has been an increase in the social support required of teachers.
- There is insufficient investment in specialised teachers to assist students with special needs.

Personalised Attention

- There is inadequate attention paid to personalised learning for high-achieving students.
- Some students progress through the grades without learning.

Testing

- An excessive focus on data / test outcomes can distract attention from the broader school curriculum.
- NAPLAN tests are not aligned with the Queensland curriculum.

Assessment

- Other sources of assessment data are required in primary schools to balance test data.
- Primary teachers need more training in alternative assessment methods.

School Leaders

- There is a need for a greater focus on curriculum leadership rather than administration.
- There is a lack of support (coaching, mentoring) at the principal level.

Parental Engagement

- Current parental engagement structures are not effective in developing an engagement between parents and schools for educational purposes.
- Many parents are too accepting of deviant behaviour such as absence from school.

Societal Factors

- Many students have low levels of motivation / aspiration.
- Family mobility is a major issue in some places.
- There is a need to build closer links between schools and other health and community agencies.

5 Visits to Schools

This chapter sets out observations made during visits to a small number of Queensland schools during the course of the review. The aim of the school visits was to observe and discuss current practice, including schools' responses to NAPLAN; to better understand how some schools are translating the theory of good practice into performance; and to observe how schools are overcoming obstacles to improved student and school performances. As the number of schools visited was small, some caution is required in generalising from the observations made about their practice.

Schools visited were selected on the basis of their NAPLAN 2008 performances, as well as on indicators such as evidence of innovative programs. Schools were not selected exclusively for high performance on NAPLAN. Some schools were selected on the basis of significant recent improvements in literacy and numeracy test results, innovative approaches and/or progress towards improved student outcomes. Some of the schools visited might be described as 'struggling'; others are achieving outstanding results in very complex communities.

Discussions were held in nine schools in total, including government and non-government schools, and schools in metropolitan and regional areas. School leaders, teachers and support staff were asked about initiatives and experiences in improving literacy, numeracy and science learning in each school. The observations in this chapter are based on records of those discussions and general background information gathered about each school, such as school enrolment and socioeconomic status. In addition to school visits, discussions were held with senior administrative and support staff in regional offices.

Common Factors

A number of common factors that appear to facilitate better student learning outcomes were noted in the schools visited. Not surprisingly, these factors tend to be consistent with the large body of school improvement research. They include:

- strong and effective school leaders;
- a learning culture and strong commitment to continuous improvement;
- teachers with high expectations, thorough knowledge of their subjects and a deep understanding of how students learn those subjects;
- a safe, well-organised and supportive school environment which prioritises learning;
- well-developed systems for evaluating and monitoring performance; and
- parent and community engagement and support.

Strong and effective school leaders

The majority of the schools visited displayed strong school leadership. This manifested differently depending primarily on the size of the school and the personal leadership style of each principal, but was characterised in all but one instance by 'leadership density', drawing on the expertise of other

administration and/or teaching staff to extend the leadership capacity in the school. In the smaller schools, the principal carried the bulk of the load in this regard; in most of the larger schools, strong leadership teams had been established and shared a common understanding of and commitment to the school's underpinning values and goals.

In most of the schools, the principal had been in place for an extended period (more than five years). Stable leadership appears to have been a significant factor in the success of the schools visited, however the main role of leadership stability seemed to be as an enabler for other success factors, such as establishment and maintenance of a learning culture, aligning school systems and fostering strong community relationships.

Conversely, the problems arising from constant turnover in school leadership were raised in discussions with regional executive staff. These issues present a significant challenge in some parts of Queensland, such as rural and remote areas, particularly in small schools where constant transfers make it difficult to establish any form of leadership stability or density. In one region visited by the review, one District has a concentration of small and one-teacher schools and constant 'churn' in staffing. In an attempt to create more stable leadership in that District, the Executive Director (Schools) provides support and direct leadership across a number of small schools.

A learning culture and a strong commitment to continuous improvement

In each school, the principal played a key role in establishing or maintaining the values and ethos of the school and in setting directions for development. The principal did this by treating learning as the core business of the school. They established a framework that clearly articulated the centrality of learning and the belief that every child can achieve. Importantly, this framework was not a 'set-and-forget'/point in time document. Instead, it was integral to school strategic planning conversations, a frequent point of reference, and formed the basis for a network of internal and external relationships and systems that enabled all members of the school community to focus on and participate in learning.

A key element of a learning culture is a commitment to continuous improvement across all aspects of the school. This was evident to a greater or lesser degree in all of the schools visited, and where it was most evident, tended to be a marker of schools that are already achieving outstanding results or are showing signs of improvement. In some schools, the commitment to continuous improvement had yet to take root across the school. Observations in these schools underlined the important role of the principal in leading learning, and the need to allow time for change to take place in school cultures.

Subject knowledge and teaching practice

Significant research evidence points to the importance of good teaching, and the factors that underpin effective teaching. Thorough knowledge of the subject area to be taught and deep knowledge of teaching practices have been shown in a number of studies to be associated with improved student performance (e.g., Darling-Hammond, 2000). All the schools visited were characterised by

continuing efforts to improve expertise in subject area knowledge across the Key Learning Areas, as well as to improve teaching practice. As mentioned above, in some instances this had not permeated below the level of the principal or leadership team.

In the majority of cases, however, a strong culture of teacher professionalism and engagement with continually improving knowledge and skills was evident. Further, in a number of schools, professional development designed to improve the skills and knowledge of classroom teachers in addressing literacy and numeracy issues was routinely made available to all staff, including Teacher Aides.

Of particular note in these schools was the existence of Head of Curriculum (HOC) and similar roles. In almost every school, the principal had established a position or identified a person with specific responsibility for providing curriculum support across the school. These positions were identified as the lynchpin in providing strong curriculum leadership, development, and in many cases as making whole school curriculum development and continuity possible. Each of the HOC positions was distinctive; however the existence of the role itself was critical. Few of the schools were actually 'entitled' to a HOC, however, and some creativity had been required in a number of schools to find resources to support the role.

Research also points to high expectations for individual student learning as an important part of effective teaching. Effective teachers know their students well, are clear about the standards students are expected to meet and set high expectations for individual students based on their current stage of learning. Two of the schools delivering better results than would be predicted from their school characteristics demonstrated significant capacity in differentiating learning. They provided evidence of their systematic identification of, and planning for, individual student needs.

In one large metropolitan school, personal learning plans are developed for each student based on teachers' observations and test results to ensure that no student 'falls through the cracks'. This school identified the factors contributing to teacher effectiveness as clear direction (developed through purposeful school planning), explicit knowledge of curriculum, and a team approach. Teachers at this school are involved in an iterative process of planning, development and reflection around curriculum, led by the HOC; they develop shared assessment tasks; have a clear understanding of what they are expected to teach combined with high levels of professional autonomy; and actively participate in professional development.

Safe, well-organised and supportive school environment which prioritises learning

All the schools visited were characterised by an orderly learning environment. None of the schools visited was a new school, and several were in areas with significantly disadvantaged populations. All of the schools were well cared for and tidy, and students were observed participating with appropriate levels of

enthusiasm in a range of activities. In some schools there was also evidence of systematic planning to ensure classroom continuity when teachers were absent.

In more than one of the schools visited, behaviour management had been a significant issue a number of years ago, and the principals described having to commit significant time and energy to getting this under control as a first step. The Department's Schoolwide Positive Behaviour Support Program was cited as having provided a particularly effective solution for behaviour issues in schools.[7]

The importance of establishing a caring and inclusive school environment was well recognised in the schools visited. Some schools described this as a vital first step enabling 'teachers to teach instead of responding to crises'. As well as having to address student behaviour issues, some schools also had to work at changing staff attitudes and developing a whole-school commitment to learning and to a belief in every student's ability to learn. In one school this was referred to as a 'relentless focus on learning' and on promoting teacher ownership of learning and behaviour in their classrooms. More than one school described having to change teacher behaviour. This ranged from ensuring that teachers were visible in the school, not just in classrooms but around the school at lunch time, to addressing how teachers spoke to students. It also included working with district office staff to ensure a 'fit' between the school and incoming staff.

Schools that prioritise learning organise the school day around learning and minimise interruptions to teaching. In some of the schools visited, substantial effort had been made to ensure that this happened. For example, in one large metropolitan school, access to specialist teachers was restricted to specifically planned blocks, driven by classroom teacher needs rather than the availability of specialist teachers.

The high-performing schools visited by the review all displayed a commitment to whole school planning. They used their framework as a reference point for curriculum planning to ensure continuity of learning across the years of school and to meet the needs of every child in the school.

Well-developed systems for evaluating and monitoring performance

Just as effective teachers monitor the progress of individual students and provide feedback on their progress, effective schools have well-developed systems for evaluating and monitoring school performance.

Not surprisingly, given the recent roll-out of the Queensland Curriculum, Assessment and Reporting Framework (QCAR) and the implementation of the first Queensland Comparable Assessment Tasks (QCATs), a number of schools visited were in the process of reviewing curriculum and work programs. The conjunction of QCAR with Queensland's first NAPLAN test results appeared to have stimulated a significant interest in the use of data for learning.

[7] http://education.qld.gov.au/studentservices/behaviour/swpbs/index.html

While most of the schools visited were very interested in what NAPLAN and other sources of data could do to stimulate improved school practice, there was significant variation in the extent to which schools gathered additional data on student performance, were equipped to effectively analyse and understand data, and actually used data to inform their practice.

Larger schools tended to have greater capacity for data analysis – usually through a teacher with skills and interest in this area. To boost existing capacity, one region was investing in the development of a data analysis tool to be made available to all schools in the region. The capacity for the Department's 'Oneschool' system to provide such a tool in the future was noted, but staff in one school observed, 'We can't wait for Oneschool. We need this now.'

One non-government school visited had invested significant energy into analysing and responding to NAPLAN results. This work had resulted in a range of changes within the school and some innovative practices in preparing students to approach this year's tests with confidence. Opportunities to share information and experience, and to benefit from other schools' practices and from expert advice on the use of data to improve learning, were raised as issues at this school.

Parent and community engagement and support

Departmental satisfaction surveys and research on parent engagement show that very few parents are not interested in seeing their child safe and happy at school. However, there is a difference between parent interest in their child and parent engagement with the school, and the difficulty experienced by some schools in engaging parents and communities with schools can be profound. The research is also clear that, where this engagement happens, it provides a significant boost to positive school culture and to student outcomes (Saulwick Muller Social Research, 2006).

More than one school visited noted the importance of relationships in the development of a truly effective school, and all schools were aware of the importance of building relationships with parents and the community. Schools continue to grapple with the challenge of engaging parents and other stakeholders and of responding to parents' expectations.

One school described its efforts to overcome the perception that parents are called to the school only when something is wrong. Teachers emphasised the need for engagement efforts that are congruent with the way the local community operates. Many teachers assume that middle-class values and assumptions are universal. Just as some schools have to actively teach students how to be at school, so they need to work with their communities to establish ways of being part of the school community. In an effort to build relationships, this school had issued parent invitations for purely social occasions, structured around a simple barbecue but with a requirement for students to introduce parents to their class teacher before tickets for free rides were provided.

Other schools visited had highly active parent communities with very high expectations for what the school could achieve. But it should not be assumed that these schools do not have to work to maintain relationships, provide avenues for effective communication and feedback, and be responsive to community expectations.

Importantly, another aspect of community engagement that was raised was the value of an extended view of 'community' that includes professional networks external to the school and relationships with other schools. Positive examples described during the visits to schools included virtual forums created through the Department's *Learning Space*, informal networks, networks arising from centrally provided professional development, and formal networks drawn together at the regional level to share experiences and ideas. A stand-out program operating in one area draws on a local university and has in place a network of mobility liaison officers. Several of the schools visited also regularly work with other schools or with universities to develop inter-school programs or to address specific needs.

NAPLAN 2009

Also of interest to the review was the question of how schools were preparing for NAPLAN 2009 tests, including their implementation of the review's interim recommendation (Appendix 2) that:

> last year's NAPLAN assessment materials – including test booklets, administration manual, marking guides, and details of the performances of last year's cohort on each test question – be made available to all Year 3, 5 and 7 teachers at the start of the 2009 school year for use in establishing students' current levels of literacy and numeracy development and to assist in identifying individual learning needs.

Following this recommendation, NAPLAN 2008 assessment materials were made available on the Queensland Studies Authority (QSA) website and state schools were required by the Minister to administer these materials to all students who would sit NAPLAN tests in 2009. In addition, support was provided to state schools through the Maximising Achievement Program (MAP), the aim of which was to harness the commitment of principals and schools to the challenge of raising literacy and numeracy outcomes for all state school students. The program assisted schools in using test results to inform teacher practice and student learning.

Independent schools were advised by Independent Schools Queensland (ISQ) that the NAPLAN materials were available on the QSA website, and support was provided to schools through workshops designed to assist schools in their preparation for the 2009 tests and in their interpretation and use of test data to inform teaching.

The Queensland Catholic Education Commission (QCEC) advised all Catholic Schooling Authorities of the preliminary report and the resources available to teachers. Schools were particularly encouraged to focus on teacher knowledge and skills, school leadership, diagnosis of learning difficulties and monitoring individual progress. The regional diocesan offices responded in a range of

ways, including making NAPLAN a major focus of in-service for primary and secondary curriculum coordinators and regional principals' meetings; the preparation of memos for schools on student preparedness and teaching and learning; the provision of test preparation booklets, information and PowerPoint presentations; and the preparation of pamphlet and newsletter articles for parents.

All schools visited by the review, including those whose NAPLAN 2008 results had been excellent, shared the conviction that students' test performances could be improved. This conviction appeared to stem not from a narrow impetus to do better on the tests, but from a view that NAPLAN results provide schools with important information about student achievement that can be used to improve outcomes in all areas of schooling. This observation was indicative of the high levels of teacher professionalism and commitment in the schools visited.

It also was recommended that parents of students entering Years 3, 5 and 7 be informed about the availability of these assessment materials and encouraged to talk with teachers about their children's performances on them. The Premier wrote to Queensland parents advising them that the NAPLAN materials were being made available for use by schools.

Several schools reported that, since the publication of the NAPLAN 2008 results, greater attention had been given to ways of improving students' literacy and numeracy skills. Attention also was being given to improving students' test-taking skills, such as completing test booklets and working under test conditions. Teachers had become more aware of testing and supervision considerations and of the need to teach the language of mathematics test questions. One school had developed an animated PowerPoint presentation to familiarise students with NAPLAN tests and test taking procedures.

Some teachers and principals believed that schools had not placed a high priority on NAPLAN test performances. There was evidence in the school visits that this had changed. A feature of the change appeared to be a high level of interest in understanding and using NAPLAN data to improve teaching.

All the schools visited had undertaken some analysis of their NAPLAN 2008 results. The sophistication of these analyses and the degree to which they were used across the school to enhance teacher practice varied widely, even across the small number of schools visited. Schools clearly differed in their access to skills in data analysis. At one school, a Deputy Principal who was a mathematics specialist had interrogated the school data in detail, for example analysing results on the basis of question structure and gender at the item level. The school then applied the analysis to unpack teaching and assessment practices at the school and individual classroom level. Other schools lacked the capacity to do this, and used the data primarily to identify areas of the test on which students had performed less well.

It was common for principals and teachers to emphasise that achieving improved results on NAPLAN was only part of the picture, and that the longer-

term objective was to improve teaching practices and student outcomes in literacy and numeracy. Principals, in particular, commented on the strong alignment between NAPLAN and QCAR, providing a launching pad for curriculum planning. Systematic use of data was being combined in the highest-performing schools with (ongoing) curriculum reviews.

Summary

The high-performing schools visited as part of this review tended to display common characteristics. Having addressed issues of behaviour management and established a school culture focused on improving learning for every child, these schools used their curriculum framework as a reference point for whole school planning. In these schools there was a relentless focus on learning as the core business of the school. Whole school planning was used to align every aspect of the school with the drive for continuous improvement in student outcomes. This included curriculum planning, financial and human resource allocation, professional development and school-community engagement activities. Characteristics of these schools included:

- shared responsibility for leadership and student learning and clear accountability structures;
- whole school curriculum planning to ensure a rich and challenging curriculum with an emphasis on continuity across year levels;
- systems to support teachers' use of a range of student data to enable targeted teaching and personalised approaches to learning, ensuring individual student needs are identified and met;
- active engagement with professional development to build content and pedagogical content knowledge as required, with significant in-school learning; and
- creative use of the school's financial and human resources to achieve desired outcomes, including by accessing local and regional support from school systems, local networks and academics.

Part V. Reflections and Recommendations

Queensland's ability to maintain its international competitiveness, strong economy and superior quality of life for its citizens into the 21st century will depend, in part, on increased levels of productivity and the development of the state as a global innovation leader. Productivity and innovation, in turn, will depend on a highly skilled and knowledgeable workforce. Because tomorrow's workforce can be found in today's schools, it is appropriate to ask how well Queensland schools are preparing students for this challenge – particularly in relation to other economies, and in the crucial areas of literacy, mathematics and science.

The evidence considered by this review reveals a great deal of good practice and high achievement in Queensland primary schools. But it also raises questions about the overall performance of Queensland students and highlights significant disparities in achievement across the state. For example, very few Queensland primary students currently reach high levels of achievement in mathematics and science. A 2007 study showed that while 40 per cent of Year 4 students in Hong Kong reach an 'advanced' international standard in mathematics, only three per cent of Queensland students reach this standard. In science, 36 per cent of Singaporean Year 4 students reach an 'advanced' standard compared with only four per cent of Queensland students. To the extent that advanced mathematics and science are keys to future national productivity and innovation, Queensland schools (and Australian schools generally) appear not to be providing the strong foundations being provided by some other countries in the region.

The review also noted some evidence of a decline in mathematics and science performances in Queensland schools over recent decades. In the 1960s and 1970s, Queensland students significantly outperformed students in other Australian states in mathematics. Researchers attributed this superior performance to the very strong emphasis given to mathematics in Queensland primary schools. However mathematics levels have declined in absolute terms in recent decades. The decline in junior secondary mathematics in Queensland government schools between 1964 and 1995 was greater than in any other Australian government system and has been estimated by independent researchers as being the equivalent of more than two years of learning. Queensland students are now consistently outperformed by students in New South Wales, Victoria and the Australian Capital Territory in mathematics and science.

Of equal concern are the low levels of interest Queensland students appear to have in mathematics and science. When asked in a 2006 OECD survey about their interest in physics, chemistry, plant biology, human biology, astronomy and geology, Queensland 15-year-olds expressed lower average levels of interest in these subjects than students in all of the 41 countries participating in this survey. Students' experiences of school science up to this age clearly are not sparking their interest in science and this, no doubt, is part of the explanation for the declining percentages of students enrolling in science subjects in the senior secondary school.

It was regularly pointed out to the review that Queensland students currently have had 12 months less schooling than students in the same year level in other states and territories and that this difference is likely to explain observed differences in achievement levels. This is a valid observation and no doubt does explain some of the observed difference, particularly in the earlier years of school. Whether this observation is an acceptable explanation for the fact that Queensland students continue to be significantly outperformed by students in New South Wales, Victoria and the Australian Capital Territory in the lower secondary school is another matter. Students in Finland do not commence formal schooling until eight years of age, but that does not prevent them from outperforming the rest of the world by age 15. This observation also does not explain why achievement levels in Queensland have flat-lined over the past 15 years while achievement levels in some other states have significantly increased – for example, there has been a significant and sustained improvement in Year 4 mathematics levels in New South Wales and Victoria over this period. There is also evidence of a very recent decline in literacy and numeracy levels in Queensland schools.

As well as reviewing evidence relating to the overall performances of Queensland students, consideration has been given to within-state disparities in student achievement. Although achievement disparities are not necessarily any greater in Queensland than in other Australian states, they present a major and ongoing challenge to governments, education systems and individual schools. For example, the 2008 NAPLAN data reveal that, within any randomly selected group of twenty Year 9 students, five have literacy levels below the average Year 7 student, and one of those students is performing below the Year 5 average.

Very large achievement gaps are observed between some groups of students. Taking into account the slower average rates of literacy and numeracy progress in the junior secondary school, this review has concluded that Year 9 students living in very remote parts of Queensland are, on average, 3.5 years behind students living in metropolitan areas in literacy and 4.5 years behind in numeracy. Achievement gaps are even wider for Indigenous students. Indigenous students living in remote parts of the state perform in the bottom ten per cent of students nationally; those in very remote locations perform in the bottom five per cent nationally. By Year 9, thirty per cent of all Indigenous students in Queensland perform below a minimum national standard in reading, and those living in very remote parts of the state are, on average, perhaps ten years behind non-Indigenous Queensland students.

Regardless of how Queensland students perform in comparison with students in other countries and parts of Australia, it is clear that unacceptably large numbers of Indigenous students, students living in remote parts of the state and students from low socioeconomic backgrounds are failing to achieve minimal levels of literacy, numeracy and science. These students often slip further behind the longer they are in school and, in many cases, probably never achieve minimally acceptable standards of performance. This is a significant concern because it is now well established that low levels of adult literacy are

associated with a range of other outcomes including unemployment, lower lifetime earnings, poorer health and crime.

Queensland primary schools operate in very different circumstances, meaning that very different levels of challenge are being faced by teachers and schools across the state. Schools differ greatly in their geographical locations, in the socioeconomic backgrounds of their students, their proportions of Indigenous students and students from language backgrounds other than English, and in their levels of parental and community support and engagement. But input to this review also has drawn attention to schools' differing levels of readiness and success in addressing these challenges. While there are many outstanding teachers, outstanding school leaders and outstanding primary schools in all school sectors and throughout the state, the review also was told of teachers whose own literacy skills are little better than those of the students they teach, of under-performing school leaders, and of entire schools in which levels of student attendance, behaviour and achievement are unacceptably low.

In developing recommendations for raising literacy, numeracy and science achievement levels in Queensland primary schools, attention has been paid to international research into the characteristics of highly effective teachers, highly effective schools and highly effective school systems. The views and suggestions of a range of stakeholders have been taken into consideration, and visits have been made to talk with the staff of a number of primary schools that appear to be performing particularly well given their circumstances and student intakes.

Evidence from these sources has highlighted some of the pre-requisites for improved student performance, including: committed teachers who know their subjects well and who are skilled in implementing teaching approaches known from research to be effective in promoting student learning; school leaders who set high expectations and create a school environment and culture that demands success for all; and (where schools are part of a system) easily accessible expert support and advice in relation to day-to-day teaching and school leadership issues. A theme that emerged from the review was the fundamental importance of having all players – teachers, students, parents, school leaders, system leaders and system support staff – working in a consistent and mutually supportive way with a common focus on achieving continuous improvement in student outcomes. The task of raising literacy, numeracy and science levels in Queensland primary schools is *a shared challenge*.

6 Teachers

A key to raising student achievement levels is to ensure that effective teaching is taking place in *every* classroom; in other words, to ensure that all teachers are doing what the best teachers already do.

Content Knowledge

Highly effective teaching in every classroom is possible only if every teacher has a sound understanding of the subjects they teach. Highly effective mathematics teaching depends on a sound understanding of mathematics; highly effective science teaching depends on a sound understanding of science. Just as being an expert in a subject does not guarantee that a person will be a good teacher, so being a good teacher does not guarantee that a person can teach any subject. Highly effective teaching depends on the bringing together of general pedagogical skills and knowledge and specific 'content' knowledge.

In the course of this review, concerns were raised about the adequacy of some primary teachers' levels of content knowledge. For example, reference was made to the limited writing skills of some teachers. These concerns echo concerns raised with the National Inquiry into the Teaching of Literacy about the literacy skills of pre-service teachers. The Inquiry noted 'some scepticism among practising teachers about the personal literacy standards of new graduates':

> The literacy competency of student teachers was raised as an issue in all focus group discussions. Participants reported that many students lacked the literacy skills required to be effective teachers of reading. These students needed help to develop their foundational literacy skills.
>
> (*National Inquiry into the Teaching of Literacy*, 2005)

Questions also were raised with the current review about some teachers' levels of mathematics and science knowledge. Again, these concerns echo national concerns. The Parliament of Victoria's 2005 Inquiry into the Promotion of Mathematics and Science Education received submissions from stakeholders expressing concerns about primary teachers' levels of knowledge and conceptual understanding in mathematics. Groves et al. (2006) found that many pre-service primary teachers themselves believe that they are insufficiently prepared in terms of their knowledge of mathematics. They also found that teachers' levels of mathematics knowledge were strongly correlated with their confidence in teaching mathematics.

> In the Queensland context, there is enormous diversity amongst preservice teachers in terms of their ages, mathematical backgrounds, beliefs and attitudes towards mathematics, and numeracy skills. Currently in Queensland, preservice teacher education programs give uneven attention to the development of personal numeracy skills and preparation for numeracy teaching. (*Numeracy in Teacher Education*, 2005)

The 2008 National Numeracy Review called for the clearer specification of the mathematics knowledge required for effective primary teaching:

> There is considerable evidence (e.g., *Teachers Enhancing Numeracy*, 2004; Baturo et al., 2004) that primary school teachers' confidence and competence with mathematics are a cause for concern… It is important to describe what mathematics effective primary teachers need to know and use in sophisticated ways. (*National Numeracy Review*, 2008)

Input to the current review also included concerns about the very limited amount of science being taught in some teacher education programs – concerns reinforced by the observation that only 44 per cent of Queensland Year 4 teachers say that they feel 'very well' prepared to teach Year 4 science (Thomson, Wernert, Underwood, & Nicholas, 2008) and that only 18 per cent of Australian primary teachers believe that they have 'all the expertise needed' to teach primary science (Angus, Olney, & Ainley, 2007).

Pedagogical Content Knowledge

Highly effective teaching in every classroom also depends on teachers having knowledge about how students learn, and the best ways to teach, a subject. This 'pedagogical content' knowledge (Shulman, 1987) includes knowing how students' understandings in a subject typically develop, how to engage students and sequence subject matter, the kinds of misconceptions that students commonly develop, and the most effective ways to teach a subject. As the National Inquiry into the Teaching of Literacy observed:

> Quality teaching depends upon a thorough knowledge of content and of how students learn that content. It also requires knowledge about how to teach the content. In the case of the teaching of reading, quality teaching depends upon knowledge of how students learn to read, knowledge of how to assess reading ability and growth, as well as knowledge of how to use assessment information to apply appropriate strategies from a range of evidence-based effective practices for teaching students to read.
> (*National Inquiry into the Teaching of Literacy*, 2005, 58)

The National Inquiry into the Teaching of Literacy recommended that the preparation of primary teachers include a strong focus on evidence-based findings relating to the teaching of reading, including the use of integrated approaches to the teaching of phonemic awareness, phonics, fluency, vocabulary knowledge and text comprehension. It concluded that teachers also require an understanding of principles of child and adolescent development and an ability to implement inclusive approaches to literacy teaching.

Groves, Mousley, and Forgasz (2006) reported that many Australian pre-service teachers believe that they are insufficiently prepared both in terms of their mathematics knowledge and their pedagogical content knowledge in mathematics. The National Numeracy Review (2008) recommended that pedagogical content knowledge be a prime focus of both pre-service and in-service programs for teachers who teach mathematics across all years of schooling.

Teacher Recruitment

A number of stakeholders expressed concern that not enough highly able secondary school graduates are being attracted to teaching as a career. References were made to some teacher education programs that currently accept applicants with relatively low tertiary entrance (Overall Position or 'OP') scores. This was seen as a factor explaining low levels of literacy, numeracy and science knowledge among some graduates of pre-service teacher education programs.

Teacher recruitment issues are complex and it has not been possible to address these issues as part of this review. It is interesting to note, however, that the world's top-performing education systems have developed more effective mechanisms than low-performing systems for selecting people into teaching training:

> These mechanisms acknowledge that for a person to become an effective teacher they need to possess a certain set of characteristics that can be identified before they enter teaching: a high overall level of literacy and numeracy, strong interpersonal and communication skills, a willingness to learn, and the motivation to teach. (Barber & Mourshed, 2007)

High-performing education systems – such as Singapore and Finland – select people for entry into teacher education programs and limit places in those programs so that teacher supply matches demand. Finland, for example, conducts a two-stage screening of applicants for entry to teacher education. Since 2007, the first stage has been based on a national multiple-choice examination designed to test applicants' literacy, numeracy and problem-solving skills.

It also is interesting to note the introduction of 'Teach for Australia', a program modeled on Teach First in Britain and Teach for America in the US. Teach for Australia aims to attract top graduates from all disciplines to teach for two years in disadvantaged secondary schools as a first step in their career. Recruits will be intensively trained for six weeks before they commence teaching. In 2010 opportunities will be based in Victoria, with the expectation that other states and territories will join the program in 2011. The total numbers of teachers employed in this way are likely to be small, but initiatives of this kind have the potential to attract into teaching graduates with superior levels of literacy, numeracy and science knowledge.

6.1 Ensuring Prerequisite Knowledge

In light of research evidence that teachers' own levels of subject knowledge and pedagogical content knowledge are key determinants of classroom teaching effectiveness; commonly expressed concerns about the literacy, mathematics and science knowledge of some primary teachers; and the percentage of teachers who themselves report that they do not feel as well prepared as they could be (particularly to teach science), a starting point in

improving teaching and learning in primary schools would be to ensure that every graduating primary teacher meets minimally acceptable standards in English literacy, mathematics and science and in the teaching of these subjects.

The proposal that graduating teachers be required to demonstrate at least minimally acceptable standards of content knowledge and pedagogical content knowledge as a condition of registration is contained in the reports of both the National Inquiry into the Teaching of Literacy and the National Numeracy Review:

> The Committee recommends that the conditions for teacher registration of graduates from all primary and secondary teacher education programs include a demonstrated command of personal literacy skills necessary for effective teaching, and a demonstrated ability to teach literacy within the framework of their employment/teaching program.
>
> (*National Inquiry into the Teaching of Literacy*, 2005)

> While there is considerable discussion about the need to assess pre-service teachers' mathematical knowledge, there seems to be little agreement on what to measure and how. Pressing questions – 'such as the balance of knowledge of content and knowledge of pedagogy, the nature of content knowledge useful for teaching, and the "content" of pedagogical knowledge – have not been answered' (Hill, Sleep, Lewis, & Ball, 2007, p.149). While the push for accountability is not likely to reduce, the challenge is to create the best tests possible.
>
> (*National Numeracy Review*, 2008)

Some countries have well-established methods of ensuring that beginning teachers meet minimally acceptable standards in areas such as literacy and numeracy. For example, in England, qualified teacher status (QTS) skills tests in numeracy, literacy and information and communications technology (ICT) were introduced in 2000-01 following concerns that teacher training was not providing a sufficient grounding in the basics. All teachers in England must pass these tests before they can be recommended for the award of qualified teacher status by their initial teacher training provider. There is no limit to the number of times the tests can be taken. In 2008, just over a quarter of the annual teacher intake failed to pass the literacy test and almost twice that number failed to pass the numeracy test on their first attempt.[8]

In the United States, tests are used both on entry to teacher education programs and at the point of registration to practice. Universities in many states use the *Praxis I: Pre-Professional Skills Tests* to measure the reading, writing and mathematics skills of applicants for entry into teacher education programs. *Praxis II: Subject Assessments* are used as part of the teacher registration process in almost all states to assess content knowledge as well as general and subject-specific teaching skills and knowledge. States specify which tests candidates must take and also set their own minimum performance requirements.

[8] www.tda.gov.uk/skillstests.aspx

RECOMMENDATION 1

That all aspiring primary teachers be required to demonstrate through test performances, as a condition of registration, that they meet threshold levels of knowledge about the teaching of literacy, numeracy and science and have sound levels of content knowledge in these areas.

This recommendation proposes that satisfactory performance on a set of standard assessment tasks become a requirement for registration to practise as a teacher in Queensland. Registration (Provisional and Full) and permission to teach are provided by the Queensland College of Teachers under the provisions of the Education (Queensland College of Teachers) Act 2005. The goals of QCT include 'upholding and enhancing the standards of the teaching profession; maintaining and enhancing public confidence in the teaching profession; and supporting and protecting the public by ensuring education in schools is provided in a professional and competent way by approved teachers' (Queensland College of Teachers, 2008).

In pursuit of these goals, the College has developed a set of Professional Standards for teacher registration. These Standards 'outline the capabilities that teachers must possess in order to provide high quality instruction and to support improved student learning' (Queensland College of Teachers, 2006). The Standards include 'knowledge statements' (see Figure 6.1) which are designed to 'identify the body of knowledge that underpins effective practice'.

The above recommendation proposes further work to elaborate on the specific literacy skills and mathematical and scientific content knowledge that every primary teacher should be able to demonstrate. It also proposes that essential pedagogical content knowledge be specified in greater detail in each of these three areas of learning. In this way, the recommendation builds on work already begun by QCT to identify what it is that every Queensland primary school teacher should know and be able to do.

Beyond the clarification of essential skills and knowledge for beginning teachers, the implementation of this recommendation requires the development of tests that can be administered to all graduate teachers applying for registration and the setting of minimally acceptable standards of performance on these tasks. As noted above, there is considerable international experience that could be drawn on in undertaking these activities. And, ideally, these activities eventually might be undertaken at a national rather than state level.

Teachers know and understand:

- the content, processes and skills of the areas they teach, and links across content areas
- the socially, culturally and historically constructed nature of knowledge
- ways of identifying learning goals and developing and documenting learning plans
- ways of gathering and using student information in the design of learning experiences
- how students learn and the implications for practice relevant to early, middle and senior phases of learning
- ways of identifying, evaluating and selecting teaching, learning and assessment strategies, resources and technology
- individual learning needs of students including those with particular needs, such as students with disabilities and learning difficulties, and gifted students
- techniques for planning, negotiating and implementing the curriculum and evaluating learning experiences
- the pervasive nature of language, literacy and numeracy and their role in learning and everyday situations
- a range of contemporary evidence-informed theories on language, literacy and numeracy development and the role of effective strategies and resources in enhancing this development
- techniques for determining language, literacy and numeracy learning opportunities and requirements in curriculum, school, classroom and community contexts
- authentic literacy and numeracy assessment strategies for gathering information and making judgements about students' language, literacy and numeracy development
- how students develop language, literacy and numeracy
- mathematical applications and problem solving
- the ways that different communication methods and social, cultural and historical contexts influence language choice and literacy and numeracy practices
- a range of teaching strategies and resources for supporting language, literacy and numeracy development across teaching areas and in different contexts
- how ICT supports, enhances, enables and transforms language, literacy and numeracy expectations and development
- how to monitor and evaluate students' language, literacy and numeracy needs (including those for whom English is a second language or dialect) and are aware of appropriate intervention strategies and support services

Figure 6.1 'Knowledge statements' (excerpts) from the Professional Standards for Queensland Teachers, *2006*

6.2 Building Expertise

To raise overall levels of achievement and narrow achievement gaps in Queensland primary schools, attention must be paid to ways of building the expertise of *all* teachers. As the McKinsey report observed, the only way to improve student outcomes is to improve the quality of classroom teaching across an entire system. The best-performing systems internationally go to great lengths to ensure that all their teachers are well prepared in the subjects they teach and have access to high-quality, ongoing professional learning opportunities (Barber & Mourshed, 2007).

Finland has attempted to ensure that all its teachers are well prepared by requiring that every commencing teacher has a master's degree. In the process, Finland has succeeded in raising the perceived status of the teaching profession. Singapore has placed its emphasis on ensuring the academic rigour of its teacher education programs and also provides all teachers with an entitlement to 100 hours of fully-paid professional development each year through its National Institute of Education. The District of Boston has established three pillars to its education reform effort – 'professional development, professional development and professional development' – and has allocated five per cent of its education budget to this purpose.

In England, the government has established the Training and Development Agency for Schools (TDA) to oversee teacher recruitment and pre-service training and to work with schools and providers to ensure the availability of high quality professional learning for teachers. The TDA currently is implementing the Prime Minister's commitment to a new practice-based Masters in Teaching and Learning (MTL) to deepen and broaden practising teachers' professional skills. The MTL, which will commence in September 2009, will be a joint undertaking of schools and participating higher education institutions, with each teacher being supported by a school-based coach and university tutor (see Figure 6.2).

Studies of high-performing education systems suggest that improved outcomes for students depend on specific kinds of teacher learning:

> Top-performing systems are relentless in their focus on improving the quality of instruction in their classrooms. Yet this focus on instruction, though a necessary condition, is in itself insufficient to bring about improvement. In order to improve instruction, school systems needed to find ways to change fundamentally what happens in classrooms. At the level of individual teachers, this implies getting three things to happen:
> - Individual teachers need to become aware of specific weaknesses in their practices.
> - Individual teachers need to gain understanding of specific best practices.
> - Individual teachers need to be motivated to make the necessary improvements.

> Such changes come about when teachers have high expectations, a shared sense of purpose, and above all, a collective belief in their common ability to make a difference to the education of the children they serve.
>
> (Barber & Mourshed, 2007, 27)

UK Masters in Teaching and Learning

In England, the government has given the Training and Development Agency for Schools (TDA) the role of introducing the new Masters in Teaching and Learning (MTL).

The MTL is a new qualification designed to boost the quality of teaching to improve the achievement of all students; to help meet the needs of a 21st century profession working in 21st century schools; and to further advance the status of the profession. The program will be practice-based and only available to practising teachers.

Higher Education institutions will validate that the program is genuinely at master's level and provide a tutor for each participant. Schools will collaborate with universities in joint delivery, with teachers in schools acting as coaches for each participant.

It is envisaged that the program will be modular with a mix of core and elective modules which will progressively build on each other. These could be taken at any point during the first five years of teaching but ideally might be completed within a three year period to help to ensure coherence and progression and to make it easier to provide continuity of support. Modules might cover a range of areas, such as: subject knowledge and subject pedagogy, special education needs and disability, assessment for learning and personalisation of teaching and learning, early years, teaching in complex school settings (those facing challenging circumstances), behaviour management, and integrated working in schools.

The increased levels of knowledge, understanding and skills and the development of professional attributes that the program provides should mean that teachers with the MTL are well placed to demonstrate professional standards at a higher level in support of applications to be assessed as Excellent Teachers or Advanced Skills Teachers. But there is no direct link between the MTL and pay or progression decisions.

The costs of the program initially will be met by the TDA.

The TDA recently undertook a procurement exercise to commission MTL providers (schools and universities working together) and issued preferred supplier status to four consortia.

Being the Best for our Children (2008)

Figure 6.2 Details of the UK Masters in Teaching and Learning program

In general, initiatives to build teacher expertise are likely to be more effective if they:

- are focused on changing classroom practices and, in particular, giving teachers a wider repertoire of effective teaching strategies;
- are part of a whole-school effort to improve learning outcomes for all students;

- are targeted on individual teachers' needs and readiness;
- develop teachers' content knowledge and pedagogical content knowledge;
- increase teachers' familiarity with research evidence around best practice;
- are an integral part of a teacher's ongoing work and learning (rather than an isolated event);
- include the detailed analysis of student responses and work;
- involve teachers working together and learning from each other; and
- are supported by a school culture of coaching and mentoring.

In relation to the delivery of professional development, Luke and McArdle (2009) note that the trend in Australia has been to devolve decisions about professional development to schools, clusters and regions, under the premise that principals and teachers are best positioned to select and implement professional learning programs. While centrally prescribed professional development may not always be well targeted on local teacher needs, 'it is equally clear that simply outsourcing PD to schools for principals to allocate on a discretionary basis has, at best, highly variable results' (Luke & McArdle, 2009). They argue for a balance between central prescription and local decision making, and point to the Ontario Literacy and Numeracy Directorate's system-wide, evidence-based literacy professional development as an example of an approach that has led to improved teacher learning and demonstrated improvements in student outcomes.

An approach to building increased levels of expertise in the teaching of primary literacy, numeracy and science would be for the Queensland Government to introduce a new structure and program of advanced professional learning and to give an agency responsibility for overseeing the implementation of this program.[9] Courses offered under this program would sit alongside other professional learning opportunities offered to schools, such as the widely-used Australian Academy of Science's Primary Connections program and the six Science Centres of Innovation and Professional Practice (SCIPPS).

RECOMMENDATION 2

That the Queensland Government introduces a new structure and program of advanced professional learning in literacy, numeracy and science for primary school teachers.

This recommendation envisages the specification and development of a number of professional learning *modules* in literacy, numeracy and science. The modular approach would enable schools and teachers to select modules

[9] An appropriate agency may be the Queensland College of Teachers.

appropriate to their particular needs. The modules would be designed to extend teachers' content knowledge and pedagogical content knowledge, including their knowledge and skills in diagnosing learning difficulties, assessing and monitoring student progress, and targeting teaching on individual needs and readiness. Each module would draw on, and familiarise participants with, evidence from research and best practice in the teaching of literacy, numeracy and/or science. Each module also would have a significant practice-based component requiring teachers to apply and explore the content of the module in their own classrooms.

Key features of the proposed modules are that they would be undertaken over a period of time, be delivered by accredited providers and have an associated assessment requirement (usually involving a classroom application). Providers would be expected to make provision for the delivery of modules by distance education.

It is envisaged that the responsible government agency would develop broad specifications for the set of modules, with the exact content and assessment requirements of each module being developed by providers. The responsible agency would review how providers proposed to develop and deliver the modules and endorse proposed modules for use by schools. The agency also would keep a record of teachers' successful completion of modules.

Teachers would register for a module with a provider and pay a registration fee to that provider. This fee would be paid from the school's professional development budget, by teachers themselves, from a special-purpose fund (e.g., a National Partnership agreement), or some combination of these.

Where a provider is a university or a consortium involving a university, consideration should be given to the possibility of successfully completed modules being credited towards a postgraduate qualification (graduate certificate, graduate diploma or master's degree).

The proposed approach would require the development of a coherent program of professional learning modules designed to build expertise in the teaching of literacy, numeracy and science. Some modules would build on to other modules in the program in a sequential way. The successful completion of modules would not have direct implications for teacher remuneration or status, although schools and education systems may choose to link the successful completion of a program of learning to curriculum leadership positions. For example, the completion of a defined combination of advanced literacy, numeracy and science modules might be treated as an expectation for appointment to a general curriculum leadership position in a school, or the completion of a specific sequence of in-depth modules in a particular curriculum area (e.g., science) might be an expectation for appointment to a specialist teaching position in that area.

6.3 Specialist Teachers

A further strategy for raising levels of literacy, numeracy and science in primary schools is to increase the number of teachers with advanced training and expertise in these curriculum areas and to encourage schools to make greater use of these teachers as coaches and mentors to other teachers, in team teaching, and in providing general curriculum leadership to these areas (Dinham, Ingvarson, & Kleinhenz, 2008).

Many Australian primary schools report already having 'specialist' teachers in areas such as science. This may be more common among private schools, in K-12 schools, and in schools that have established close relationships with local secondary schools. Specialist science teachers often are involved in team teaching, lead extra-curricular activities such as the school's participation in science projects and competitions, and sometimes maintain a special science room/laboratory.

In Western Australia, the *Getting it Right* program trains specialist literacy and numeracy teachers who work alongside classroom teachers to assist in diagnosing and addressing the needs of students who are at risk, including Aboriginal students, boys, students with a language background other than English, and students in rural and remote locations.

> Specialist teachers model teaching strategies in their area of specialisation and support the planning and implementation of effective teaching and learning programmes. They do not routinely withdraw groups of students from a class, and the classroom teacher maintains responsibility for the progress of all students in the class. Specialist teachers share their expertise with colleagues and gradually build the capacity of the whole school to improve literacy and numeracy. They support the collection, analysis and use of information about literacy and numeracy progress of individual students, groups and the whole school so planning decisions can be informed by quality evidence of learning and ongoing needs.
>
> (Department of Education and Training, 2007)

In Victoria, coaching is part of the professional learning culture in many government schools (Boyd, 2008). This coaching ideally is focused on improving student outcomes; is research-based; embedded in teacher practice; collaborative and reflective; based on feedback and evidence to progress teacher learning; and an ongoing element within the school culture.

> The ultimate goal of any coaching program is to institutionalise reflective practice and continuous improvement among staff as part of collaborative, collegial learning environments for the purpose of improving student achievement. (Boyd, 2008)

A general strategy that should be considered is to increase the number of specialist literacy, numeracy and science teachers in Queensland primary

schools. These teachers could be appointed on the basis of their advanced training and expertise in these areas and, where possible, should work with other classroom teachers in team teaching arrangements.

Ideally, every primary school teacher would be an expert teacher of literacy, numeracy and science. This ideal should remain the ultimate goal. The intention of specialist teachers should not be to relieve colleagues of the need to continue to develop their own expertise in these curriculum areas. Rather, this recommendation recognises the reality that some teachers will have higher levels of interest, training and expertise in particular areas of the primary curriculum than others, and seeks to give those teachers a role in raising the quality of teaching and learning throughout the school.

RECOMMENDATION 3

That additional funding be made available for the advanced training and employment of a number of 'specialist' literacy, numeracy and science teachers to work in schools (and/or district offices) most in need of support.

The Bligh Government's 2009 election commitment to employ 100 new science teachers in primary schools to work with students in Years 4 to 7 under the 'Science Spark' program is consistent with the increase in the number of specialist science teachers being suggested here.

7 Effective Classroom Practices

The recommendations in Chapter 6 assume that expertise in the teaching of primary literacy, numeracy and science can be described and developed – that the characteristics of highly effective teachers and highly effective teaching practices in these areas are well understood and capable of development through exposure to appropriate professional learning opportunities. This assumption is well supported by a substantial body of international research.

It is beyond the scope of this review to consider the evidence relating to specific classroom teaching practices in literacy, numeracy and science. For the present purpose it is sufficient to note that there is clear research support for particular approaches to the teaching of these subjects, and that evidence-based teaching strategies should be at the core of attempts to enhance primary teaching expertise in Queensland. Some of this evidence has been consolidated in meta-analyses of international research. For example, research into the teaching of literacy is very well developed (Louden, et al., 2005; Freebody, 2007) and there have been major international reviews of the most effective ways to teach reading (National Reading Panel, 2000; Snow, Burns & Griffin, 1998).

In Australia, the National Inquiry into the Teaching of Literacy and the National Numeracy Review both included reviews of recent research into specific classroom teaching practices. For example, the National Numeracy Review reported research findings on some common approaches to the teaching of numeracy:

> Instructional programmes based around cooperative learning, like the Classwide Peer Tutoring programme, showed the largest gains in student learning. Cooperative and collaborative learning approaches, including peer-tutoring programmes, were [particularly] effective with low attaining 'at risk' students and students with special educational needs… Other instructional approaches with more modest effects included mastery learning and direct instruction [which] has been described as a 'systematic method for presenting learning material in small steps, pausing to check for student understanding, and eliciting active and successful participation from all students'
>
> (*National Numeracy Review*, 2008)

In a review of research into effective early literacy teaching practices, Louden et al. (2005) highlighted the crucial importance of the teacher in producing exceptional learning outcomes. On the basis of their review, they concluded that highly effective literacy teachers:

- have a *wide repertoire* of teaching practices which they are able to skilfully employ to suit the classroom context, their purposes and the needs of their students;
- *individualise* instruction in order to support and challenge students;

- *motivate* students to participate in classroom activities at the same time as they gain the respect of their students and skilfully structure activities and instruction; and
- teach a *balanced* literacy curriculum which includes word and text level knowledge and skills, particularly phonemic awareness, phonics, fluency, comprehension and oral language.

In addition to research support for specific teaching practices in literacy, numeracy and science, there is research support for general pedagogical strategies such as connecting with and engaging learners; building students' positive views of their own learning capacities; and providing timely feedback to guide student action. The remainder of this chapter sketches three general pedagogical strategies that have been shown to make a difference in improving outcomes for students.

7.1 Early Intervention

Unsurprisingly, there is powerful research support for identifying and addressing individuals' learning needs – including their learning problems and difficulties – as early as possible in the schooling process. On entry to school, children have very different levels of language, social, cognitive and psychomotor development and are developing at different rates. Some children have little difficulty catching up during their first few years, but others who begin school with developmental delays can experience ongoing problems, for example in learning to read.

Children whose learning needs are not identified and addressed in the early years of school sometimes fall increasingly behind their age peers with each year of school. Hauser (2003) reports increasing variability in US students' performances on standardised mathematics tests across the primary years, due largely to the tail of the student distribution falling further behind with each year of school. Wiliam (2007) reports a parallel observation for a range of UK achievement measures. Research in the UK (e.g., Harlen, 1997; Wiliam, 2007), USA (e.g., Hauser, 2003) and Australia (e.g., Masters & Forster, 1997) reveals that, by the end of primary school, the gap between the highest and lowest achieving students in reading and mathematics can be the equivalent of six or more years of school. And, because some student groups (e.g., Indigenous students and students living in remote locations) tend to be over-represented among lower achieving students, gaps for these groups often widen across the primary years.

By the end of primary school, some students have slipped so far behind in their learning that it can be difficult to return them to a trajectory of successful literacy, numeracy and science learning. By the middle years of school, significantly under-achieving students often become disengaged, disenchanted, and increasingly absent. Many of these students eventually leave school early. It is during the primary years – and particularly the early primary years – that

individuals' learning needs must be identified and addressed and children's views of themselves as successful learners must be promoted and reinforced.

A number of the schools visited as part of this review place a high priority on diagnosing and addressing individual learning needs in the first two years of school. These schools have made decisions to dedicate discretionary resources to the early years, for example by employing teaching assistants to work with teachers and children in this phase of schooling. A priority is placed on supporting students' oral language development and their pre-reading skills, and a range of programs for these purposes are being implemented across the schools we visited.

The focus in these schools is consistent with a broader national recognition of the importance of the preschool years and the early years of school in laying the foundations for successful ongoing learning. National agreement to provide learning opportunities for all children in the year before formal schooling; the development of an Early Years Learning and Development Framework that emphasises play-based learning, early literacy and numeracy skills, and social development; agreement to increase investment in the training of the early childhood workforce; and the creation of the Australian Early Development Index (AEDI) all reflect a greater recognition of the importance of the early years to a child's later learning and success.

For example, the AEDI – an adaptation of the Canadian Early Development Instrument – is being promoted by the Australian Government to provide local communities with information about young children's developmental levels and to encourage collaboration between schools, early childhood services and local agencies to support children's development. Teachers complete an AEDI checklist for each child covering five areas of development:

- *physical health and wellbeing* (whether a child is healthy, independent, ready each day);
- *social competence* (whether a child plays, gets along with others, shares, is self-confident);
- *emotional maturity* (whether a child is able to concentrate, helps others, is patient, not aggressive or angry);
- *language and cognitive skills* (whether a child is interested in reading and writing, can count and recognise numbers and shapes); and
- *communication skills and general knowledge* (whether a child can tell a story, communicate with adults and children, is articulate).

Year 2 Diagnostic Net

The Queensland Year 2 Diagnostic Net is a further example of an initiative to identify and address learning needs in the early years of school (Education Department of Western Australia, 1995). The Diagnostic Net is used by teachers of children in Years 1, 2 and 3 to monitor progress in reading, writing and number and to provide reports in these areas to parents. Teachers:

- observe and map children's progress using developmental continua for literacy and numeracy;
- assess identified Year 2 children with specially designed tasks and identify children who require intervention;

- provide support to children requiring additional assistance; and
- report to parents on children's literacy and numeracy development.

This review has examined preliminary analyses of the 2008 Year 3 NAPLAN results of children identified by the Year 2 Diagnostic Net as having low levels of reading, writing and numeracy. It has not been possible from the provided analyses to gauge the effectiveness of interventions for children identified in the Year 2 Net.

Conversations with teachers in schools visited by the review raised – but left unanswered – a question about the adequacy of current support materials for diagnosing children's learning needs on entry to school. The National Numeracy Review argued that appropriate school entry assessments would have value in better supporting early numeracy teaching and learning:

> The evidence shows that school entry assessments have potential for informing the teaching and learning of numeracy, and that appropriately constructed school entry assessments, along with adequate school and system support for teachers to administer the assessments, and associated teacher professional development, would assist teachers in supporting the subsequent learning of all students. (*National Numeracy Review*, 2008)

A related question concerns the adequacy of materials for monitoring progress in literacy and numeracy between the commencement of Prep and Year 3. There are very few Australian assessment resources that permit rigorous longitudinal mapping of children's literacy and numeracy development through this phase of schooling. Available materials include those created for the Longitudinal Literacy and Numeracy Survey (Meiers et al., 2006). Further exploration of the adequacy of available resources and training in the diagnosis and monitoring of children's literacy and numeracy development across the earliest years of school may be warranted.

7.2 Targeted Teaching

A second general pedagogical strategy with strong support in research is the targeting of teaching on students' current levels of readiness and need. This strategy is sometimes referred to as the 'personalisation' of teaching.

Because students of the same age can be at very different stages in their learning and development, and because most learning is a personal process of making sense of the world and building new knowledge from existing knowledge, to be effective, teaching must be tailored to students' current levels of understanding and readiness. This fact has long been understood:

> The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him [sic] accordingly.
>
> (Ausubel, 1968)

Highly effective teachers work at understanding the knowledge, skills, beliefs, interests and motivations that students bring to the classroom and pay attention

to individuals' incomplete understandings and naïve conceptions. This requires much more of teachers than the creative delivery of subject matter; highly effective primary teachers actively inquire into students' understandings and create classroom activities capable of revealing student thinking:

> A critical feature of effective teaching is that it elicits from students their pre-existing understanding of the subject matter to be taught and provides opportunities to build on – or challenge – the initial understanding.
>
> (Bransford et al, 2000)

Recent research has made clearer the importance of 'starting point' assessments: that is, assessments designed to establish individuals' current understandings, misconceptions and levels of attainment as starting points for teaching. Fullan, Hill, and Crévola, (2006) contrast this use of assessment to guide teaching with the more usual use of assessment to establish how much of what teachers have taught students have learnt:

> In an ideal world, the teacher would have precise and current knowledge of each student's starting points and also of what assistance each student requires to move to the next level. (Fullan et al., 2006)

Having established individuals' current levels of achievement, effective teachers then find ways of matching learning opportunities to these levels. Learning is maximised when tasks are not so easy as to be boring, and not so difficult that students become disengaged and give up. There is evidence that learning is most likely to occur when a student is presented with challenges just beyond their current level of attainment – in what Vygotsky (1978) referred to as the 'zone of proximal development' – the region of 'just manageable difficulties' where students can succeed, but often only with the support of others, for example through 'scaffolding' activities (Wood et al., 1976).

Ensuring that every student is presented with maximally challenging learning opportunities is difficult in a class of 25 to 30 students of mixed abilities. Highly effective schools and highly effective school systems find ways to address the learning needs of individuals within existing school structures. This involves engaging and challenging students at all levels of achievement, including students already working well beyond the average for their grade.

Among the strategies that appear to be effective in addressing the needs of students who are slipping behind in their learning are individualised and small group teaching tailored to the needs of those students. In some schools and school systems, students who are experiencing difficulties are withdrawn from their classes and work with teachers trained in addressing special learning needs. For example, in Finland, every eighth teacher is a 'special education teacher' who does not have a class, but works with students – either individually or in small groups – who require additional help. Up to 30 per cent of students in Finland are supported at some time by a special education teacher, and so there is little stigma attached to being withdrawn for this purpose (Barber & Mourshed, 2007). In other schools and school systems, students experiencing difficulties remain in their classrooms and receive

additional support and attention. Both broad strategies appear to be effective in addressing individual learning needs:

> There is evidence of successful approaches to supporting at risk students through withdrawal programmes, both individually and in groups and involving direct teaching. There is also evidence of successful approaches that support at risk students within classrooms. Classroom approaches seem to have the added benefits of supporting teacher professional development and therefore building school capacity.
>
> (*National Numeracy Review*, 2008)

The important point is that high performing schools and the world's top-performing school systems have well-developed strategies for identifying students who are slipping behind in their learning and for addressing their individual learning needs.

7.3 Continuous Monitoring

A third and closely related pedagogical strategy is close, ongoing monitoring of the progress of individual learners in key areas of the school curriculum.

At any point in a student's learning it is important that teachers have a good understanding of where the student is up to, including an understanding of the student's current strengths and weaknesses, so that learning needs can be addressed and appropriate learning opportunities can be provided. This 'formative' monitoring of learning and its use to provide feedback to students on how they are performing and what they could do to make further progress is a key element of highly effective teaching. Wiliam and Thompson (2007) found that close monitoring of this kind had a greater impact on student achievement than either reductions in class sizes or increases in teachers' content knowledge. They also identified effective monitoring as having three elements: establishing where learners are in their learning, establishing where they are going, and establishing how to get there.

Clarity about where students are up to in their learning can be lost at transition points between the years of school, between phases of schooling, and when students move from one school to another. Marshak (2003) describes how knowledge about individual students and their learning needs is often lost in US primary schools:

> In elementary schools, children move from one teacher to the next every year. Every year we trash a year's worth of relationships built between children and their teacher, and we throw away all the knowledge the teacher has gained about what each child needs and can do. Each year, we tell every child and teacher to start over again. (Marshak, 2003)

In some of the schools visited by this review, school-wide processes have been put in place to ensure that information about individual students and their learning is not lost but communicated between teachers across the years of school.

A prerequisite for monitoring a student's progress in literacy, numeracy or science across the primary years is a shared understanding of the nature of long-term progress in each of these areas of learning. All teachers must have a good understanding not only of the knowledge, skills and understandings that students should be developing across the primary years, but also of typical sequences and paths of student development. If teachers are to establish where individuals are up to in their learning, then they require good understandings of the learning terrain through which they are progressing and of the paths along which students typically travel.

The developmental continua that underpin the First Steps literacy and numeracy materials (Education Department of Western Australia, 1995) and the Year 2 Diagnostic Net provide teachers with maps that describe typical sequences and paths of literacy and numeracy development in the early years of school. These maps include 'indicators' that teachers can use in making judgements about individuals' levels ('phases') of development and progress over time.

The NAPLAN literacy and numeracy scales are other examples of continua that can be used to map and monitor student progress over time. Each of the NAPLAN continua is marked out numerically using a scale from 0 to 1000. This scale can be used to track a student's progress from Year 3 to Year 10. Figure 7.1 illustrates for a hypothetical student (Daniel T) how NAPLAN can be used to record and monitor an individual's numeracy progress across these years of school.

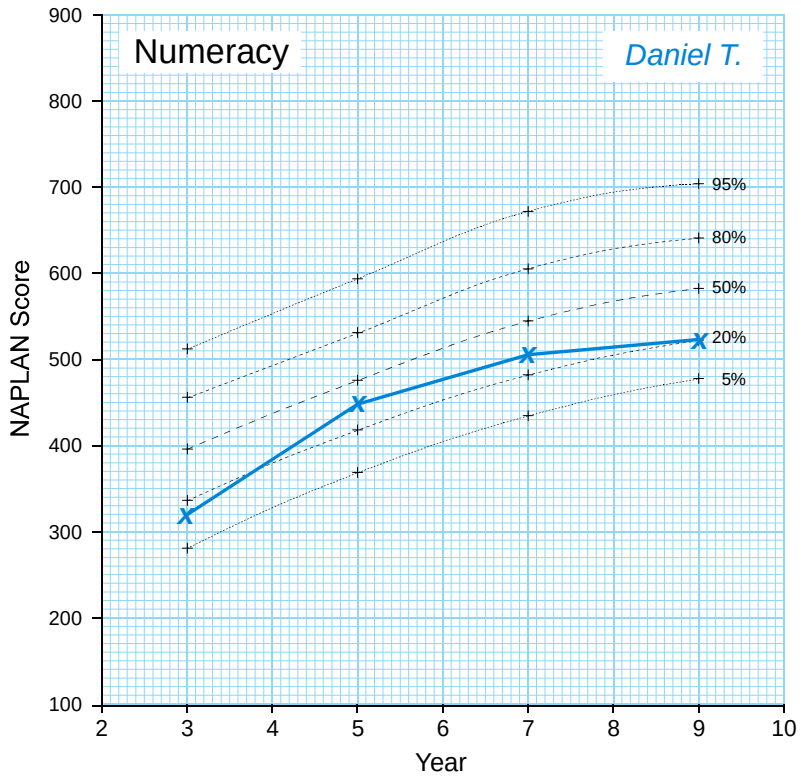

Figure 7.1 Example of individual growth chart in numeracy

The NAPLAN continua also are divided into ten described 'bands' of increasing literacy and numeracy proficiency. For each year level, one of these bands is identified as a 'national minimum standard' (Year 3, Band 2; Year 5, Band 4; Year 7, Band 5; Year 9, Band 6). Further work is required over the next few years to develop more comprehensive descriptions and illustrations of each of these ten bands. As teachers become more familiar with the NAPLAN continua and bands, these have the potential to become nationally agreed frameworks for monitoring students' literacy and numeracy development.

Because results on NAPLAN tests in Years 3, 5, 7 and 9 are reported on the same NAPLAN scale, and results on all future NAPLAN tests will be reported on this scale, it will be possible to track individual growth across the years of school and also to monitor trends in performance over time. In charting an individual's literacy or numeracy progress, a teacher could, in future, use not only the student's regular NAPLAN results (as in Figure 7.1), but also results on other tests calibrated on the NAPLAN scale (e.g., previous years' tests administered by the teacher at other times).

While the NAPLAN scales provide frames of reference for the regular monitoring of students' literacy and numeracy skills, and also establish national minimum standards for these skills at Years 3, 5, 7 and 9, no such national frame of reference exists for monitoring progress in science.

The Essential Learnings of the Queensland Curriculum, Assessment and Reporting (QCAR) Framework identify what science teachers are expected to teach and students should have opportunities to learn by the end of Years 3, 5, 7 and 9. However, under QCAR, students' knowledge and understandings of science concepts, facts, procedures, and processes at each year level are reported on a 5-point scale: *Very Limited – Limited – Sound – High – Very High*. A disadvantage of this system of reporting is that it does not allow progress to be measured and mapped across the years of school. For example, a student whose achievement is assessed as 'Limited' in each of Years 3, 5, 7 and 9 is almost certainly developing steadily higher levels of science knowledge and understanding across these six years of school. But this system makes it difficult to describe with precision what a student knows in science at any given time and impossible to quantify the student's progress over time.

As part of the QCAR Framework, the Queensland Studies Authority also has developed Queensland Comparable Assessment Tasks (QCATs) in English, Mathematics and Science at Years 4, 6 and 9. The QSA describes QCATs as 'low stakes' because they are not intended to be suitable for use in measuring school or teacher effectiveness or for comparing the performances of students in one school with the performances of students in other schools. The value of the tasks is considered to be at the school level. The (approximately) 90-minute performance tasks are designed to support consistency of teacher judgement, to provide parents/carers with information on how well their child has performed, to provide feedback to students, and to provide information for school planning (*Queensland Comparable Assessment Tasks,* 2009).

Teachers judge and report the quality of their students' responses to each QCAT using five grades, A to E. Once again, these grades do not provide a basis for monitoring student growth in science (or any other key learning area) across Years 4 to 9 and do not provide precise information about what students know and understand in science at any given time.

Information of this latter kind requires complementary assessments of science learning based on standard tests of science knowledge and understanding. Such tests could be developed for particular year levels (e.g., Years 4, 6, 8 and 10) and results on these tests reported on a scale similar to the NAPLAN scales, enabling individual progress to be tracked across the years of school and trends in performance to be monitored over time.[10] Described and illustrated levels of science achievement could be developed and minimum standards set at each of these four year levels. Ideally, these tests would be aligned with the planned national school science curriculum. In the meantime, the tests could be aligned with the science knowledge and understandings (K&U) identified by QCAR. These tests might be computer-based.

RECOMMENDATION 4

That standard science tests be introduced at Years 4, 6, 8 and 10 for school use in identifying students who are not meeting year-level expectations and for monitoring student progress over time.

Because NAPLAN tests (and the proposed science tests) report students' achievements in each aspect of literacy, numeracy and science on a continuum that is not tied to any particular year of school, but instead can be used to track student progress across a number of school years, and because levels of increasing proficiency (bands) along each of these continua describe and illustrate the knowledge, skills and understandings typical of students at each proficiency level:

- teachers and school leaders are provided with an improved basis for establishing students' current levels of literacy, numeracy and science achievement and for monitoring student growth in these key areas of the primary curriculum;
- the resulting measures of growth provide a better basis for evaluating a school's performance (i.e., the contribution the school is making to literacy, numeracy and science learning) than point-in-time measures of student achievement; and
- parents are provided with a better picture of students' *progress* in literacy, numeracy and science across these years of school than is provided by more traditional methods of reporting to parents (e.g., letter grades).

[10] TIMSS assesses samples of Year 4 and Year 8 students every four years.

Although individual growth charts of the kind shown in Figure 7.1 are familiar to parents for monitoring young children's physical growth (height, weight, etc.), parents generally do not expect to be able to monitor a child's increasing reading proficiency in this way – or the child's increasing proficiency in numeracy or science. The advantage of such a chart is that it enables parents to see an individual's progress from one occasion to another; to compare the child's current level of achievement with the achievements of other students in the same year level; and, by referring to the described and illustrated levels of proficiency, to see the kinds of knowledge, understandings and skills typical of that level of achievement.

Consideration also should be given to improved ways of supporting schools to analyse and interpret results on NAPLAN and the proposed science tests. Some interstate school systems have developed software to assist schools in interrogating and making best use of students' NAPLAN performances. An example is the 'SMART' software developed by the NSW Department of Education and Training. Ideally, such software would support schools not only in conducting detailed analyses of school data, but also in tracking and reporting student growth across the primary-secondary transition and across changes of school. At least one Queensland government school region is investing in a data analysis tool for use by all schools in that region. Although the Department's 'Oneschool' software may provide such a tool in the future, this is an area in which some schools are in current need of support.

8 School Leadership

A striking feature of the high-performing schools visited as part of this review was the strength of the school leadership. In each of these high-performing schools, the principal had been in place for a number of years, had built the tone and ethos of the school over time, had high expectations of teachers and students and had put in place an effective leadership team with a shared commitment to continuous improvement. What these schools had in common were strong leaders with a determination to improve outcomes for *all* students.

An important conclusion of this review is that a key to raising levels of literacy, numeracy and science achievement in Queensland primary schools is to ensure that every school has strong and effective school leadership.

The observations made in these schools parallel the recent conclusions of a study conducted in eight Victorian government schools which have been performing unusually well given their circumstances and student intakes:

> The reality in each of the eight schools studied is that leadership has been the key determinant of the success of the school… Each of the study schools is characterised by having strong leadership, with a clear vision and direction for the school and a high degree of leadership stability over time. (Zbar et al., 2009)

The Victorian study identifies strong leadership as the first of four 'preconditions' for improved student outcomes in a school. Strong leadership then plays a key role in establishing the other three preconditions:

- *high expectations of all students*
  ('In these schools, disadvantage is not used as an excuse for poor student outcomes.');
- *an orderly learning environment*
  ('In under-performing schools, the absence of an orderly learning environment is usually the first thing noticed and the major impediment to improvement and change.'); and
- *a focus on what matters most*
  ('In the primary schools, in particular, this means a real emphasis on literacy and numeracy.').

The conclusion that strong school leadership is a key to improved learning outcomes also is reached in a 2008 OECD study of school leadership in 22 education systems around the world:

> A large body of research on school effectiveness and improvement from a wide range of countries and school contexts has consistently highlighted the pivotal role of school leadership in making schools more effective (Scheerens and Bosker, 1997; Teddlie and Reynolds, 2000; Townsend, 2007). (Pont et al., 2008)

The OECD study identifies four strategic activities of school leaders associated with improved student learning:

- *Goal-setting, Assessment and Accountability*
  (includes setting strategic directions; developing school plans and goals; monitoring progress; and using data to improve practice)
- *Supporting, Evaluating and Developing Teacher Quality*
  (includes adapting the teaching program to local needs; promoting teamwork among teachers; and engaging in teacher monitoring, evaluation and professional development)
- *Strategic Financial and Human Resource Management*
  (includes allocating physical and human resources in the interests of improved student learning and influencing staffing decisions to ensure a match between staff and the school's needs)
- *Collaborating with other Schools*
  (includes developing relationships beyond the school borders to improve outcomes for students)

The improvement of literacy, numeracy and science performance in Queensland primary schools will depend in large measure on strong school leaders who are committed to a continuous improvement agenda and who know what to do to raise levels of student achievement. This chapter summarises what highly effective school leaders do to improve student learning and considers implications for school leadership development.

8.1 Setting High Expectations

In the schools visited as part of this review, high expectations for student behaviour and performance were driven by the school principal. The principal often was supported by an equally committed senior leadership team, but the principal usually had been instrumental in assembling this team and aligning it with his or her vision for the school.

The principal's expectations began with high expectations for student and staff behaviour. In some schools, the principals explained that, when they first commenced at the school, behaviour management had been an issue and their first priority had been to establish and ensure acceptable standards of student behaviour. It was only after this issue had been addressed – which included insisting on appropriate forms of interaction between staff, students and parents – that they were able to turn their attention to improving learning outcomes at the school.

Underpinning the efforts of these schools appeared to be a belief that *every* student in the school was capable of successful learning and should be expected to demonstrate progress. The fact that a school was in a socioeconomically disadvantaged area was not seen by the principal as an acceptable excuse for reduced expectations.

A commitment to high expectations was accompanied in these schools by a deep interest in how well these expectations were being achieved. The principal and other members of the senior leadership team analysed, discussed and shared with staff evidence about student performance, including comparisons of the school's results over time and with state-wide data. This observation also has been made in high-performing Victorian schools:

> Each of the schools has been particularly active in identifying tests and other assessments which contribute both to an objective picture of student achievement and to the determination of the value that the school itself adds, through an analysis of trends over time.
>
> (Zbar, Kimber, & Marshall, 2009)

If they are to make best use of objective evidence of this kind, school leaders require a level of expertise in the analysis and interpretation of school data and an understanding of how evidence can be used to guide strategic decision making:

> To make external accountability beneficial for student learning, 'data-wise' school leadership is needed. This involves school leaders developing skills in interpreting test results and using data as a central tool to plan and design appropriate strategies for improvement… Participatory evaluation and data analysis can strengthen professional learning communities within schools and engage those who need to change their practice to improve results. (Pont et al., 2008)

8.2 Ensuring Quality Teaching

The principals of high-performing schools view the quality of the teaching occurring in their school as *their* responsibility. In these schools, teaching is not seen as the sole responsibility of teachers working behind closed classroom doors while school leaders attend to school administration. Instead, school leaders and classroom teachers work together as a team to improve their shared understandings of effective teaching practices and to improve the quality of teaching occurring throughout the school. This expectation that school leaders will play a more direct hand in monitoring and supporting the professional work and learning of teachers is observed internationally:

> While practices vary across countries, it is clear that school leadership is generally expected to play a more active role in instructional leadership: monitoring and evaluating teacher performance, conducting and arranging for mentoring and coaching, planning teacher professional development and orchestrating teamwork and cooperative instruction.
>
> (Pont et al., 2008)

In the schools visited as part of this review, principals understood the importance of recruiting excellent teachers to the school and of keeping them there. They had developed various ways to do this, working with and around system processes as required. These principals used contacts and networks to identify potential recruits to the school, and several told stories of how they had

succeeded in 'moving on' teachers who clearly were not going to contribute to the school culture they wanted to build.

These high-performing schools also were characterised by high levels of collegiality. Structures and processes had been established for discussing the school curriculum, teaching practices, student work and the nature of student progress across the years of school. In this sense, teaching in these schools had been 'de-privatised'. Teachers with more advanced knowledge in the teaching of literacy, numeracy or science were used as in-school resources and coaches to support other staff, sometimes team teaching or leading group discussions of teaching methods.

The principals of these schools made strategic use of professional development to build the knowledge and skills required by teachers (and themselves) to deliver improved outcomes for students. Robinson (2007) identifies the strategic promotion of teacher learning and the direct engagement of principals in this learning as the leadership behaviour most strongly associated with improved student learning.

8.3 Allocating School Resources

In the schools visited as part of this review, school leaders allocated the human and physical resources of the school in ways that they judged would maximise learning for students. In a number of schools, this meant allocating additional resources to the earliest years of school. For example, available funds were used to employ additional teaching assistants to work with teachers of Prep, Year 1 and Year 2 students, enabling greater use to be made of small group and one-on-one teaching of oral language, pre-reading and early reading skills.

8.4 Supporting and Developing School Leaders

Many education systems now recognise that excellent school leadership is a key to improving outcomes for students and are giving significantly increased attention to the development and support of school leaders (Anderson, & Cawsey, 2008; Caldwell, 2006; Pont et al., 2008). Some systems have established specialised institutions to train and develop school leaders. Examples include the National College for School Leadership in England, the Austrian Leadership Academy and the proposed Victorian Institute of Educational Leadership (see Figure 8.1).

Education systems have developed a range of strategies for developing the capabilities of school leaders. These include:

- the development of standards and frameworks that identify the roles and functions of school leaders, specify what leaders need to know and be able to do, and set levels of performance competence;
- induction programs for newly appointed principals;
- mentoring and coaching programs;

National College for School Leadership
The National College for School Leadership (NCSL) in England is a government-funded non-departmental public body established to serve the professional development needs of school leaders and aspiring school leaders in England's 23 000 state-maintained schools. The NCSL does this through professional development programs, strategic initiatives, and by providing support and networking opportunities. The NCSL was launched in 2000 and has a purpose-built Learning and Conference Centre in Nottingham.

The NCSL's four key goals are to: 'transform children's achievement and well-being through excellent school leadership; develop leadership within and beyond the school; identify and grow tomorrow's leaders; and create a "fit for purpose" national college that is more strategic and offers school leaders increased leadership support'. The NCSL website (www.ncsl.org.uk) says that it tailors services to individual and local needs and draws on leadership practice from around the world in an effort to remain an authoritative national voice on school leadership and management issues both to school leaders and the government.

Austrian Leadership Academy
The Austrian government established the Leadership Academy in 2004 with a brief to develop the leadership capabilities of school leaders and other executives in the Austrian school system. The original focus of the Academy was on preparing principals who had worked in a hierarchical, bureaucratic structure to work with greater autonomy in leading schools. The Academy draws on research findings relating to innovation and change and conducts a program of leadership development for between 250 and 300 leaders each year.

Victorian Institute of Educational Leadership
In Victoria, the government has committed $10 million to establish a new Victorian Institute of Educational Leadership. The Institute, which will provide purpose-built learning and teaching spaces in a heritage site in North Melbourne, will open in 2010 to provide professional development for aspiring school leaders, principals and regional education network leaders.

Victoria's recent overhaul of school leadership preparation and development includes the introduction of mentoring programs for new principals, a coaching program for experienced principals, an accelerated program for high-potential leaders, extension programs for high-performing principals and a more rigorous job selection process for principals.

Figure 8.1 Examples of state/national bodies established to support the professional learning and work of school leaders

- in-service professional development for school leaders; and
- school leadership institutions with responsibility for developing leadership capabilities across a system.

The Victorian leadership development strategy (Learning to Lead Effective Schools, 2006) provides 19 programs for aspirant leaders, assistant principals and principals, including a Master in School Leadership qualification for teachers who demonstrate high leadership potential. The nineteen programs are commissioned from higher education institutions and other providers of professional development, together with nationally funded programs (Pont, et al., 2008).

Conversations with some Queensland government school principals suggested that they would appreciate greater access to support in the form of leadership coaching. In general, increased attention to the professional development of school leaders – particularly in leadership behaviours known to be associated with improved student outcomes – is likely to be an effective strategy for raising levels of literacy, numeracy and science achievement in Queensland primary schools.

In addition to needing greater support for their own professional learning, a number of principals referred to the increasing demands of the leadership role and their need for additional support in undertaking this role. If principals are to take greater responsibility for the quality of teaching and learning occurring in their schools, then they require additional support with other aspects of their role, including day-to-day school administration. Again, this issue is not specific to Queensland schools; it is made internationally:

> There can be few enterprises as large as a typical secondary school or a large primary school where the chief executive does not have a personal assistant and several managers to deal with business and finance… It is inexplicable that such support is not included in the basic package of support for leaders of schools in the public sector, when it is taken for granted for their counterparts in the private or independent sector.
>
> (Caldwell, 2006)

RECOMMENDATION 5

That the Queensland Government initiates an expert review of international best practice in school leadership development with a view to introducing a new structure and program of advanced professional learning for primary school leaders focused on effective strategies for driving improved school performances in literacy, numeracy and science.

9 System Support

In addition to the issues discussed in Chapters 6 to 8, a number of other matters were raised with the review. Some of the matters raised (such as detailed proposals for the teaching of reading) fell outside the scope of this review and it has not been possible to pursue them further. Other matters took the form of general challenges that governments and education systems face in delivering quality primary education and, because of their potential impact on literacy, numeracy and science learning in Queensland schools, are taken up in this final chapter.

9.1 Recruiting Teachers

A common response to the general question, 'What would it take to raise levels of literacy, numeracy and science achievement in Queensland primary schools?' was: 'Improve the quality of the people entering teaching in the first place'. This response usually was followed by a reference to the low standards required for entry into some teacher education courses and to the limited academic abilities of some graduate teachers. As noted in Chapter 6, school-based staff occasionally referred to the limited personal literacy skills and mathematical and scientific knowledge of some teachers.

Concern about the quality of students entering teacher education is not limited to Queensland, or even to Australia. Many countries are working to make teaching more attractive as a career, to raise standards for entry into teaching, to elevate the status of the teaching profession, and to find alternative pathways for bright young graduates who might not otherwise have considered teaching. Countries like Australia – which tend to draw teachers from the middle third of secondary school graduates and have witnessed a decline in the perceived status of teaching – are seeking ways to emulate countries such as Finland and South Korea which now experience competition for entry into teacher education courses and draw their teachers from the top 10 per cent of high school graduates.

A recent McKinsey study (Barber & Mourshed, 2007) notes that, in the world's top-performing school systems, high standards are set for entry into teacher education, the number of places in teacher education programs is limited to the number of graduates required, students compete for entry, and the status of teaching is high. In contrast, low-performing systems often set low standards for entry and train more teachers than they require, resulting in limited competition and low status. The dilemma is that it is difficult for education systems to raise entry standards when teachers are in short supply. However international experience suggests that unless entry standards are raised, teaching will remain unattractive to highly able high school graduates and the status of teaching will remain low.

This review makes no specific recommendation for increasing entry standards to teacher education courses or for raising the status of teaching as a career. Nevertheless, these are clearly issues that should continue to be addressed. A review of experience elsewhere, including initiatives to market teaching as a career (e.g., England), to restrict the number of places in teacher education programs (e.g., South Korea - primary), to set rigorous standards for entry into teacher training (e.g., Finland, Singapore), and to create alternative pathways into teaching for highly able graduates (e.g., US, England) may be useful in this process.

9.2 Appointing Staff to Schools

Another conclusion of the McKinsey study was that the world's top-performing education systems are unusually effective in ensuring that high quality teaching is distributed throughout the system. These systems come closest to achieving the ideal of providing every student in every classroom with access to excellent teaching.

A concern raised with this review was that the quality of teaching in Queensland primary schools varies significantly across the state. It was claimed that less able teachers sometimes end up in hard-to-staff schools – often schools in lower socioeconomic areas. The review also was shown staffing details for schools in one remote government school district. The figures showed that almost all schools in the district had experienced significant staff turnover in recent years. Many schools had several principals during this period, and most of the current teachers had been in these schools for very short periods of time. The review was told that, although remote schools and schools in low socioeconomic areas usually face greater challenges than other schools, they often are staffed by the least experienced teachers and school leaders.

Because of its geographical spread and the unusually high percentage of its population living outside metropolitan areas, Queensland faces greater challenges in providing uniformly high quality schooling throughout the system than most of the world's top-performing countries. Nevertheless, success in raising levels of literacy, numeracy and science achievement in Queensland primary schools – and particularly success in reducing achievement gaps – will depend on improving outcomes for students in schools throughout the state.

The challenges faced by staff in some schools are different because students and families do not share white middle-class experiences and values. Some schools reported considerable difficulty in getting parents to visit the school to talk with teachers. It was explained that parents in these schools often had negative experiences of school themselves and associated requests for meetings at the school with being in trouble. Teachers and principals outlined the difficulties of working with students who have no experience of, and no access to, books outside school. One principal explained how some students at her school had not understood what it meant to wear the school uniform. (She had

to explain to students that the shirt did not constitute the uniform and now specifies the number of articles of the uniform that students are expected to wear.) In some schools, student mobility is a very significant problem with large percentages of the student population moving between homes, family members, towns and schools each year.

Again, no specific recommendation is made in relation to this set of observations. The challenges of ensuring high quality literacy, numeracy and science teaching and learning in *all* Queensland primary schools are significant and have no simple solution. Approaches being attempted in other parts of Australia include the introduction of increased financial incentives for principals and teachers to work in poor performing schools in lower socioeconomic areas. Greater stability of staffing in these schools is likely to be a key. Additional specialised training and support in addressing the kinds of challenges being confronted in remote and very remote schools and schools in low socioeconomic areas also may assist.

9.3 Providing School Support Staff

Queensland primary teachers appear to have very variable access to colleagues with pedagogical expertise in literacy, numeracy and science. Many teachers have in-school access to another staff member (e.g., head of curriculum; curriculum coordinator) who may provide support and some coaching. However, these staff are not always in a position to provide expert teaching advice across the curriculum. In some large P-12 schools visited by the review, it has been possible to appoint key learning area coordinators, with teachers of secondary mathematics and science also team teaching and providing coaching to primary teachers. But in most schools, teachers appear to have very limited access to expert coaching and support in these areas of the curriculum.

The review visited one government district office in which external support of this kind had been established. District office staff ran professional development workshops for teachers and leaders in the district, attended meetings of school staff to discuss issues relating to curriculum and pedagogy, and provided one-on-one coaching to individual teachers as required. The arrangements in this office were described as an exception rather than the rule, and there was a view among some senior staff of the Department that the level of support to classroom teachers had declined in recent years. Consideration should be given to providing teachers and schools with greater access to highly trained local support staff in literacy, numeracy and science (e.g., working in district offices).

9.4 Specifying Teaching Time

Another question raised with the review related to the hours spent teaching literacy, numeracy and science in primary schools. It has not been possible to collect data on the amount of time Queensland teachers spend each week on these areas of learning. Some data are available from the 2007 Trends in

International Mathematics and Science Study (TIMSS) for Australia as a whole. TIMSS reports the number of hours Year 4 teachers are expected to spend on mathematics and science according to available curriculum documents. These expectations are then compared with the amount of time teachers report spending on these subjects.

According to the international TIMSS report (Martin, Mullis, & Foy, 2008), Australian curricula intend Year 4 teachers to spend about 5.4 hours per week teaching mathematics and 2.2 hours teaching science. Australian Year 4 teachers report spending, on average, 4.5 hours per week teaching mathematics and 1.2 hours teaching science. This reported time on science teaching places Australia among the countries spending least time on Year 4 science (Figure 9.1). Notice, however, that if Australian teachers spent as much time on science as intended in Australian curriculum documents, then they would spend about the same amount of time on science as teachers in Austria.

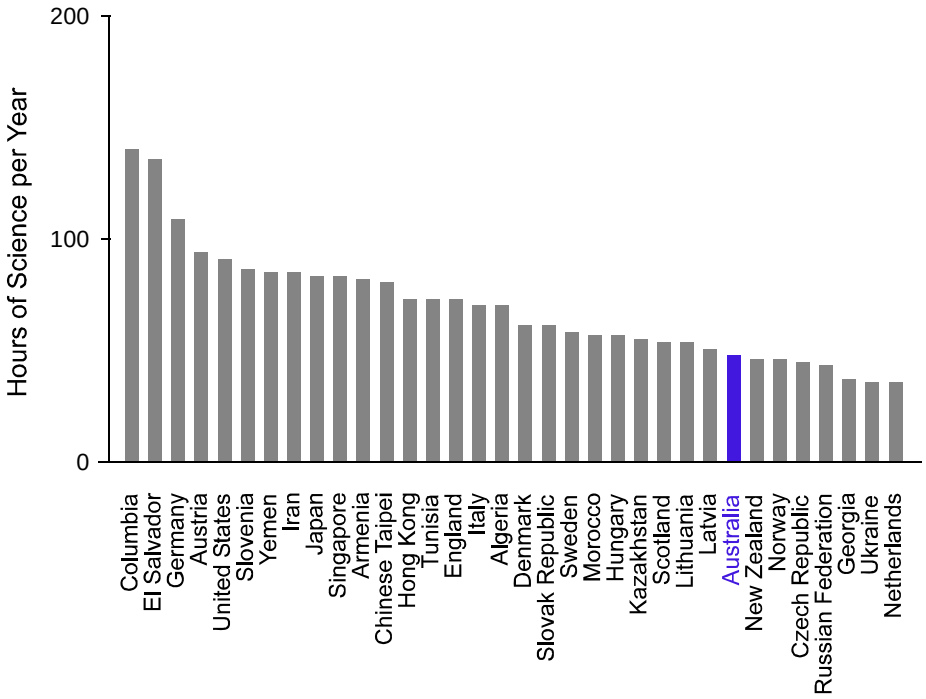

Figure 9.1 Hours of science teaching time at Year 4 (TIMSS 2007)

Further exploration of the amount of time being spent on literacy, numeracy and science in Queensland primary schools, and of the amount of time teachers should be devoting to these areas of the curriculum, may be useful. However, simply specifying that more time be spent on a subject such as science may not alone be sufficient to increase the amount of time given to this subject.

9.5 Promulgating Effective Practices

Finally, consideration could be given to improved ways of identifying and sharing practices that are already working to raise levels of literacy, numeracy and science achievement in primary schools. In addition to reviewing and learning from international experience, there is a need to encourage and support local experimentation and innovation and to systematically identify and scale up effective models of teacher and school practice. Continuous improvement – particularly progress in closing gaps and improving outcomes for Indigenous and disadvantaged students – will require ongoing organisational learning, not only at the level of the school, but also at the level of the system.

The magnitude of the challenge of ensuring that *every* student completes primary school with the knowledge, skills and attitudes required for success in secondary school suggests that entirely new solutions will be required to some longstanding problems. Technology is likely to play a part in some of these solutions. So too will new partnerships between schools, other community organisations and the business community. Education systems have a role to play in catalysing and supporting innovative practices to promote literacy, numeracy and science learning in schools and in ensuring that effective solutions are identified, disseminated and taken up more widely.

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Appendices

Appendix 1

Queensland Education Performance Review Steering Committee

Chair

Ken Smith	Director-General, Department of the Premier and Cabinet

Members

Annette Whitehead	Executive Director – Social Policy, Department of the Premier and Cabinet
Rachel Hunter	Director-General, Department of Education, Training and the Arts
Jenny Cranston	Deputy Director-General – Education, Department of Education, Training and the Arts
Mike Byrne	Executive Director, Queensland Catholic Education
Terry Creagh	Assistant Director - Education, Queensland Catholic Education Commission
David Robertson	Acting Executive Director, Independent Schools Queensland
Dr John Roulston	Executive Director, Independent Schools Queensland
Kim Bannikoff	Director, Queensland Studies Authority

Secretariat

Andrew Walker	Executive Director, Policy, Planning and Performance, Department of Education, Training and the Arts

In Attendance

Prof Geoff Masters	Chief Executive Officer, Australian Council for Educational Research
Prof Gabrielle Matters	Principal Research Fellow, Australian Council for Educational Research

Appendix 2

Improving Literacy, Numeracy and Science Learning in Queensland Primary Schools

PRELIMINARY ADVICE

Geoff N Masters

Australian Council for Educational Research

January 2009

This document provides preliminary advice to the Queensland Government and forms part of my review of levels of literacy, numeracy and science achievement in Queensland primary schools.

Performances of Queensland Students in NAPLAN and TIMSS

During January 2009, work was commenced to review available evidence concerning levels of achievement in Queensland primary schools. This work will continue over the next three months. The focus of the early data analyses has been on students' performances in the 2008 National Assessment Program - Literacy and Numeracy (NAPLAN) and state-wide literacy and numeracy tests prior to the introduction of NAPLAN, and on students' performances in the 2007 Trends in International Mathematics and Science Study (TIMSS) and in earlier studies conducted by the International Association for the Evaluation of Educational Achievement (IEA).

Following the release of NAPLAN and TIMSS results late in 2008, concerns were expressed about the performances of Queensland primary students in comparison with students in other states and territories. For this reason, our initial data analyses have focused on the *relative* performances of Queensland students and trends in these relative performances over time. Some preliminary conclusions are summarised below. More detailed analyses will be undertaken in the period February to April.

- *In 2007 and 2008, Queensland Year 3, 4 and 5 students were ranked below students in all states and territories other than the Northern Territory in tests of literacy, numeracy and science. The average performance of Queensland students in these year levels usually was significantly lower than the average performance in other states.* [11]

  There are several possible explanations for these lower performances. An obvious explanation is that students in Queensland, on average, have been in school for a shorter period of time than students in other states and territories. This is likely to have a particular influence in these early years of school. It should be noted, however, that in Finland – one of the highest performing countries internationally – the fact that students have had fewer years in school is not an impediment to a world-class performance.[12] The large number of small and remote schools in Queensland also may be part of the explanation for lower achievement levels.

- *There is some evidence that the reading and numeracy achievements of Queensland Year 3, 5 and 7 students relative to students in other states and territories declined between 2004 and 2008.*

[11] Based on Year 3 and 5 NAPLAN results and Year 4 TIMSS results. Differences between states are considered statistically significant if the 95 per cent confidence intervals around the means do not overlap.

[12] Students in Finland start school at age seven and attend school for four or five hours each day during their first two years. At age 15, students in Finland outperform students in other countries in reading literacy, mathematical literacy and scientific literacy.

This observation is based on a comparison of the percentages of students in the Australian states and territories achieving the relevant reading and numeracy 'benchmarks'. There is some evidence to suggest a decline in the relative performance of Queensland students over the past five years, particularly at Year 3.

- *There is evidence of a long-term decline in the mathematics and science achievements of Queensland students since the 1970s, both in relation to students in other states and in absolute terms.*

  This conclusion is based on Queensland's participation in international mathematics and science studies since 1964. One study of the mathematics performances of lower secondary students in the period 1964 to 1995 concluded that the decline in Queensland during this period was greater than in any other state and represented more than two years of learning.[13]

Recommendation 1
That the Queensland Government establish a goal to have Queensland primary students performing at the level of students in the highest-performing Australian states in literacy, numeracy and science within the next three years.

I view this as an aspirational goal, consistent with the stretch targets set by the Queensland Government in its 2020 vision statement. (Under the Government's ambition to deliver world-class education and training, 2020 targets have been set to provide all children with access to a quality early childhood education so they are ready for school, and to provide three out of four Queenslanders with trade, training or tertiary qualifications. No 2020 targets have been set for improving results in the school sector.) In practice, the goal could be to have Queensland primary students performing at the level of students in Victoria and New South Wales in most aspects of literacy, numeracy and science learning by 2012. The setting of such a goal would make clear what level of improvement was being sought for the state as a whole and could be followed and supported by targets for improvement within school sectors and individual schools.

A clear and realistic timeline for the achievement of this goal is important. International research shows that targeted interventions to improve the quality of classroom teaching can have a dramatic impact on student outcomes in a relatively short period of time. In England, new national training programs to promote best-practice teaching saw the number of students meeting literacy targets increase from 63 per cent to 75 per cent in three years. Similar initiatives in Boston saw the number of students meeting its mathematics standards increase from 25 per cent to 74 per cent, and the number of students meeting its English standards increase from 43 per cent to 77 per cent, in six years.[14]

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[13] Afrassa, TM & Keeves, JP (1999). Changes in students' mathematics achievement in Australian lower secondary schools over time. *International Education Journal,* 1 (1), 1-21.

[14] Barber, M & Mourshed, M (2007). *How the world's best-performing school systems come out on top*. McKinsey & Co.

Recommendation 2
That progress towards the achievement of this goal be monitored using NAPLAN Year 3, 5 and 7 tests in 2009, 2010, 2011, 2012 and TIMSS Year 4 tests in mathematics and science in 2011.

NAPLAN and TIMSS assessments should not be the only basis for monitoring progress in raising levels of literacy, numeracy and science achievement in primary schools. However, these two assessment programs provide independent measures of how Queensland students perform in relation to other states and territories and – in the case of TIMSS – other countries. Annual NAPLAN data will allow state and school performances to be monitored and compared from one year to the next, and trends over time to be established. TIMSS results will be released in 2012.

Improving Achievement: Research Evidence

The mere setting of a goal to improve achievement levels in primary schools will not in itself lead to improvement. Achievement levels will improve only if changes are made to current practices. With this in mind, during January a review was undertaken of international research evidence that might inform efforts to raise achievement levels in Queensland primary schools.

This research review concluded that the most effective way to increase achievement in literacy, numeracy and science is to increase the effectiveness of classroom teaching practices. A great deal is known from international research about the practices of highly effective teachers. In particular, research shows that highly effective teachers:

- set high expectations for student learning
- have deep knowledge of the subjects they teach and of how students learn[15]
- target teaching to individuals' levels of readiness and need
- continually monitor student learning and provide feedback to guide learning.

A great deal also is known about what high-performing schools and education systems do to promote more effective teaching. Findings from international research may provide a useful frame of reference for reflecting on current practices and for identifying strategies and initiatives to raise achievement levels.

Recommendation 3
That the Queensland Government put in place a range of initiatives to achieve its goal of increasing levels of literacy, numeracy and science achievement in primary schools over the next three years. These initiatives will be informed by the recommendations of the current review (to report at the end of April). At this stage I expect the review to make recommendations in a number of areas, including strategies for:

[15] In contrast, in the 2007 TIMSS study, fewer than half of Australian Year 4 teachers said that they felt very well prepared to teach Year 4 science.

- building teachers' knowledge and skills in literacy, numeracy and science teaching;
- enhancing the capacity of school leaders to drive improvement in schools;
- diagnosing student learning difficulties and monitoring individual progress; and
- creating a state-wide culture of continuous improvement that includes targets and systems for monitoring school performance and improvement.

The final review recommendations will be informed by detailed analyses of available performance data, an analysis of current practices in Queensland primary schools, and consultations with a range of stakeholders in the period February to April 2009. A general strategy should be to ensure that all teachers and all schools are doing what the best Queensland teachers and schools already are doing.

Identifying Students' Literacy and Numeracy Learning Needs

The research evidence on effective teaching suggests that levels of student achievement improve when teachers identify and understand individuals' current levels of attainment, diagnose learning difficulties and misunderstandings, and target teaching on student needs and readiness. When teachers work in this way, they use assessments to identify starting points for their teaching and to identify students who require special assistance or support.

The best teachers, when beginning work with a new class, do not assume that all students in the room will be equally ready for the same learning experiences. They do not teach to the middle of the class, but instead spend time establishing where students are up to in their learning and then differentiate their teaching accordingly. This is essential because, in a typical classroom, the highest-achieving children in reading and numeracy may be five or more years ahead of some other children in the room.

Recommendation 4
That last year's NAPLAN assessment materials – including test booklets, administration manual, marking guides, and details of the performances of last year's cohort on each test question – be made available to all Year 3, 5 and 7 teachers at the start of the 2009 school year for use in establishing students' current levels of literacy and numeracy development and to assist in identifying individual learning needs. To ensure the best outcomes at a classroom level, there should be no central marking or collection of students' test responses. This will be undertaken through the NAPLAN tests to be administered on 12-14 May 2009.

I am proposing that last year's NAPLAN materials be made available as a *resource* that teachers can use early in the 2009 school year to assist them in establishing students' commencing literacy and numeracy skills, to identify areas of strength and weakness, and to plan their teaching. These materials also may provide students with some useful test taking experience. Under this

recommendation, there would be no central collection of students' test responses: the materials simply would be made available for classroom use.[16]

I am proposing that teachers be provided with all of the 2008 materials (administration manual, test booklets, marking guides, etc.) together with an item-by-item commentary on how last year's students performed on these materials. An advantage of having teachers mark their own students' work is that this should provide them with a better appreciation of the current literacy and numeracy levels of individual students – information that should assist them in their literacy and numeracy teaching in the first three months of the school year, prior to the 2009 testing.[17] It also may draw attention to gaps in aspects of the school curriculum.

I envisage the materials being made available for downloading and printing from the Queensland Studies Authority (QSA) website. Schools would then print sufficient copies for students in each of the relevant year levels.

This proposed use of NAPLAN materials as a classroom resource is very different from the way in which NAPLAN tests are used as part of the annual national assessment program. To achieve national comparability, students' test responses in the national assessment program are collected and marked centrally. Classroom teachers do not see the written responses of their own students and they do not see the national marking guides that are used to evaluate students' responses. In contrast to what is being proposed here, no opportunities are provided in the annual national assessment program for in-school discussions of students' responses to NAPLAN materials.

The value of making last year's assessment materials available to schools will depend on how widely they are used. An important opportunity will be lost if the materials are simply added to a range of other assessment materials available for teacher use on the QSA website and are not widely used in schools. I believe that the use of past NAPLAN materials by teachers could provide a useful basis for conversations with parents about their children's levels of literacy and numeracy development early in the 2009 school year.

Recommendation 5
That parents of students entering Years 3, 5 and 7 be informed about the availability of these assessment materials to schools and encouraged to talk with teachers about their children's performances on them. Consideration also should be given to making the materials available for online access by parents following their use by teachers.

The intention in making last year's NAPLAN materials available to schools is for teachers to use individual and class performances on these materials to

[16] Students in Years 3, 5, 7 and 9 will sit the nationally administered 2009 NAPLAN tests on 12-14 May.

[17] A similar strategy is used by some schools in Victoria. For example, schools in the Northern Metropolitan Region administer that state's previous literacy and numeracy tests at the start of each school year. These tests are available online to all Victorian schools and are known as *AIM On Demand (*www.aimonline.vic.edu.au).

inform and guide their teaching. Many teachers will be better able to do this if they also are provided with assistance in interpreting students' NAPLAN performances and given advice on teaching strategies that could be used to address student needs.

Recommendation 6
That teachers be provided with online advice on teaching strategies to address identified learning needs.

This online advice might take the form of general advice already provided to schools (e.g., by the Government or Catholic education systems). Consideration also might be given to using advice developed by other states or territories directly linked to students' performances on NAPLAN assessments (e.g., advice developed in NSW and incorporated into that state's SMART software).[18]

[18] The School Measurement, Assessment and Reporting Toolkit (SMART) facilitates student, class, school and system analyses of NAPLAN data.