

and have done so for decades. Countries in our region are rapidly ramping up access to two years of preschool, framing this as a necessary investment in human capital and future productivity.

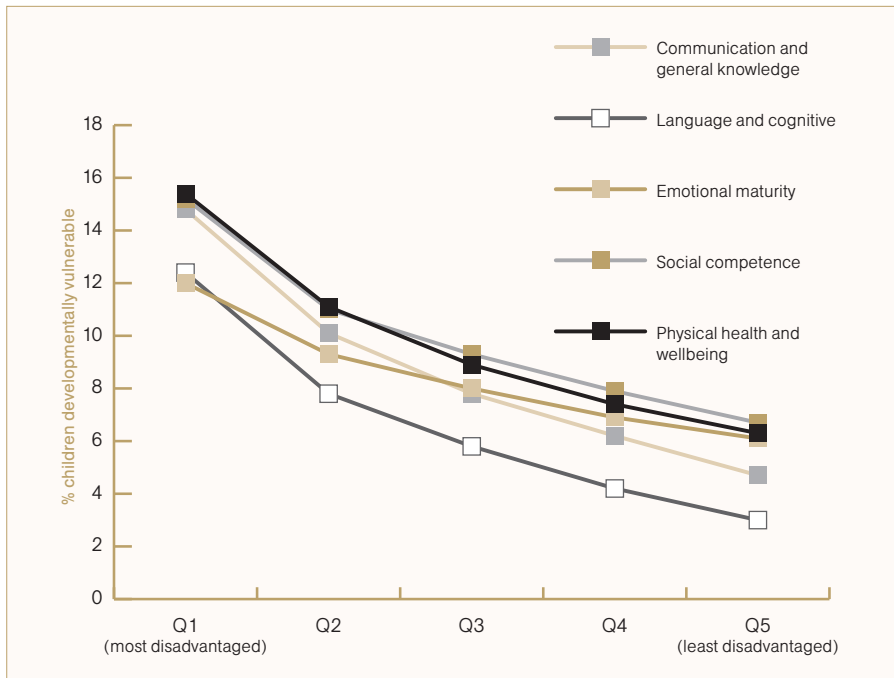
Investing in an additional year of preschool is the next big policy opportunity for Australia.

Link between early childhood development and school outcomes

Each year, at least 62,000 children start school experiencing significant vulnerabilities in key areas of development (Australian Early Development Census 2016). This is 22 per cent of all children, more than one in five. Around half of those children are vulnerable in multiple areas.

Children from low socioeconomic backgrounds are much more likely to experience developmental vulnerability (Figure 1), but there are children across the community, and in every classroom, who are struggling. Half of all children who are developmentally vulnerable are in the bottom two income quintiles (their family incomes are in the lowest 40%), and the other half are in the middle and upper quintiles.

Figure 1: Developmental vulnerability (measured by the AEDC) by community socio-economic status (measured by SEIFA) (Australian Early Development Census 2016)



Reducing the number of children who start school significantly behind their peers is a key strategy for boosting educational performance, ensuring young people are equipped with the range of skills and capabilities they will need for a lifetime of learning, and improving the wellbeing and lifetime outcomes for children.

Young children are learning and developing an enormous range of critical foundational skills in the years before they start school. These key areas of early childhood development – physical health and wellbeing, social competence, emotional maturity, language and cognitive skills, and communication skills and general knowledge – have been shown to predict children’s later outcomes in health, wellbeing and academic success.

Children who do not have the opportunity to fully develop these foundational skills can struggle significantly in their transition to school, throughout their education and with their movement into the workforce.

The case for two years of preschool

Attending the right amount of a high quality preschool program is one of the few proven strategies for lifting outcomes for all children. Its effectiveness is borne out in Australian and international research (AIHW 2015; Barnett et al. 2013; Goldfeld et al. 2016; Zaslow et al. 2010), with leading Australian child development researchers concluding that “preschool attendance was consistently associated with the lowest odds of developmental vulnerability” (Figure 2).The impact of preschool is seen across the socioeconomic spectrum (Figure 3).

Figure 2: Preschool attendance and developmental vulnerability (Goldfeld et al. 2016)

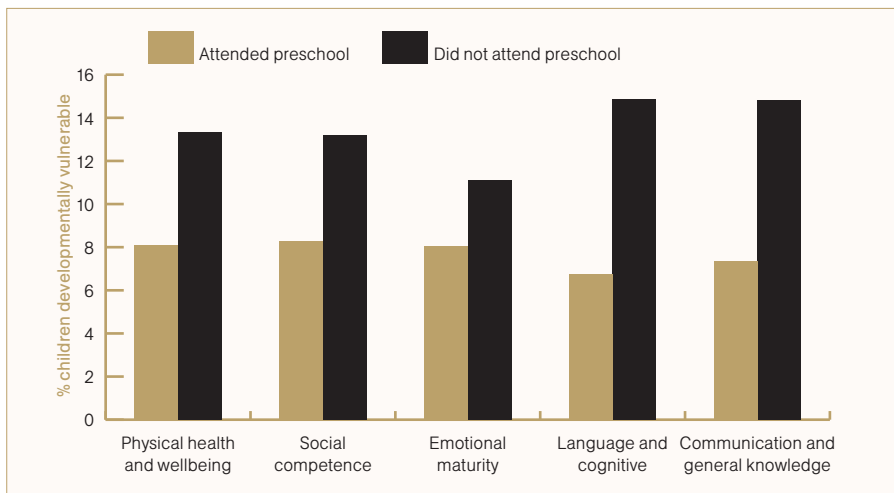
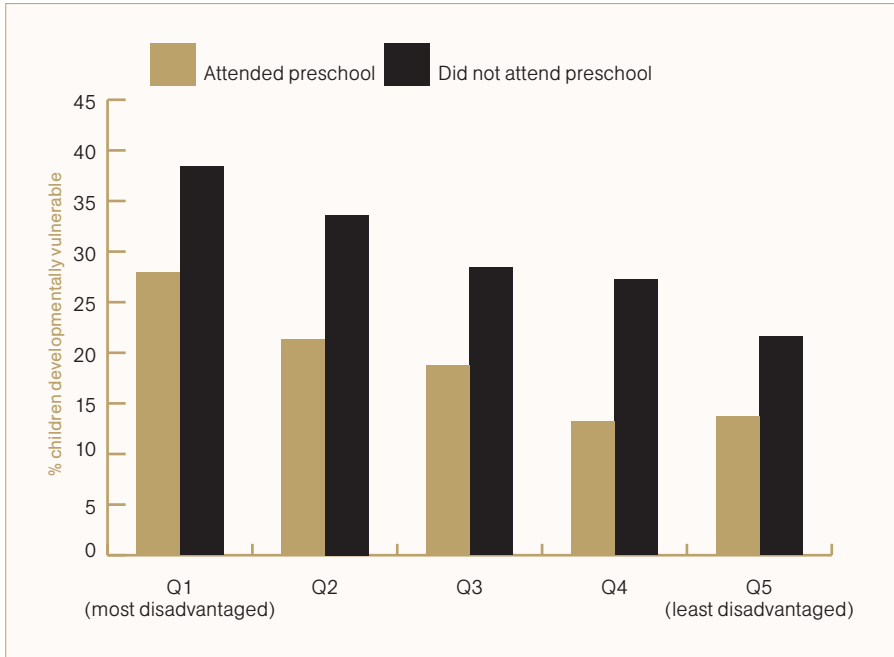


Figure 3: Impact of preschool by socioeconomic status (Goldfeld et al. 2016)



The potential impact of preschool is, however, influenced by:

- The quality of the preschool program and the learning environment children experience ; and
- The 'dose' of preschool that children have access to; how many hours, over how many years, they attend preschool programs.

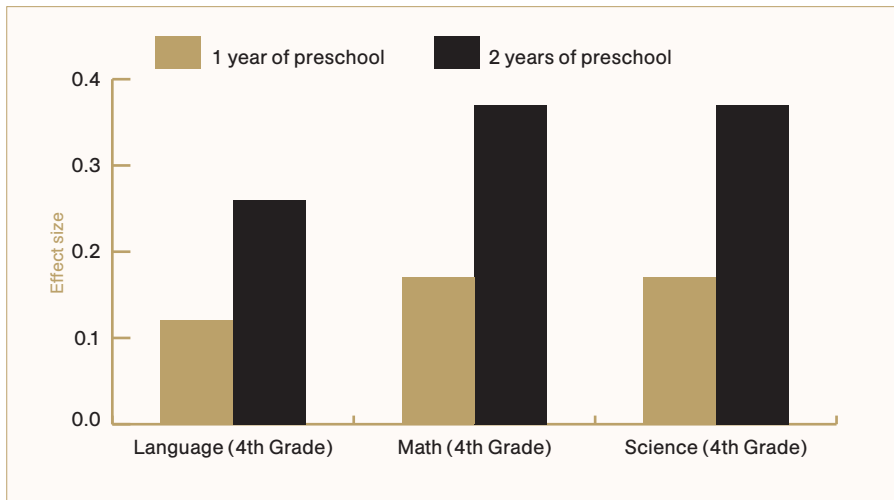
Key findings from the international research literature are that:

- Starting early and staying in for longer is beneficial for many children – studies from Europe, the US and UK show consistent benefits from two rather than one year of preschool.
- Disadvantaged children benefit the most – a range of studies highlight substantially greater impacts on cognitive and social and emotional outcomes for more disadvantaged children.
- The quality of programs matters – low and medium quality programs deliver very little short or long-term impacts, but the impact of high quality persists over time.
- Preschool programs improve cognitive as well as social and emotional outcomes – research on the long-term impacts of preschool highlights the interaction of academic and social and emotional skills on lifetime education and employment.

Starting preschool at age 3 and attending for two years appears to have the greatest impact on child outcomes. For disadvantaged children in particular, one year of preschool is not an adequate dose for closing achievement gaps that are already present at age 4. For example:

- Analysis of the impact of preschool on PISA, TIMSS and PIRLS consistently identifies that students who attended more years of preschool receive higher scores (an average of 33 points higher) in these key international benchmarking tests (Mostafa & Green 2012; Mullis et al. 2012; Mullis et al. 2016).
- The landmark Effective Provision of Pre-School Education (EPPE) study found that, at age 16, students who had spent longer in preschool (between two or three years) obtained higher total scores in secondary exams, better grades in English and in maths, and participated in more subjects/exams in secondary (Taggart et al. 2015).
- The Abbott Pre-K preschool program, a high-quality program delivered to around a quarter of children in New Jersey, also found that two years of preschool, starting at age 3, had much larger persistent effects on achievement in Grade 4 than one year (Figure 4). The strong impacts of this program are attributed to the provision of support for professional learning and continuous quality improvement mechanisms (Barnett et al. 2013, p. 19).

Figure 4: Abbott Pre-K Effects by years of attendance (Barnett et al. 2013)



Two years of preschool is good for schools too

High levels of developmental vulnerability in a classroom, or significant variation in children's underpinning skills and knowledge, make a teacher's role even more complex and places

additional pressure on schools to adequately meet the needs of all children in their community.

Children experiencing developmental vulnerability are likely to need significantly greater support in the classroom. This may range from physical challenges, like difficulty undoing buttons, managing lunch routines and sitting still, to challenges following instructions, communicating with other children and managing emotions. Teachers must utilise sophisticated teaching and learning strategies to develop and extend each child's learning, but this can be very challenging when children start school with very different capabilities.

It appears that for many students, the achievement gap evident at the start of school continues to grow as they progress through school (Goss & Sonnermann 2016; Lamb et al. 2015).

Research shows that "all children in a classroom tend to learn more during a given year if the average skill level in the classroom at the year's start is higher" (Bartik 2014, p. 56). The overall improvement in attainment in classrooms where a smaller proportion of children experience developmental vulnerabilities is likely to come both from peer effects, the influence children have on each other's learning, as well as from the enhanced capacity of the teacher to direct adequate time and resources to the students who require additional assistance (Burke & Sass 2011; Henry & Rickman 2007; Neidell & Waldfogel 2010).

Universal access to high quality preschool for all children is one of the most effective strategies to help children start school on a more equal footing.

School and community stories taken from the Australian Early Development Census show how schools are working in partnership with early education and care services to reduce developmental vulnerability in their community (AEDC 2017).

Early childhood educators change children's trajectories

There is growing community recognition and government support for the important role of teachers, and the importance of providing appropriate training and support to enable effective, high-impact teaching. However, this recognition has not been equally extended to early childhood educators, who – in spite of their pivotal influence during a fundamental stage in children's learning and development – are often still regarded as child-minders rather than educators.

The evidence is very clear that preschool programs achieve substantial and sustained impacts on children’s development and wellbeing, but that they need to be high quality to do so. Highly skilled and well supported educators are essential for high quality learning environments.

The quality of a learning environment in early education settings is, to a large extent, determined by the capacity of educators to provide responsive interactions and to construct a learning program that engages and extends children in developmentally appropriate ways (Cascio & Whitmore Schanzenbach 2013; Yoshikawa et al. 2013). This requires an in-depth understanding of early cognitive and social development, and a sophisticated approach to designing learning opportunities that progressively develop and extend a broad range of complex, fundamental skills – while working with large groups of young, energetic children.

All educators need high-quality initial qualifications and effective placements in collegiate, supportive environments that allow educators to develop and test new skills. Effective leadership, access to professional learning opportunities, positive work environments and appropriate remuneration all enhance the capacity of educators to deliver high quality learning environments for children.

The early education and care system does not provide the same pay and conditions for its educators as those enjoyed by school teachers, and early childhood educators often experience isolation, high levels of churn, low pay, restrictive working conditions and limited access to professional learning.

In order to have a positive impact on children’s long-term outcomes, and to change the trajectories of children experiencing developmental vulnerability, early education must be high quality – and it will be necessary for Australia to invest in its early years workforce.

Introducing an additional year of a preschool program targeted at 3 year olds will require a workforce strategy to boost the number of early childhood educators, and resources to support existing educators to deliver a high quality preschool program that engages and meets the needs of 3 year olds.

To be high quality, preschool programs for 3 year olds need to be developmentally appropriate, designed around the way 3 year olds learn best – through exploration and inquiry, free and guided play, rich engagement and conversation with educators, opportunities to practise and master new skills, and positive relationships with peers and educators.

It is important that a preschool program for 3 year olds should not be a 'pushed down' curriculum or 'sped up' learning experience, and should not simply replicate the 4 year old preschool program.

Some of the ways a preschool program can be developmentally appropriate for 3 year olds include:

- Approaches to programming that give children the opportunity for emerging skills to be practised and mastered, with the support and encouragement of educators;
- Smaller group learning experiences that don't place unfair demands on 3 year olds' listening skills and capacity to be actively engaged in the group experience;
- Reflecting 3 year olds' developing ability to wait, be patient and share with others in the design of activities, for example, by giving each child their own resource and gradually building their capacity to work collaboratively;
- Learning experiences designed around the attention span of 3 year olds, including planning fewer but richer and more engaging experiences that will capture children's interest, sustain their attention, and build their ability to focus over time;
- Supporting 3 year olds' flourishing expressive and receptive language, helping them tune into the rhythms of language, and building their confidence as communicators through responsive conversation;
- Exploring basic numeracy concepts such as counting, sorting, classifying, comparing and patterning;
- Identifying opportunities for play-based exploration of basic science concepts, supported by questioning, hypothesising and scaffolding children's everyday experiences;
- Outdoor play that helps 3 year olds to progressively develop new skills, building their strength, confidence and coordination.

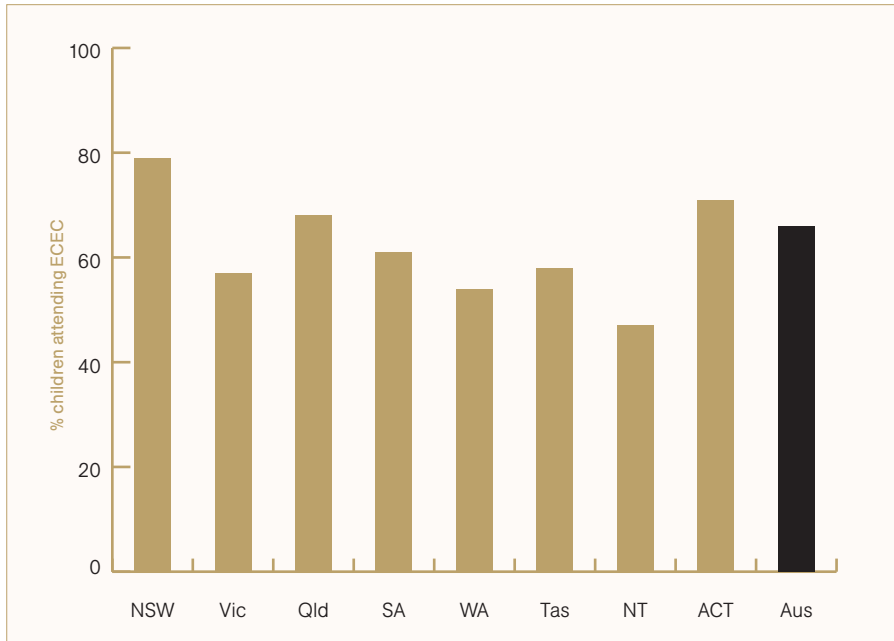
Yoshikawa et al. (2013) suggest that professional learning models that provide ongoing reflective coaching for educators, combined with assessments of child progress that are used to inform and individualise instruction, best allow educators to monitor the progress of each child in the classroom and modify their content and approach accordingly.

The path to two years of preschool in Australia

For nearly two thirds of Australian 3 year olds, participation in early education and care is the norm (Figure 5). However, only a small proportion of 3 year olds are enrolled in a program led by an early childhood teacher, not all are attending for the number of hours per week they need to, and the children most likely to miss out are the ones who will benefit most. There is no national policy or funding to support access to a preschool program for all 3 year

olds (although some states support some cohorts of children experiencing disadvantage to attend preschool).

Figure 5: Proportion of 3 year olds attending any early education and care, 2015 (ABS 2016; Steering Committee for the Review of Government Service Provision 2015)



There is a clear opportunity to leverage high current participation rates by 3 year olds as the existing investment in early education and care, the ongoing roll-out and future components of the National Quality Framework, and the existing National Partnership Agreement between the Commonwealth and states and territories that provides preschool in the year before school, are up for re-negotiation this year.

It is both appropriate and feasible to build on the platform provided by the existing service system – including long day care and sessional preschools – to provide universal access to preschool in the two years before formal schooling begins.

Consideration should also be given to how to best meet the needs of the approximately 5 per cent of children experiencing multiple and complex forms of disadvantage (including children known to the child protection system) who require much more intensive provision of the highest quality early education.

To capitalise on the opportunity to lift children's academic and life outcomes through an additional year of preschool, the challenge is to:

- Ensure all 3 year olds already attending early education and care services receive an adequate 'dose' of sufficiently high-quality preschool; and
- Ensure the children currently missing out due to financial and non-financial barriers have the opportunity to participate.

At the same time, we need to continue the work already underway across the country to lift the quality and impact of early education and care in Australia, including through delivering world-class pre-service education for teachers and other educators, developing and skilling up leaders in the early childhood sector, and using evidence and data more effectively.

References

- ABS (2016), *Preschool Education, Australia, 2015*, Canberra, <<http://abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4240.0Main+Features12015?OpenDocument>>.
- AEDC (2017), *Community Stories*, Australian Government Department of Education and Training, <<http://www.aedc.gov.au/resources/community-stories>>.
- AIHW (2015), *Literature Review of the Impact Of Early Childhood Education and Care on Learning and Development: Working Paper*, Australian Institute of Health and Welfare, Canberra.
- Australian Early Development Census (2016), *National Report 2015: A Snapshot of Early Childhood Development in Australia*, Australian Government Department of Education and Training, Canberra.
- Barnett, S., Jung, K., Youn, M-J. & Frede, E. (2013), *Abbott Preschool Program Longitudinal Effects Study: Fifth Grade Follow-Up*, National Institute for Early Education Research, New Jersey, <<http://nieer.org/sites/nieer/files/APPLES%205th%20Grade.pdf>>.
- Bartik, T. (2014), *From Preschool to Prosperity: The Economic Payoff to Early Childhood Education*, WE Focus Series, W.E. Upjohn Institute for Employment Research, Kalamazoo.
- Burke, M. & Sass, T. (2011), *Classroom Peer Effects and Student Achievement*, Federal Reserve Bank of Boston, Boston.
- Cascio, E & Whitmore Schanzenbach, D 2013, *The Impacts of Expanding Access to High-Quality Preschool Education*, Brookings Institute, Washington DC.
- Goldfeld, S., O'Connor, E., O'Connor, M., Sayers, M., Moore, T., Kvalsvig, A. & Brinkman, S. (2016), 'The Role of Preschool in Promoting Children's Healthy Development: Evidence From an Australian Population Cohort', *Early Childhood Research Quarterly*, vol. 35, pp. 40-8.
- Goss, P. & Sonnermann, J. (2016), *Widening Gaps: What NAPLAN Tells us About Student Progress*, Grattan Institute, Melbourne.
- Henry, G.T. & Rickman, D.K. (2007), 'Do peers influence children's skill development in preschool?', *Economics of Education Review*, vol. 26, no. 1, pp. 100-12.
- Lamb, S., Jackson, J., Walstab, A. & Huo, S. (2015), *Educational Opportunity in Australia 2015: Who Succeeds and who Misses Out*, Centre for International Research on Education Systems, for the Mitchell Institute at Victoria University, Melbourne, <<http://www.mitchellinstitute.org.au/reports/educational-opportunity-in-australia-2015-who-succeeds-and-who-misses-out/>>.
- Mostafa, T. & Green, A. (2012), *Measuring the Impact of Universal Pre-School Education and Care on Literacy Performance Scores*, Centre for Learning and Life Chances in Knowledge Economies and Societies, London.

- Mullis, I., Martin, M., Foy, P. & Drucker, K. (2012), *PIRLS 2011 International Results in Reading*, TIMSS & PIRLS International Study Center, Boston College and International Association for the Evaluation of Educational Achievement, Massachusetts, viewed 27 July 2016, <http://timssandpirls.bc.edu/pirls2011/downloads/P11_IR_FullBook.pdf>.
- Mullis, I., Martin, M., Foy, P. & Hooper, M. (2016), *TIMSS 2015 International Results in Mathematics*, TIMSS and PIRLS International Study Centre, Lynch School of Education, Boston College, Boston, <<http://timss2015.org/wp-content/uploads/filebase/full%20pdfs/T15-International-Results-in-Mathematics.pdf>>.
- Neidell, M. & Waldfogel, J. (2010), 'Cognitive and Noncognitive Peer Effects in Early Education', *The Review of Economics and Statistics*, vol. 92, no. 3, pp. 562-76.
- Steering Committee for the Review of Government Service Provision (2015), *Report on Government Services 2015: Part 3 Early Childhood Education and Care - Attachment*, Productivity Commission, Canberra.
- Taggart, B., Sylva, K., Melhuish, E., Sammons, P. & Siraj, I. (2015), *Effective Pre-School, Primary and Secondary Education Project (Eppse 3-16+): How Pre-School Influences Children and Young People's Attainment and Developmental Outcomes Over Time*, Department for Education, London.
- Yoshikawa, H., Weiland, C., Brooks-Gunn, J., Burchinal, M., Espinosa, L.M., Gormley, W.T., Ludwig, J., Magnuson, K., Phillips, D. & Zaslow, M. (2013), *Investing in Our Future: The Evidence Base on Preschool Education*, Society for Research in Child Development and Foundation for Child Development.
- Zaslow, M., Anderson, R., Redd, Z., Wessel, J., Tarullo, L. & Burchinal, M. (2010), *Quality Thresholds, Features, and Dosage in Early Care and Education: Secondary Data Analyses of Child Outcomes*, Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services, Washington.

The relationship between homework practices and educational outcomes

Justin Bowd

Time spent on homework, attitudes towards homework, and parental involvement in students' homework may be functions of students' socioeconomic or cultural backgrounds. The relationship between homework and motivation may also be mediated or moderated by differences in student background. Understanding these interactions has the potential to improve educational outcomes by informing policy around pedagogy, resource allocation and curriculum development.

That attitudes towards, and achievement in, formal education vary (on average) across class and cultural divides is widely known (Bourdieu & Passeron, 1977; Connell, Ashenden, Kessler, & Dowsett, 1989; Portes, 1996; Teese & Polesel, 2003). As noted by Lareau (1987), much research examining the effects of students' demographic characteristics on education has focused mainly on variation in achievement outcomes rather than variation in the processes and practices that may lead to differential outcomes. It may be that differences in homework practices contribute to this variation in outcomes, or there may be potential for effective homework practices to reduce the influence of student family background and other demographic variables on achievement. In order to reduce the degree to which structural variables such as socioeconomic status (SES), parental education, gender, cultural background, and the like influence educational outcomes, it is important to first establish which of these factors are linked with processes, like homework practices, that may produce differential outcomes on an aggregated level.

Defining homework

As one researcher has noted, 'homework is a complicated thing (and) the process of assigning and doing homework rarely works in the idealised way that laypeople—and apparently, most policymakers—envision it' (Corno, 1996, p. 27). One of the likely reasons

Justin Bowd is a research officer at the AEU Victorian Branch and a PhD student at the Melbourne Graduate School of Education. He previously worked in a research position at the Victorian Curriculum and Assessment Authority and has co-authored several peer-reviewed articles on teenagers' time-use with Professor Pavla Miller from RMIT.

for this complexity is the wide range of definitions and functions that can be applied to the concept of homework. Another possible explanation for the gap that exists between an idealised vision of homework and the reality surrounding its practices, is that homework's meanings and functions may well be subject to significant and structural, economic, social and cultural variations. The dynamic relationships between homework's content and context may be one reason for the high level of complexity.

Given this high level of complexity, defining and operationalising homework as a construct amenable to formal examination in research can be challenging. In interrogating large-scale datasets the definition of homework is necessarily constrained to that used in data collection. For example, the Program for International Student Assessment's (PISA) *2012 Student Questionnaire* asks respondents (15-year-old students) to provide an estimate of how many hours per week on average they spend on 'Homework or other material assigned by your teachers' (OECD, 2013, p. 233). Although the questions that follow in the survey ask for separate estimates of time spent with home tutors; in outside-of-school classes; on 'Practice content from school lessons by working on a computer'; and studying 'with a parent or other family member', it is not clear whether 'material assigned by your teachers' is inclusive or exclusive of these subsequent categories, highlighting the difficulties associated with defining and measuring homework and its utility.

A frequently cited definition of homework as 'tasks assigned to students by school teachers that are meant to be carried out during non-school hours (excluding) in-school guided study, home study courses, and extracurricular activities' is simple and convenient (Cooper, 1989b, p. 86). By constraining homework to mean 'tasks assigned' by teachers, this definition excludes outside-of-school study that is purely student-directed or parent-directed, allowing homework to be studied as an educational tool at the disposal of teachers. This is a useful way of operationalising the concept of homework but it is not unproblematic. For instance, there may be differences in the level of student autonomy required by different homework assignments (compare a mathematics worksheet to an exploratory research assignment, for example), and for many, one of the primary goals of homework is to promote independent learning (Bempechat, 2010). Indeed, the metaphor of homework as a 'tool' with which a teacher 'works' on students is one that a deep exploration of the concept of homework must critically examine. On a subjective level homework may have radically different meanings for different actors (Coutts, 2004).

Positive and negative effects of homework

Before examining how homework practice varies with student background characteristics it is worthwhile outlining a few of the positive and negative effects homework practices may

entail - a subject of much debate. Evidence of a positive relationship between homework time and achievement is more commonly reported for secondary school students than for primary school students (Cooper, 1989a; Daw, 2012; Hattie, 2013; Horsley & Walker, 2013). It has also been found that this relationship is often not linear, and contingent on a range of contexts including subject domain, demographic variables and learning styles (Daw, 2012; Flunger et al., 2015), and the relationship may also vary significantly across national borders (Dettmers, Trautwein, & Lüdtke, 2009).

Perhaps the most obvious benefit of homework is its potential to increase time on-task. Although the quality of this time and the amount of actual academic learning time (Berliner, 1990) experienced by the student out of the classroom is potentially less responsive to the direct intervention of a teacher, allocated time, at least, is increased.

It is the absence of a proximate teacher that actually accounts for another of homework's purported benefits by providing the space for students to move from proximal to actual developmental stages of learning (Horsley & Walker, 2013; Tharp & Gallimore, 1991). In Tharp and Gallimore's four stage adaptation of Vygotsky's zones of proximal and actual development, homework may provide space not only for the development of specific task capacities, but for human development more generally (1991). In this way homework is potentially beneficial in providing students with the opportunity to develop and practise self-directed and self-regulated learning (Bempechat, 2010; Kitsantas, Cheema, & Ware, 2011; Ramdass & Zimmerman, 2011; Zimmerman & Kitsantas, 2005).

Reported negative effects of homework include satiation (including emotional and physical fatigue), a reduction in time available for leisure and community activities, parental interference, increased opportunities for cheating, and 'increased differences between high and low achievers' (Cooper (1989b, p. 86). It has been reported that achievement benefits for extra time invested in homework are greater for students from higher SES backgrounds (Daw, 2012; Ronning, 2011). Lamkin and Saleh suggest that homework provision:

can elevate the Mathew's [sic] effect: Parents from low socioeconomic and educational background can provide little support to their children at home, while parents from high socioeconomic and educational background are more able to provide support to their children at home. This practice can directly contribute to increasing the gap between the poor and rich children (2010, pp. 452-453).

Conversely, the OECD suggests that a lack of homework undertaken by low performing secondary students is an explanation of the achievement gap: 'Low performers are not

devoting enough time to homework – at least not more than their better performing peers – to close the performance gap’ (2016). Confusingly, it appears that homework is both the performance gap’s cause and cure.

Homework in Australia

PISA data from 2012 shows that Australian 15 year-old students reported spending around six hours per week on homework compared to the OECD average of around five hours (Figure 1).

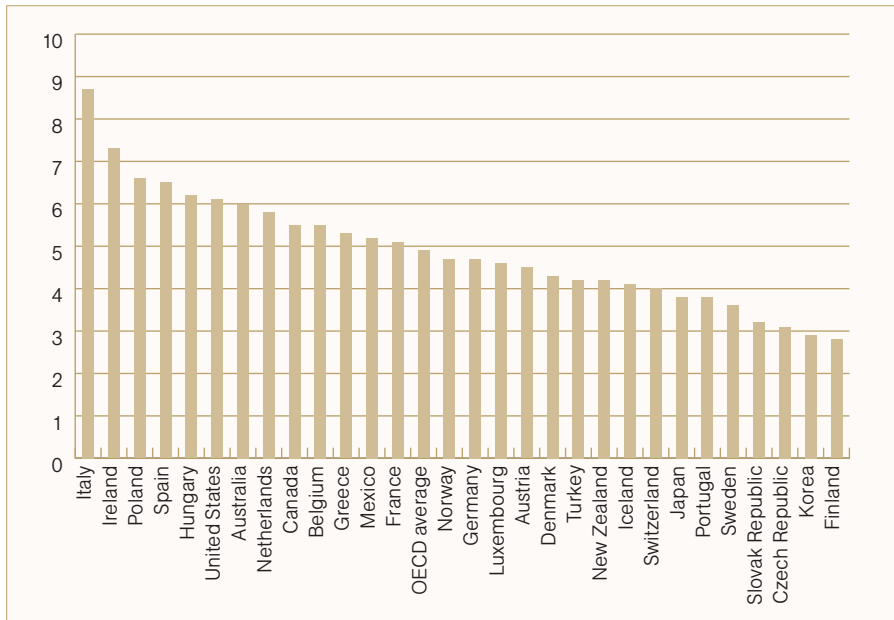


Figure 1. Hours of homework per week – PISA 2012. Source: (OECD, 2014)

The PISA data also shows that although the OECD average of reported weekly homework time reduced by about an hour between 2003 and 2012, homework time in Australia increased by 24 minutes.

Australia also stands out from the bulk of OECD countries in the degree to which the amount of reported homework time varies by SES. The SES measure used in Figure 2 is PISA’s index of economic, social and cultural status (ESCS). In Australia, the difference in reported homework time between the top and bottom ESCS quartiles was 2.9 hours compared to the OECD average of just 1.7 hours (Figure 2).

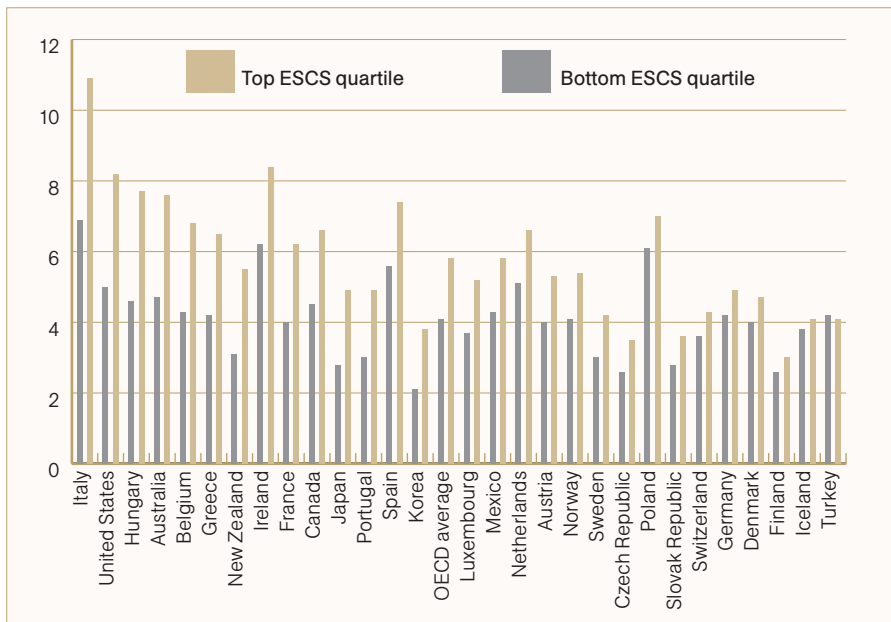


Figure 2. Weekly homework hours, bottom and top ESCS quartiles, PISA 2012. Source: (OECD, 2014)

It would seem that SES is a strong predictor of reported homework time, particularly in Australia. It is of interest here to examine whether other variables generally associated with achievement differences also account for differences in reported homework practices whilst SES is held constant. These variables include school type (government, non-government) and location (metropolitan, non-metropolitan), language background (language other than English spoken at home), previous achievement (previous grade repetition is a proxy here), and gender.

Statistical analysis and results

The 2015 PISA student survey was administered to 14,481 Australian 15-year-old students of which 8,995 provided estimates of how many hours they spent per week on 'Homework or other material assigned by [their] teachers' (OECD, 2013, p. 233). These students were selected randomly from within 769 schools which in turn were selected by stratified sampling methods. We ran two analyses examining the relationship between the student background variables described above and reported weekly homework time. Firstly we ran a mixed-effects binary logistic model to see if the independent variables affected the likelihood of students reporting that they undertook no homework. We found that high SES students were less likely to report undertaking no homework than low SES students. Female students,

students having a language background other than English, students from metropolitan schools, and students from non-government schools were also less likely to report that they spent no time on homework.

Next we ran a mixed-effects maximum likelihood model for students who reported undertaking at least some homework per week. The findings here were similar to those of the first model except grade-repeaters were found to report significantly less homework than students who had not repeated a grade. It is possible that this relationship was not found in the first model due to low cell counts for grade-repeaters and students reporting no homework.

Another measure of homework practice – the extent to which students agreed that they had their 'homework finished in time for mathematics classes' – was also examined against the student background variables described above. We used the same method as the first model to test whether the independent variables affected the likelihood of students agreeing or disagreeing with the statement. High SES students were more likely to agree with the statement than low SES students. Students with language backgrounds other than English and students from non-government schools were also more likely to agree that they had their mathematics homework completed on time. No significant effects were found for gender, school location or grade repetition.

Conclusion

The results obtained here largely support the conclusion that many of the variables associated with greater levels of achievement are also positively related to measures of homework practice. However, the model for reported timeliness of mathematics homework completion found that gender, location and grade repetition had no effect suggesting that this model was measuring a substantively different phenomenon with possible domain effects as reported by Trautwein, Lüdtke, Schnyder, and Niggli (2006).

Taken together, these findings do not prove that variation in homework practices cause variation in achievement; the direction of causality may flow in either direction which is not the case when considering the relationships between demography and achievement or demography and homework practices. Motivational factors may explain differences in reported homework time and may be involved with feedback relationships with both homework and achievement. It may also be the case that the material requirements necessary for homework may vary across demographic variables, as might the amount of time available or required to undertake homework tasks.

In light of these limitations, further research focusing on the relationships between demography, homework, motivation and measures of achievement outcomes (short-term and long-term) is required to provide a more complete picture of why homework practices vary according to student backgrounds. A substantial qualitative examination of how homework is perceived and practised by students from varying backgrounds is also likely to provide a richer source of data that may, at some point, be of practical use to students, teachers, schools and school systems.

This article is a synopsis of a research paper by Justin Bowd, Terry Bowles and Vicki McKenzie presented at the 2016 Australian Association for Research in Education (AARE) conference. The full paper is available at <http://www.aare.edu.au/publications-database.php/11073/an-exploratory-analysis-of-the-personal-school-and-demographic-variables-affecting-the-homework-effo>

References

- Bempechat, J. (2010). The Motivational Benefits of Homework: A Social-Cognitive Perspective. *Theory into Practice*, 43(3), 189-196.
- Berliner, D. C. (1990). What's all the fuss about instructional time. *The nature of time in schools: Theoretical concepts, practitioner perceptions*, 3-35.
- Bourdieu, P., & Passeron, J. (1977). *Reproduction: In Education, Society and Culture*. London: Sage Publications.
- Connell, R. W., Ashenden, D. J., Kessler, S., & Dowsett, G. W. (1989). *Making the Difference: Schools, Families and Social division*. North Sydney: Allen and Unwin.
- Cooper, H. (1989a). *Homework*. White Plains, NY: Longman.
- Cooper, H. (1989b). Synthesis of research on homework. Grade level has a dramatic effect on homeworks effectiveness. *Educational leadership*, 47(3), 85-91.
- Corno, L. (1996). Homework is a complicated thing. *Educational Researcher*, 27-30.
- Coutts, P. M. (2004). Meanings of homework and implications for practice. *Theory into Practice*, 43(3), 182-188.
- Daw, J. (2012). Parental income and the fruits of labor: Variability in homework efficacy in secondary school. *Research in social stratification and mobility*, 30(3), 246-264.
- Dettmers, S., Trautwein, U., & Lüdtke, O. (2009). The relationship between homework time and achievement is not universal: Evidence from multilevel analyses in 40 countries. *School Effectiveness and School Improvement*, 20(4), 375-405.
- Flunger, B., Trautwein, U., Nagengast, B., Lüdtke, O., Niggli, A., & Schnyder, I. (2015). The Janus-faced nature of time spent on homework: Using latent profile analyses to predict academic achievement over a school year. *Learning and Instruction*, 39, 97-106.
- Hattie, J. (2013). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Routledge.
- Horsley, M., & Walker, R. (2013). *Reforming homework : practices, learning and policies*. South Yarra, Vic.: Palgrave Macmillan.
- Kitsantas, A., Cheema, J., & Ware, H. W. (2011). Mathematics achievement: The role of homework and self-efficacy beliefs. *Journal of Advanced Academics*, 22(2), 310-339.
- Lamkin, M., & Saleh, A. (2010). Homework. *Encyclopedia of Curriculum Studies*. SAGE Publications, Inc (pp. 452-453). Thousand Oaks, CA: SAGE Publications, Inc. doi:<http://dx.doi.org/10.4135/9781412958806>
- Lareau, A. (1987). Social class differences in family-school relationships: The importance of cultural capital. *Sociology of education*, 73-85.

- OECD. (2013). *PISA 2012 Assessment and Analytical Framework: Mathematics, Reading, Science, Problem Solving and Financial Literacy* doi:<http://dx.doi.org/10.1787/9789264190511-en>
- OECD. (2014). *Does Homework Perpetuate Inequities in Education?* OECD Publishing.
- OECD. (2016). *Low-Performing Students*. Paris: OECD Publishing.
- Portes, P. R. (1996). Ethnicity and culture in educational psychology. *Handbook of educational psychology*, 331-357.
- Ramdass, D., & Zimmerman, B. J. (2011). Developing Self-Regulation Skills: The Important Role of Homework. *Journal of Advanced Academics*, 22(2), 194-218.
- Ronning, M. (2011). Who benefits from homework assignments? *Economics of Education Review*, 30(1), 55-64.
- Teese, R., & Polesel, J. (2003). *Undemocratic schooling: Equity and quality in mass secondary education in Australia*. Melbourne Univ. Publishing.
- Tharp, R., G., & Gallimore, R. (1991). *Rousing minds to life: Teaching, learning, and schooling in social context*. Cambridge University Press.
- Trautwein, U., Lüdtke, O., Schnyder, I., & Niggli, A. (2006). Predicting homework effort: Support for a domain-specific, multilevel homework model. *Journal of educational psychology*, 98(2), 438.
- Zimmerman, B. J., & Kitsantas, A. (2005). Homework practices and academic achievement: The mediating role of self-efficacy and perceived responsibility beliefs. *Contemporary Educational Psychology*, 30(4), 397-417.

School funding policies and their impact on student achievement

Trevor Cobbold

Introduction

The Federal Minister for Education, Simon Birmingham was quick to pounce on the PISA 2015 results published in early December to put another knife in the Gonski funding plan. He took the opportunity to repeat his highly misleading claim that school funding increases don't improve school outcomes. His oft-repeated claim serves one purpose only – to justify his Government's refusal to fully fund Gonski.

Birmingham dismissed funding as a factor in school outcomes because he says that Federal funding has increased by 50 per cent since 2003 while the PISA results have declined (Belot 2016, Munro & Bagshaw 2016). However, he vastly exaggerated the actual increase in funding which was only very small and largely misdirected to schools least in need of additional funding; he ignored significant improvements in Year 12 outcomes that are in sharp contrast to the PISA results; and ignored several recent academic studies showing that increased funding does improve school outcomes, especially for students from disadvantaged backgrounds.

1. The funding increase was only small and largely went to private schools

Birmingham's claim of a 50 per cent increase in Federal school funding since 2003 is deceptive. It is far from the full picture:

- It is not adjusted for inflation;
- It ignores cuts in state government funding of public schools;
- It does not distinguish between funding increases for public and private schools; and
- It ignores changes in the composition of enrolments.

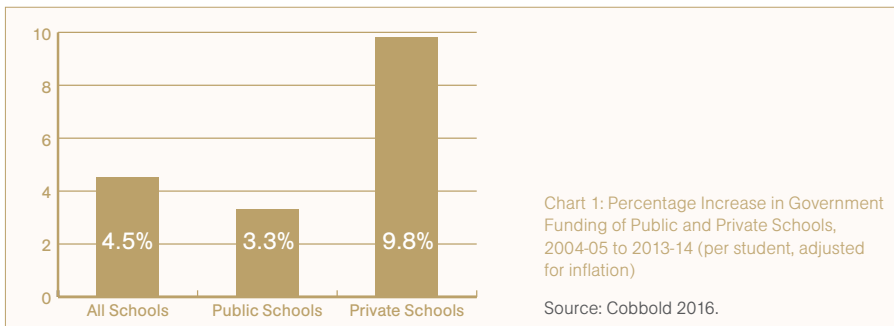
Trevor Cobbold has been convenor of Save Our Schools since it was established in 2006. He has been active in advocating for public education and equity in education for 30 years. He was a delegate to the ACT Council of P&C Associations for 20 years and is a life member of the Council. He was a member of the Council Executive from 1987 to 2005 and was honorary Secretary from 1988 to 2000. He worked as an economist for the Productivity Commission and its predecessors for over 30 years and has wide-ranging experience in economic research and policy analysis.

The actual increase in total government funding (Commonwealth and state/territory) per student, adjusted for inflation, for the nine years from 2004-05 to 2013-14 was only 4.5 per cent, some eleven times less than the Minister's claim [Chart 1]. This increase amounts to an increase of only 0.5 per cent per year. The increase in dollar terms was a mere \$472 per student for the whole period, or a miniscule \$52 a year. Not surprisingly, this has had little impact on school outcomes.

State/territory governments, which account for over 80 per cent of public school funding, have cut funding of public schools while increasing funding of private schools. State/territory governments have taken the opportunity of an increase in Commonwealth Government funding for public schools of \$744 per student to cut their own funding of public schools by \$348 per student. In effect, they cut the Commonwealth increase by nearly half. In contrast, they increased private school funding by \$135 per student to supplement the Commonwealth increase of \$700 per student.

The picture is even worse because the large part of the small increase in total funding per student favoured private schools who enrol only a small proportion of disadvantaged students. Total government funding per student in private schools increased by three times more than for public schools - 9.8 per cent compared to only 3.3 per cent. In dollar terms, funding for private schools increased by \$835 per student compared to \$385 per public school student. That is, the most disadvantaged school sector got an increase of \$43 per student per year compared to \$93 per student per year for private schools.

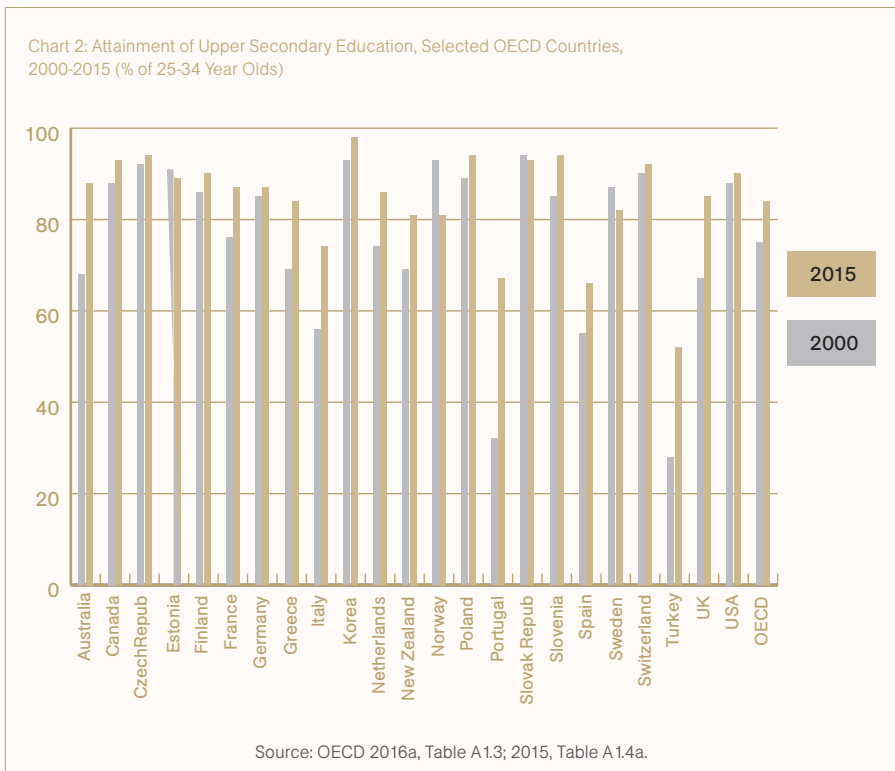
The PISA results show that low achievement is concentrated amongst low SES, Indigenous and remote area students. The large majority of these disadvantaged students attend public schools. In 2014, 82 per cent of students from low SES families, 84 per cent of Indigenous students, 79 per cent of remote area students and 87 per cent of very remote area students were enrolled in public schools. Despite higher need in public schools, the biggest increases in funding went to private schools.



Birmingham's claims also ignored changes in the composition of enrolments. Indigenous students, disability students and senior secondary school students attract significantly higher funding per student than average and have increased as a proportion of all students. They increased by three percentage points from 23 to 26 per cent between 2003 and 2014. The increase in public schools was 3.4 per cent compared to 2.2 per cent in private schools.¹ The increase in the percentage of these students in public schools could well have accounted for the increase in funding per student in public schools.

2. Improvement in Year 12 outcomes contrasts with the PISA decline

While the declining PISA results are a major concern, Birmingham's criticism of the lack of responsiveness of student outcomes to increased funding ignores some significant improvements in school outcomes over the period of the small funding increase. For example, there were significant improvements in Year 12 outcomes which are in sharp contrast with the declining PISA results.

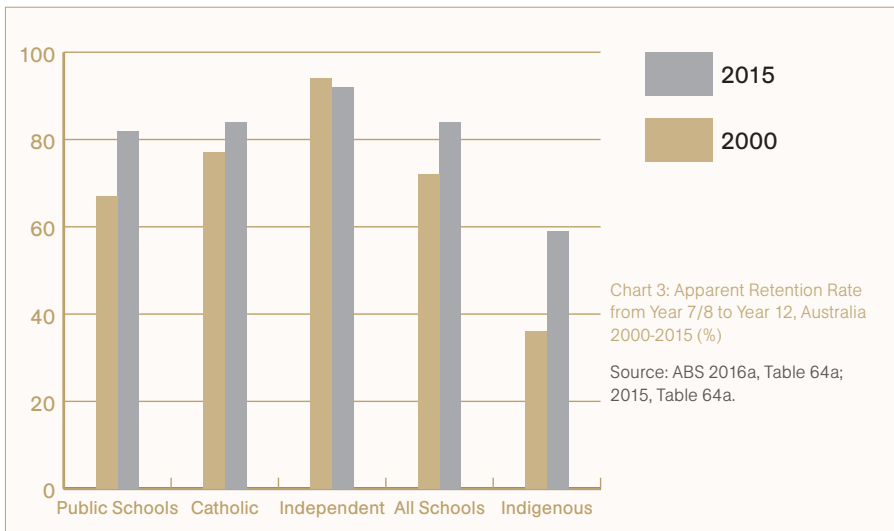


There was a large increase in the proportion of young adults (20-24 year-olds) attaining a Year 12 or equivalent outcomes since 2001. In 2016, 90 per cent of young people attained Year 12 or Certificate II, up from 79 per cent in 2001, while 89 per cent attained Year 12 or Certificate III compared to 77 per cent in 2001 [ABS 2016b, Tables 31 & 32; ABS 2011].²

It is also notable that the proportion of 25-34 year-olds in Australia who have attained an upper secondary education increased from only 68 per cent in 2000, when it was the 5th lowest in the OECD, to 88 per cent in 2015 [Chart 2]. The increase of 20 percentage points was the largest in the OECD except for Portugal and Turkey.

The apparent retention rate to Year 12 and the Year 12 completion rate are additional ways to measure the outcomes of school education. The average retention rate from Year 7/8 to Year 12 increased from 72 per cent in 2000 to 84 per cent in 2015 [Chart 3]. The retention rate in public schools increased by 15 percentage points from 67 per cent to 82 per cent and increased for Catholic schools from 77 to 84 per cent. In Independent schools, it fell from 97 to 92 per cent. In Independent schools, it fell from 97 to 92 per cent. Indigenous retention rates increased from 36 to 59 per cent.

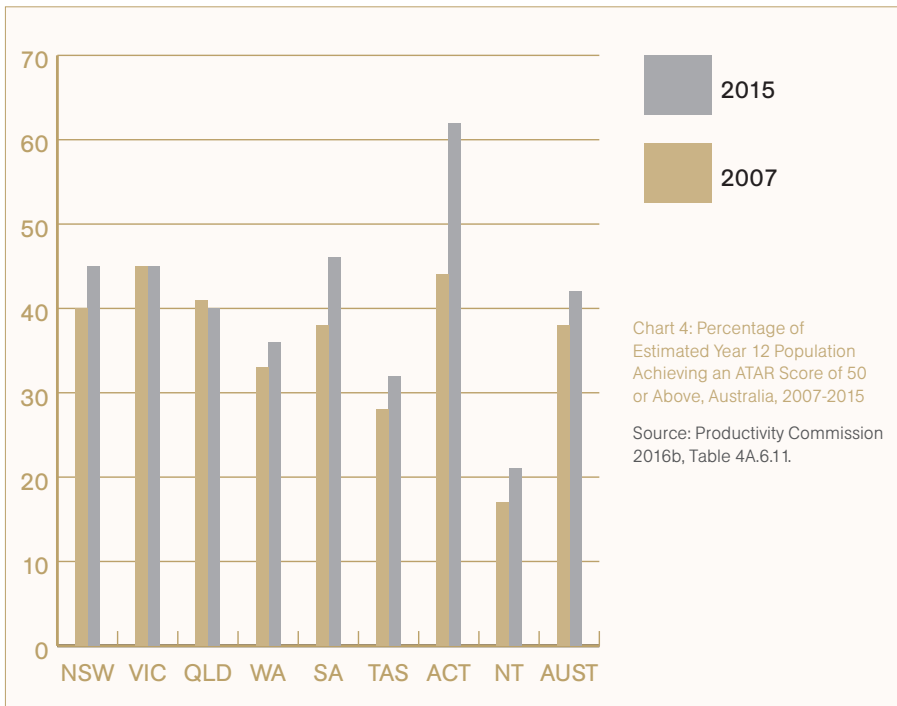
Year 12 completion rates have also increased. The rate for all students increased from 69 per cent in 2003 to 72 per cent in 2014. The completion rate for low SES students increased from 64 to 67 per cent, but fell for high SES students from 78 to 76 per cent [Productivity Commission 2005, Table 3A.40; Productivity Commission 2016a, Table 4A.124]. Despite this improvement, a large proportion of students still do not complete Year 12.



The percentage of the estimated year 12 population achieving an ATAR score of 50 or above has increased significantly in recent years from 38 per cent in 2007 to 42 per cent in 2015 [Chart 4, earlier figures are not available]. The percentage increased in all states/territories except Queensland, with a large increase in the ACT and significant increases in NSW and South Australia.

The contrast between the declining PISA results for 15 year-old students (largely Year 10 students) and the improvement in Year 12 results is a puzzle that warrants further analysis. It may partly reflect a difference in student attitudes to the PISA tests, which have no personal consequences attached to them, and the Year 12 assessments which have a major influence on the future paths that students take after leaving school.

The one thing in common between the PISA results and Year 12 outcomes is huge achievement gaps between disadvantaged and advantaged students. The PISA results show that disadvantaged 15 year-old students are three to four years of learning behind advantaged students. Year 12 retention and completion rates for disadvantaged students are well below those of advantaged students.



3. Many studies show that increased funding improves school results

Improving the results of disadvantaged students is the major challenge facing Australian education.

Yet, Birmingham continues to wilfully ignore the extensive research evidence demonstrating that increasing funding for disadvantaged students is critical to improving outcomes. Five major studies published in the last year alone show that increased funding improves results, especially for disadvantaged students.³ For example, an extensive review of studies by an academic expert on education finance at Rutgers University in New Jersey shows strong evidence of a positive relationship between school funding and student achievement and that particular school resources that cost money have a positive influence on student results [Baker 2016]. It concludes:

The growing political consensus that money doesn't matter stands in sharp contrast to the substantial body of empirical research that has accumulated over time... [p. 2]

The available evidence leaves little doubt: Sufficient financial resources are a necessary underlying condition for providing quality education. [p. 20]

A study published in the *Quarterly Journal of Economics* found that a ten per cent increase in per-student spending each year for all 12 years of public school for low income students extends their schooling by nearly half a year, increases their adult earnings by nearly ten per cent and family income by 16 per cent, and reduces their annual incidence of adult poverty by six percentage points [Jackson et.al. 2016]. The study found that the positive effects are driven, at least in part, by some combination of reductions in class size, having more adults per student in schools, increases in instructional time, and increases in teacher salary that may have helped attract and retain a more highly qualified teaching workforce. The authors concluded that their results:

... highlight how improved access to school resources can profoundly shape the life outcomes of economically disadvantaged children, and thereby significantly reduce the intergenerational transmission of poverty. [p. 212]

A study published by the US National Bureau of Economic Research found that school finance reforms in the United States that increased funding for low income school districts improved the results of students in those districts [Lafortune et. al. 2016]. It also found that the increased funding reduced achievement gaps between high and low income school

districts. The authors concluded that "marginal increases in school resources in low-income, poorly resourced school districts are cost effective from a social perspective..." [p. 7]. Further, "Our results thus show that money can and does matter in education..." [p. 35]

Another study found that increased spending following court-ordered school finance reforms in the United States increased high school graduation rates in high-poverty districts [Candelaria & Shores 2016]. High poverty school districts in states that had their finance regimes overthrown by court order experienced an increase in school spending by four to 12 per cent and an increase in high school graduation rates by five to eight percentage points seven years following reform.

In addition, a study soon to be published in the academic journal, *Economic Policy*, on the long-run effects of school spending on educational attainment following school finance reform in Michigan found that increases in school expenditure improve the later life outcomes of students [Hyman 2017]. Students who gained a ten per cent increase in school funding were seven per cent more likely to enrol in college and eleven per cent more likely to receive a post-secondary degree.

An OECD report on how to improve results for low performing students found that the incidence of low performance in mathematics is lower in countries where educational resources are distributed more equitably between socio-economically disadvantaged and advantaged schools. It concluded:

The evidence presented in this report suggests that all countries and economies can reduce their share of low-performing students, and that a reduction can be accomplished in a relatively short time. The first step for policy makers is to prioritise tackling low performance in their education policy agendas, and translate this priority into additional resources. [OECD 2016b, p.190]

The OECD has also highlighted a key message from PISA 2015:

In countries and economies where more resources are allocated to disadvantaged schools than advantaged schools, overall student performance in science is somewhat higher... [OECD 2016c, p. 189]

These studies show that targeting funding increases to disadvantaged schools and students is fundamental to improving student achievement and reducing achievement gaps between the advantaged and disadvantaged. Inadequate funding is likely to be a factor behind the

failure to improve the results of disadvantaged students and reduce the large achievement gaps between them and high SES students. Past funding increases have been very small and were not directed primarily to disadvantaged students. Needs-based funding in Australia, especially for low SES students, has only ever been a very small proportion of total school funding as demonstrated by a research report prepared for the Gonski review [Rorris et.al. 2011]. As David Gonski said in response to criticism of his plan that increased funding has failed to improve outcomes:

...the essence of what we contended, and still do, was that the way monies are applied is the important driver. Increasing money where it counts is vital. The monies distributed over the 12-year period to which the commission refers were not applied on a needs based aspirational system. [Gonski 2014]

If there is any credibility to Birmingham's criticism of past funding increases failing to improve results, it is in relation to private schools. As shown above, funding per private school student, adjusted for inflation, increased by ten per cent between 2004-05 and 2013-14 but student performance fell in both Catholic and Independent schools. It suggests that private schools did not use their larger funding increases efficiently.

Federal and state education ministers are due to meet in coming months to decide future school funding arrangements. State education ministers should not be misled by Birmingham's false claims about school funding and outcomes. All the evidence shows that increased funding for disadvantaged students is critical to improving school outcomes.

The national education ministers' council should support the full implementation of the Gonski plan. It should resist the Federal Government's proposal to cut education funding further by reducing funding indexation rates.

This article was first published as a Policy Brief – "Birmingham is Wrong Again on School Funding and Outcomes" (Jan. 2017) – written by Trevor Cobbold and published by Save Our Schools.

Notes

- 1 These figures are derived from ABS 2016a, Tables 43a, 46a; Productivity Commission 2005, Tables 3A.17, 3A.18; Productivity Commission 2016a, Table 4A.31.
- 2 The Council of Australian Governments has designated Certificate II as the vocational equivalent to Year 12, but this will change to Certificate III by 2020. See COAG 2009.
- 3 Many studies prior to these have come to the same conclusion. See Cobbold 2014.

References

- Australian Bureau of Statistics (2011), Education and Work, Australia – Additional Data Cubes, May 2011, Catalogue no. 6227.0.55.003, Canberra. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6227.0.55.003May%202011?OpenDocument>
- Australian Bureau of Statistics (2015), *Schools Australia 2014*, Catalogue No. 4221.0 Canberra. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/F302F1EA2C6060A3CA257F4E0011A509?opendocument>
- Australian Bureau of Statistics (2016a), *Schools Australia 2015*, Catalogue No. 4221.0, Canberra. <http://www.abs.gov.au/ausstats/abs@.nsf/0/9448F2F814FA0311CA2579C700118E2D?OpenDocument>
- Australian Bureau of Statistics (2016b), *Education and Work, Australia, May 2016*, Catalogue No. 6227.0, Canberra <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6227.0May%202016?OpenDocument>
- Baker, Bruce (2016), *Does Money Matter in Education (2nd edition)*. Albert Shanker Institute, Washington DC. <http://www.shankerinstitute.org/resource/does-money-matter-second-edition>
- Belot, Henry (2016), Education Minister responds to damning report, says he's open to importing specialist teachers, *ABC News*, 7 December. <http://www.abc.net.au/news/2016-12-07/education-minister-simon-birmingham-responds-to-damning-schools/8098842>
- Candelaria, Chris & Shores, Ken (2016), The Sensitivity of Causal Estimates from Court-Ordered Finance Reform on Spending and Graduation Rates, CEPA Working Paper No. 16-05, Centre for Education Policy Analysis, Stanford University, Stanford, CA. <http://cepa.stanford.edu/content/sensitivity-causal-estimates-court-ordered-finance-reform-spending-and-graduation-rates>
- Cobbold, Trevor (2014), Money Matters in Education, Education Research Brief, Save Our Schools, July. <http://www.saveourschools.com.au/funding/money-matters-in-education>
- Cobbold, Trevor (2016), Productivity Commission Fails to Lift the Bonnet on its Own Funding Figures, Education Policy Brief, Save Our Schools, September. <http://www.saveourschools.com.au/funding/productivity-commission-fails-to-lift-the-bonnet-on-its-own-funding-figures>
- Council of Australian Governments (COAG) (2009), Communique, 30 April, Hobart. <http://www.coag.gov.au/meeting-outcomes/coag-meeting-communici%C3%A9-30-april-2009>
- Gonski, David (2014), Jean Blackburn Oration, University of Melbourne, 21 May. <http://apo.org.au/node/39724>
- Hyman, Joshua (2017), Does money matter in the long run? The effects of school spending on educational attainment, *Economic Policy* (forthcoming). <http://www-personal.umich.edu/~jmhyman/research.html>
- Jackson, C. Kirabo, Rucker, Johnson C. & Persico, Claudia (2016), The effects of school spending on educational and economic outcomes: Evidence from school finance reforms, *Quarterly Journal of Economics*, 131 (1): 157-218. <http://qje.oxfordjournals.org/content/131/1/157>
- Lafortune, Julien, Rothstein, Jesse & Schanzenbach, Diane Whitmore (2016), School Finance Reform and the Distribution of Student Achievement, National Bureau of Economic Research, NBER Working Paper No. 22011, February, Cambridge, Mass. <http://www.nber.org/papers/w22011>
- OECD (2016a), *Education at a Glance 2016: OECD Indicators*, OECD Publishing, Paris. DOI: <http://dx.doi.org/10.1787/eag-2016-en>
- OECD (2016b), *Low-Performing Students: Why They Fall Behind and How to Help Them Succeed*, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264250246-en>
- OECD (2016c), *PISA 2015 Results (Volume II): Policies and Practices for Successful Schools*, PISA, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264267510-en>
- Productivity Commission (2005), *Report on Government Services*, Canberra. <http://www.pc.gov.au/research/ongoing/report-on-government-services>
- Productivity Commission (2016a), *Report on Government Services*, Canberra. <http://www.pc.gov.au/research/ongoing/report-on-government-services>

Productivity Commission (2016b), *Overcoming Indigenous Disadvantage: Key Indicators 2016*, Canberra. <http://www.pc.gov.au/research/ongoing/overcoming-indigenous-disadvantage/2016#thereport>

Rorris, Adam, Weldon, Paul, Beavis, Adrian, McKenzie, Phillip, Bramich, Meredith & Deery, Alana (2011), *Assessment of Current Process for Targeting of Schools Funding to Disadvantaged Students*, Australian Council for Educational Research, Camberwell. http://research.acer.edu.au/policy_analysis_misc/10/

Interview: Barbara Arrowsmith-Young

The Arrowsmith Program: neuroplasticity in the classroom

Rachel Power

As a child, Barbara Arrowsmith-Young read and wrote backward, struggled to understand basic concepts, continually got lost, and was physically uncoordinated. Her long struggle to address her own severe learning difficulties led her to recognise the benefits of exercising the brain. This became the basis for the Arrowsmith Program, her approach to helping students overcome specific learning difficulties, which has been operating in Canadian schools for more than 35 years and increasingly taken up around the world. A revised edition of Arrowsmith-Young's bestselling memoir, *The Woman Who Changed Her Brain*, was released in early 2017.

RP Considering the extent of your own learning difficulties as a child, which were profound, it's extraordinary that you had the tenacity to overcome them. What was it about you that gave you that determination?

BA-Y I think it was the unique combination of my cognitive strengths and weaknesses. I had an exceptional pre-frontal cortex, which controls executive functioning – thinking, problem-solving, planning. That critical part that drives for a solution was in really good shape. So I was incredibly driven; I just couldn't make sense of most of my experiences and my world. Whereas somebody who possibly had the same problems I had, but didn't have really strong problem-solving capacity, might just have given up.

Very early on, I tried to come up with solutions or compensations for my difficulties and, for me, it was relying on my memory, which was pretty exceptional. I had a whole ritual, where I would line all my books up on my bed when I was studying, I would kneel down in front of my bed and basically cry until there was nothing left in

Rachel Power is a writer, editor and artist. She has contributed to many publications, including *Mamamia*, *The Big Issue*, *Kill Your Darlings* and *The Age*. She has worked as a court illustrator for Channel 9, production editor of *Arena Magazine*, and is currently Communications Manager for the Australian Education Union (Victoria). Rachel is the author of *Alison Rehfisch: A Life for Art*, *The Divided Heart: Art and Motherhood*, and *Motherhood & Creativity*.

my system. I think actually I was draining my amygdala of all that fear and anxiety, till I was just empty, almost in a Zen state. But, as an 11 or 12-year-old, I had no idea that that's what I was doing. And then I would start this memory process – I would look at my book, I would read the first sentence, say it to myself, close my eyes, visualise it; then I'd read the next sentence, do the same process, then match it to the first sentence... and I'd just keep going until I could close my eyes and go through all of my notebooks.

Then, when it came to an exam, I'd go through that library in my head and try to match the question to an answer. Sometimes I'd do a really good job, and sometimes not such a good job, it would depend on the match I made, because I didn't really understand the question, and I was always hypothesising, always thinking maybe this is what it means but never being certain.

Secondly, I think it was my parents. My mother was an educator, and passionate about education, so that got instilled in me very early. When I was identified in Grade 1 as having "a mental block", she just decided, "Well, my daughter's going to learn how to read and write, and learn numbers", so she started using flashcards and teaching me those skills, which didn't address the learning difficulty, but gave me the skills to read and write, and some basic numeracy.

My father was a physicist and mathematician, who became an engineer, and was always very creative – he had 30 or 40 patents over the course of his career. He would come home with all his blueprints and designs and lay them out on the living room floor and try to explain them to me. I had no idea what he was trying to explain, but I caught his excitement about creating something. Also, he had this belief, which he instilled in all of us, that if you had a problem and no solution, you go out and find one. He said, "Don't be limited by conventional wisdom. If the rest of the world tells you that you can't do it, don't let it stop you, this is part of the process in creating something that didn't exist before."

So my cognitive strengths and having those two models – that, I think, is what drove me.

RP *Later, at university, you came across two very important pieces of research that transformed your approach to your own situation.*

BA-Y Very early on, I was hunting for a solution to my difficulties – initially compensation, and using strengths to support the weaknesses. Then, in graduate school, coming

across [neuropsychologist Aleksander] Luria's work out of Russia, looking at the impairment of brain function, and really starting to see: "Oh my gosh, that's what my problem is, it's parts of my brain that aren't working as they're designed to" – because if you're solving a problem, you have to understand its nature.

And then, this concept of neuroplasticity with [American research psychologist Mark] Rosenzweig's work looking at rats – and figuring that if rats, through experience, can actually improve brain physiology and function, which led to better learning, probably humans had that same capacity, even though people weren't really looking at it at that time.

That was my breakthrough – that hunt, and then coming across those two pieces of information – which led me to create the first cognitive exercise, which was "symbol relations" [then a series of 100 handmade flashcards featuring analogue clocks]. It wasn't that I wanted to tell time; I couldn't at that point. But it was trying to find an activity that would work that part of the brain as much as possible without the supports and compensations that people use.

Luria talked about the fact that someone with that particular difficulty couldn't tell time because they couldn't see the relationship between the hour hand and the minute hand, and I thought maybe this was a way to force my brain to start seeing relationships, making connections. Again, I had no idea if it would work, but I thought I had to try something, because I was pretty desperate. I was in graduate school at that point and I just truly didn't see a future. At that point I was thinking, for the second time in my life, that I was going to end my life, and this time I knew how to do it, more than I could at 13.

RP I suppose that you were always going to hit a point where those compensatory methods weren't going to work for you anymore.

*BA-Y Well, there just aren't enough hours in the day! By the time I got into graduate school, where clearly you're expected to *understand* information, I was working seven days a week, 20 hours a day, just to tread water. There was no future. I compromised my immune system – I have an immune disorder even now, due to all that adrenaline and all that stress. Then I'd get pneumonia, and I'd just work through...*

RP So, it all started with Luria's discovery with the rats in 1977, which destabilised that common wisdom that the brain is fixed. Then, 40 years later, brain plasticity is

discovered, and suddenly all that work that you've done is in the spotlight. The timing is quite extraordinary.

BA-Y Again, I do thank my father, because it was his message of not being limited by conventional wisdom [that drove me]. Certainly, when I first developed this work, I thought the world would be excited. When I had my first breakthrough, at the four-hand level [of the clock exercise], I was ecstatic! I could sit and watch *60 Minutes* on TV and I could understand it as the people were talking. Before, I used to have a friend who would interpret for me, and even with his interpretation I didn't always get it. I would read a page in a book – not something simple like *Nancy Drew*, but anything conceptual – and I might have to read it 20 times before I thought I knew what it was saying.

You live in this constant state of uncertainty, and Luria was the first person I read who described it so beautifully: he said you can never verify meaning, so you're walking in this cloud of the unknowing all the time, and just feel incredibly threatened because you don't understand. I was always terrified that one of my professors would get on the elevator with me and ask me a question. I'd think: "I'm not going to understand what he's saying and I don't have time to play it over for the next hour in my head before I answer him."

It was like all of a sudden the fog was gone and I could listen to conversations and understand what the person was asking me and be part of the conversation. Before – it was so profound – I was not part of human discourse; I was not a part of human relations, because I couldn't follow things. I used to feel like my face was pressed up against a plate glass window and there was this banquet on the other side, which I wanted so much to be part of. It was incredibly isolating, and then all of a sudden I could do it. I was walking on air!

But the world was not at all excited, because it was still in the paradigm of seeing the brain as fixed; back then, in 1977–78 (and I like the term in Australia 'specific learning difficulties' versus 'disability'), there was the belief that these difficulties didn't have anything to do with the brain. I don't know where they thought learning resided. The idea that the issue was cognitive – there's something not working properly in the brain, and then that we can change the brain – those were two very controversial statements at the time.

So I decided I had two possible paths. One was to spend a lot of time arguing the point; or to spend time working with people developing more and more programs.

And I felt that if there was validity and truth to what I was seeing, over time the field would come to that recognition or understanding, which is what's happened.

RP And yet you still face the argument that your work is not scientifically proven.

BA-Y What is scientific proof? There are different levels of proof. We have a number of very reputable outcome studies – from University of Calgary, University of Toronto, the Toronto Catholic District School Board – some looking at academic measures, some looking at cognitive measures, showing significant change. Now are they randomised control studies? No. But most social science does not use randomised control studies; it's too hard to split classes into those kids who can and those kids who can't participate – we don't want to run it like that.

There are lots of other experimental designs, one called an N1, where you take, say, 40 Grade 5 students, all with learning difficulties, and you have them as their own baseline, based on their progression since Grade 2. Then you have an intervention, and if they've improved by two year levels, whereas before they were achieving at half a level per year, you can infer that it's probably the outcome of that intervention.

So we have a number of research designs used in social sciences. The piece that we didn't have, which we're getting now, is the imaging work, and that's what is being done at Southern Illinois University. We're seeing now the changes in the brain that I've postulated all these years; we're seeing the pre-frontal cortex activated in the brain in students where it wasn't active; we're seeing reorganisation in their brain structures; and we're looking at cognitive and academic changes as well.

In the study that's being done at the University of British Columbia, we have students in the Arrowsmith program; we have a group of normally developing individuals – because we know that in normal development the brain changes through childhood, so we want to control for that; and then we have a group of students who are in traditional special education programs. What we're working on now is to increase those sample sizes. And we're seeing really positive change, both cognitive and academic, and in neurophysiology. So it will be there in the next year. It takes time to get all this research done and then it's a process to get publication.

RP Do you still confront the attitude that the brain is fixed?

BA-Y I think it'd be very hard to find anyone who still believes in that pre-neuroplastic paradigm where the brain is fixed. But there are those who still say: "Yes,

neuroplasticity is a phenomenon, but it has no place in education.” Those individuals – I don’t know whether they’re ever going to be convinced by the research. Then there are those who will want this [scientific] research in order to feel more comfortable about implementing the program. And then there are schools around the world that say: “We’re dealing with students whose needs we’re not meeting through traditional programs, so we going to try this.”

When a school signs on with us, it’s just a one-year commitment; I’m never going to lock anybody in beyond that. But I don’t think there’s been one school that hasn’t continued beyond a year, because parents, teachers and students see the results. So I think over time there’ll be a groundswell, where we’ll have enough on-the-ground evidence. I like research – I think it’s useful and important – but, to me, it’s much more important to see what these individuals can do in the world that they couldn’t do before.

For me, it was [a case of] one day I couldn’t do this, and then one day, getting to a critical point in the exercise, I could. Before, with all the compensation in the world, it didn’t matter how hard I tried, I could not listen or read and understand simultaneously.

RP The implications are enormous, particularly for early intervention, and I imagine it could seem like a big leap for many education systems, which can be very constrained for various reasons, including a lack of resources.

BA-Y The vision that I ended my book with is one where every child starting in Grade 1 would do a cognitive program, and we have two schools that are doing that now – one taking the Grade 1 class and one taking the Grade 2 class. For Grade 1, we’ve picked the exercises related to Motor Planning; every child can benefit from that, not just students who’ve been identified as having difficulties. And what they’re already seeing is that after ten weeks [of the program] not one of the students identified as needing Reading Recovery still needs it.

There are a number of different models. One is you take a cognitive exercise per year and progressively work through the critical ones in those early years. Or a school can have a full-service model, where those students who get to the end of the first year and clearly need more, could filter in and out of a cognitive classroom for any number of activities. It’s very fluid, and that’s why it’s a real vision of personalised education. Everyone can benefit from cognitive stimulation, and the

ones who are more at risk can have access to a more intensive program. It's based on their needs.

RP So what do you see as the main barriers to schools picking up the program?

BA-Y I think lack of awareness. There's still a lack of understanding about neuroplasticity and a lack of awareness that brain functioning is a problem. And there's still this divide. Most of education is still content and skills-based: the idea that education is pouring content into a black box. A lot of educators are committed to supporting the learner in learning *how* to learn, but they have a mandate whereby they've got to teach a lot of basic content throughout the school years. And then there's the capacity-based model, which is saying that we can change the *capacity*, which will allow the student to learn the skills and the content not only more efficiently, but it will also be retained, as the structure will be there to retain it and build on it.

The University of British Columbia is looking at creating a Department of Education Neuroplasticity, which I'm really excited about, and that has partly grown out of the work that we're doing on my program there. It will be the first in Canada, bringing all of this knowledge into education so that students can benefit from this. I'm very optimistic; I think that in the next 10 or 15 years we'll see this much more accepted: that you go to school to learn, and that we learn with our brains, so if we can do things to enhance cognitive functioning, that's going to make us better lifelong learners.

RP As you say, there are those standard subjects, such as Maths, which require cognitive development but also impart the building blocks of knowledge. Given that Arrowsmith students are working outside the curriculum, or parts of it, while doing the program, what would you say to those with concerns about students potentially missing out on those building blocks?

BA-Y When Arrowsmith is implemented in a school, we request four periods a day, so there's another half day that students can be undertaking academic subjects, and we will recommend literacy and numeracy for the reasons you're suggesting, because there are critical experiences and building blocks that are necessary, and what we see are the cognitive functions start to improve, so they start to be able to benefit from that learning.

But we know that once a child can think, reason, problem-solve, retain information and express themselves, they can pick up subjects like History and Geography in

Grades 3, 4, 5 or 6, whereas before they could have sat in those classes not being able to comprehend what they were meant to be learning. We learn the content more efficiently and effectively, and retain it, when we have the capacity to do so. They go hand in hand.

That's what we have to foster out there in the world: that understanding that we *can* change capacity, which then will allow content to be learned, but also all the effective ways of *how* to learn. We know that many graduates can move between quite different disciplines because they've got the capacity and wherewithal to pick up the content. I think some of the criticisms that get levelled at this work are by people who aren't informed: they just want to put up a barrier.

RP *And of course students who are struggling in class are not only failing to learn, they are also likely to be having a very negative experience of schooling.*

BAY That's right. Learning becomes negative and aversive, and students get into all sorts of behaviours we wish they wouldn't, from avoidance to self-harm to addiction. We're currently putting the Arrowsmith program into an American school for troubled youth, because we know a number of these individuals go down that path because of learning difficulties.

If you can't reason, you can't see cause and effect, and you can't benefit from therapy. I could have been in therapy for years and my eyes would have glazed over, because I just couldn't see the consequences of my behaviour. So it's not just critical for education, it's critical for learning in life, and being able to benefit from insight. Our brains are fundamental to the core of our beings; it's what mediates our relationship to the world. When something's not working there, it means our relationship to the world is distorted.

When I started this work, the belief that was promoted by organisations dealing with people with learning disabilities, as we define it here, was that we have to accept that "some people are squirrels, some people are rabbits, some people are ducks... and you're not going to be able to make that rabbit swim". That's essentially what I was told in Grade 1: "You've got a mental block; just accept that there are certain things that are going to be impossible for you."

What makes me really sad is that when I go out there and give talks, there are still pockets of people operating with that world view. It's not that I'm suggesting that you don't accept that beautiful being and love your child as they are – however, it's

Professional Voice

Back issues

The following back issues are still available, free to AEU members. Contact Marlene McLean marlene.mclean@aeuvic.asn.au indicating the volume, number, and title of the edition and your postal address.

Others can order copies for \$10 each by contacting Marlene McLean marlene.mclean@aeuvic.asn.au indicating the volume, number, and title of the edition and your postal address. These and other issues can be found online at www.aeuvic.asn.au/pv.

PV 11.2: Teaching in context

This edition is about the conditions and context of teaching. The authors challenge some of the current "truths" about education such as the need for greater school autonomy and choice, the unimportance of class size, the unalloyed benefits for teachers of the new digital environment, the negligible need for mainstream gender diversity education and the quality of private schooling.

PV 11.1: School choice

The theme of the Autumn 2016 edition of Professional Voice is school choice. There are four articles directly related to the theme. Two of them describe and analyse research studies of school choice in Melbourne. The other two have an international flavour and investigate charter schools in America and academies in the UK.

PV 10.3: Teaching "teaching"

This edition's focus is initial teacher education. Three authors comment on the national (TEMAG) report into teacher education and give their views about how to improve the quality of pre-service education. There is also new evidence about the decline in equity in Australian schools and an article about diagnosing and accommodating in schools the increasingly common Autism Spectrum Disorder.

PV 10.2 Public, Private and Edu-business

This edition looks at the relationship between the public and private education sectors and busts the myth that education offered in private schools is superior to that

offered in public schools. We also examine the alarming rise of edu-business in Australia.

PV 10.1: Testing Times

From NAPLAN to PISA, tests have become a defining feature of global education systems. But how much do testing regimes really tell us about education systems and how much do they distort the very thing they report on?

PV 9.3: Global Education Reform Movement

With an editorial overview of the GERM agenda, stories include a look at NAPLAN and assessment, collaborative teaching, class sizes and the models of reform being pursued in America and the UK.

PV 9.2: School Improvement

This edition of Professional Voice moves away from the thematic approach we have used in the past and instead highlights quality writing that questions taken-for-granted ideas surrounding contemporary educational discourse.

PV 9.1: Equity and Disadvantage

The autumn 2012 edition takes a broad look at equity issues. Alan Reid argues that governments have fallen in love with quick fixes and easy answers. Alan Smithers notes that choice and standards policies in England failed to increase equity because they were not part of a well-designed system. Tony Vinson says that investment in early years is not only the best investment we can make in society, it is a moral imperative.

