



Australian Government

Chief Scientist

1 May 2020

The Hon Dan Tehan MP
Minister for Education
Parliament House
CANBERRA ACT 2600

CC:

The Hon Karen Andrews MP, Minister for Industry, Science and Technology

Dear Minister

Please find attached a response to your request for advice on the differential learning outcomes for online versus in-class education; factors that moderate the relative effectiveness; and distinct implications for students in metropolitan, remote, rural and Indigenous communities.

This rapid response has been prepared by the Rapid Research Information Forum that I Chair. The report synthesises the evidence base on this matter and has been informed by relevant experts and has been peer reviewed. Details of the authors and peer reviewers can be found in the Appendix.

I hope this document proves useful to you and your colleagues.

Yours sincerely,

A handwritten signature in purple ink, reading 'Alan Finkel'.

Dr Alan Finkel AO FAA FTSE FAHMS
Australia's Chief Scientist

1 May 2020

This rapid research information brief responds to the request for advice on the differential learning outcomes for online versus in-class education; factors that moderate the relative effectiveness; and distinct implications for students in metropolitan, remote, rural and Indigenous communities.

- The current remote learning arrangements have the potential to result in poorer educational outcomes for almost half of Australian primary and secondary students if continued for an extended period.
- Students at particular risk of poorer learning outcomes include those from low socioeconomic backgrounds, those with English as a second language, those with special learning needs and those in rural and remote areas.
- Factors that moderate the effectiveness of remote learning include: a) access to digital technology and the internet; b) home learning environment and family support; c) teacher and student readiness and capability.
- There is evidence to suggest that ‘blended learning’, combining face-to-face and remote learning, may be as effective as classroom learning for many students.
- Aboriginal and Torres Strait Islander students are likely to face particular challenges with remote learning related to lack of internet service and device availability, reduced opportunities for interaction with Indigenous teacher assistants, and the challenge of incorporating culturally appropriate pedagogies into online resources.

The COVID-19 pandemic has driven a rapid and unexpected shift to remote learning for many Australian school students. Within just a few weeks the nature of teaching and learning has transitioned to methods that, until now, have only been used by a minority of students and teachers.¹ As the growth curve of new infections flattens, several states and territories are moving to blended learning approaches in which students receive a mix of online and face-to-face instruction.

1. Differential learning outcomes

Remote learning

The limited and varied evidence in primary and secondary schools, both from Australian and international sources, suggests an extended period of remote learning is likely to result in poorer educational outcomes for almost half of Australian students,² including those in early-years students (those five and under), students from low socioeconomic backgrounds, those with English as a second language, those with special learning needs, and students who are generally less engaged with school.³⁻⁵ This includes evidence from five

independent reports commissioned by the Australian Government to examine the impact of remote learning on vulnerable students.

However, the evidence summarised here also demonstrates that remote learning can be as effective as classroom education when teachers and students are adequately prepared and supported, and when the necessary technology and learning resources are available.

System-wide studies of virtual charter schools in the United States have found variable results. Some virtual charter schools achieve similar or better student outcomes than conventional schools. But on average, virtual schools have lower graduation rates and poorer student outcomes across maths, reading, English, language and arts subjects when ranked against comparable students in conventional schools.⁶ Differences between US and Australian education systems, and the unplanned and rapid transition to remote learning in Australia due to COVID-19, may limit the direct relevance of these studies to the current context.

There is also evidence to suggest that any adverse outcomes of remote learning may be negligible over the short term. For example, following the New Zealand earthquakes in February 2011, students in Christchurch and the surrounding Canterbury region experienced several months of disruption as a result of damage to school facilities. Despite this disruption, a New Zealand Ministry for Education study found there were no adverse educational outcomes for the majority of students,⁷ particularly when learning gaps were quickly identified and addressed.

Blended learning

'Blended learning' involves a mix of online and classroom instruction. A review of blended learning studies across primary, secondary and tertiary institutions in the UK and US suggested that high-quality blended learning can result in equivalent or in some cases superior student outcomes to traditional classroom learning.⁸⁻¹⁰ These studies indicate important design factors for successful blended learning programs include providing engaging content, opportunities for interaction with teachers and peers, and support for learners.

As an example, an evaluation of the Australian eKids Framework that has been supporting blended learning for rural and remote students for the past decade, found significantly better educational outcomes from blended learning compared to classroom or online delivery.¹¹

2. Factors moderating the effectiveness of online learning

Research suggests three key factors moderate the effectiveness of remote learning.

A. Access to reliable broadband internet and technology (hardware and software)

Effective remote learning requires that students have dedicated access to a computing device (a desktop, laptop or tablet computer) during their learning hours and a reliable, high-speed internet connection.¹² It also requires access to appropriate digital resources, learning and communication software.

The National Broadband Network has gone some way to reducing the digital divide between rural and metropolitan areas, as has the expansion of 4G and 5G mobile coverage. Across Australia, low-income households and those in rural and remote areas are less likely to have a reliable, fast broadband internet and are more likely to share computing devices among household members than those in metropolitan areas.¹³

Specifically:

- Low-income households and those in remote areas have on average half as many desktop, laptop or tablet computers as middle-income households.¹⁴ As a consequence, many students may not have access to an appropriate device for online learning, or may be required to share a device with parents or siblings.
- 31% of single parents with school-aged children only access the internet through a smartphone.¹³ It is possible that some students in such circumstances will face challenges accessing online learning; particularly if relying on the smartphone of a parent.
- Aboriginal and Torres Strait Islander students in remote communities are also less likely to have reliable access to computing devices and high-speed internet than non-Indigenous Australians.¹⁵

B. Appropriate home learning environment and family support

Effective remote learning requires an environment free of excessive disturbance or distraction, along with appropriate support from teachers and parents or carers. High school and senior primary students are more likely to be familiar with the technologies and digital resources being used to support remote learning, and able to work independently or with remote teacher guidance at least for limited periods of time. However, younger students and those with special emotional, behavioural or learning needs require substantial supervision and help from parents or other carers.¹⁶

A recent study from the UK reported that children from middle-income families were familiar with the use of computer and smartphone devices and that their parents also felt more confident in supporting their children's learning online. Middle-income families were also more likely than lower-income families to have purchased additional resources to support home schooling during COVID-19.¹⁷

Further, students from lower-income families are less likely to have a quiet place to study and access to technology and parental support, leaving them less equipped for remote learning in the home.^{1,18} In addition, vulnerable children (those with health, physical or mental difficulties) face increased cyberbullying and other risks associated with online activity.¹⁹

C. Readiness and capacity of teachers and students

Remote learning requires both teachers and students to have the skills and capacity to effectively engage with and benefit from online education. For teachers, effective remote education requires more than simply knowing how to use technology or transferring existing materials to an online platform.²⁰ It requires new or adapted pedagogies, management and organisation of content, institutional support and new or adapted ways of engaging and interacting with students.^{21–23}

Preliminary results from a national survey of over 10,000 Australian teachers conducted during April 2020 show only 30% of teachers had been trained to deliver remote learning prior to the crisis, and the majority (80%) felt unprepared for the transition, particularly in non-metropolitan areas.²⁴ Further, only 25% felt confident their students were learning well under the current arrangements and less than half (43%) were confident the majority of their students were positively engaged with online learning.

Effective engagement with remote learning on the part of students also requires well-developed digital literacy and the ability to self-regulate and manage their time.²⁵

Despite a high frequency of device usage, an assessment of information and communication technology (ICT) literacy of Year 6 and 10 students through the National Assessment Program suggests that nearly half of Australian students experience challenges working independently with ICT.²⁶

3. Distinct implications for Aboriginal and Torres Strait Islander students

Some Aboriginal and Torres Strait Islander students are likely to face particular challenges with remote learning as a result of:

- Potential lack of internet services and access to devices, particularly in remote areas.
- Reduced opportunities to work closely with Aboriginal and Torres Strait Islander teacher assistants.
- Reduced opportunities to engage with learning experiences that support culturally responsive pedagogies and embed Aboriginal and Torres Strait Islander perspectives and knowledges.

Aboriginal and Torres Strait Islander teacher assistants play a vital role relating content to students' cultural identity and experiences, as well as code switching between English and home language for students.

Research demonstrates that they are central to Indigenous students' success and wellbeing.^{27,28} Challenges associated with device and internet access, the need for teacher assistants to support both in-school and remote learning students, and demands associated with preparing resources and supporting families will likely reduce opportunities for interaction between Indigenous teacher assistants and students.

Studies have also demonstrated the importance of culturally-responsive pedagogies for overcoming educational vulnerability among Aboriginal and Torres Strait Islander students.^{29–33} This includes teaching that emphasises relational practices; connects learning to country and community; values cultural identity and draws on student strengths. While teachers and authorities are making great strides in incorporating

these pedagogies into remote learning, the rapid and unplanned nature of the transition to remote learning has presented significant challenges.

An important note on available COVID-19 research

Although current COVID-19 research is available through pre-print servers, some of the articles referenced in this report has not yet been peer reviewed (note particularly reference 24, marked with a §) and the relatively short time length of the current outbreak has resulted in variable testing and reporting practices in different countries. As such, conclusions drawn need to be interpreted with caution.

The impact of online learning and COVID-19 is also a rapidly developing area of research with frequent updates to the research evidence. This brief is accurate at the time of writing and may become out of date at a later time of reading. Consultation with the Academy of the Social Sciences in Australia is possible if the reader has questions.

References

1. Thomson, S. What PISA tells us about our preparedness for remote learning. *Teacher* (2020). Available at: <https://www.teachermagazine.com.au/columnists/sue-thomson/what-pisa-tells-us-about-our-preparedness-for-remote-learning>. (Accessed: 20th April 2020)
2. Brown, N., Te Riele, K., Shelley, B. & Woodroffe, J. Learning at home during COVID-19: Effects on vulnerable young Australians. Independent Rapid Response Report. Hobart: University of Tasmania, Peter Underwood Centre for Educational Attainment. (2020).
3. Lamb, S. Impact of learning from home on educational outcomes from disadvantaged children. Brief Assessment. (2020).
4. Reich, J. & Ito, M. From good intentions to real outcomes: Equity by design in learning technologies. *The Digital Media + Learning Research Hub* Available at: https://clalliance.org/wp-content/uploads/2017/10/GIROreport_v3_complete.pdf. (Accessed: 1st May 2020)
5. Watterston, J. & O'Connell, M. *Those that disappear. An MGSE Industry report #1*. (Melbourne graduate School of Education. University of Melbourne., 2019).
6. Fitzpatrick, B. R., Berends, M., Ferrare, J. J. & Waddington, R. J. Virtual illusion: Comparing student achievement and teacher and classroom characteristics in online and brick-and-mortar charter schools. *Educ. Res.* **49**, 161–175 (2020).
7. Beaglehole, B., Bell, C., Frampton, C. & Moor, S. The impact of the Canterbury earthquakes on

- successful school leaving for adolescents. *Aust. New Zeal. J. Public Heal.* **41**, 70–73 (2016).
8. Escueta, M., Quan, V., Nickow, A. & Oreopoulos, P. Education technology: An evidence-based review (No. w23744). (2017).
 9. Means, B., Toyama, Y., Murphy, R., Bakia, M. & Jones, K. Evaluation of evidence-based practices in online learning: A meta analysis and review of online learning studies. (2010).
 10. Thalheimer, W. *Does eLearning work? What the scientific research says!* (2017).
 11. Country Education Partnership. E-kids report. (2013). Available at: <https://cep.org.au/wp-content/blogs.dir/884/files/2013/05/eKids-Report-2013.pdf>. (Accessed: 28th April 2020)
 12. Haßler, B., Major, L. & Hennessy, S. Tablet use in schools: A critical review of the evidence for learning outcomes. *J. Comput. Assist. Learn.* **32**, 139–156 (2016).
 13. Thomas, J. *et al.* Measuring Australia’s digital divide: The Australian digital inclusion index 2018. (2018).
 14. Australian Bureau of Statistics. Household use of information technology, Australia, 2016-17. (2018).
 15. Rennie, E., Yunkaporta, T. & Holcombe-James, I. Privacy at the margins | Privacy versus relatedness: Managing device use in Australia’s remote aboriginal communities. *Int. J. Commun.* **12**, (2018).
 16. Clinton, J. Supporting vulnerable children in the face of a pandemic: A paper prepared for the Australian Government Department of Education, Skills and Employment. (2020).
 17. Cullinane, C. & Montacute, R. *COVID-19 and social mobility impact brief #1: School shutdown.* (2020).
 18. Hattie, J. Visible learning effect sizes when schools are closed: What matters and what does not. *Corwin Connect* (2020). Available at: https://corwin-connect.com/2020/04/visible-learning-effect-sizes-when-schools-are-closed-what-matters-and-what-does-not/?utm_source=miragenews&utm_medium=miragenews&utm_campaign=news. (Accessed: 1st May 2020)
 19. El Asam, A. & Katz, A. *Vulnerable young people and their experience of online risks. Human-Computer Interaction* (Taylor & Francis). doi:10.1080/07370024.2018.1437544
 20. Palloff, R. & Pratt, K. *Lessons from the virtual classroom: The realities of online teaching (2nd ed.)*. (Jossey-Bass, 2013).
 21. Jensen, L., Price, L. & Roxå, T. Seeing through the eyes of a teacher: Differences in perceptions of Higher Education teaching in face-to-face and digital contexts. *Stud. High. Educ.* 1–11 (2019).
 22. Philipsen, B., Tondeur, J., Pareja Roblin, N., Vanslambrouch, S. & Zhu, C. Improving teacher

- professional development for online and blended learning: A systematic meta-aggregative review. *Educ. Technol. Res. Dev.* **67**, 1145–1174 (2019).
23. Rodrigues, H., Almeida, F., Figueiredo, V. & Lopes, S. Tracking e-learning through published papers: A systematic review. *Comput. Educ.* **136**, 87–98 (2019).
 24. § Wilson, R., McGrath-Champ, S. & Mude, W. Preliminary results from a survey of remote learning arrangements during COVID-19. (2020).
 25. Kirschner, P. & De Bruyckere, P. The myths of the digital native and the multitasker. *Teach. Teach. Educ.* **67**, 135–142 (2017).
 26. Australian Curriculum Assessment Authority. NAP Sample Assessment ICT Literacy Years 6 and 10 2017. (2018).
 27. Armour, D., Warren, E. & Miller, J. Working together: Strategies that support cross-cultural engagement of Indigenous teacher assistants working in Indigenous contexts. *Asia-Pacific J. Teach. Educ.* **44**, 421–435 (2016).
 28. Shay, M. Emerging ideas for innovation in Indigenous education: A research synthesis of Indigenous educative roles in mainstream and flexi schools. *Teach. Educ.* **28**, 12–26 (2017).
 29. Matthews, C. Maths as storytelling: Maths is beautiful. In K. Price (Ed). in *Aboriginal and Torres Strait Islander Education: An Introduction for the Teaching Profession* 102–120 (Cambridge University Press, 2015).
 30. Norman, T., Pearce, W. & Eastley, F. Perceptions of a culturally responsive school-based oral language and early literacy programme. *Aust. J. Indig. Educ.* 1–10 (2020).
 31. Warren, E. & Miller, J. *Mathematics at the margins*. (Springer, 2016).
 32. Rigney, L., Garrett, R., Curry, M. & MacGill, B. Culturally responsive pedagogy and mathematics through creative and body-based learning: Urban aboriginal schooling. *Educ. Urban Soc.* (2019). doi:<https://doi.org/10.1177/0013124519896861>
 33. Lewthwaite, B. *et al.* Seeking a pedagogy of difference: What Aboriginal students and their parents in North Queensland say about teaching and their learning. *Aust. J. Teach. Educ.* **40**, 132–159 (2015).

APPENDIX

Contributing authors and peer reviewers of this rapid research report

Contributing authors

Dr Danielle Armour, Senior Lecturer Indigenous Futures, School of Education, College of Arts, Social Sciences & Commerce, La Trobe University

Professor Hill Blackmore AM FASSA, Alfred Deakin Professor and Professor of Education, Deakin University

Professor Natalie Brown, Director, Peter Underwood Centre for Educational Attainment

Professor Janet Clinton, Director, Centre for Program Evaluation and Director, International Teacher Education Effectiveness Research Hub Melbourne Graduate School of Education

Associate Professor David Geelan FACE, School of Education and Professional Studies Griffith University

Professor Andrew Martin FASSA, Scientia Professor and Professor of Educational Psychology School of Education (Educational Psychology Research Group), University of New South Wales

Dr Jodie Miller, Senior Lecturer, Faculty of Humanities and Social Sciences, University of Queensland

Mary Mulcahy, Director CSIRO Education

Dr Sarah Prestridge, Senior Lecturer Program Director, Bachelor of Education, School of Education and Professional Studies, Griffith University

Professor Neil Selwyn, Faculty of Education, Monash University

Professor Pauline Taylor-Guy, Director, ACER Institute and Centre of School and System Improvement

Professor Julian Thomas FAHA, Professor for Media and Communications and Enabling Capability Platform Director, Social Change, RMIT University

Professor Deborah West, Pro Vice Chancellor (Learning and Teaching Innovation), Office of Deputy Vice Chancellor (Students), Flinders University

Dr Rachel Wilson, Associate Professor, Educational Assessment, Evaluation & Research Methodology, Sydney School of Education & Social Work, Centre for Educational Measurement and Assessment, University of Sydney

Rapid Research Information Forum

Differential learning outcomes for online versus in-class education

Peer reviewers

Emeritus Professor Peter Lee FTSE

Emeritus Professor John Loughran FASSA, Executive Dean, Faculty of Education, Monash University

Professor Mitch Parsell, Academic Executive Director, University of Tasmania

Professor George Siemens, Professor and Director Centre for Change and Complexity in Learning Teaching Innovation Unit, University of South Australia

The production of this rapid research report was supported by staff of the Academy of the Social Sciences in Australia: Ms Andrea Horsburgh and Dr Chris Hatherly. Edited by Ms Robyn Diamond and Dr Elizabeth Finkel AM.

RAPID RESEARCH INFORMATION FORUM

Learning outcomes for online versus in-class education

The Rapid Research Information Forum (RRIF), is a forum for rapid information sharing and collaboration within the Australian research and innovation sector. It is convened by Australia's Chief Scientist, Dr Alan Finkel AO FTSE FAA FAHMS, and its operations are led by the Australian Academy of Science.

RRIF provides a mechanism to rapidly bring together relevant multidisciplinary research expertise to address pressing questions about Australia's response to COVID-19, as they emerge.

RRIF enables timely responses to be provided to governments based on the best available evidence. RRIF also informs the Chief Scientist's interactions and collaboration with other national chief scientific advisers. It demonstrates the critical value of research and innovation in driving societal as well as economic progress now and into the future.

Forum member organisations

- Australia's Chief Scientist (Chair)
- Australian Academy of Science (AAS)
- Australian Academy of Health and Medical Sciences (AAHMS)
- Australian Academy of Technology and Engineering (ATSE)
- Academy of the Social Sciences in Australia (ASSA)
- Australian Academy of the Humanities (AAH)
- Royal Society Te Apārangi (New Zealand)
- Australian Council of Learned Academies (ACOLA)
- State and Territory Chief Scientists and representatives
- Chief Science Advisor to the Government of New Zealand
- Scientific expert members of the National Science and Technology Council (NSTC)
- CSIRO
- Universities Australia (UA)
- Science & Technology Australia (STA)