Reform Challenges in School Education

Geoff Masters

Australian Council *for* Educational Research

ACER

First published 2023
by ACER Press, an imprint of
Australian Council for Educational Research Ltd
19 Prospect Hill Road, Camberwell, Victoria, 3124, Australia

https://shop.acer.org
sales@acer.org

In the spirit of reconciliation, ACER Press acknowledges the Traditional Custodians of Country throughout Australia and their connections to land, sea and community. We pay our respect to their elders past and present and extend that respect to all Aboriginal and Torres Strait Islander Peoples today.

Cover design, text design and typesetting by Karen Wilson

PDF ISBN 978-1-74286-705-2
Print ISBN 978-1-74286-710-6

A catalogue record for this book is available from the National Library of Australia

This research paper was commissioned by Independent Schools Australia (ISA). As the national peak body for the Independent sector, ISA contributes to the debate about ways through which schools might improve outcomes for all students. ISA believes this paper will contribute significantly to the national conversation about the future of education.

CONTENTS

INTRODUCTION

Schools everywhere face ongoing challenges in better preparing young people for their future and ensuring that every student learns successfully and meets high expectations.

Globally, these two challenges are now viewed as urgent. Countries are re-evaluating the kinds of learning prioritised by school curricula and questioning their adequacy for the future. In response, many are placing less emphasis on passive, reproductive forms of learning and more emphasis on developing students' deeper conceptual understanding; skills such as critical thinking, problem solving, collaborating and innovating; and personal attributes such as resilience, empathy and global competence.

In parallel, there is growing global concern over the numbers of young people who fall behind in their learning as they move through school and so fail to achieve minimally acceptable exit standards—even in essential areas such as reading and mathematics. This is a major concern in developing countries, but even among the world's top-performing nations, significant percentages of students fail to reach minimally adequate standards.

These two educational challenges are no less urgent in Australia. School curricula in this country are sometimes overloaded with factual and procedural content that students are expected to memorise and reproduce, leaving reduced time for deep conceptual learning, opportunities to transfer and apply knowledge, and the development of broader competencies and student attributes. Perhaps reflecting this, there has been a long-term decline in Australian 15-year-olds' abilities to apply knowledge and skills in reading, mathematics and science to everyday situations.

At the same time, large numbers of Australian students perform below expectations throughout their schooling. In each year of school, the gap between the most and least advanced students corresponds to about six years of learning. Among the least advanced learners, some demographic groups are significantly over-represented, including students from lower socio-economic backgrounds, First Nations students and students living in rural and remote locations. And no obvious progress has been made in closing these achievement gaps over recent decades.

This paper contends that progress in addressing these two challenges will require fundamental reform of the framework within which schools operate. This framework includes the curriculum, assessment and reporting requirements, credentialling arrangements, additional supports for students who require them, and processes for preparing and developing teachers and school leaders. In Australia, these framework components are primarily the responsibility of federal and state education authorities.

But the need for fundamental framework reform is often underestimated. Instead, it has become common to pursue improved educational outcomes through the tighter specification of what teachers should teach and how they should teach it, resulting in detailed curricula, increased government testing and a search for teaching strategies that all teachers can be encouraged or required to use. In contrast, many top-performing school systems have moved in the opposite direction in recent decades, making their curricula less prescriptive and giving teachers more flexibility to make professional judgements about what and how they teach. Their improvement efforts have been focused instead on transforming the frameworks within which teachers and schools work.

Reform in these countries has involved reviewing and reforming most if not all aspects of the schooling framework. The objective has been to better address current challenges by creating a coherent learning 'system' underpinned by common, evidence-based principles. This paper considers three such principles and their reform implications.

First is the importance of recognising the personal nature of learning. Too often, schooling arrangements are designed for groups rather than individuals. They assume that students in the same group—for example, age or year group, First Nations students, socio-economic group—have the same or similar learning needs. This is patently not the case, and many students can be treated inequitably as a result. A transformed learning system would be designed to better support teachers to establish and respond to individuals' backgrounds and current learning needs, including through more flexible curriculum content and structures, and more adaptive teaching and learning resources and assessment processes.

Second is the importance of broadening what is valued. Too often, learning at school is dominated by the need to memorise and reproduce facts and procedures. Across geographies, countries now recognise that as important as what students know is what they can do with what they know. This depends on how deeply they understand; whether they have skills in knowledge application (such as critical and creative thinking and problem-solving skills); and the development of personal attributes such as persistence and resilience. A transformed learning system would promote more 'holistic' student development, including through curricula and assessment or examination processes requiring the close integration of knowledge, skills and attributes.

Third is the importance of recognising the developmental nature of learning. Too often, learning at school is a matter of mastering a defined body of content in a specified period of time. Students are then assessed and graded and move in unison to make a fresh start on the next body of content. In reality, students are at very different points in their long-term progress and often require different kinds of learning support. A transformed learning system would respond to this reality and be built from an understanding of learning as ongoing and lifelong. Curriculum, assessment and reporting processes would be redesigned to better support teachers to establish where individuals are in their long-term progress, to target their teaching accordingly and to monitor a student's growth across the years of school.

The paper concludes by reflecting on the implications of these principles for the reform of each component of a learning system. Some examples are provided of how these principles have guided reforms in some of the world's top-performing school systems.

TWO GLOBAL CHALLENGES

Across the globe, efforts are being made to reimagine and transform school education. There are two main reasons for this: growing concern that young people are not being equipped with the kinds of learning they will require to thrive and flourish in the future; and recognition that too many young people are completing school with unacceptably low levels of attainment, even in the basics. Both concerns are now considered urgent.

CHALLENGE ONE

Better preparing students for their future

The question of how best to prepare young people for future learning, life and work is a perennial educational challenge. What was believed important for students to learn in the 19th century was different from the priorities of the 20th century, which are different again from today's priorities. The ongoing reconsideration of what schools should be teaching is not an indictment of past decisions, but recognition that the knowledge and skills essential for life and work are continually changing.

A current concern in many countries is that school curricula are skewed toward the memorisation of substantial bodies of factual and procedural content. Although sound disciplinary knowledge is recognised as essential, there is concern that the volume of material students are expected to learn is limiting teachers' abilities to promote deeper conceptual understanding and to demonstrate the meaning and relevance of what students are learning through opportunities to apply knowledge. The amount of curriculum content in these countries is being reduced in the belief that 'deeper' forms of learning will better prepare students for their future.

Deeper learning is understood to include not only deeper understanding of important concepts, principles and disciplinary methods, but also skills in thinking, problem solving and applying knowledge. In a world in which facts are readily accessible and routines are increasingly performed by machines, most countries are giving greater priority to students' abilities to think critically and creatively, to use

technologies effectively, to solve problems and to work collaboratively with others.

At the same time, schools are finding it necessary to give more attention to students' social and emotional wellbeing—particularly as a result of the COVID-19 pandemic—as well as a range of personal attributes and dispositions such as resilience, persistence and a growth mindset. Although schools have always prioritised the development of healthy, well-rounded young people, most countries are giving greater attention to student wellbeing, which is now seen as an essential objective of schooling and of the school curriculum.

As the balance of learning in schools is being shifted toward deeper conceptual understanding, skills in thinking about and using knowledge, personal attributes and student health and wellbeing, there is growing global appreciation of the ways in which learning systems, including school curricula and associated assessment processes, can work against these intentions. For example, in most countries, learning at school continues to separate and privilege knowledge over skills, theory over practice and academic learning over vocational learning. The challenge many countries are taking up is to bring together and more closely integrate head, hands and heart learning to better mirror the learning that occurs in life beyond school, including in workplaces.

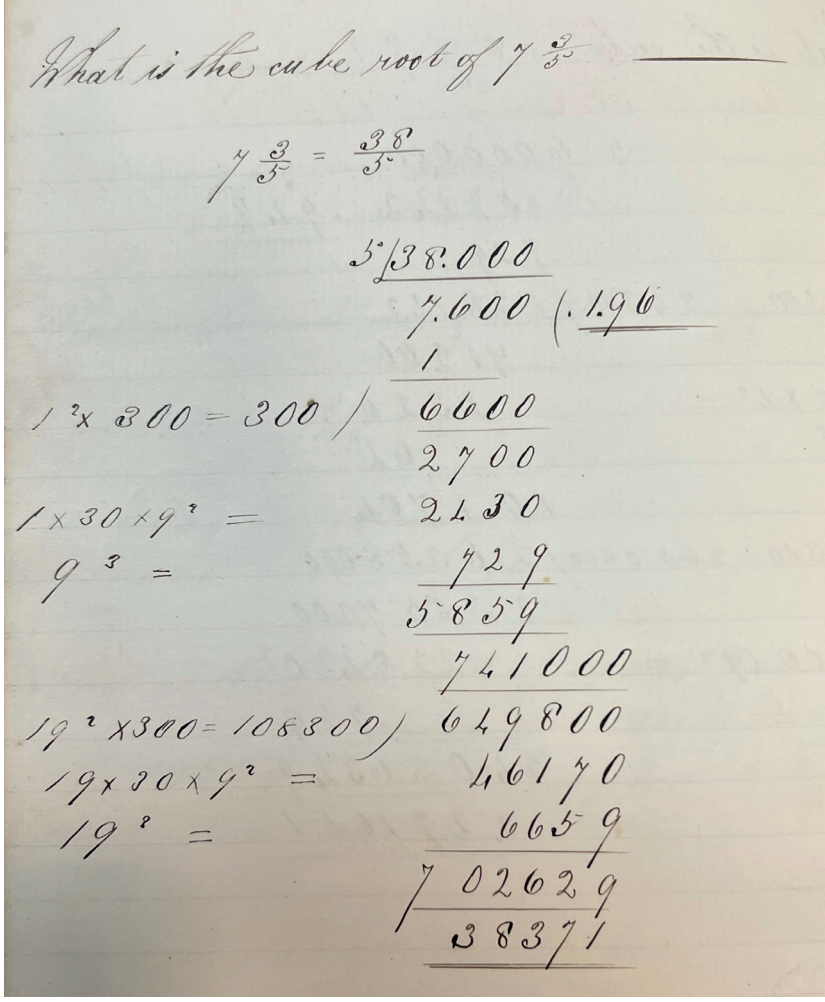

Exhibit 1. A page of the 1869 mathematics workbook of 13-year-old Walter Martin of McLaren Vale, South Australia. We no longer teach students how to find the cube root of a number because it is rarely required and readily calculated electronically

How well is Australia doing?

Global questions about how well today's schools are preparing young people for future learning, life and work are also crucial questions for Australia.

Promoting deep understanding

As elsewhere, there are concerns, often on the part of teachers, that Australian students are not being prepared as well as they could be because of the 'overcrowding' of some curricula with factual and procedural content. This is resulting in time pressure to cover centrally specified material and limiting the time available for deep learning, thinking and meaningful applications. The review of the New South Wales curriculum recommended reducing the amount of content in some syllabuses and giving greater priority to developing students' conceptual understanding and skills in applying disciplinary knowledge.[1] This need has also been recognised nationally and has influenced the revision of the Australian Curriculum.

However, little is known about how well Australian students develop the deep understandings required to transfer and apply what they learn at school to real-world contexts. Anecdotally, much learning at school is driven by current assessment requirements, which can make school learning inward looking and result in relatively passive forms of learning such as rote memorisation to pass tests and examinations.

Year 12 examinations provide some evidence of deep learning; however, examination questions often involve applications to standard problem

types and predictable contexts and can encourage memorisation of pre-prepared answers. Some other assessment programs provide information only about basic skills (e.g. the National Assessment Program—Literacy and Numeracy, NAPLAN) or students' abilities to recall and demonstrate facts and routines specified in year-level curricula (e.g. the Trends in International Mathematics and Science Study, TIMSS).

One program that attempts to gather information about deeper learning is the OECD's Programme for International Student Assessment (PISA). Rather than being a test of factual and procedural recall, PISA assesses what students can *do* with what they know. The OECD refers to this as 'literacy' or 'competence' (as opposed to knowledge recall or basic skills alone). PISA assesses students' understanding of concepts and principles and their skills in applying these in the domains of reading literacy, mathematical literacy and scientific literacy.

In Australia, PISA reveals a steady decline over the past two decades in 15-year-olds' abilities to apply what they are learning (see Exhibit 2). Australia is not the only country to have seen a decline; on average, there has been a decline across OECD countries. However, in some countries, such as Estonia, there has been an increase over the same period. In 2000, the average performance of Australian 15-year-olds was well above the OECD average (set at 500 in that year), but has declined to be at or near the current OECD average.[i] In mathematical literacy, only one of 69 countries and economies (Finland) saw a greater decline than Australia between 2003 and 2018.

An interesting observation is that, while 15-year-olds' abilities to use their reading, mathematics and science knowledge and skills to meet real-life challenges have been in decline, there has been no obvious decline over the past decade in Year 3, 5, 7 and 9 students' basic skills in literacy and numeracy, based on results from NAPLAN. A recent Productivity Commission report speculated that this may reflect 'curriculum drift'—changing emphases

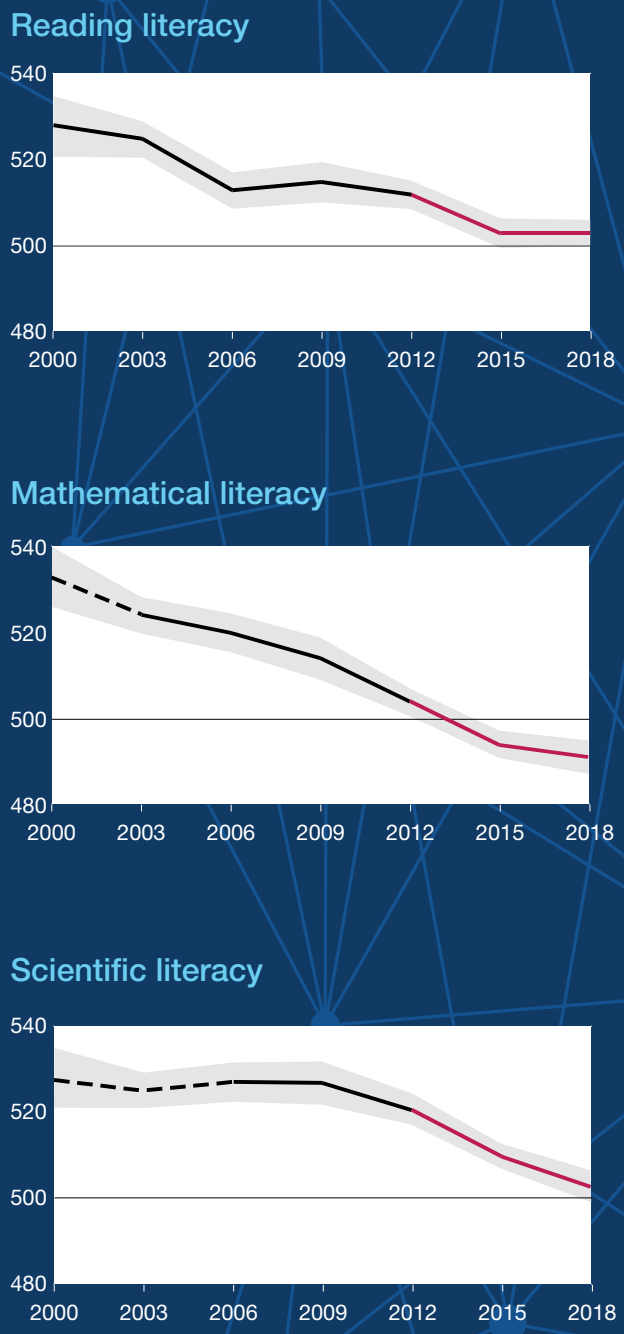

Exhibit 2. Trends in the ability of Australian 15-year-olds to apply their reading, mathematics and science knowledge and skills to everyday situations[ii]

i In 2018, the OECD mean for countries that have participated in PISA over multiple cycles was 483 in reading literacy, 494 in mathematical literacy and 489 in scientific literacy.

ii Based on OECD PISA. Broken lines show performance prior to mathematical literacy and scientific literacy becoming major domains in 2003 and 2006 respectively. The shaded region represents two standard errors of the mean. The red sections show further declines since the publication of *Five Challenges in Australian School Education* in 2016.

and priorities, with less emphasis now being given to the deeper understandings and skills that PISA assesses.[2]

Although the purposes of schooling are much broader than the ability to apply knowledge and skills in reading, mathematics and science, these continue to be recognised globally as core outcomes of schooling, essential for effective functioning in adult life. Being able to read at only a minimal level will be inadequate in a future that will require discerning adults who can identify misinformation, engage with complex issues and recognise writers' purposes and biases. Similarly, basic mathematical and scientific knowledge will be necessary but not sufficient for evaluating sometimes conflicting evidence and making personal decisions on matters such as finance, health and the environment. Young Australians will not be well prepared for their future by overcrowded curricula that promote breadth but not depth of learning, or by assessment processes that promote only memorisation or only the mastery of basic skills.

Promoting general skills and attributes

Internationally, there is recognition that, to thrive and flourish in the future, young people will require more than sound disciplinary knowledge and the ability to apply their knowledge in real-world contexts; they will also require a range of competencies and personal attributes relevant to all facets of life and work. These include skills in using digital technologies, solving problems, thinking critically and creatively, and working effectively with others. Such skills are sometimes referred to as '21st century' skills, 'transversal' skills or general capabilities.

The Australian Curriculum identifies a number of these general skills and attributes: literacy, numeracy, information and communication technology capability, critical and creative thinking, personal and social capability, ethical understanding and intercultural understanding. The intention is that students will develop and apply these general capabilities across the years of school through subject learning, co-curricular programs and activities outside school.

One set of skills likely to be increasingly important in the future will be skills in addressing complex, non-routine problems and challenges that have no obvious solutions. Solving non-routine problems will require a willingness to engage with such challenges, to gather and review relevant information, to think creatively, to try out possible solutions and to learn from mistakes. In 2012, the OECD collected information about 15-year-olds' creative problem-solving skills in a number of countries, including Australia. The most effective general problem solvers were students in four Asian economies: Macao-China, Hong Kong China, Shanghai-China, and Chinese Taipei. Australian students' problem-solving skills were better than average in OECD countries, and better than would have been predicted from their performances in reading, mathematics and science.

Another set of skills young people are likely to require to be well prepared for their future are skills in collaborating with others. These skills are becoming increasingly important in workplaces and include skills in communicating effectively, managing conflict, organising a team, building consensus, and monitoring and managing progress. However, skills of these kinds have generally not been explicit intentions of school curricula, and limited evidence is available about how well they are being developed in schools. In 2015, the OECD collected information about 15-year-olds' abilities to collaborate to solve problems across 52 countries. Students in Singapore and Japan were better at collaborative problem solving than students in all other countries. Students in Australia had much higher skills in collaborating than would have been predicted from their performances in reading, mathematics and science. Although girls outperformed boys in collaborative problem solving in every country, the gender gap in Australia was one of the largest observed.

Today's students are also likely to require higher levels of capacity to engage with global issues, including social, political, economic and environmental challenges. And they are likely to require higher levels of understanding of, and respect for, other cultures, including the ability to recognise

and challenge cultural biases and stereotypes, and to live harmoniously in multicultural communities. In 2018, the OECD collected international evidence of capabilities of these kinds, which it referred to as 'global competence'. Australian 15-year-olds, in comparison with students in other countries, displayed more positive attitudes toward immigrants and other cultures. Although students from higher socio-economic backgrounds and girls displayed more positive attitudes to immigrants and other cultures in all participating countries, socio-economic differences were particularly marked in Australia. Similarly, while students from higher socio-economic backgrounds had greater awareness of global issues in all countries, Australia was among the countries with the largest socio-economic difference.

In a world dependent on innovation and the creation of solutions to complex and emerging challenges, there will also be a need for people who can think creatively and develop original ideas and solutions. Creative thinking will be essential not only in areas such as the arts, but also in addressing issues, problems and society-wide concerns, and there will be a need for skills in evaluating, improving on and communicating new ideas and solutions. In 2022, the OECD conducted a global assessment of 15-year-olds' abilities to think creatively. As yet, there are no national data on the creative thinking skills of Australian students.

Finally, a crucial set of skills that young people will require to be well prepared for in the future will be skills in using digital technologies, including skills in accessing, evaluating, managing, creating and sharing information. As they move through school and into post-school life and work, today's students will increasingly interact with digital environments to explore issues, to innovate and to solve problems. Data on the Information and Communication Technology (ICT) literacy skills of Australian Year 6 and Year 10 students have been collected nationally since 2005. This has included information about ICT literacy levels in different states and territories, for boys and girls, First Nations and non-First Nations students, and students from different geographic locations and language backgrounds, as well as information about students' access to, familiarity with, and interest in using computers. There is currently limited data on how ICT literacy skills in Australia compare with skill levels in other countries, however a 2013 study of Year 8 students found that, in 14 participating countries, only students in the Czech Republic had significantly higher skills than Australian students, and students in nine countries had significantly lower skills.[3] In 2025, the OECD will collect information globally on two capabilities essential to learning with technologies: self-regulated learning, and computational and scientific inquiry practices.

In summary, available international evidence suggests that many Australian students are successfully developing the broader skills and attributes they are likely to require for future learning, life and work. In areas such as problem solving, collaborating, using digital technologies and global competence, Australian 15-year-olds tend to perform above the OECD average, and better than would be predicted from their performances in reading, mathematics and science. The fact that students in some countries outperform Australian students on these skills and attributes suggests ongoing opportunities for improvement.

Promoting social and emotional skills

Preparing young people for their future includes attending to individuals' health and wellbeing. In recent years, and particularly as a result of the COVID-19 pandemic, school systems throughout the world have recognised that mental health and wellbeing are not only prerequisites for successful learning, but also important educational objectives in their own right.

The first national data on the mental health and wellbeing of young Australians was collected through a survey of children aged 4–17 and their parents in the 1998–2000 National Survey of Mental Health and Wellbeing, the first national survey of its type in the world.[4] This was followed by the Young Minds Matter survey in 2013–2014.[5] These two surveys highlighted the prevalence of depression, self-harm and thoughts of suicide among teenagers. For example, in the Young Minds Matter survey, 10 per cent of teenagers reported having engaged in self-harming

behaviour, and 20 per cent of girls aged 16–17 met the clinical criteria for depression.

Globally, it is being recognised that levels of wellbeing can be enhanced through the development of young people's social and emotional skills. However, relatively little is known about these skills and their development. The OECD has made efforts to conceptualise and gather information about such skills through its Survey of Social and Emotional Skills. That survey identifies 15 skills: self-control, responsibility, persistence, stress resistance, optimism, emotional control, empathy, trust, cooperation, tolerance, curiosity, creativity, energy, assertiveness and sociability. The first international survey of these skills was conducted in 2019 in 10 cities from nine countries, not including Australia.[6] The second international survey will be conducted in 2023 and reported in 2024. There is growing recognition internationally that, if young people are to be well prepared to flourish in the future, greater attention to the development of social and emotional skills will need to be part of efforts to reimagine and transform school education.

CHALLENGE TWO

Ensuring that every student learns successfully

A reality in every school system globally is that a significant proportion of students complete school not having reached minimally acceptable levels of attainment, even in core areas of learning such as reading and mathematics. This is true even in countries that perform unusually well on international surveys of student attainment. Among the top-performing countries in PISA, about a third of 15-year-olds perform at or below the level identified by the OECD as the minimum required for successful further learning and full participation in society.[7]

Many students who complete school with unacceptably low levels of attainment perform below expectation throughout their schooling. Some begin school well behind and never catch up. Others fall further behind the longer they are in school. Results from NAPLAN show that, in reading and mathematics, the lowest-performing 10 per cent of students in each year of school are at least 5 to 6 years of learning behind the highest performing 10 per cent. This means that students experience school very differently. For some, school is an ongoing experience of failing to live up to expectations. Each year, the low grades they receive reinforce the message that they are not learning successfully and add to the perception that they are simply poor learners. Eventually, many accept this message and disengage from school learning, either through non-attendance or non-participation.

In the United States, there is evidence that this situation is worsening. Long-term trend data from that country's National Assessment of Educational Progress show greater declines over time among low-performing students than among high-performing students in reading and mathematics. This widening gap accelerated between 2020 and 2022 during the COVID-19 pandemic.[8] And in some other countries, the majority of students experience limited success. According to the World Bank, the reading levels attained by 90 per cent of students in wealthier countries are attained by only 50 per cent of students in low- and middle-income countries, and only 10 per cent of students in poor countries.[9] The international evidence is clear that, despite significant government investments, decades of research into learning and the best efforts of teachers and schools, many children now attend school but have limited success in learning. This is a second urgent reason for reimagining and transforming school education.

The urgency of this challenge becomes clearer when the consequences of low performance are considered. In the past, a significant percentage of students completed school with unacceptable or minimally acceptable levels of learning. This was often accepted as more or less inevitable and explained by the fact that some students were inherently poorer learners than others. Indeed, part of the role of schools was to identify 'more academic' students capable of further learning and professional and leadership roles in society, and other students who were better suited to trades

or low-skill, manual work. However, routine low-skill tasks are increasingly being performed by machines, and even more complex human activities are now being automated. In the future, there are likely to be fewer job opportunities for students who are unsuccessful at school, with a growing range of consequences, including unemployment and under-employment, reduced standards of living and growing social divides. And globally there is concern that education itself is beginning to be seen by marginalised sections of the community as part of the problem by providing further advantages to already advantaged social elites.

In this context, most school systems are recognising that it is no longer acceptable to have large percentages of students not learning successfully at school. The kinds and levels of learning once expected of only a minority of students are now being recognised as necessary for the vast majority of students. This is presenting governments and school systems with a pressing question: What will it take to ensure that every student learns successfully and achieves the standards once achieved by only some?

How well is Australia doing?

Global questions about how well today's schools are ensuring that every young person learns successfully are also crucial questions for Australia. Although inevitably limited in its coverage by available assessment instruments, recent national and international evidence provides some insights into how well every child and young person is learning successfully and being prepared for their future.

Supporting successful early learning

Children begin school at very different points in their learning and development. The Australian Early Development Census (AEDC) documents this variability for children in their first year of formal, full-time school in 5 developmental domains: physical health and wellbeing, social competence, emotional maturity, language and cognitive skills, and communication skills and general knowledge. Approximately 300 000 children are assessed every 3 years.

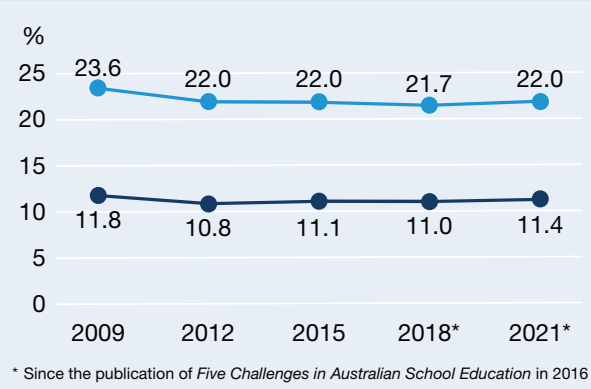

Exhibit 3. Percentage of children developmentally vulnerable in one or more domain(s) and two or more domains. Source: Australian Early Development Census[10]

Based on the AEDC, most Australian children starting school are on track in all 5 domains. The percentage on track increased from 50.7 per cent in 2009 to 54.8 per cent in 2021. However, about 22 per cent of children commencing school are judged by the AEDC to be 'vulnerable' in at least one domain, and this percentage has been relatively stable over time (see Exhibit 3). About half of these children are judged to be vulnerable in two or more domains.

The significance of these observations is that many children are much less advanced than others in their learning and development upon entry to school, and often continue to lag through the early years and beyond. Differences in children's levels of attainment by Year 3 are often continuations and reflections of differences in their cognitive, language, physical, social and emotional development on entry to school. Many less advanced children remain behind throughout their schooling, continually not meeting year-level expectations and being locked into trajectories of 'underperformance' that often lead to disengagement, poor attendance and early exit from school.

One of the most effective strategies for ensuring that every young person succeeds at school and is well prepared for their future is to minimise gaps in learning and development by the time children enter school. This, in turn, depends on universal access to high-quality, affordable, integrated early childhood education and care delivered by qualified early childhood educators. Effective pedagogy in the preschool years includes the early detection of developmental delays and the implementation of effective intervention strategies, which in

turn depend on a deep understanding of child development and the ongoing monitoring of young children's learning.

Meeting individuals' varying needs

A second strategy for ensuring every student learns successfully and is well prepared for their future is the better identification of where individuals are in their learning to enable the improved targeting of individual learning needs. There are two reasons why this is crucial.

First, within any year of school, students are at widely different points in their learning and development. These differences are clear from assessments of student performance. For example, Exhibit 4 shows the distributions of students' reading proficiency levels in Years 3, 5, 7 and 9 based on NAPLAN. From these distributions it can be seen that some students in Year 3 are already reading at the level of an average Year 7 student, and some students in Year 9 are still reading at the level of an average Year 5 student. It can also be seen that the difference between the most advanced 10 per cent of students and the least advanced 10 per cent of students in each year group is equivalent to 5 to 6 years of average reading development. Because students in the same year of school are at very different levels of reading ability, they are likely to require different kinds of support for their further reading development. Similar observations are made for numeracy.

A second reason is that most centrally developed curriculum, assessment and reporting arrangements are not designed to address students' differing levels of attainment. In fact, most are designed on the assumption that students are, or should be, at very similar points in their learning. For example, curricula are designed for age or year groups in the expectation that all students will be taught the same content, all beginning at the same time and for the same amount of time. Assessment processes usually administer the same tasks to every student.

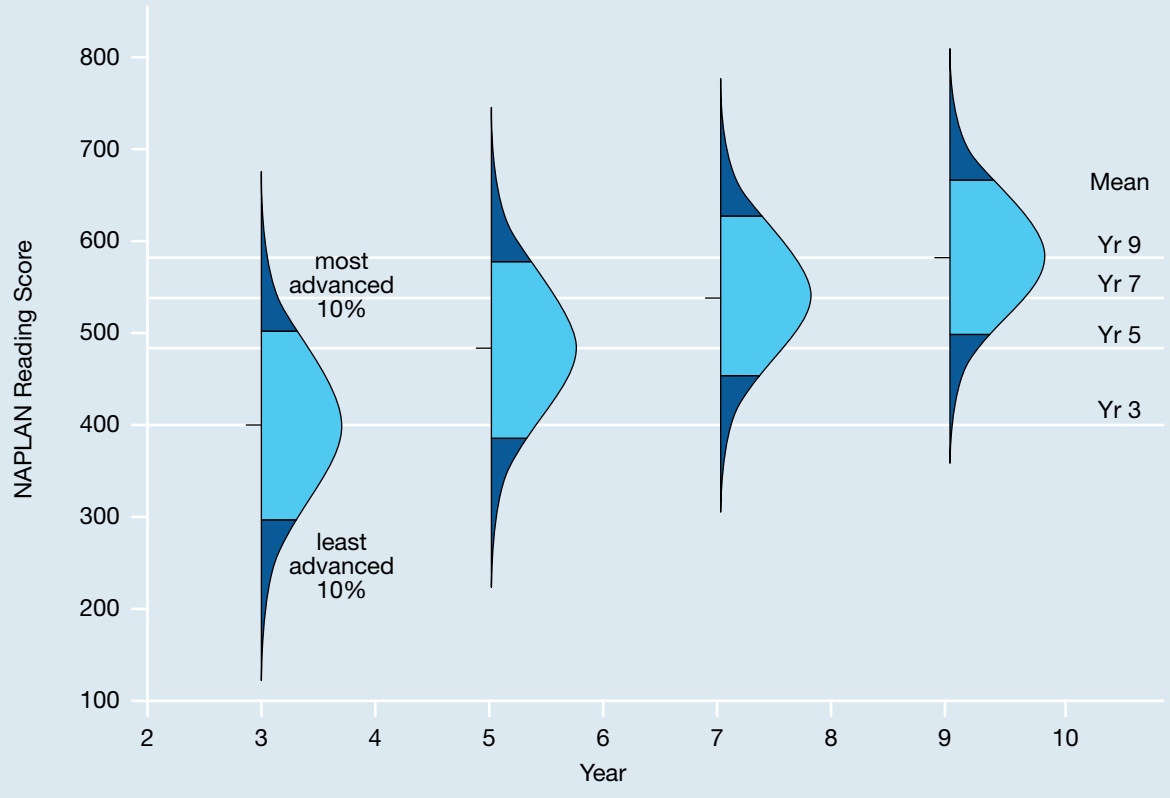

Exhibit 4. Distributions of Year 3, Year 5, Year 7 and Year 9 students' levels of reading proficiency based on NAPLAN[11]

And reporting requirements grade every student's learning against the same expectations. In such arrangements there is usually little acknowledgement that the most advanced learners may be 6 or more years of learning ahead of the least advanced learners.

Improving outcomes for the least advanced learners

The students most likely to be adversely affected by existing arrangements are students who are less well prepared for what school curricula specify and assessment processes expect. These students sometimes begin school behind and slip further behind as year-level curricula become increasingly beyond their reach, learning gaps remain unaddressed and they are required to move from one curriculum to the next regardless of their readiness. These students often complete school with unacceptably low levels of attainment.

The OECD identifies a 'baseline proficiency level' that it considers all students must reach in reading literacy, mathematical literacy and scientific literacy to be adequately prepared for further learning and full participation in society. Exhibit 5 shows that the percentage of Australian 15-year-olds not reaching this minimum level has been increasing steadily over the past two decades to approximately 20 per cent of students in 2018. For comparison, only about 10 per cent of Estonian 15-year-olds did not achieve this minimum standard in the 3 domains in 2018.

Closing demographic gaps

The evidence just considered reveals wide variability in Australian students' levels of attainment. A further observation is that some demographic groups are greatly overrepresented among the lowest achievers. These include students from lower socio-economic backgrounds, students living in rural and remote locations and First Nations students. This overrepresentation is evident from the earliest years and throughout the years of school.

While the Australian Early Development Census concluded that 22 per cent of children in their first year of school were vulnerable in one or more AEDC domains in 2021, this percentage was higher

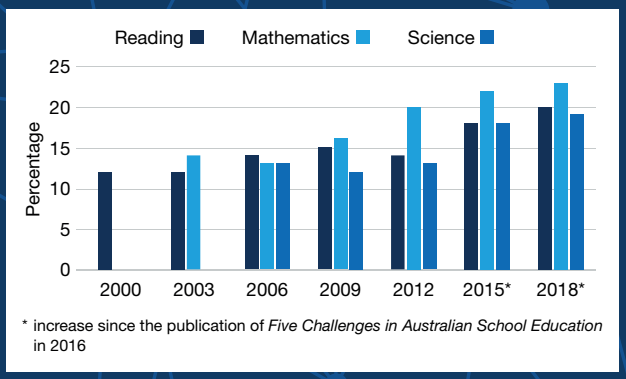

Exhibit 5. Percentage of Australian 15-year-olds performing below the international baseline proficiency level in reading literacy, mathematical literacy and scientific literacy[12]

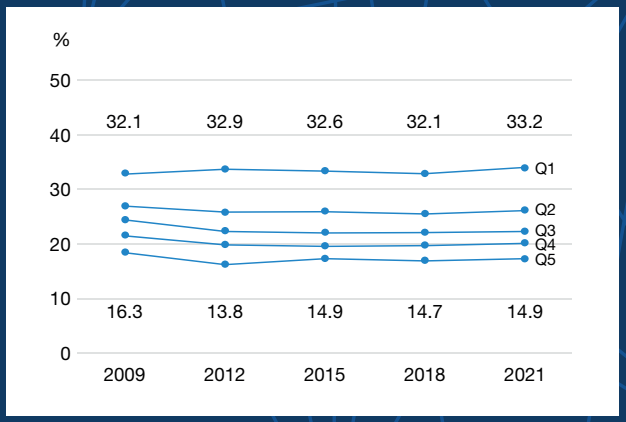

Exhibit 6. Percentage of children developmentally vulnerable in one or more domain(s) by socio-economic indexes for areas quintile[13]

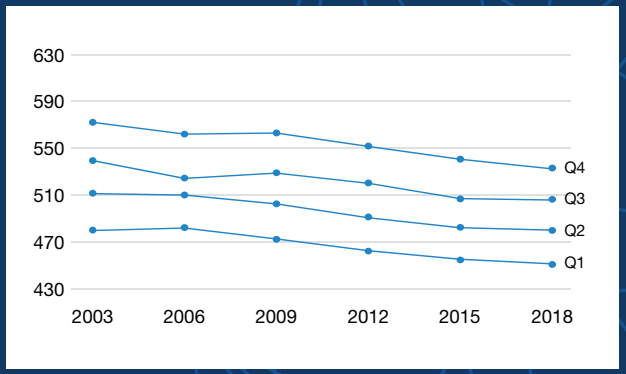

Exhibit 7. Average performance of Australian 15-year-olds in mathematical literacy by socio-economic quartile. Source: OECD PISA[14]

for the most disadvantaged children (33.2%), for children living in remote and very remote locations (34.3%), and for Aboriginal and Torres Strait Islander children (42.3%). Exhibit 6 shows how vulnerability varied with socio-economic background, with the most disadvantaged quintile (Q1) having the highest percentage of children vulnerable in one or more domains, and the least disadvantaged quintile (Q5) having the lowest.

Significant gaps in attainment persist for these demographic groups throughout the years of school and are evident in all national and international surveys of Australian students. For example, Exhibit 7 shows the relationship between socio-economic background and the mathematical literacy levels of Australian 15-year-olds as assessed by PISA. Students in the lowest socio-economic quartile (Q1) had much lower levels of mathematical literacy than students in the highest quartile (Q4). The average performance of First Nations students in 2018 was 426; the average performance of students living in remote locations was 440.

Summary

This brief review of some available evidence indicates that the two identified global challenges are equally relevant to Australia. In particular, large numbers of Australian children are beginning school 'vulnerable' in one or more areas of their development; very wide differences exist in students' levels of attainment in every year of school; there has been an ongoing decline in Australian 15-year-olds' abilities to apply knowledge and skills in reading, mathematics and science; and no obvious progress has been made over recent decades in closing achievement gaps between major demographic groups. The remainder of this paper considers what it might take to address these challenges.

SOME GUIDING PRINCIPLES

The position taken in this paper is that the challenges of better preparing young people for the future and ensuring that every student learns successfully are unlikely to be met by minor modifications of existing schooling arrangements; instead, they require deeper reforms of the frameworks within which teachers and schools work. Moreover, these reforms need to be guided by research-informed principles for improving educational outcomes, including the following three.

Learning as personal

A first principle recognises learners as individuals and is based on evidence that successful learning is more likely when individuals' learning needs are understood and addressed. It stands in contrast to attempts to infer learners' needs from the groups to which they belong. It has deep implications for how learning at school is organised and delivered, including for the curriculum, teaching, assessment processes and forms of student support.

Most school curricula are designed for age or year groups. A curriculum redesigned for individuals rather than groups would provide the flexibility for individuals to be given learning opportunities appropriate to the points they had reached in their long-term progress. In this way, the probability of successful learning would be maximised by providing every individual with well-targeted stretch challenges.

At the same time, it has become common in school education to search for 'evidence-based' teaching strategies that all teachers can then be encouraged or required to use with all students. The assumption is that, if a highly effective strategy can be identified, then it should be used with every learner. This is often described as an alternative to teachers making their own decisions about the best ways to teach. In contrast, this first principle would see teachers choosing from a repertoire of proven strategies and making professional judgements about the best ways to address the learning needs of individuals.

Assessment processes, too, have been group-based in the sense that all students have been administered the same assessment tasks. The assumption has been that it is 'fair' to administer the

same test questions or assessment tasks to every student. However, for students who find a set of common questions or tasks much too difficult, the assessment experience is not only demoralising, but also a wasted opportunity to better understand the points they have reached in their learning. It is also a wasted opportunity for students who find common questions or tasks much too easy. In contrast, 'adaptive' assessment processes identify and adapt to where individuals are in their learning without compromising the opportunity to compare students' levels of attainment.

Furthermore, attempts to address equity tend to be group-based. The assumption is that the learning needs of students in particular 'equity groups' are different from the needs of other students, and that group-based solutions need to be developed to address these different needs. Not only has this approach been unsuccessful in closing achievement gaps, but it is also based on the incorrect assumption that students in the same group have the same needs, which they clearly do not. Worse, group-based approaches run the risk of treating individuals inequitably—for example, treating a First Nations student as disadvantaged; having lower expectations of a student from a low socio-economic background; or making incorrect assumptions about a new arrival from a particular part of the world. High-performing countries tend to address equity first by reducing or removing obstacles that some students may face (for example, by ensuring that *every* student learns in an environment that incorporates First Nations ways of knowing and learning; that *every* student is given a daily hot meal and free access to learning resources; and that *every* student is taught by an expert teacher, regardless of where they live). Beyond this, there is recognition that an equitable education system is one in which every individual's needs are identified and met.

Learning as holistic

A second principle recognises the purpose of schooling as the development of well-rounded young people not only through intellectual learning and development, but also through emotional, social, physical, cultural and moral learning and development. This purpose is sometimes referred to as 'whole-person' or 'holistic' learning. This second principle is based on evidence of the interrelatedness of learners' knowledge, skills and personal attributes, and supports their integrated development.

In practice, the attention of schools is sometimes focused largely on intellectual learning, particularly in the later years of school when there can be a strong emphasis on subject learning, the completion of assessment requirements and preparation for examinations. At these times, the focus of teaching and learning can be narrowed to the mastery of subject content, leaving little time even for other aspects of intellectual development such as creative thinking and open-ended problem solving.

And although published school curricula generally promote holistic student development, integrated learning may not be a high priority. For example, some aspects of students' learning and development may be addressed only in specific subjects or through extracurricular activities, and 'the curriculum' may be viewed narrowly as the specified content of school subjects. Holistic student development requires a conception of the school curriculum that is both multidimensional and integrated.

Such a conception would see general skills and personal attributes as essential aspects of subject learning. Although school systems globally are now giving greater priority to general capabilities such as critical thinking, creative thinking, problem solving, using digital technologies and working with others, these are often treated as separate from, or even competing with, subject learning. In published curricula, they are sometimes represented as sitting alongside, and needing to be imported into, school subjects. And attempts may be made to assess them separately from subject learning. A more holistic approach would recognise that the ability to think critically and creatively about a subject, to solve problems that require subject knowledge, and to use technologies and work with others in doing this should be an integral part of developing competence in every subject.

Working against holistic, integrated learning is a long-standing divide between knowledge and skills. In the past, lower secondary students often were assigned to different schools. Some schools focused on academic learning (theory and knowledge) and others focused on preparation for work (application and skills). This historical divide has been replaced by comprehensive lower secondary schools, but the divide often continues at the upper secondary level, either in the form of separate schools or as academic and vocational streams within schools. A more holistic, integrated approach would recognise that all learning and every vocation depend on both theory and knowledge, and application and skills, and that these are ideally integrated in the learning of all subjects.

Holistic student development can also be promoted through activities that require learners to draw on different areas of their learning. Examples include multidisciplinary projects that require students to bring together and use what they have learnt in different subjects, and community-based activities that provide opportunities for students' intellectual, social, emotional, cultural and moral development. For example, all students in Finland undertake multidisciplinary projects that address 'phenomena' such as 'oil' and 'the Middle Ages', and students in Hong Kong engage in 'experiential' learning outside schools to apply what they learn to meaningful, real-world situations and problems.

Learning as developmental

A third principle recognises long-term student growth as an essential purpose of school learning. It is based on evidence of the cumulative nature of most human learning, with new learning building on prior learning and laying the foundations for further learning, as well as evidence that successful learning is most likely when learners have the prerequisites to benefit from new learning opportunities. This third principle, too, has deep implications for all aspects of a learning system.

The importance of growth is perhaps best appreciated by imagining its absence. If a curriculum consisted of many facts and routines, each of which could be taught and learnt independently of all others, then the concept of growth would be largely irrelevant. Learning would simply involve accumulating 'more' individual pieces of content. And because they were independent, there would be no logical or necessary order in which these should be introduced; the timing of their introduction would be only a matter of convenience or convention.

In general, school curricula are not collections of independent pieces of content. Instead, they are designed to progressively build more sophisticated knowledge, deeper understanding and higher levels of skill in an area of learning over extended periods of time—sometimes throughout the years of school. New learning continually builds on and extends prior learning and lays the foundations for further learning. In other words, the concept of long-term student growth is at the heart of most school curricula. And the sequencing of curriculum content is based on more than convenience and convention; it also reflects what is known from research and experience about the trajectories through which deeper knowledge, understandings, skills and attributes are developed in an area of learning over time.

With school systems now giving greater priority to deep learning, the concept of growth is becoming increasingly important. Deeper understanding of important concepts and principles are typically developed through many years of learning. Similarly, skills in problem solving, critical thinking, creative thinking, collaborating and using technologies are not developed in a single year or even phase of school. They develop throughout the school years and beyond. The same is true of personal attributes such as resilience. Educational outcomes of these kinds are not taught and learnt in specified time periods and then assessed as present or absent; they develop progressively and continually as aspects of a learner's long-term growth.

However, the structure and delivery of school curricula and associated assessment processes are not always consistent with the cumulative, ongoing and lifelong nature of learning. Rather than being

presented as roadmaps of long-term development, curricula are often presented as packages of content to be delivered in specified time periods. When this occurs, all students commence learning the same body of content at the same time and are given the same amount of time to learn it. They are then graded on how much of that content they can demonstrate, and move in unison to the next body of content where they make a fresh start and the process is repeated. Because advancement through the curriculum is heavily time-based, requiring students to move to the next body of content whether or not they are ready, students who lack prerequisite knowledge and skills often fall increasingly behind.

A lack of learning continuity can be especially evident at major transition points, for example, between preschool and school, primary and secondary school, and secondary and tertiary education. These transition points can function as significant disjunctures in learning as students are confronted with different approaches to teaching and learning. Ideally, learning systems would be designed from an understanding of learning as continuous growth to promote smooth, uninterrupted learning.

The conceptualisation of learning as long-term growth also has significant implications for assessment processes. Most assessments of learning are designed not to establish and understand the points individuals have reached in their long-term growth in an area of learning, but to determine how much of a packaged body of content a student can demonstrate. As a result, the grades students receive are unhelpful for monitoring ongoing learning. For example, a student can receive the same grade year after year, failing to reveal the absolute progress they are making and, especially in the case of students who consistently receive low grades, suggesting something stable about their ability to learn.

Summary

These three principles have implications for most aspects of learning at school. These implications include the reform of the content of subject curricula to incorporate a broader range of skills, competencies and attributes integrated with knowledge acquisition; the reform of the structure of curricula to replace time-based, lock-step learning with the better targeting of individual needs and greater flexibility in the timing and rate of learning; the reform of assessment processes to provide information about where learners are in their long-term progress and about their growth over time; and the reform of reporting and credentialling processes to reflect and communicate this information. The following section explores these implications in more detail.

REFORMING THE SCHOOLING FRAMEWORK

The framework within which teachers and schools work consists of the curriculum, assessment and reporting requirements, processes for preparing and developing teachers and school leaders, additional supports for students who require them, and the broader ecosystem including parents and other stakeholders. Ideally, these various components would function as a coherent learning system underpinned by common principles.

Exhibit 8 is a pictorial representation of a learning system, developed as part of a study of five high-performing jurisdictions (British Columbia, Estonia, Finland, Hong Kong and South Korea). The intention of this representation is to convey that, in a coherent learning system, all components are mutually supportive and designed to promote core educational imperatives.

The importance of redesigning entire learning systems is often underestimated in practice. The observation that what matters in schools is the quality of the student–teacher interaction sometimes leads to a conclusion that reform depends primarily on getting teachers to change what they do. From this perspective, the frameworks within which teachers work may be seen as relatively fixed and immutable, and perhaps too far removed from day-to-day classroom decision making to be effective levers for improvement. However,

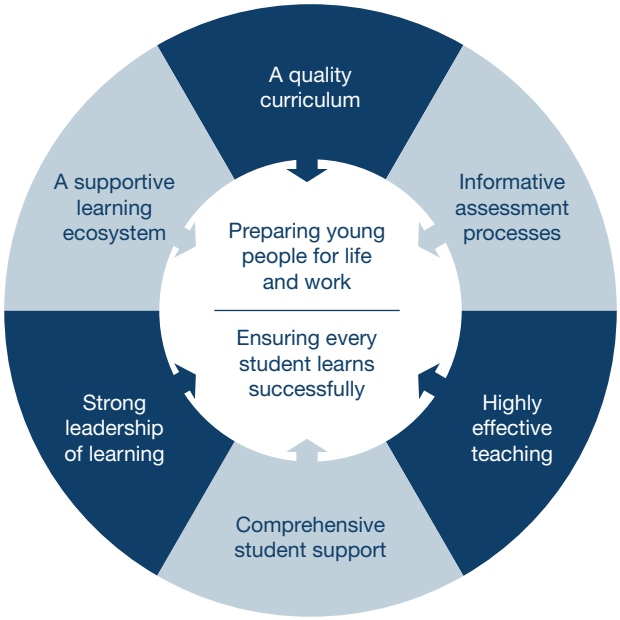

Exhibit 8. Some components of a focused, coherent learning system[15]

this view underestimates the role that learning systems—particularly centrally prescribed curricula, assessment and reporting requirements, external tests and examinations, credentialling arrangements and processes for preparing and developing teachers—have in shaping and determining the day-to-day work of teachers and students.

Beyond this, attempts at educational reform are often not based on the concept of a learning 'system'. Instead, they take the form of isolated initiatives or projects, such as the addition of a new topic to the curriculum, a new test or assessment initiative, a new reporting requirement or the training of teachers on a new policy initiative. Such reforms may be the result of political decisions or be limited to initiatives on which national consensus could be reached, rather than being designed to create focused, coherent frameworks underpinned by common principles.

Given the challenges now confronting Australian school education, deep reforms are required to the frameworks within which schools, teachers and students work. This will involve reforms to most if not all components of learning systems. In the process, there will be a need to tackle obstacles to reform, provide greater flexibility and encourage innovation.

The curriculum

Reforms of the school curriculum will require changes in both content and structure, including by anticipating a growing role for digital technologies in future teaching and learning.

Implications for the *content* of the curriculum include the reconsideration of the amount of factual and procedural content students are expected to memorise and be able to reproduce. Although the memorisation of facts and routines will continue to be essential, curriculum reforms are now required to promote students' deeper understandings of organising concepts and principles and their abilities to transfer and apply those understandings to a range of relevant contexts. Learning with understanding and opportunities to apply knowledge will require dedicated time. In some curricula, this time is currently not available because of the amount of material teachers are expected to cover, resulting in time pressure, excessive rote learning and limited opportunities for students to explore the meaning and relevance of what they learn.

In addition to building deeper understanding of subject matter, curriculum reforms are required to build skills in applying knowledge, including skills in critical thinking, creative thinking, problem solving, using digital technologies and working productively with others. To prepare students for the future, curricula will need to place less emphasis on passive, reproductive learning and more emphasis on the ability to think about, transfer and use knowledge. As important as what students know will be the question of what they can do with what they know.

Active learning of this kind will require students to bring together and apply knowledge, skills and personal attributes. Rather than focusing primarily on knowledge and theory, or primarily on skills and their application, school curricula are required that integrate head, hands and heart learning, including through the application of learning from different learning areas. This will have implications for how skills in applying knowledge are integrated into subject learning, and also for current narrow definitions of 'vocational' learning and its separation from 'academic' learning in the upper secondary school.

Implications for the *structure* of the curriculum include the reconsideration of the heavily time-bound way in which existing curricula organise learning. As already noted, students typically all commence a curriculum at the same time and are given the same amount of time to master it. They are then graded on how much of the taught content they can demonstrate and move in lock step to the next curriculum where they all make a fresh start and the process is repeated. A consequence of simultaneous advancement based on elapsed time (rather than mastery) is that some students inevitably lack the prerequisites for the next curriculum and fall further behind as each curriculum becomes increasingly beyond their reach. When students are

required to move to the next curriculum regardless of their mastery of the prior curriculum, and teachers are expected to teach what some students are not yet ready to learn, schooling functions as a highly effective sorting mechanism and attainment gaps are maintained or widened.

An alternative way of structuring a curriculum can be imagined from Australian research by Siemon and her colleagues.[16] They began by describing and illustrating 8 levels of mathematics proficiency, from the lowest (Level 1) to the highest (Level 8). Each level represented an absolute level of mathematics knowledge and skill, independent of age or year level. They then assessed about 1300 students in each of Years 5 to 9 against these 8 levels. Exhibit 9 shows the results. In each year level, there were some students at each of the 8 proficiency levels. The researchers concluded that 'the spread within each year level represents a range in students' mathematics achievement equivalent to 7 years of schooling'.

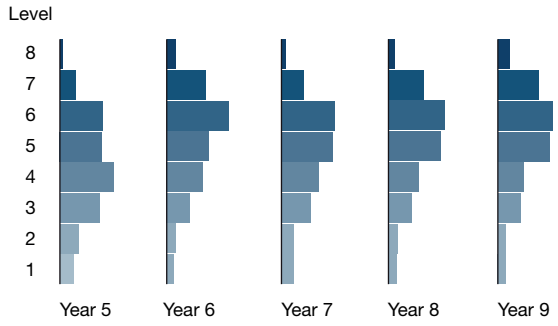

Exhibit 9. Students' levels of mathematics attainment. Source: Siemon et al.

Conventionally, a mathematics curriculum is developed for all students in each year group. In other words, the structure of the curriculum mirrors the structure of school itself. All students advance (horizontally in Exhibit 9) to the next curriculum based on time. Given that students in each year group vary by the equivalent of '7 years of schooling', year-based mathematics curricula are inevitably poorly targeted on the needs of some students.

Siemon and colleagues noted the possibility of developing teaching and learning materials appropriate to students at each of their 8 levels. From Exhibit 9, teaching and learning materials designed for any given proficiency level are likely to be appropriate for some students in each of Years 5 to 9. This observation suggests an alternative way of structuring a mathematics curriculum, with all students advancing (vertically) through a sequence of curriculum levels, not based on time, but on demonstrated mastery. The advantage of such a curriculum would be the possibility of better targeting individuals' levels of attainment and learning needs. In the future, learning technologies will make it increasingly possible to do this, and for students to progress through well-structured learning sequences at their own pace.

Assessment processes

Essential to transformed learning systems will be reconceptualised and redesigned processes for assessing, recognising and communicating student learning. This will require changes to both the focus and purpose of assessments.

A shift in the *focus* of assessment is required to encourage, and provide evidence of, a broader range of learning and student development. This includes giving more priority to the assessment of students' conceptual understanding, skills in applying knowledge and personal attributes and dispositions. A challenge will be to broaden the focus of assessment across all learning contexts, including in the upper secondary school.

The reform of assessment is crucial because of its role in directing teacher and student effort. Although school curricula commonly espouse holistic student development, this intention is often undermined by narrow assessments of learning. If skills such as critical and creative thinking, problem solving and collaborating, and personal attributes such as resilience and a growth mindset are to be given increasing priority, then they also must be prioritised in student assessment processes.

However, this raises the question of how outcomes of these kinds are best assessed. One possibility is through standalone tests—for example, a test of critical thinking or a test of resilience. This may be appropriate for some kinds of learning; however, many competencies and attributes are likely to be best assessed in complex contexts such as investigative student projects or problem-solving activities. For example, observations of project work may simultaneously provide evidence of a student's ability to gather and analyse relevant information, use digital resources, work collaboratively and think creatively. In general, a shift in the focus of assessment will require less use of traditional tests and examinations, and more use of complex, technology-supported applications of learning.

A shift in the *purpose* of assessment is required to focus effort on establishing and understanding the points individuals have reached in their long-term progress—as a basis for identifying starting points and next steps in teaching, and for monitoring growth over time. This purpose contrasts with the use of assessment primarily to judge and grade students on how much of a body of taught content they can demonstrate.

This shift in purpose is deeper than the formative–summative distinction. Conventionally, summative assessments occur at the end of teaching and formative assessments occur during teaching. However, when the purpose is to establish where students are in their long-term progress, this question can be addressed at any time, and the answer can be used both prospectively (formatively) to decide next steps, and retrospectively (summatively) to evaluate a student's progress since some earlier assessment. The process of establishing where students are in their learning will usually include diagnostic analyses of the difficulties individuals are experiencing, gaps in learning and student misunderstandings. Digital technologies that incorporate professional knowledge about how students learn are likely to assist in the diagnosis and targeting of individuals' readiness and needs.

Redesigned assessments of this kind depend on well-constructed frames of reference for monitoring long-term learning progress. These frames of reference will describe and illustrate what it means to become increasingly proficient in an area of learning—that is, the nature of increasingly sophisticated knowledge, deeper conceptual understanding and higher levels of skill. They will make explicit progressions of learning that are often implicit, but less well developed and articulated, in traditional year-based curricula.

Assessments to monitor long-term progress will require transformed approaches to communicating learning. Rather than defining success only as the proportion of taught content a student can demonstrate, conclusions about learning will consider the progress individuals make. Percentages and letter grades will be inadequate for this purpose; reports of learning will need to convey the stage an individual has reached and, ideally, the progress they have made over time.

Effective teaching

Personal, holistic, and developmental reforms also will require teachers who can work at high levels of professional expertise. This high-level expertise will include the ability to:

- *promote holistic student development*—including students' deep conceptual understanding, personal attributes and dispositions, abilities to think and problem solve, to innovate, to make effective uses of digital technologies and to understand and work collaboratively with others
- *establish where individuals are in their learning*—that is, establish what individuals know, understand, can do and are ready to learn next, including by diagnosing learning gaps, misunderstandings and difficulties
- *use a repertoire of proven teaching strategies*—to target individual learning needs, address student difficulties, and promote further learning.

Such teaching requires ongoing professional judgements about students and their learning, the kinds of assistance they require and the most effective ways to support further learning.

It is possible to imagine forms of teaching that would not require high levels of professional judgement. For example, if teachers saw their role as simply 'delivering' a detailed, centrally prescribed curriculum, and then assessing students' mastery of the delivered content, there may be little need for professional judgement. The same would be true if teachers were required to use the same teaching method or the same teaching resources with all students, with little opportunity to adapt to students' varying backgrounds and needs.

A feature of high-performing school systems globally is that they expect teachers to work with a high degree of professionalism. Rather than specifying what and how teachers should teach, they tend to provide broad curriculum frameworks within which teachers and schools develop local adaptations. For example, in Estonia and South Korea, schools are responsible for developing local curricula. In high-performing systems, teachers are trusted to make professional judgements about what will be in the best interests of their students. Across the world, teachers' perceptions of the extent to which teaching is valued by society are correlated with the degree of professional autonomy they are given. These perceptions are highest in Singapore, South Korea and Finland—all very high-performing countries in international surveys of student achievement.[17]

High-performing countries generally do not encourage or discourage teachers' use of particular teaching strategies such as within-class grouping, individualised instruction, the provision of feedback, setting homework or parental engagement. Instead, they have a strong focus on the teaching of subjects, including clarity about what students are expected to learn, where individuals are in their learning, what difficulties they are experiencing and effective ways to build further subject knowledge and understanding. Teachers are trusted to make judgements about how to pursue this focus in their own contexts.

To ensure teachers can work in this way, high-performing countries provide very high levels of initial preparation in the subjects teachers will teach. Both primary and secondary teachers are expected to develop deep subject matter expertise and deep knowledge of how students learn subjects (pedagogical content knowledge), usually in research universities and sometimes to the level of a master's degree. In some countries, including Finland, initial teacher education programs require the completion of a major research project into student learning of some aspect of a subject. It is understood that, to develop students' deep understanding, teachers themselves must have deep understanding. For this reason, these countries also work to minimise out-of-field teaching.

High-performing jurisdictions also provide teachers with time to work collaboratively to plan and review lessons and to discuss individual student needs. In some countries, including China, this is achieved by maintaining relatively large class sizes, but significantly decreasing contact hours. By creating more non-contact time and minimising administrative demands, these systems support teachers to observe and provide feedback on one another's teaching, to undertake joint activities across classes, to team teach and to engage in collaborative professional learning—all of which have been shown internationally to be directly correlated with teachers' levels of self-efficacy.[18] More generally, when countries accord teachers greater trust and professionalism, teachers express greater satisfaction with their work and work environments.

Finally, high-performing school systems pay considerable attention to the ongoing development of teacher expertise, beginning with well-designed induction and mentoring programs. Career progression is based not simply on willingness to take on additional schoolwide and administrative responsibilities, but on evidence of increasingly expert classroom teaching. Teaching standards and career paths reflect this emphasis. Teachers are also encouraged to work as part of professional communities to innovate, experiment and evaluate the effectiveness of particular pedagogical approaches. And some jurisdictions, including Hong Kong, support the professional work of teachers through sabbaticals, study tours and opportunities for secondments and involvement in external research.[19]

Student support

The reform of school learning systems will also require greater attention to processes for identifying and meeting the needs of individual learners.

Student-centred approaches to teaching and learning recognise that students come from widely varying cultural, language, socio-economic and other backgrounds, have very different interests and aspirations, and are at markedly different stages in their learning and development. Success in ensuring every student learns successfully depends on understanding and addressing individual circumstances and needs. This is also the key to equity in school education.

The efforts of governments and school systems to address students' varying needs are often limited to initiatives relating to specific 'equity' groups, such as students with special needs, First Nations students and students from low socio-economic backgrounds. Beyond these groups, it is seen to be the job of teachers to address individual needs. However, there is little evidence that Australian programs and initiatives targeted at equity groups over the past two decades have been successful in closing achievement gaps. In this context, it is again instructive to consider the policies and practices of some high-performing school systems and the broader understanding of equity that underpins them.

A general strategy of high-performing countries is to ensure that *every* student has access to high-quality schooling and pre-schooling, regardless of their background and circumstances. This can begin before birth. For example, Hong Kong provides free prenatal care services for all expectant mothers, and Korea provides all expectant parents with vouchers to cover expenses related to pregnancy and childbirth. Finland provides every newborn child with a pack that includes basic clothing, toys, a book and a baby-care guidebook. Ongoing support in these countries often includes free nutritional services, free health checks, a monthly child allowance regardless of income, and free or heavily subsidised early education and care for all (British Columbia provides free full-time kindergarten for all 5-year-olds; Hong Kong provides free half-day kindergarten for all 3- to 6-year-olds). This general strategy of minimising the impact of family circumstances through universal provision continues throughout the school years.

An intention in these high-performing jurisdictions is that no student should be denied access to educational opportunities available to others. To this end, their earlier dual systems of schools have been replaced by comprehensive schools, ensuring every student has access to higher stages of education. Within-school streaming that locked some students into lower streams and placed ceilings on how far they could progress have been abolished. And efforts have been made to remove obstacles that some students may face. For example, when the leaving age was raised in Finland in 2021, educational programs and learning materials, including laptops, were provided to every student free of charge. High-performing jurisdictions also make efforts to ensure every student has access to an excellent school and high-quality teaching, regardless of their circumstances, and when necessary, provide differential support in the form of fee remissions, scholarships, textbook assistance schemes and educational camps to enable the full participation of students from low-income families. As a result, the correlation between socio-economic background and student achievement in these jurisdictions tends to be lower than in others.

Importantly, in high-performing school systems, systemic efforts to address student needs are not limited to identified demographic groups. Instead, it is recognised that many students—and potentially every student—will require support with their learning at some time during their schooling. The fact that many students struggle and slip behind is seen not only as an issue and challenge for teachers, but as a general issue requiring a national response. Finland's response has been to recruit and train teachers whose sole job is to work with individual students who are at risk of falling behind. One of these 'special education' teachers is appointed for every 7 or 8 classroom teachers. They work with students who require additional support, either within their classroom or by withdrawing them for a period. By some accounts, up to a third of Finnish students

work with a special education teacher at some point during their schooling.

Other countries respond in other ways. In Estonia, students who require additional support are withdrawn and taught intensively in small groups of about 8 students. In Hong Kong and South Korea, students who slip behind in their learning are often taught and tutored outside school hours in an effort to get them back on track. These high-performing school systems see it as a system responsibility to ensure that no student falls behind. In contrast, lower-performing school systems tend to assign this responsibility to teachers who share the onus for successful learning with students themselves.

Strong leadership

The reform challenges outlined in this paper will require visionary and effective leadership at all levels—from governments and education policy makers to school leaders and classroom teachers.

The focus of this paper has been on arrangements with a relatively direct influence on teaching and learning. However, these are not the only reforms required. The challenges of better preparing students for the future and ensuring every student learns successfully also require general structural and funding reforms to ensure every Australian child has access to an excellent school and excellent teachers. These reforms will require leadership courage and resolve.

In parallel, reforms of school learning systems will not be achieved through isolated initiatives or on short timelines. They involve changes to multiple aspects of schooling and depend on a larger vision and an understanding that personal, holistic and developmental principles require *transformational* change, which will take time and committed leadership.

Many of today's high-performing school systems made transformational changes at particular times in their history. Examples include Finland's introduction of comprehensive schools in the 1970s; Estonia's broadening of the purpose of schooling at the time of its independence in the early 1990s; and Hong Kong's far-reaching reforms of its curriculum in the early 2000s. These changes all required determined leadership by governments and the profession.

School principals and other senior leaders in schools are also in influential positions to drive transformational change. Again, this depends on recognising existing shortcomings and thinking creatively about alternatives. Highly effective school leaders promote cultures of self-reflection, planning and experimentation, and are often prepared to challenge and innovate within and around externally imposed expectations. In these ways, they sometimes achieve breakthroughs well before they are incorporated into wider policy changes. Such leaders often play a role in education reform efforts through collaborations with colleagues and networked professional communities.

Leadership at all levels involves an understanding of, and ability to negotiate, obstacles to reform. These obstacles include reform fatigue arising from continual piecemeal additions to teachers' workloads; inertia due to community acceptance of the status quo and inability to imagine alternatives; unwillingness to commit to the long timelines required for deep reform; and a desire by some interest groups to preserve the advantages they believe they enjoy under existing arrangements.

Learning ecosystems

Transformative reforms will also depend on schools working closely with, and drawing on the wider resources of, the communities in which they operate.

Increasingly, schools do not work in isolation from each other or from their wider communities. School 'ecosystems' include parents, professional associations, businesses, non-government organisations, other schools, higher education institutions, community organisations, government education ministries and agencies, and for some schools, regional or diocesan offices of education. These stakeholders form part of the framework within which schools work. Their assistance and support are likely to be essential for deep and sustainable educational transformation.

There are various ways in which school ecosystems can provide such support. In some countries, schools are seen as keys to the future. Singapore is an example. It looks to its schools to help build a citizenry capable of engaging with 21st century challenges and a highly skilled workforce necessary for enhanced national productivity, international competitiveness and future standards of living. As a result, schools and teachers enjoy wide community support. The same is true in many other countries, including Finland, South Korea and Estonia, where schools and teachers also are highly valued because of their past roles in preserving national culture and language following occupation and war. But in other societies, the connection between school education and the nation's future may be less clearly drawn; respect for teachers may be relatively low, and there may be a community perception that schools are underperforming.

External support for the work of schools also results from strong beliefs in education as a means to personal advancement and success. In many high-performing jurisdictions, educational success is very highly valued and families are prepared to allocate significant discretionary spending to children's education, including out-of-school learning, and to make substantial commitments of family time and effort. However, the priority families attach to school success can work against educational reforms and the kinds of learning now required. In some jurisdictions, including Estonia and South Korea, students spend extraordinary amounts of time on homework and other out-of-school learning, often to the detriment of their lives and wellbeing. At the same time, competitive examinations that measure and determine success often narrow teacher and student effort to particular forms of learning. In many countries, including Australia, university admissions processes form part of the schooling ecosystem and can make transformative reforms more difficult.

External stakeholders also can make direct contributions to schools' educational objectives through their provision and support of out-of-school learning. This can be systematic and planned and part of government policy to expand learning opportunities through career-related experiences, community services, sporting activities, programs in the arts and music, and student participation in national and international competitions. In Hong Kong, this is referred to as 'life-wide' learning. In Estonia, various external organisations including workplaces, museums, science centres and environment centres offer learning programs aligned with the school curriculum. By directly supporting student learning, external organisations can contribute to better preparing students for the future and ensuring that every student learns successfully.

School ecosystems are most likely to support transformative change when they are strongly aligned around the need for change. Globally, some jurisdictions have been more successful than others in achieving consensus on required reforms. For example, in British Columbia, a network of consultants, former educational leaders and academics has had a significant influence in providing directions for change. But more generally, deep change is likely to require the support of a range of stakeholders, including employers, teacher and parent associations, non-government organisations, universities, philanthropic organisations, expert task forces and think tanks.

CONCLUSION

The central thesis of this paper has been that the challenges now confronting schools globally will require fundamental reforms of the external frameworks within which schools work. Today's challenges to better prepare young people for the future and to ensure that every student learns successfully will not be met by simply expecting teachers to change what they do or by making minor adjustments to current curricula, assessment, examination, reporting and credentialling arrangements. Today's challenges require deep reforms and a willingness to reimagine—in other words, to 'transform' existing learning systems. This is essential because the external frameworks within which teachers and students work are such strong determinants of day-to-day practice.

Three principles with the potential to guide transformation efforts were outlined. Each principle challenges features of existing learning systems, including a widespread emphasis on passive, reproductive learning at the expense of more holistic student development; an emphasis on timed, lock-step learning at the expense of flexibility in the timing and rate of learning; and an emphasis on grading students on how well they have learnt bodies of taught content at the expense of understanding individual learning needs and monitoring students' long-term growth. The paper has argued that deep reforms guided by these principles are urgently required if progress is to be made in addressing the two global challenges.

Endnotes

1. Masters, G. N. (2020). *Nurturing wonder and igniting passion: Designs for a new school curriculum: NSW Curriculum Review*. NSW Education Standards Authority. http://works.bepress.com/geoff_masters/304

2. Productivity Commission. (2022). *Review of the National School Reform Agreement*. https://www.pc.gov.au/inquiries/completed/school-agreement#report

3. Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Gebhardt, E. (2014). *Preparing for life in a digital age. The IEA International Computer and Information Literacy Study international report*. International Association for the Evaluation of Educational Achievement. https://doi.org/10.1007/978-3-319-14222-7

4. Sawyer M. G., Arney, F. M., Baghurst, P. A., Clark, J. J., Graetz, B. W., Kosky, R. J., Nurcombe, B., Patton, G. C., Prior, M. R., Raphael, B., Rey, J., Whaites, L. C., & Zubrick, S. R. (2000). *Mental health of young people in Australia*. Commonwealth Department of Health and Aged Care.

5. Goodsell, B., Lawrence, D., Ainley, J., Sawyer, M., Zubrick, S. R., & Maratos, J. (2017). *Child and adolescent mental health and educational outcomes. An analysis of educational outcomes from Young Minds Matter: The second Australian Child and Adolescent Survey of Mental Health and Wellbeing*. The University of Western Australia. https://youngmindsmatter.telethonkids.org.au

6. Organisation for Economic Cooperation and Development. (2021). *Beyond academic learning: First results from the Survey of Social and Emotional Skills*. OECD Publishing. https://doi.org/10.1787/92a11084-en

7. Masters, G. N. (in press). *Building a world-class learning system: Insights from some top-performing school systems*. National Center on Education and the Economy and the Australian Council for Educational Research.

8. National Center for Education Statistics. (2022). *NAEP Long-Term Trend Assessment Results: Reading and Mathematics*. https://www.nationsreportcard.gov/highlights/ltt/2022

9. Saavedra, J. (2019, October 11). Ending learning poverty: The call of our times. *Education for Global Development*. https://blogs.worldbank.org/education/ending-learning-poverty-call-our-times

10. Commonwealth of Australia. (2022). *Australian Early Development Census National Report 2021: Early childhood development in Australia*. https://www.aedc.gov.au/resources/detail/2021-aedc-national-report

11. Australian Curriculum, Assessment and Reporting Authority. (2022). *National Assessment Program-Literacy and Numeracy (NAPLAN) National Report*. https://www.nap.edu.au/results-and-reports/national-reports

12. Thomson, S., De Bortoli, L., Underwood, C., & Schmid, M. (2019). *PISA 2018: Reporting Australia's Results. Volume I Student Performance*. Australian Council for Educational Research. https://research.acer.edu.au/ozpisa/35

13. Commonwealth of Australia. (2022).

14. Thomson, S., De Bortoli, L., Underwood, C., & Schmid, M. (2019).

15. Masters, G. N. (in press).

16. Siemon, D., Barkatsas, T., & Seah, R. (Eds). (2019). *Researching and using progressions (trajectories) in mathematics education*. Brill. (Figure 1.1, p. 13)

17. Schleicher, A. (2022). Leveraging PISA to build better education systems: Lessons for South-East Asia. Presentation to the International Conference on Assessment and Learning, Bali Indonesia, October.

18. Schleicher, A. (2022).

19. Masters, G. N. (in press).