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Beating lockdown blues: Students pass the Covid test

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Research Report 42

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Executive summary

Students across Australia have suffered educational disruption throughout 2020 and 2021 due to efforts to combat the spread of Covid-19.

As students in Australia's major population centres return to classrooms, it is timely to take stock of the evidence of the impact of home-based learning.

As with other public policy measures, education policy and practice during the pandemic have faced uncertainty. Some *a priori* assumptions have proven true, while others have not.

Now that there is an emerging evidence base to draw on, it is important that policymakers and educators make evidence-based decisions in advancing education policy and practice.

Key assumptions made about the potential impact of home-based learning are evaluated against, among other data sources, a survey of Australian students aged 16-17.

Assumption #1: Disadvantaged students will suffer from a digital divide

Some students did suffer from unreliable internet access (13%), a lack of electronic devices (6%), and not having a place to study (12%) during home-based learning.

However, **there is little evidence disadvantaged students were disproportionately impacted in their access to home-based learning supports**. At least in part, this appears to be thanks to efforts of policymakers and schools.

Assumption #2: Students will suffer from a significant learning loss

International studies found students made almost no progress during their respective periods of home-based learning.

However, **national- and state-level NAPLAN results suggest no significant difference in Australian students' overall achievement level** — when comparing pre-pandemic, 2019 results and the 2021 results (there was no NAPLAN in 2020). If Australian students suffered similarly slow progress as in overseas studies, the average Australian student would be the equivalent to 6.6 weeks behind in reading and numeracy — and as much as 19.4 weeks behind in Victoria.

Further data is required to confirm the indicative outcomes of the 2021 NAPLAN results. In particular, an important point is that, even if average student achievement appears not to have been significantly impacted during the home-based learning period, aggregate NAPLAN results don't note which students are achieving well or not. This study provides insights on which students may have fared better or worse during home-based learning and what factors explain differences in students' experiences. In other words, *why* students progressed the way they did, not only *whether* they progressed.

23% of students say their achievement was low or very low during home-based learning. Among the same cohort of students, just 9% were previously identified as being relatively low achievers.

Students who self-reported very low achievement during home-based learning were already achieving well behind the average student — around 2.1 years behind in numeracy and 1.8 years behind in reading.

After accounting for a range of academic, non-academic, and demographic factors, several drivers explain how students rate their achievement during home-based learning:

- Their level of engagement in regular in-school classes.
- Their ability to focus during home-based learning.
- Their level of motivation to study during home-based learning.
- Their ability to cope during home-based learning.
- The time spent studying during home-based learning, particularly between students who increased and decreased time studying.

Assumption #3: Disadvantaged students will be disproportionately impacted in learning outcomes

There's **no clear relationship between students' disadvantage demographics and their reported achievement during home-based learning**. Students whose parents did not complete Year 12 reported lower achievement (compared to those whose parents completed to Year 10). However, after accounting for other factors, students in inner regional locations actually rated their achievement higher than metropolitan students. Students in more advantaged schools or living in more socio-economically advantaged areas are no more or less likely to report higher achievement than those who are not.

Assumption #4: The mental health impact on students will negatively impact their educational outcomes

There is considerable evidence students' mental health has been negatively impacted during the home-based learning periods, as well as coronavirus restrictions more broadly.

48% of respondents aged 16-17 recorded being at high, or very high, risk of psychological distress. That is around 2.5 times higher than previously recorded.

26% reported many, or very many, problems or stresses. 21% coped a little or not at all. 17% needed support but couldn't get it.

While there is a consistent negative correlation between students' perceptions of their achievement and adverse psycho-social factors, there is no significant statistical relationship after accounting for other factors, including students' coping levels during home-based learning.

Students who reported not being able to cope at all also reported much lower achievement, while those with higher coping levels reported higher achievement.

There is some evidence that adverse mental health outcomes of students can rebound relatively quickly when students return to face-to-face schooling. However, it appears that some negative social outcomes are slower to rebound without intervention.

Despite concerns about students' elevated stress levels, particularly in the Year 12 cohort, study-related stress was lower during home-based learning than it was when students returned to school. **There is also no observed correlation between students' reported achievement during home-based learning and their study-related stress level**. This suggests that expanded special consideration programmes — motivated largely by concern for potentially elevated stress levels — for school leavers, especially for university entry, may not be warranted. Policymakers should limit the adjustments and accommodations made to students' school leaving exams and ATARs as a result.

Assumption #5: Significant additional resourcing is required to address learning losses, especially those of disadvantaged students

Some degree of policy intervention is justified as a precautionary principle. Policymakers should anticipate that some students may be adversely impacted by the prolonged disruption to schooling in NSW, Victoria, and ACT. However, policymakers must be clearer in distinguishing Covid catch-up responses from wider remedial efforts to address pre-existing achievement gaps from before the pandemic — particularly in terms of what is intended to be temporary and what is intended to be permanent. Conflating these purposes may produce suboptimal outcomes.

Based on students' reported achievement in this research, the proportion of students that seem to require remedial support — due to a change in their progress during home-based learning — may be much smaller than initially feared. It also suggests that those students may not be as clearly identified as initial assumptions.

In this study, **at least 6%, and as many as 14%, of students reported lower, or much lower, achievement**. However, around 20% of students have participated in current small group tutoring programmes in NSW and Victoria. Moreover, participants are highly represented in NSW regional and remote schools, though there is no evidence these students were especially likely to have suffered during home-based learning.

In any case, **small group tutoring could deliver the equivalent of around 4 months of additional learning progress** in reading and numeracy over the course of a year.

The OECD has recently recommended policymakers consider a summer school option for students whose learning or social and emotional development has been negatively impacted. This could potentially result in an academic boost similar to small group tutoring, while also offering opportunities to address concerns for students' social outcomes. However, it is also relatively expensive and would require careful design to ensure it is effective — not least of which to ensure there are sufficient educators willing and able to staff a summer school.

Similar gains to student achievement are possible without requiring additional resourcing. For instance, the equivalent of around 5 months of additional learning over a year can be achieved by implementing phonics-based reading programmes (at least for earlier year groups). There is also considerable evidence demonstrating that some students could make similar gains if they consistently benefitted from evidence-based, explicit instruction more frequently. While this requires concerted efforts — particularly through sustained, high quality professional development — it would not necessarily demand a high additional cost or workload burden.

Policymakers should be conscious of the potential for white elephant projects in addressing potential short term needs. Covid catch-up funding is on top of considerable existing resourcing and budgets that have built-in increases each year under federal-state funding agreements. Additional Covid-related administrative and regulatory burdens for risk management add to an already existing burden. Infrastructure upgrades to comply with further health regulations are on top of already high building and safety standards. Interventions to address social and emotional needs of students are on top of existing services and there is little independent evidence to suggest they will deliver additional benefits. There is risk that these additional costs and burdens will not only fail to deliver benefits in the first instance, but might also become prolonged or permanent.

Introduction

Around the world, 1.5 billion students, across 188 countries, experienced at least some disruption to regular face-to-face schooling in 2020 due to efforts to contain the spread of the Covid-19 pandemic.[1] In Australia, most states and territories experienced relatively short periods of disruption — some less than one full school week.[2] However, Victorian students — representing around 25% of all Australian students — were most significantly impacted, as they experienced extended school closures throughout 2020. In addition to closing schools, policymakers also cancelled the national standardised NAPLAN assessments, originally scheduled for May 2020. These assessments were subsequently sat in May 2021, as this coincided with a period in which Australian schools were operating with relative normalcy. Preliminary results from NAPLAN 2021 suggest that the educational disruption experienced until that time had not significantly impacted on the average students' achievement in literacy and numeracy — in any states or territories, any of the tested domains, or in any particular year groups (Years 3, 5, 7, and 9).

However, as major Australian population centres were impacted by an outbreak of the delta strain of Covid-19 from June 2021, many students, teachers, and families returned to months of home-based learning. The result is that for many of Australia's students, the educational disruption will end up being greater in the 2021 school year, rather than 2020.

Special concern has surrounded the Class of 2021, who will have had little in-person schooling ahead of their Year 12 school-leaving examinations (Higher School Certificate (HSC) in NSW and Victorian Certificate of Education (VCE) in Victoria), which can determine entry to further education. In 2020, the Victorian Curriculum and Assessment Authority (VCAA) introduced the "Consideration of Educational Disadvantage" (CED) process to calculate VCE results, resulting in adjustments to students' final scores and ATAR rankings. Other support measures such as reducing course content and rescheduling the exam and assessment dates were implemented to reduce pressure on VCE students. In 2020, around 60 percent of Year 12 cohorts received special entry access scheme (SEAS) in their university application, requesting further ATAR adjustments for course entry.

In NSW, a "COVID-19 Special Consideration Program" has also been announced to support HSC students significantly impacted in 2021, largely managed through existing Illness/Misadventure Application schemes, and by rescheduling of HSC exam dates to accommodate impacted students.

Analysis in this paper is primarily based on data collected towards the end of 2020 from a survey of students who are mostly in Year 12 in 2021, based on data found in the Longitudinal Study of Australian Children (LSAC). The empirical analysis is centred around analysing students' perceptions of achievement during the home-based learning period (see Appendix B for further survey details).

The research tests the following *a priori* assumptions surrounding the home-based learning experience against the new evidence that has become available:

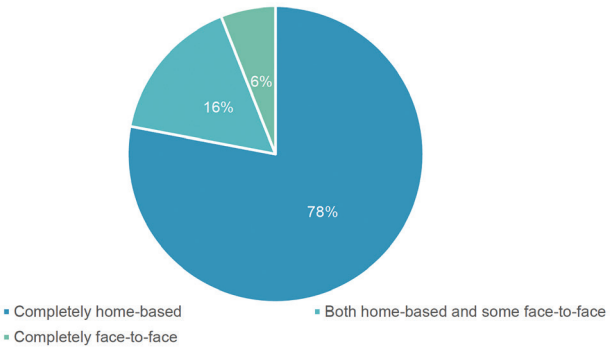
- Disadvantaged students will suffer educationally from a digital divide.
- Students will suffer from a significant learning loss.
- Disadvantaged students will be disproportionately impacted in learning outcomes.
- The mental health impact on students will negatively affect their educational outcomes.
- Significant additional resourcing is required to address learning losses, especially those of disadvantaged students.

School closures

By the end of March 2020, almost all school systems around the world had imposed restrictions on face-to-face schooling in efforts to contain the Covid-19 pandemic. Generally speaking, the older the student, the more likely they were to have reduced face-to-face instruction time. This has been justified on both health (greater transmission risk associated with adolescents than with younger children) and educational grounds (such students typically have greater capacity for independent study during home-based learning).

Most Australian 16-17 year olds (typically in Year 11 at the time of the initial coronavirus restrictions period (CRP)) spent at least some time learning from home in 2020. Only around 6% of students continued accessing face-to-face instruction — largely this relates to students whose parents were essential workers and were unable to provide supervision at home.

Figure 1. Students' study patterns during the coronavirus restrictions period.



Source: Longitudinal Study of Australian Children (LSAC); Cohort B, Wave 9C1.

School closures have been longest in Victoria, NSW, and ACT

School closures have varied greatly between states and territories since the initial stages of the coronavirus restrictions period (CRP), when schools were temporarily closed nationally.

Victorian schools have been most significantly impacted. In 2020, Melbourne students missed around 21 weeks of face-to-face schooling, and at least 15 weeks in 2021.

NSW schools have sustained much longer closures in 2021 than in 2020. NSW students will miss around 13 weeks of face-to-face schooling in 2021 and are due to fully reopen on October 25 (with some year groups returning earlier).[3]

Table 1. School closure durations, by state and territory, and remoteness.

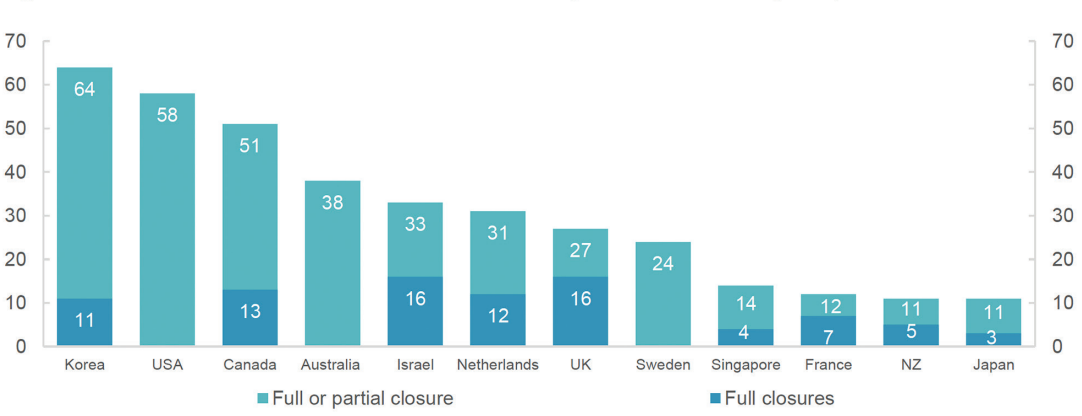
State/ territory	Duration of full and partial closures 2020 (metro/regional)	Duration of full and partial closures 2021 (metro/regional)	Scheduled date for full in-person learning
NSW	7 weeks / 7 weeks	13 weeks / 6 weeks	October 25
VIC	21 weeks (+1 week*) / 18 weeks (+1 week*)	15 weeks (+1 week*) / 15 weeks (+1 week*)	November 5
QLD	5 weeks (+ 1 week*) / 5 weeks (+ 1 week*)	3 weeks / 0 weeks	Not applicable
ACT	5 weeks (+ 3 weeks*) / 5 weeks (+ 3 weeks*)	9 weeks / 9 weeks	November 1
NT	0 weeks (+ 1 week*) / 0 weeks (+ 1 week*)	0 weeks/ 0 weeks	Not applicable
TAS	6 weeks (+ 1 week*) / 6 weeks (+ 1 week*)	0 weeks / 0 weeks	Not applicable
SA	0 weeks (+ 1 week*) / 0 weeks (+ 1 week*)	1 week / 1 week	Not applicable
WA	1 week (+ 1 week*) / 1 week (+ 1 week*)	1 week / 0 weeks	Not applicable

NB: *Includes pupil-free days, brought forward holidays etc.

Australian school closure duration — international comparison

There is huge variation in duration and nature of school closures around the world. Generally, Japan, New Zealand, and Norway (and Sweden, for all age groups other than senior secondary) have experienced the least disruptions to face-to-face schooling. Interestingly, across countries, the likelihood and severity of school closures is not necessarily related to the stringency of their wider health policy efforts, nor the infection rates.[4] On average across the 30 countries with comparable data for all levels of education, pre-primary schools were fully closed for an average of 42 days in 2020, primary schools for 54 days, lower secondary for 63 days, and upper-secondary schools for 67 days.[5] Compared to the OECD average, most Australian schools were closed for a shorter period than in North American school systems, but longer than much of Europe, New Zealand, and Japan.[6]

Figure 2. Cumulative weeks of national school closures (at least one school system).



A digital divide?

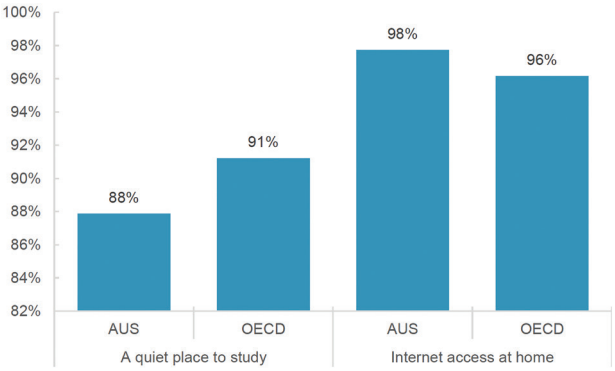
Like other countries, home-based learning in Australia has depended upon the use of digital instruction and supports. Accordingly, the OECD warned that disadvantaged students faced additional risks associated with home-based learning, due to a digital divide.[7] Similarly, UNICEF noted the digital divide is not only one between advanced and developed economies, but also within developed ones — namely between high SES and low SES households, as well as a rural-urban divide.[8]The digital divide refers to the gap between students from high- and low-socioeconomic backgrounds in terms of access to internet and digital devices, with expressed concerns that students with limited home digital access and support are more likely to disengage from learning and be irreversibly left behind.

In Australia, several reports commissioned by the Australian Health Protection Principal Committee (AHPPC) highlighted additional risk factors facing disadvantaged students — particularly inequities in access to digital supports.[9] For instance, the Peter Underwood Centre predicted that nearly half of Australian students were at risk of having their learning and wellbeing significantly compromised by not being at school, particularly families lacking physical spaces at home, as well as the technology and other resources to support learning at home.[10] The Australian Council for Educational Research added that students from socially disadvantaged households may also suffer because their parents may lack the capacity to provide sufficient learning supports for students during home-based learning.[11]

There is evidence of a pre-pandemic digital divide in Australia

By international standards, the average Australian student was relatively well placed to respond to home-based learning demands.[12] Compared to OECD countries, Programme for International Student Assessment (PISA) 2018 data shows that while Australian students are slightly less likely to have access to a quiet place to study at home, they are slightly more likely to have internet access at home.

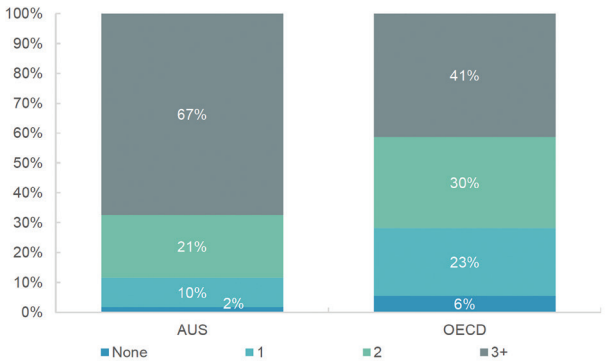
Figure 3. Proportion of students with access to a quiet place to study and internet access at home, Australia vs OECD average.



Source: OECD (2019), Programme for International Student Assessment 2018 database.

Compared to other OECD countries, Australian students have access to more electronic devices at home. More than two in three students have access to three or more electronic devices.

Figure 4. Number of electronic devices (desktop computer, laptop, notebook etc) students have access to, Australia vs OECD average.



Source: OECD (2019), Programme for International Student Assessment 2018 database.

However, there's also evidence that, pre-pandemic, Australia's disadvantaged students suffered from a digital divide. A 2015 report estimated that around 40% low-income households in Australia didn't have access to the internet, that 63% of Indigenous households didn't have internet access at home, and that only 68% of children in disadvantaged households used the internet at home (compared to 91% in more advantaged households).[13] PISA data also shows that around 15% of disadvantaged students don't have access to a device for homework or a quiet place to study at home. And even larger than the gap in access to devices (the first digital divide) is the disparity in the adequacy of devices (the second digital divide) — around a third of disadvantaged students have devices without sufficient computing capacity, and half do not have sufficient internet bandwidth and speeds.

This is not just about an inequity in inputs, but outcomes too. Students from disadvantaged backgrounds also record lower levels of ICT literacy in Australian testing. Students whose parents did not complete Year 12, those living in remote locations, and those with an Indigenous background are much less likely to meet the proficient standard in ICT literacy — meaning they could potentially face additional challenges undertaking home-based learning.

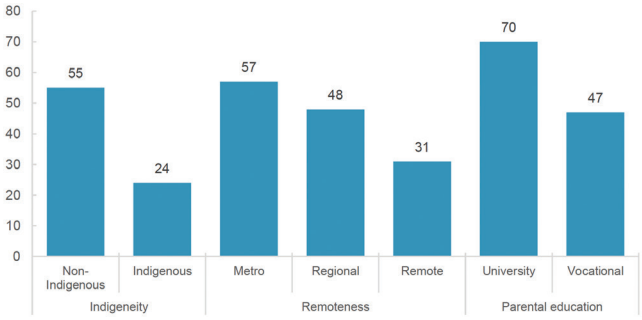
Policymakers responded to address risks of exacerbating digital inequities

In the immediate roll out of home-based learning, policymakers in many countries responded by providing additional digital resources to students at risk of exclusion. The most commonly reported approaches include providing free or subsidised access to electronic devices (72% of high-income countries), free or subsidised internet access (66% of high-income countries), while some also upgraded infrastructure to support learners in remote areas (40% of high-income countries).

Australian policymakers also took considerable lengths to address the digital divide. For some families without a suitable learning environment at home, on-site learning remained open for students. However, there's little data on which to draw to observe exactly how many students accessed physical space at schools to study.

The Victorian government provided free internet access and laptops to students who lacked access to digital resources — amounting to more than 6,000 laptops and tablets, as well as 4,000 free SIM cards in partnership with Telstra.[14] Similarly, the NSW government distributed 7,000 laptops and 5,000 dongles, as well as 13,000 devices and 8,000 SIM dongles distributed to support remote learning in 2020.[15] There is no publicly available data to empirically assess the distribution of these devices against students' needs.

Figure 5. Percentages of students attaining the proficient standard in ICT literacy, Year 10.



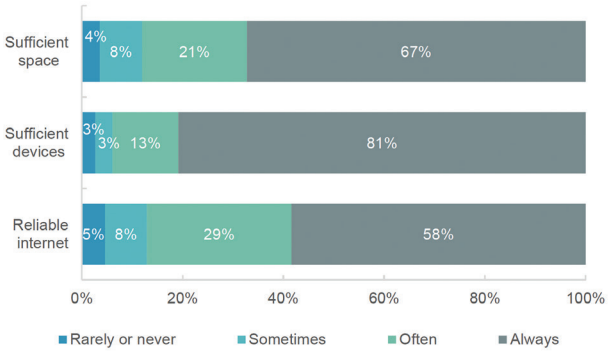
Source: ACARA (2018). 2017 NAP–ICT Literacy Report.

Some students suffered from difficulties during home-based learning

LSAC data show that some students experienced difficulties with home-based learning. While appearing relatively small in percentage point terms, the number of students impacted is considerable once extrapolated out over the entire national student population.

- Around 13% of students (or extrapolated out to around 520,000) reported at least sometimes having an unreliable internet connection.
- Around 6% (or around 240,000) reported at least sometimes not having sufficient electronic devices.
- Around 12% (or around 480,000) reported at least sometimes not having sufficient space for their needs.

Figure 6. Students' experience of risk factors during home-based learning.



Source: Longitudinal Study of Australian Children (LSAC); Cohort B, Wave 9C1.

Policy interventions may have minimised the impact on disadvantaged students

Despite expectations that disadvantaged students may disproportionately suffer from a digital divide during home-based learning, the data from the 2020 LSAC survey do not provide evidence to support this. There is no observed correlation between virtually any socio-educational disadvantage factors and the likelihood of reporting an unreliable internet connection, having insufficient access to electronic devices, or having insufficient space for needs (see Table 2). A lack of correlation implies that more socio-educationally disadvantaged students did not consistently record lower access to home-based learning supports, compared to less socio-educationally disadvantaged students.

When observing values in Table 2, correlations are reported as either Kendall's tau (τ) and Somers' delta (δ) (see Appendix B). Higher values indicate a stronger relationship between factors (-1 to +1). Positive (negative) values indicate that measures move in the same (opposing) direction. A zero or low value correlation means how respondents order their responses between two variables are unrelated. To provide a standard and consistent measure across this paper, the Cohen's *d* value is also calculated (see Appendix B for details). As a rule of thumb, *d* values smaller than 0.2 are small, while those up to 0.5 are moderate size, and those over 0.8 are large effects.

Almost all correlations (particularly those that are statistically significant) in Table 2 are thus considered to be of relatively small magnitude. This shows that there's little evidence that disadvantaged students ultimately experienced less access to resources needed to conduct home-based learning.

The only factor consistently correlated with educational risk factors for home-based learning is the number of people living in a household. Students in households with more people reported less access to reliable internet, having access to sufficient devices, and having sufficient space for study. Students whose parents had lower post-school attainment were slightly more likely to report not having sufficient space. Students in a capital city metropolitan area, and those in more socio-educationally advantaged schools, are slightly more likely to have had access to sufficient devices.

Given that Table 2 mostly shows little correlation between socio-educational disadvantage and access to home-based learning resources, it suggests that interventions from policymakers and educators in providing support to at-risk students and families may have contributed to preventing a significant digital divide during home-based learning.

Table 2. Correlation between home-based learning risk factors and socio-educational factors.

	Reliable internet		Sufficient devices		Sufficient space	
	τ, Somers' δ	Cohen's *d*	τ, Somers' δ	Cohen's *d*	τ, Somers' δ	Cohen's *d*
Remoteness	-0.02	-0.06	-0.04	-0.14	-0.03	-0.10
Lives in capital city or surrounding area	0.00	-0.01	**0.05**	**0.17**	0.05	0.14
Educational Index of home Statistical Area 2	-0.02	-0.08	0.03	0.08	0.00	0.00
Socio-Economic Indexes for Areas (SEIFA) decile of home Statistical Area 2	-0.03	-0.09	0.03	0.11	0.01	0.02
School average Index of Community Socio-Educational Advantage (ICSEA)	-0.02	-0.07	**0.04**	**0.14**	0.03	0.10
Parent school completion	0.04	0.13	-0.04	-0.12	-0.04	-0.13
Parent post-school attainment	0.01	0.05	-0.04	-0.14	**-0.06**	**-0.18**
Single parent household	0.01	0.02	-0.08	-0.24	-0.08	-0.26
ATSI status	0.08	0.24	-0.05	-0.14	-0.05	-0.14
Students speaks language other than English at home	-0.01	-0.04	0.01	0.04	-0.02	-0.05
No of people in household	**-0.05**	**-0.15**	**-0.06**	**-0.19**	**-0.05**	**-0.15**

NB: Bolded figures indicate statistically significant correlation at 95% confidence level.

Learning loss?

From the onset of home-based learning, there's been much speculation about possible impacts on education outcomes. A widely held view among experts has been the likelihood of 'learning loss'[16], 'learning lags'[17] and 'unfinished learning'[18]. Usage of the term 'learning loss' has been popularised and is used throughout this paper, notwithstanding that it is an imperfect term.

First, the use of the term 'learning loss' in respect to Covid-related schooling disruption is different to how the term has been traditionally used in the literature. Prior to the pandemic, 'learning loss' was used to describe loss of previously acquired knowledge — typically in the context of summer and holiday breaks. More generally, it follows from the observation that, following a break from study, students typically regress slightly in what they know and can demonstrate.

And, second, the common usage of 'learning loss' in today's context has expanded, so it's used to describe not only the loss of previous learning, but also students' slower progress in learning content and mastering skills compared to the normal rate of progress. Put differently, in the current context 'learning loss' is not always lost learning *per se*, but the difference between students' actual learning and a counterfactual level absent the disruption resulting from home-based learning.

Most research predicted moderate learning loss during home-based learning

Early estimates of the potential impact of home-based learning have taken two primary approaches: one has been to consider the effect of past episodes of educational disruption (crudely, disruption-based analysis); and the second has been to consider the relative efficacy of home-based schooling compared to regular face-to-face schooling (crudely, continuity-based analysis).

To generate estimates of impact from educational disruption, researchers have looked to the effect of school closures due to periods of mass teacher strikes,[19] [20] natural disasters,[21] or major changes to school calendars.[22] Others generated estimates of potential learning loss from extrapolating out research on the 'summer slide' of lost learning observed over holiday periods.[23] [24] [25] Generally, this research has estimated significant potential learning loss — this is because, while the usual effect of 'summer slide' and the like is typically relatively small, once extrapolated out over an extended period and across a population, it can appear sizeable, especially for some students.[26] World Bank simulations estimated that learning losses could amount to around 0.9 quality-adjusted years of schooling around the world. [27]

Others, based on the continuity of progress, have generally produced more modest, but not trivial, learning loss estimates. This has largely drawn from research based on distance learning being slightly less effective than face-to-face instruction in empirical studies.[28] [29] CIS research in 2020 estimated that a 10-week-long period of home-based learning could result in around 2.3 weeks of lost learning in reading and 3.3 weeks in numeracy for disadvantaged students in Year 9, but with little effect on relatively advantaged students (based on standard socio-educational advantage factors).[30] Most researchers also noted the likely exacerbation of equity gaps in education outcomes. [31]

An international survey of education researchers predicted achievement gaps would increase by between one fifth and one third over the 2020–2021 school year.[32] In Australia, the Grattan Institute estimated a widening of the achievement gap between advantaged and disadvantaged students (a grouping of 38% of educationally vulnerable students) of 7% in 2020.[33] Others suggested home-based learning could reverse years of progress made in narrowing the gap.[34] International estimates also predicted school closures could exacerbate post-schooling outcomes, such as the socioeconomic skills gap, by more than 30%.[35] A minority of researchers were sanguine about the prospect of learning loss, suggesting that a home-based learning period in the vicinity of 10 weeks would be unlikely to significantly impact on outcomes for most students.[36] Among them is eminent education researcher, Professor John Hattie, who has vocally dismissed worries that students will suffer large and irreversible learning losses, highlighting the expertise of the teacher workforce in meeting the challenge.[37]

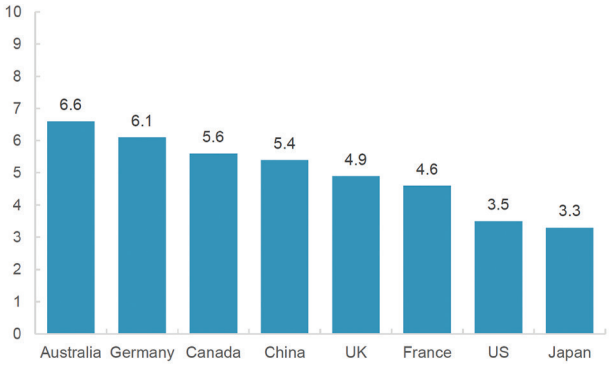
Parents and teachers have concern about students' progress

Parents have shared researchers' concerns about the potential negative impact during the home-based learning period. In the UK, almost 60% of parents of primary school children and nearly half of the parents of secondary school children reported difficulty supporting learning at home.[38] Similarly, CIS polling of Australian parents in 2020 found that about half of surveyed parents experienced difficulty in providing regular supervision.[39] Moreover, 41% of parents felt their child learnt less during home-based learning, with higher rates observed by regional parents.

A similar survey of parents in France suggests around 41% of students were able to maintain their usual learning pace, while around 19% made little or no progress during home-based learning.[40] Australian teachers shared concern for student progress, but found home-based learning more effective than in similar countries. Given that standardised assessments around the world were largely cancelled or downgraded in 2020, teacher judgments and assessments have been relied upon heavily. This has produced some mixed perspectives on student progress during home-based learning.

In a 2020 survey of NSW teachers, only 35% reported feeling assured of student progress and that students were well prepared for home-based learning.[41] Teachers in disadvantaged schools were more pessimistic, with most reporting that they believed their students progressed only 25 to 50% of their usual pace during the school closures. This analysis found that many students were struggling from the lack of contact and interactions with teachers, while some were faring well or learning new skills and knowledge. However, by international standards, Australian teachers reported home-based learning as being relatively effective. On a self-reported scale, Australian teachers rated effectiveness of home-based learning at an average of 6.6/10 — twice as effective as Japanese teachers rated it — meaning around one-third of teachers felt home-based learning was just as effective as regular face-to-face schooling.[42]

Figure 7. Average effectiveness of home-based learning, as reported by teachers (scale 0-10, from ineffective to highly effective).



Source: McKinsey & Co Teacher Sentiment Survey.

International research has identified consistent learning losses

A number of empirical studies have now become available that provide *actual* impacts on student outcomes, not just *a priori* estimates of *potential* impacts (see Table 3). This body of research has identified negative effects on student achievement in most, but not all studies (including studies of Australian students). While a range of different metrics can be used to estimate the effect of learning loss in empirical studies, standardising the effect in terms of standard deviations (σ) is the convention. This is because it expresses the effect on learning is a standardised measure that allows for comparison across different studies and contexts — which is important because we are comparing students who completed different assessments, in different countries, at different ages, and different assessment topics. The effect can be positive or negative, with higher values representing a larger effect.

Table 3. Learning loss effects from the empirical literature (in standard deviations) from meta-analysis[43]

Domain	Min	Median	Max
General	-0.37	-0.1	+0.2
Mathematics	-0.19	-0.12	+0.2
Reading	-0.29	-0.14	+0.04

While the magnitude of the effect is relatively small compared to the *absolute level* of student achievement, in some cases it is large in *relative level* terms (progress). In other words, a median effect equivalent to around -0.1 of a standard deviation is not especially large compared to other effects observed in the literature, it is relatively large given the time period (generally measured over the course of only 7-8 weeks, whereas other interventions are typically much longer) and scale (across an entire population of school students, whereas other interventions are typically class- or school-based).

In international studies, students made virtually no progress during home-based learning. In fact, in some studies, home-based learning proved to be no more effective, statistically, than students having no instruction at all.[44] Students in the United Kingdom were nearly three months behind on average in their learning by July 2020, and were only able to cover about 70% of the school curriculum.[45] Studies in several European countries have shown relatively large learning losses despite similar home-based learning periods to most of Australia.[46] Nonetheless, some studies — including an Australian study[47] [48] — indicated there were no significant differences in student learning.[49]

Table 4. Summary of major studies of educational effects of home-based learning.

Source	Country	Closure length	Year level	Subject	Learning loss for students on average	Learning loss for disadvantaged students
Blainey et al., 2020[50]	United Kingdom	9 weeks	Year 1	Maths	Around 2 months behind	Not quantified in progress terms
				Reading	Around 3 months behind	Not quantified in progress terms
			Year 2	Maths	Around 3 months behind	Not quantified in progress terms
				Reading	Around 1 month behind	Not quantified in progress terms
			Year 3	Maths	Around 2 months behind	Not quantified in progress terms
				Reading	Around 1 month behind	Not quantified in progress terms
			Year 4	Maths	Around 2 months behind	Not quantified in progress terms
				Reading	Around 1 month behind	Not quantified in progress terms
			Year 5	Maths	Around 2 months behind	Not quantified in progress terms
				Reading	Around 1 month behind	Not quantified in progress terms
			Year 6	Maths	Around 2 months behind	Not quantified in progress terms
				Reading	Around 1 month behind	Not quantified in progress terms
Gore et al., 2021[51]	Australia	8-10 weeks	Year 3	Maths	2 months ahead*	2 months behind
				Reading	Not identified	Not identified
			Year 4	Maths	Not identified	Not identified
				Reading	Not identified	Not identified
Tomasik et al., 2020[52]	Switzerland	8 weeks	Primary school	Maths	200% growth	Not identified
				German	Not identified	Not identified
			Secondary school	Maths	Not identified	Not identified
				German	Not identified	Not identified
Dorn et al., 2021[53]	United States	2 months	Kindergarten to grade 12	Maths	5 months behind	6 to 7 months behind
				Reading	4 months behind	5 to 6 months behind
EmpowerK12 2020[54]	United States (District of Columbia)	9 weeks	Grade 3 to Grade 8	Maths	4 months behind	5 months behind
				Reading	1 month behind	4 months behind
Kuhfeld et al., 2020[55]	United States	3 months	Grade 3 and Grade 8	Maths	5 to 10 percentile points	-
				Reading	Not identified	-
Pier et a., 2021l[56]	United States (California)	-	Grade 4 to Grade 8	Maths	2.5 months behind	3.2 months behind
				English	2.6 months behind	2.8 months behind
Schult et al., 2021[57]	Germany	8.5 weeks	Grade 5	Math operation	0.09 of a standard deviation**	0.21 of a standard deviation
				Math numbers	0.03 of a standard deviation	0.21 of a standard deviation
				Reading	0.07 of a standard deviation	-
Maldonado & de Witte, 2021[58]	Belgium (Flanders)	7 weeks	Grade 4	Maths	0.17 of a standard deviation	Not quantified for comparison purposes
				Dutch	0.19 of a standard deviation	Not quantified for comparison purposes
				French	0.18 of a standard deviation	Not quantified for comparison purposes
Di Pietro et al., 2020[59]	France	6 weeks	Primary school	General	9% of a year of schooling	-
	Germany	5 weeks	Secondary school	General	6% to 8.7% of a year of schooling	-
	Italy	12 weeks	Upper secondary	General	10% of a year of schooling	-
Engzell et al., 2020[60]	Netherlands	8 weeks	Primary school	General	One fifth of a year of schooling	Two fifth of a year of schooling
Sharp et al., 2020[61]	United Kingdom	7 weeks	Primary school	General	3 months	4 months
Bielinski et al., 2021[62]	United States	-	Age 5 to 14	Maths	3 to 4 months	-

NB: *2 months growth only observed for schools with mid to high index of Community Socio-educational Advantage

** A standard deviation has different implications for learning progress between assessments, based on how they are scored. But the effect in standard deviation terms are broadly comparable between assessments. That means that -0.09 of a standard deviation equates to around three times the effect of a -0.03 a standard deviations effect. In other words, there is a three times greater learning loss observed.

NAPLAN results suggest students haven't fallen behind

In late 2020, 'check-in' assessments in NSW were administered in a sample of schools as a guide to student progress, in lieu of the regular NAPLAN assessment. Results showed students were, on average, significantly behind in reading progress by Term 4, 2020 — effectively indicating students had made very little to no progress, on average, during home-based learning (consistent with some of the international research; see Table 4). By contrast, some other research in NSW suggests students may have been on track in their progress in a comparable assessment administered in 2019 and 2020 on a sample of students.[63] In any case, preliminary NAPLAN results released in August 2021 — based on assessments sat nationally in May — showed no significant drop in achievement in any domain or year group, compared to the 2019 average, including in Victoria despite longer school closures than other states and territories. Some research in NSW suggests students may have been on track in their progress in a comparable assessment administered in 2019 and 2020 on a sample of students.[64] However, it is also important to be as cautious in interpreting these results as being conclusive about educational impacts.

First, at the time of publication, disaggregated NAPLAN results, by student subgrouping, were not yet available, as these are released along with ACARA's National Report on Schooling in December. The preliminary results currently available are only reported at the national and state/territory level. The finalised reporting breaks down the results according to different demographic cohorts, by Indigeneity, sex, geo-location, language background other than English, parental education and parental employment. It will ultimately take closer analysis of finer grain assessment data to make further inference about the implications of home-based learning.

And, second, there are measurement factors to consider, which may suggest additional assessment data could be useful to validate preliminary 2021 NAPLAN. It's also important to note that NAPLAN assessments were administered in May, meaning students had received time back in face-to-face schooling, so it is not a pure measure of home-based learning effects alone. Finally, NAPLAN is, by design, limited in what it assesses and may not necessarily translate to outcomes in other general subject areas.

Some past studies have observed a false inflation of assessment results following a disruptive period. This is because the composition of students can change between testing periods, particularly in secondary school, as students — particularly those at the lowest end of the achievement distribution — drop out of school entirely and are not part of the retested group.[65]

However, there's no clear evidence that this is the case in Australia, at least based on preliminary NAPLAN 2021 data and it seems unlikely to be a factor in the primary school assessments. Moreover, while there was a small decline nationally in the 2021 participation rate in NAPLAN (Year 7 — from 94.06% in 2019 to 93.42% in 2021, and Year 9 — from 90.18% to 89.14%), this is largely attributable to declines in the participation rate in Queensland and Northern Territory, not systems with the most disruption to face-to-face schooling.

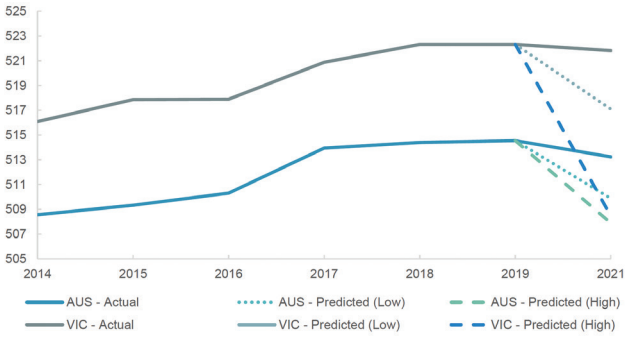
Australian students have significantly outperformed comparable groups of students in other countries

Based on the observed learning losses in international research, it's possible to estimate a counterfactual achievement prediction for 2021 results. The difference between this counterfactual and the actual results provides a reasonable approximation of what results Australian students would have been expected to record.

If Australian students experienced similar learning loss as in international studies, then students would be, on average, around 2.2 weeks behind the achievement recorded in 2021 NAPLAN reading and numeracy. Moreover, adjusted for the different period of home-based learning in Australia, particularly in Victoria, the average Australian student would be around 6.6 weeks behind the actual achievement that was recorded in 2021 NAPLAN.

The achievement comparison is especially stark when comparing Victorian student achievement progress to the learning loss experienced in international studies. Based on the first round of home-based learning period alone, the predicted average Victorian student would have fallen 5.6 weeks behind the scores they actually achieved in 2021 NAPLAN. Counting in the total period of home-based learning in 2020, the average Victorian student averted around 19.4 weeks of learning loss compared to the lower rate of progress made overseas. Put differently, if Victorian students were learning at the same pace as in international studies, they would only have progressed by the equivalent of around 1.6 weeks over the course of 21 weeks of home-based learning — whereas they actually made close to the amount of progress they would have made in a typical year.

Figure 8. NAPLAN student achievement trends (reading and numeracy), predicted and actual, Australia and Victoria.



Source: NAPLAN data time series and author's analysis.

Students' perspectives on their learning

Among the key areas of interest from empirical research on home-based learning is the differential impact on students — not all of which is consistent with *a priori* predictions.[66]

Much of the discussion surrounding potential learning loss has centred around magnitude (how far behind) and the anticipated impacts on at-risk subgroups of disadvantaged students. Instead, the analysis that follows identifies *why* some students fared better or worse during the home-based learning experience. It is based on this analysis, not *a priori* expectations (much of which to date has confounded experts' predictions), that should guide policy and practice responses.

Students' self-reported capacity to study effectively during home-based learning is mostly correlated with their perceived achievement

To indicate the possible factors explaining students' perceptions of achievement during home-based learning, a set of relevant academic variables are analysed for correlations (see Appendix D). As a rule of thumb for interpreting the correlations reported in Figure 9, values larger than around 0.15 (positive or negative) would be considered meaningfully large in terms of the relationship with students' reported achievement, and those above 0.25 (positive or negative) would be considered very large effects. Correlation values close to zero indicate that factors are not significantly related to students' reported achievement.

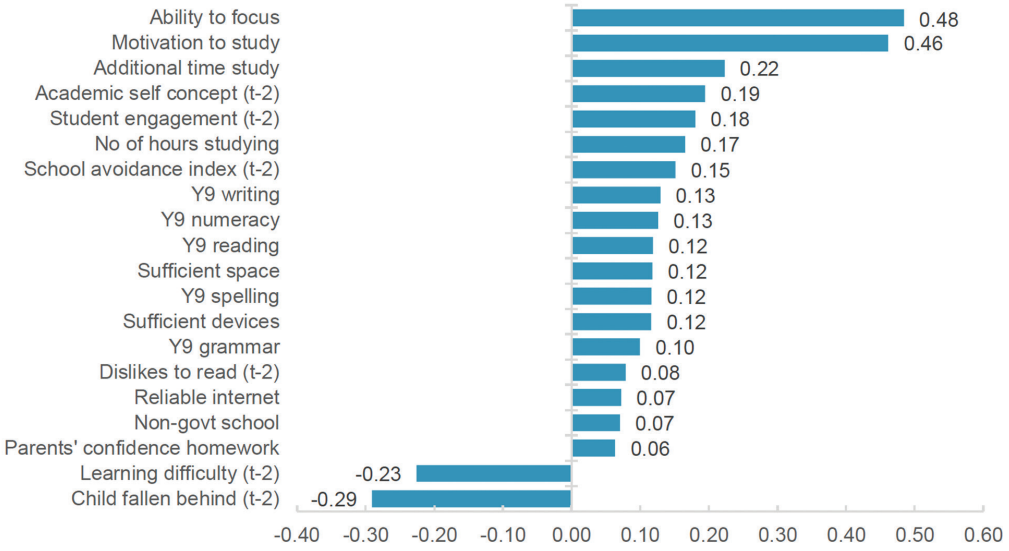
By far the highest correlations with students' perceived achievement are students' self-reported ability to focus (τ =0.48) and their motivation to study (τ=0.46). In fact, these two measures are themselves very closely correlated (τ=0.73) — meaning students who are more motivated generally report greater concentration on their studies, and vice versa. This shows that students with greater capacity to work independently during home-based learning are much more likely to report higher achievement during this time, and vice versa.

Students who spent more time studying than usual, and also those who spent more hours studying in comparison with their peers, reported higher achievement.

Related factors such as academic self-concept (how students generally perceive their achievement), engagement (absenteeism, homework submission, relations with other students, and disposition in class), and the avoidance index (how much students like school-based activities) are also positively correlated with how students rated their achievement during home-based learning.

The analysis shows that students with significant pre-existing additional learning needs were much

Figure 9. Academic factors correlation (τ, Somers' δ) with perceptions of achievement during home-based learning.



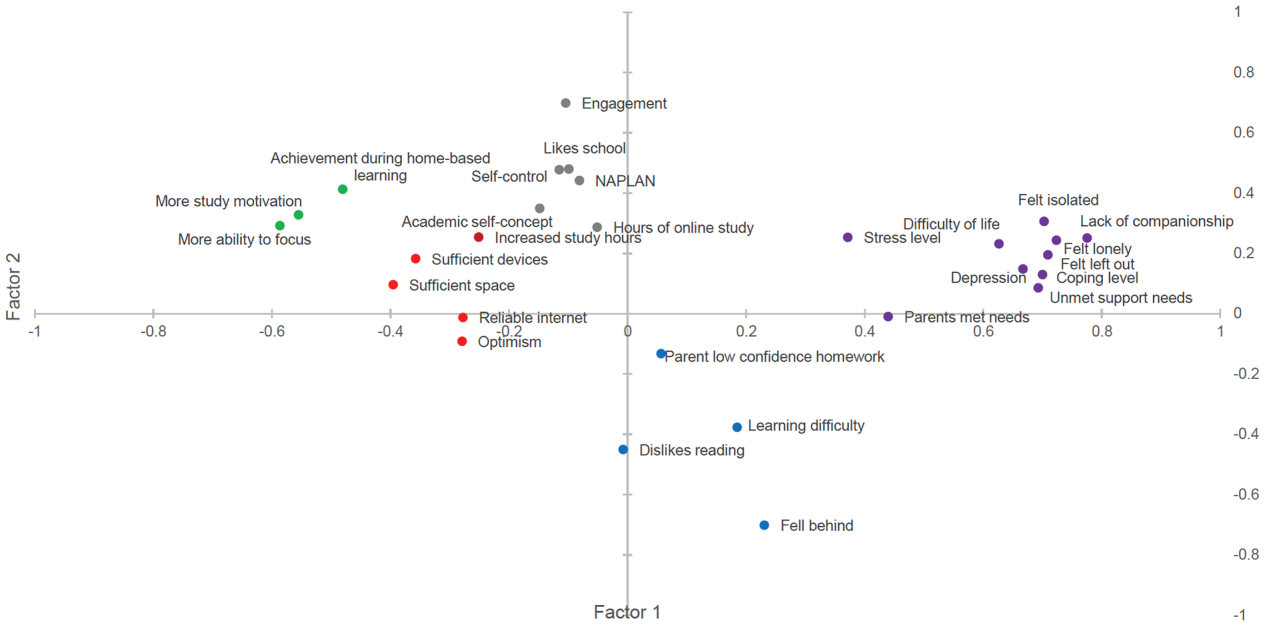
Source: Author's analysis of Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1, Wave 8.

more likely to record lower achievement. For instance, students whose teacher previously reported that they had suffered from a learning difficulty or had fallen behind in the past were more likely to report lower achievement during home-based learning. This suggests the most impacted students may be those who were already at elevated educational disadvantage.

A factor analysis helps to examine the intercorrelated elements of the data (for technical details, see Appendix). When mapped as a factor loading plot, the elements that are located closely together can be interpreted as generally sharing correlations most closely together. This reveals broadly five patterns (see Figure 10):

- Labelled in green dots are items relating to study patterns specific to the home-based learning period. It shows that students' perceived achievement, ability to focus, and motivation to study share similar correlations.
- Labelled in red dots are items relating to educational risk factors specific to home-based learning. Namely, the likelihood of having reliable access to internet, sufficient electronic devices, and sufficient space to study are closely related. Interestingly, how students rate their optimism for the future appears to also share correlations with these educational risk factors.
- Labelled in grey dots are items generally relating to general academic achievement and engagement. It shows that students' past achievement in NAPLAN, their classroom engagement, how much they like school, and how they perceive their learning ability are all closely related — and, to a lesser extent, the number of hours they spent studying online during home-based learning.
- Labelled in dark blue are items relating to general academic risk factors of low achievement. In particular, the likelihood of previously having fallen behind, disliking reading, and suffering a learning difficulty are somewhat related to each other.
- Labelled in purple dots are items generally relating to social and mental ill-health. It shows that the likelihood of experiencing difficulties, difficulty in coping, having unmet support needs during the coronavirus restrictions period, along with experiencing feelings of loneliness, isolation, lack of companionship, exclusion, and depression are all closely related to each other. While stress levels appear to share some correlation, it is not as close as the other variables.

Figure 10. Factor loadings plot based on polychoric correlation matrix.



Source: Author's analysis of Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1, Wave 8.

After accounting for a range of academic (including prior NAPLAN achievement), non-academic, and demographic factors (see Appendix C), a relatively restricted set of factors significantly explain students' perspectives on their achievement during home-based learning. To compare the relative size of the effect of the association between variables, Cohen's *d* is conventional. Higher values of *d* indicate a larger effect — specifically a stronger relationship with students' reported achievement. Positive (negative) values of *d* mean that there is a positive (negative) association. A *d* of 1 indicates the equivalent of a 1 standard deviation difference. As a rule of thumb, *d* values smaller than 0.2 are small, while those up to 0.5 are moderate size, and those over 0.8 are large effects.

Variables that have a high *d* indicate those that are the strongest predictors of how students reported achievement during home-based learning.

A constructed index measuring students' regular engagement, as reported by their previous classroom teacher, is a strong predictor of students' perceptions of their achievement. Among the items made up in this construct are absenteeism, homework submission, relations with other students, and disposition in class. This implies that students who ordinarily are generally well-engaged in face-to-face schooling are more likely to have rated their achievement well during home-based learning.

Not surprisingly, other factors related to the home-based learning environment are also associated with students' perception of their achievement. Namely, how they rated their ability to concentrate on their studies, and to a lesser extent, their motivation toward their studies, are also positively associated with how they rate their achievement. How students' time commitment to their studies changed during home-based learning is also associated with achievement (*d*=0.12) across all rating scales; but if specifically comparing students who increased time studying with those who decreased, this effect is particularly large (*d*=0.3). This means there is a moderately large effect in comparing performance during home-based learning according to whether they increased or decreased their time studying compared to their normal study hours.

Table 5. Significant variables explaining students' reported achievement during home-based learning.

Independent variable	Cohen's *d*
School engagement (t-2)	0.51
Ability to focus	0.4
Motivation to study	0.22
Level of coping	0.22
Time spent on studies	0.12

Nearly one in four students felt their achievement was poor during home-based learning

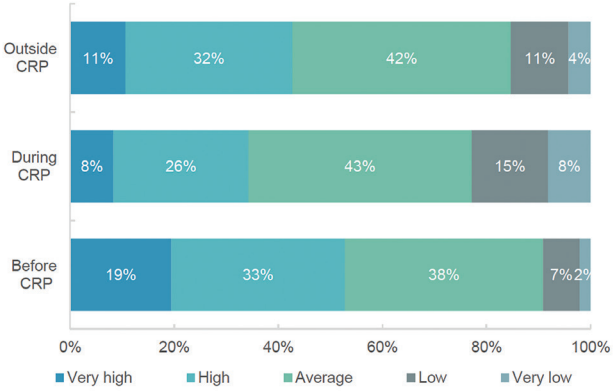
Students' self-rating of their achievement was poorer during the period of home-based learning than after the CRP, and was also poorer than the pre-pandemic achievement level reported by the same students' parents (based on collected data from when the students were 14-15 years old).

In the earlier wave of data, parents rated around 9% of students as struggling learners. During the home-based learning period, 23% of students rated their achievement as low or very low. Around 15% reported low or very low achievement after the coronavirus restrictions period ended. This suggests that there is a higher proportion of students who perceive their achievement to be lower after home-based learning than pre-pandemic, but a smaller proportion than during the home-based learning period itself.

It is not known from this data how students are likely to rate their achievement during 2021 — corresponding to Year 12 — but it would be reasonable to expect at least some reversion to the elevated levels of low achievement. Indeed, given the additional study pressures associated with Year 12, it is likely that the home-based learning ratings are conservative.

Despite the obvious cause for concern for students in the lower rating categories, it is also important to note that a sizeable majority of students rate their achievement in the average and high categories — including 69% during home-based learning.

Figure 11. Self-reported level of achievement in schools, during and after home-based learning.



Source: Author's analysis of Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1, Wave 8. NB: Prior to Wave 9C1, this is derived from parents' responses in Wave 8, with similar, but not identical, response categories.

Students' perceptions of achievement were related to their past achievement

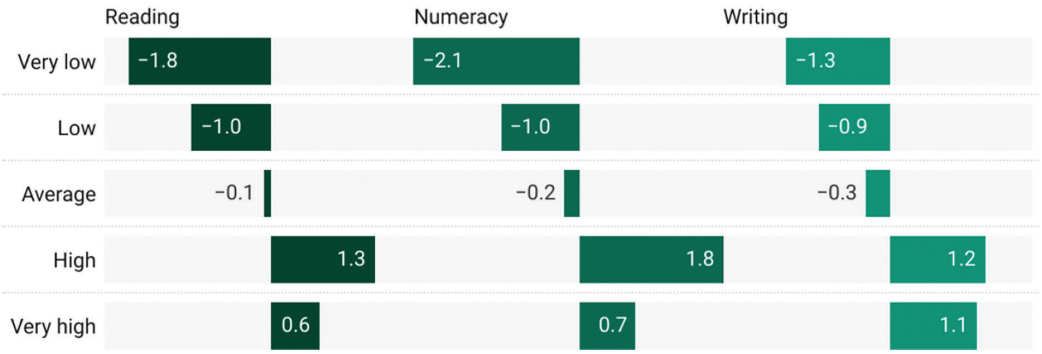
A widely held assumption is that home-based learning would have differential impacts on students based on their prior achievement. Namely, high-achieving students may disproportionately benefit while lower-achieving students may fall further behind.

International research on the impact of home-based learning has produced interesting findings. For instance, in Germany, the effects on achievement were more detrimental in mathematics for low-performing students, while effects for high-performing students were more detrimental in reading.[67] Another German study found low-performing students benefitted from home-based learning, compared to their higher-performing peers, which the authors expect is because they may have been less distracted by other students in a home-learning setting.[68]

LSAC data in Australia shows that students' rating of their own achievement is a reasonably reliable indicator of their achievement on standardised tests, but with a small margin of error that warrants some caution in extrapolation between the two indicators of achievement. Students who rated their achievement as very low are, on average, well behind the average student in their achievement in NAPLAN. Namely, by Year 9, these students were the equivalent of 1.8, 2.1, and 1.3 years behind in reading, numeracy, and writing respectively. By contrast, students who rated their achievement during home-based learning as high are, on average, well ahead of the average student — the equivalent of 1.3, 1.8, and 1.2 years ahead in reading, numeracy, and writing respectively.

One potentially important observation is that students who rated their achievement as very high during home-based learning are, on average, not as high-achieving —according to past assessments — than those who rated themselves as 'high'. While it's true the past achievement level for these students is well ahead of the average one — equivalent of 0.6, 0.7, and 1.1 years ahead in reading, numeracy, and writing respectively — the data indicate there may be some interesting information to unpack about these students. In particular, there may be some students who rated their achievement as very high because they observed a noticeable improvement in their achievement, relative to their usual achievement.

Figure 12. Equivalent years of learning, compared to the average in Year 9 NAPLAN (t-2).



Source: Author's analysis of Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1, Wave 8.

Students spent less time on their studies during home-based learning

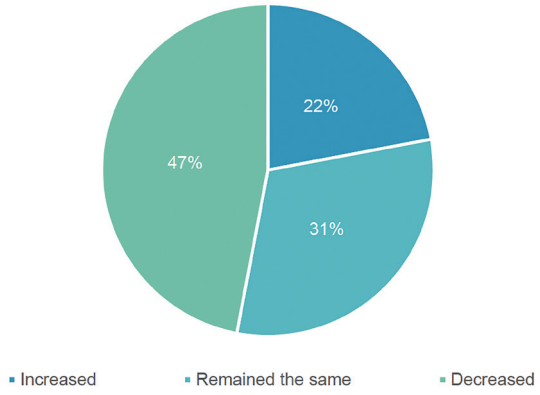
Most students changed the time they spent on their studies during home-based learning — 22% increasing it, and 47% decreasing it.

On average, students spent around 20 hours per week on online learning, however looking more closely at the distribution of how often students spent studying online is telling.

The largest category is made up of students who spent under 10 hours per week studying, while a large number spent between 20 and 30 hours per week online. A relatively small proportion spent over 40 hours per week studying online.

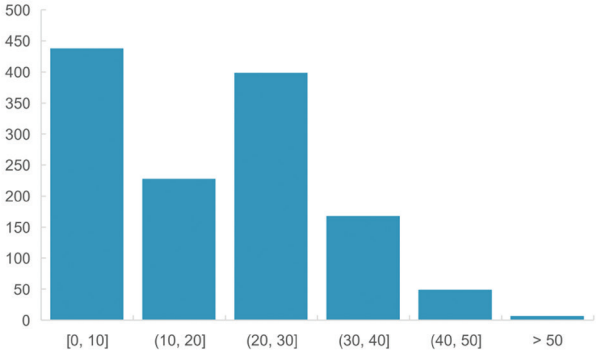
Students in non-government schools spent around an extra 5 hours per week studying online. However, these students were not any more likely to say they increased their study hours compared to normal; suggesting they were already spending more time studying than their peers in government schools pre-pandemic.

Figure 13. Change in time spent on studies during home-based learning, compared to usual.



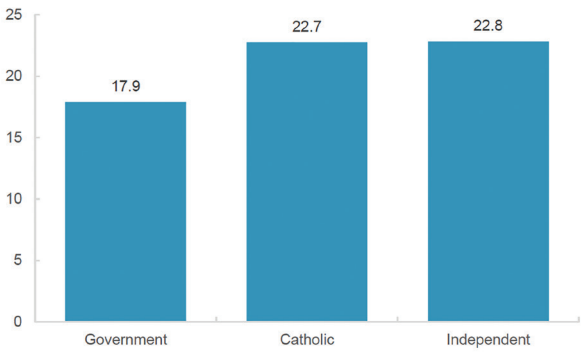
Source: Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1.

Figure 14. Average hours spent online learning during home-based learning (frequency).



Source: Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1.

Figure 15. Average number of hours per week on home-based learning, by school sector.



Source: Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1.

A majority of students had little motivation or focus during home-based learning

There is a complex relationship between academic achievement and a range of constructs relevant to educational contexts; such as motivations, attitudes, and psychological traits. Two predictive factors of how students may succeed during home-based learning — particularly those in senior secondary school, given the need for independent study — are the ability to concentrate on studies and the motivation to study.

As Figure 9 and 10 showed earlier, both are highly correlated with how students perceive their achievement during home-based learning. Even after controlling for a wide range of factors, including past achievement in NAPLAN, how students rated their motivation and ability to focus are positively related to their achievement during home-based learning (see Table 5).

During home-based learning, 55% of students reported low, or very low, ability to focus on study — 38% of the same students reported this after the coronavirus restrictions period and they had returned to regular face-to-face schooling.

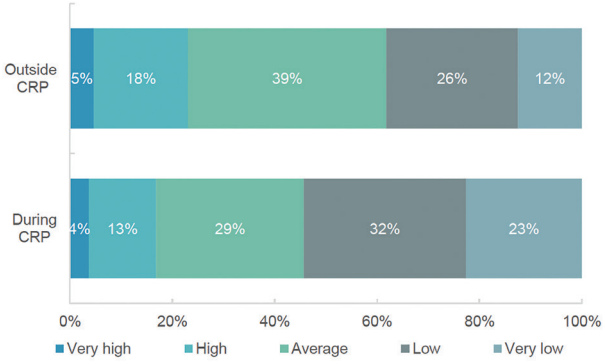
Modelling shows that differences in students' ability to focus make a large difference in how they rate their achievement, even after accounting for all other academic, demographic, and non-academic factors.

Assume one average student has a very high ability to focus — call them Student A. Compared to student A, if another student — Student B — has very low ability to focus, they are 60% less likely to report high (29%) or very high achievement (31%). Conversely, they are also 31% more likely to report low (20%) or very low (11%) achievement. And they are 29% more likely to report average achievement.

And if we take another student — Student C — who has all the same traits as Student A, except they don't record a very high ability to focus. Instead, they record a low ability to focus. Compared to Student A, Student C is 49% less likely to report high (29%) or very high (20%) achievement.

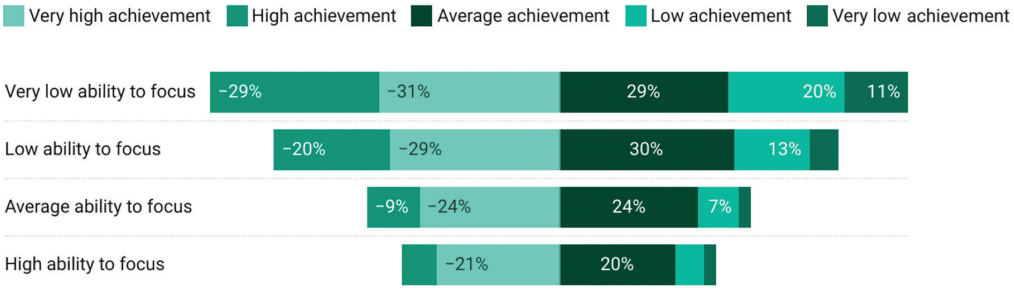
Looking closely at the group of students with low and very low ability to focus, we can see a markedly reduced chance of reporting very high achievement.

Figure 16. Students' reported ability to focus on study, during home-based learning and after.



Source: Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1.

Figure 17. Average marginal effects, ability to focus on study (base = very high ability to focus) and achievement level.



Source: Author's analysis of Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1.

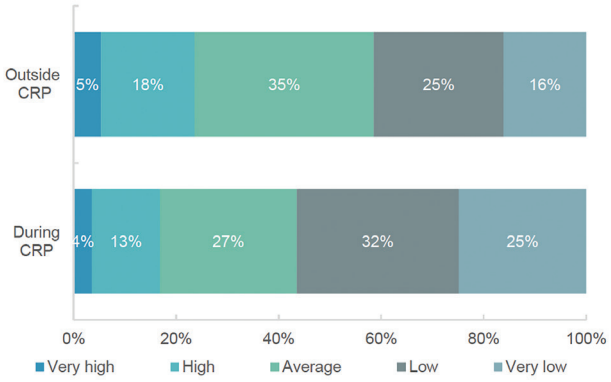
Similarly, 57% of students reported low or very low motivation to study during home-based learning, with only 17% reporting high or very high motivation to study.

After controlling for other factors, stepwise differences in motivation to study are less likely to predict students' reported achievement, compared to their ability to focus.

Compared to students with a very high motivation to study, it is only students with a very low motivation to study who have consistently significant effects on their reported achievement.

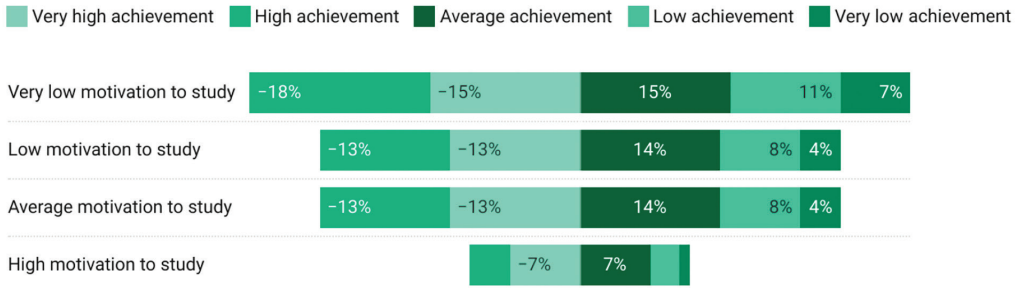
Compared to students with very high motivation to study, those with very low motivation are 33% less likely to report high (18%) or very high (15%) achievement. Conversely, they are 18% more likely to report low (11%) or very low (7%) achievement.

Figure 18. Students' reported motivation to study, during home-based learning and after.



Source: Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1.

Figure 19. Average marginal effects, motivation to study (base = very high motivation to study) and achievement level.



Source: Author's analysis of Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1.

There isn't a clear relationship between more disadvantaged students and their achievement during home-based learning

International empirical research has largely found additional negative impacts of home-based learning on already disadvantaged students (see Table 4). However, as noted earlier, there is already some evidence to indicate that policymakers' and educators' efforts to address the digital divide may have alleviated at least some of this concern in Australia. As Figure 20 shows, correlations between demographic factors and reported achievement are quite weak and most are not statistically significant. Moreover, these correlations between demographics and reported achievement during home-based learning are much weaker than those between student demographics and their achievement in NAPLAN.

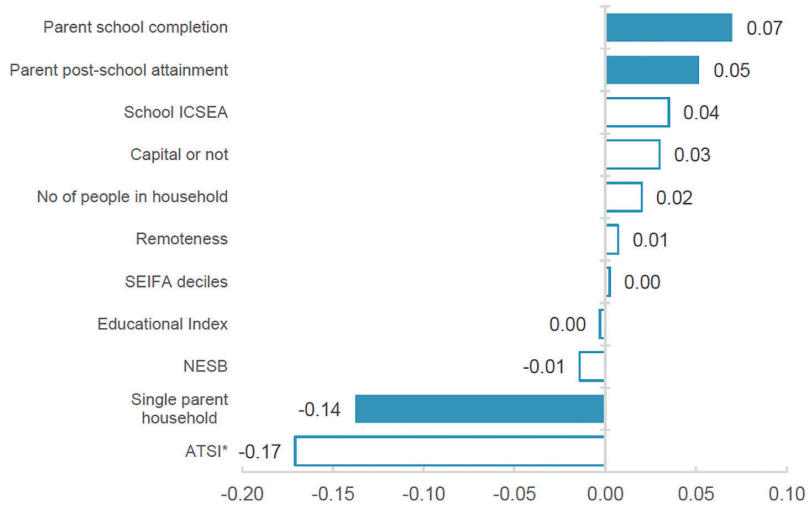
Parents' school completion overall is weakly but positively correlated with students' reported achievement, as expected.* After accounting for other factors, it's clear that the key explanation is that students whose parents did not complete Year 12, compared to those that completed to Year 10 or less, are significantly less likely to report high achievement during home-based learning.

There's no overall correlation or association between different levels of remoteness and students' reported achievement. However, there is a significant relationship with achievement when comparing inner regional with metropolitan students. This shows a significant positive association in achievement for students in inner regional locations, after accounting for all other factors, compared to metropolitan students.

There is a negative correlation between student achievement and living in a single parent household.. In fact, as Figure 20 shows, whether students are in a single parent household has the highest individual correlation with reported achievement. However, after accounting for all other factors, this is not a statistically significant predictor of students' reported achievement.

There is a negative correlation between Indigeneity of students and their reported achievement, though this is not statistically significant and would require further data to validate.

Figure 20. Demographic factors correlation with perceptions of achievement during home-based learning.



Source: Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1, Wave 8.
*NB that unshaded areas indicate that correlations are not statistically significant.

* By way of comparison, parents' school completion levels and post-school completion record a much stronger correlation with students' NAPLAN achievement (T=0.13 and T=0.2, respectively).

A shadow pandemic?

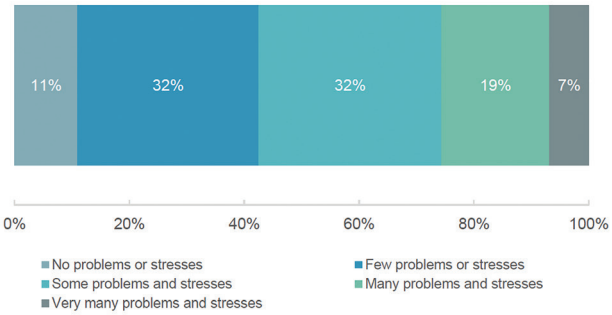
International studies have consistently identified significant declines in quality of life and mental wellbeing of children and adolescents during the coronavirus restrictions period.[69 70 71] In Australia too, concerns for the mental health and wellbeing of students have grown — particularly in 2021, given the extended and recurring lockdowns and disruption to face-to-face schooling. During the coronavirus restrictions period, 58% of students reported at least some problems and stresses, with only 11% citing no problems or stresses.

Students' social and mental health are correlated with their achievement

The evidence base linking social and mental health conditions with educational outcomes has been growing in recent years. This has clearly identified that distress and mental ill-health are associated with lower school attendance rates in the short run, along with negative impacts on overall educational attainment and school completion.[72]

LSAC data also shows a consistent, moderate sized, negative correlation between students' reported mental health and their achievement during home-based learning. Namely, students who felt lonely, felt left out, felt isolated, felt a lack of companionship, had unmet support needs, reported greater difficulty of life, and higher depression levels are all more likely to report lower achievement during home-based learning.

Figure 21. Students' reporting of feeling difficulties with life during the coronavirus restrictions period.



Source: Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1.

Unsurprisingly, these mental health indicators are themselves highly correlated (see Figure 10). A recent study attributes higher levels of depressive symptoms during home-based learning with difficulties understanding learning materials.[73]

Several factors are also positively correlated with students' reported achievement. The strongest factor is students' reported level of coping during the coronavirus restrictions period — which is also among the strongest overall predictors, even after accounting for all other factors. This shows that students with

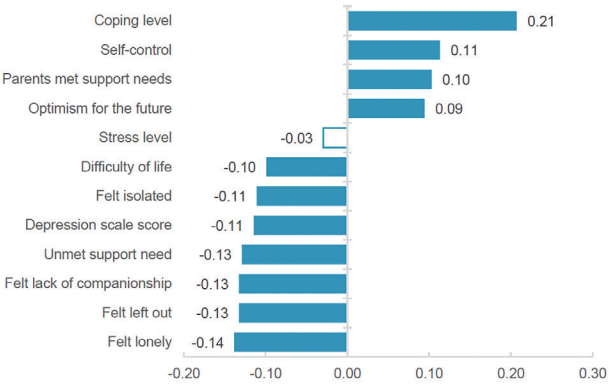
higher coping levels (or resilience, in effect), for any given level of other psycho-social factors, are more likely to report higher achievement.

Students' reported optimism about the future, the likelihood that their parents met their support needs, and an index based on the Social Skills Improvement System (SSIS) rating scales as an indicator of self-control are all positively, but rather weakly, correlated with students' reported achievement during home-based learning.

Interestingly, study-related stress shows no statistically significant correlation with students' perceived achievement. In fact, the data shows students' stress levels were generally lower during the home-based learning period than after returning to school. Students who spent more time studying reported higher study-related stress levels, and vice versa.

Interpretation of this is not straightforward. It is possible that students in the age cohort studied (16-17 year olds) in fact were less stressed during home-based learning. However, it's also the case that when students were questioned about their level of stress following return to school, they were in the latter stages of the 2020 school calendar. In some school systems, this coincides with the beginning of the Year 12 school curriculum, which may be considered more demanding — and may have lifted stress levels. As a result, it can't conclusively be stated whether students' stress levels were elevated on the return to school, or if they were artificially lowered during the home-based learning period, or both. But what is clear is that home-based learning itself is not correlated with students' reported achievement.

Figure 22. Non-academic factors' correlation with perceptions of achievement during home-based learning.



Source: Author's analysis of Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1, Wave 8.

After accounting for all academic, non-academic, and demographic factors, modelling shows the only factor that is a significant predictor of student achievement in Figure 22 is students' reported coping level (discussed further below).

Serious social and mental health concerns are widely observed

Former Deputy Chief Medical Officer, Nick Coatsworth, has repeatedly warned that school closures do more harm than good, given the 'hidden cost' of school closures on students' mental health.[74]

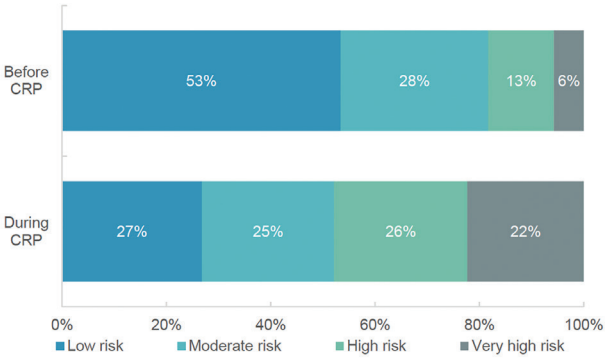
International research has found adolescents' most commonly diagnosed mental health issues under coronavirus restrictions as distress, depression and anxiety disorders. Studies show adolescents in senior high school had the highest depressive and anxiety levels, which was also significantly related to negative coping abilities.[75] There is some evidence that pandemic-related depressive symptoms were more prevalent among female adolescents than male adolescents.[76]

Comparing LSAC data with past ABS data (particularly the adolescents who participated in the 2017-18 National Health Survey) can give a rough idea of the change in psychological distress levels. The K10 psychological distress scale is widely used among education and health practitioners.[77]

In 2017-18, 18% of children recorded a high or very high distress level.[78] This compares somewhat closely with Institute for Health Metrics and Evaluation data that shows, between 2017 and 2019, around 16.6% of Australians below 20 years of age suffered from mental health problems — most of which were for depressive symptoms.[79]

During the coronavirus restrictions period, LSAC data suggests that the proportion of students at low risk halved, while those at high and very high risk doubled.

Figure 23. Kessler Psychological Distress Scale (K10) rating.

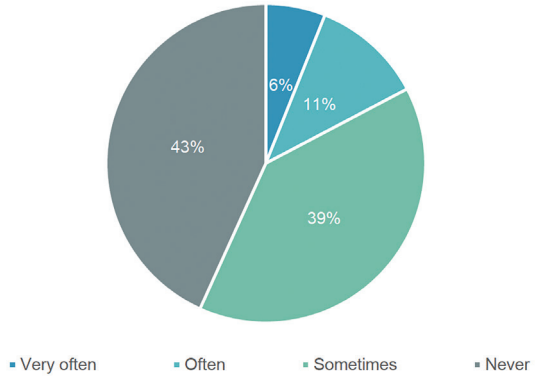


Source: Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1; ABS National Health Survey 2017-18.

The impacts of students' social and mental ill-health are widely felt

LSAC data suggests most students had their support needs met by parents either always (43%) or sometimes (39%), albeit with a substantial minority who didn't have their needs met often or very often (17%). Analysis shows that, after accounting for all other factors, there is a significant difference in students' reported achievement between those who say their needs for support were completely met and those whose needs were not met at all (d=0.86).

Figure 24. Frequency that students needed support but couldn't get it during home-based learning.



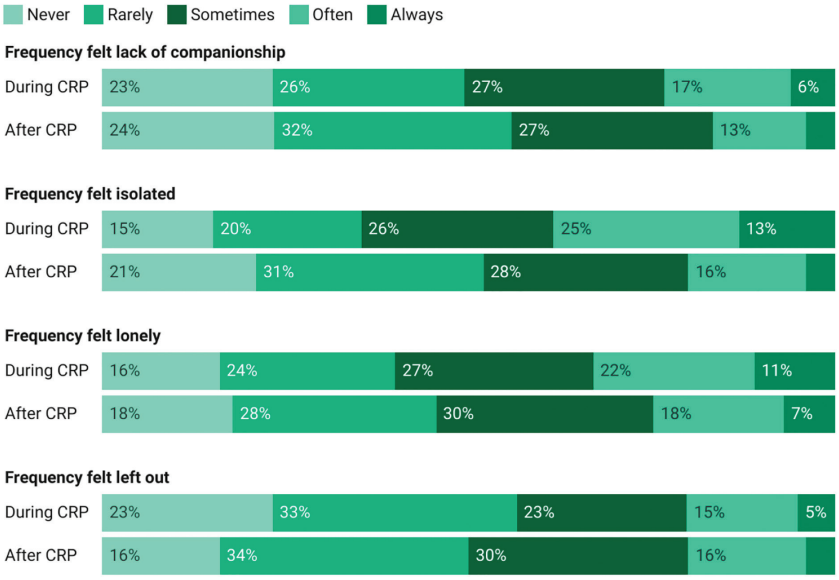
Source: Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1.

Figure 25 clearly shows students' social and emotional outcomes during and after coronavirus restrictions. Interestingly, the proportion of students suffering from poor social outcomes — particularly a lack of companionship, feeling lonely, and feeling left out — had not significantly improved even after coronavirus restrictions had eased in late 2020.

A recent report by Mission Australia and Black Dog Institute showed students aged 15 to 19 had high levels of concern for their academic performance and coping abilities.[80] In 2020, around 73% of students expressed issues of coping with stress and 54% were extremely stressed about their school or study problems. Calls to youth mental health services also increased substantially with the sustained lockdowns.[81] Kids Helpline reported 47% increase in contacts by children in Victoria while Lifeline Australia recorded the highest daily number of 3,505 calls in its history on August 19, revealing the surge in psychological stress among the Australian youth.[82] Data from the Australian Institute of Health and Welfare (AIHW) found a sharp increase in ambulance attendances for self-harm and suicidal ideation since the pandemic, especially among the younger age group.[83]

According to the recent modelling by the University of Sydney's Brain and Mind Centre, the cost of growing mental health issues associated with lockdowns amounts to $1 billion in lost productivity.[84] Professor Ian Hickie, co-director of the centre, suggested that those aged 15 to 25 are the worst affected in terms of mental illness, hospitalisations and suicide.

Figure 25. Student self-reported social and emotional factors, during the CRP and after.



Source: Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1.

Students' coping levels determine their achievement

Research shows that resilience levels are very strong predictors of likelihood of experiencing mental distress.[85] Namely, adults with low to normal resilience reported greatest mental distress whereas those with high resilience showed almost no change in mental distress during coronavirus restrictions. There is also some recent empirical evidence to suggest students who reported greater adaptability recorded greater achievement during and following home-based learning.[86]

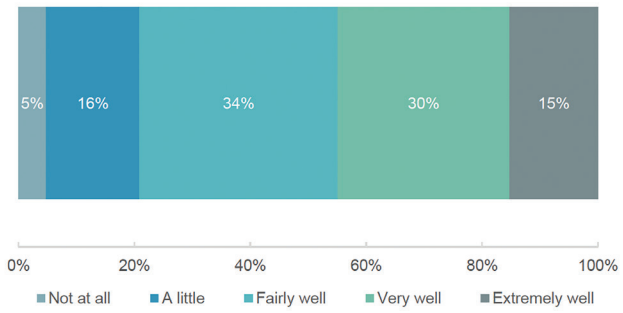
LSAC data shows that the majority of students coped fairly, very, or extremely well during the coronavirus restrictions period and home-based learning. However, 20% either coped only a little or not at all.

An analysis of cross-correlations shows no significant correlation between coping levels and students' demographics and students' prior academic achievement (see Figure 10). There are consistent correlations observed with psycho-social measures and also positive correlations with home-based learning specific factors, like having reliable internet, sufficient electronic devices, and sufficient space for study needs. There is no correlation between students' coping levels during home-based learning and their prior achievement in NAPLAN.

Compared to students who report not being able to cope during home-based learning, greater ability to cope is associated with greater likelihood of higher achievement. Generally, the stepwise differences in coping ability are not considerable in terms of the relationship with achievement. It appears that the main hurdle is whether students report having any ability to cope. This means that the 5% of students who did not cope at all are likely to be those who need remedial attention.

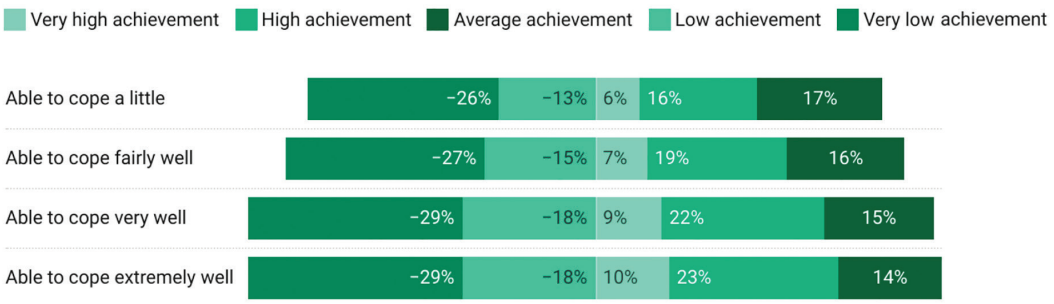
Assuming two students who are average in every other way, and comparing those without the ability to cope and those who are able to cope extremely well, they are 33% more likely to report high (23%) or very high (10%) levels of achievement. Conversely, they are 47% less likely to report low (18%) or very low (29%) levels of achievement.

Figure 26. Students' reported level of coping during the coronavirus restrictions period.



Source: Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1.

Figure 27. Average marginal effects, ability to cope (base = not able to cope at all) and achievement level.



Source: Author's analysis of Longitudinal Study of Australian Children (LSAC) data; Cohort B, Wave 9C1.

Research suggests the best treatment for addressing mental ill-health is returning students to the classroom

There is evidence that adverse psychological effects are likely to moderate once children are returned to normal face-to-face schooling and wider restrictions have eased.

A meta-analysis of the psychological effects during and after past quarantine events shows little evidence that elevated psychological distress levels persist after quarantine restrictions are lifted, and that those who are impacted are generally limited to previous sufferers of mental illness.[87]

In the Covid context, international research where substantial reopening of economies and societies have taken place, shows students' wellbeing has rebounded relatively quickly,[88] particularly mental health symptoms caused by social isolation.[89] Namely, as restrictions within the wider US population eased, the likelihood of mental distress had returned to pre-pandemic levels. This suggests that the priority should be to restore familiar social interactions at school.

Some stakeholders have advocated for mental health screening of students and others for scaling up programmes to address social and emotional learning, in order to redress concerns.

However, the evidence base for interventions addressing social and emotional needs is not very reliable. The Education Endowment Foundation describes research that assesses the efficacy of such interventions as 'low security' on account of most studies not being independently evaluated — instead, most studies are conducted by commercial, educational, or non-profit providers that are connected with the implementation of programmes. Others note that despite the already large uptake of such programmes in Australia, there are virtually no high-quality studies or stringent investigations into efficacy in Australia.[90] [91] [92] [93] Moreover, the effects of social and emotional learning interventions appear to have very little effect on student academic outcomes. [94] [95]

There are mixed results in the available research, and there's reason to believe that approaches to address these concerns may be better delivered in ways other than school-based delivery. A systematic review found little evidence of school-based interventions improving student mental health.[96] A randomised controlled trial in Norway found that psychosocial support programmes delivered in schools did not reduce loneliness or anxiety among upper secondary school students.[97]

Another study has indicated that while interventions to promote psychological wellbeing of children and adolescents produced some positive outcomes, there's no additional benefit from longer or permanent programmes.[98] Research also suggests that whatever modest effectiveness is observed, smaller, targeted programmes are better than larger, universally-delivered ones.[99]

An education recovery?

Most countries have implemented policies to address potential learning impacts due to school closures. Across OECD countries, 86% implemented remedial measures targeted at primary school students, 75% at lower secondary, and 73% at upper secondary level. [100]

In addition, many countries have also introduced interventions targeted at groups expected to have suffered most. More than half of OECD countries introduced measures specifically targeted at students at risk of repeating a grade or dropping out, more than 60% of OECD countries targeted measures toward disadvantaged students and around 40% targeted measures at immigrant, refugee, ethnic minority or Indigenous groups.

There are two main ways policymakers pursue 'catch-up'. The first is to simply provide additional hours (such as an extended school day) or additional days or weeks of schooling (like a summer school programme). The second is to use existing school hours more intensively (such as acceleration programmes or in-school tutoring).

In Australia, there is some justification for policy intervention for Covid catch-up. The remaining question is what form that intervention should take and at what scale it should be.

One way to get a (very general) ballpark estimate for the proportion of students that may require additional remedial assistance is to compare the proportions of students reporting low or very low achievement prior to, during, and after home-based learning. More students reporting low achievement would justify extra intervention.

LSAC data suggests that during home-based learning, the proportion of low and very low achievers is around 14% higher than before the pandemic. After returning back to, and settling in to, face-to-face schooling, the increased proportion of students reporting low and very low achievement is around 6% higher than before the pandemic. This implies a justification for additional remedial attention — on top of pre-existing programmes in schools — for at least 6%, and up to 14% of students.

Of course, additional and more robust data should help to validate these estimates and care should be taken in extrapolating this ballpark estimate across all age cohorts. But nonetheless, it is an indication that, at least 6% , and as many as 14%, of students may requiring extra remedial attention.

As for the form of policy intervention, in Australia, policymakers have invested heavily in within-school small group tutoring schemes. Education Endowment Foundation research suggests this approach could deliver up to the equivalent of 4 months of additional learning progress over the course of a year. There appears to be little justification in implementing 1:1 tutoring, as it is very resource-intensive and generally no more effective than 1:3, and even up to 1:5, tutoring. Policymakers' decision to cap tutoring groups at 5 is largely supported by the research.

An academically intensive summer school is an alternative approach that could potentially deliver the equivalent of around 3 months of additional learning progress. That is before counting the potential gains from mitigating of 'summer slide'. One additional benefit not calculated here is that summer school may offer additional opportunities for social development. However, there is a difficult trade-off in balancing the academic and social needs of students in designing an effective summer school programme. There are also non-trivial issues in staffing and resourcing a summer school to consider, as well as whether participation would be fully voluntary.

Extending the school day could produce the equivalent of up to around 3 months of additional learning progress over a year.

Each of these options involves a significant investment in resourcing or additional hours from educators. However, this may not be necessary. More consistently implementing evidence-based teaching methods in reading and mathematics could deliver just as much, if not more, additional learning (especially for students in the younger years), at considerably lower cost and additional workload. This would also expand benefits to students more widely than just those included in small group tutoring or a similar scheme.

The best investment is in enabling and assisting teachers to provide high quality instruction to all students. While by no means easy, helping teachers to access resources like professional development, to more consistently deliver evidence-based practices, can reasonably be accommodated within existing funding provided for training and development.

Table 6. Summary of key catch-up approaches available to policymakers.

Approach	Expected additional learning progress	Cost
Small group tutoring	Around 4 months for primary school students over the course of one year, and around 2 months for secondary school students. Around 4 months on average for literacy and around 3 months for mathematics.	Low (unless group sizes become very small or one-to-one)
Summer school	3 months for literacy and 2 months for maths. Use of intensive teaching strategies increases learning growth to around 5 months.	Moderate
Extending school hours	Around 3 months for primary school students and around 2 months for secondary school students	Moderate
Phonics	Around 5 months over the course of one year for primary and secondary school students. Around 4 months when carried out by teachers' assistants, compared to classroom teachers.	Very low

Source: Education Endowment Foundation, Teaching and Learning Toolkit.

Extending the school day would be costly with limited educational returns

Given that students have missed instructional time face-to-face, it's a reasonable assumption that the best approach is to simply add instructional hours; either before and after school, or on weekends. Sceptics of such interventions rightly note that OECD data clearly shows no correlation between the hours of *regular* schooling hours of countries and PISA achievement — and, moreover, Australia already has among the longest school days and calendars in the world.

But sceptics are also partly mistaken in looking primarily at between-country instructional hours of schooling, because it presumes that an additional hour of schooling is equally effective from one country to the next. For this reason, the more applicable research to consider is generally quasi-experimental studies that test changes in schooling hours within the same schooling system. By and large, the research tends to show very small, positive effects of additional hours of schooling (see Table 7). [101]

Summer school is costly, but may provide both academic and social benefits for participating students

An alternative to extending the school day is to offer additional schooling — either in a formal academic setting or a more extra-curricular format — over the holiday period. The OECD has recently recommended that summer school be considered by countries concerned about students' academic and social progress.

Summer schools provide additional lessons or classes during the summer holidays — sometimes with an academic focus for catch-up, but generally are focussed on non-academic activities (like sport or recreational) or supporting students with behavioural or other difficulties.

However, the evidence base on summer school interventions is mixed. In part, this is because traditional summer school programmes have had mixed purposes and are not always used for large-scale academic catch-up.

What is clear in this research is that light touch approaches, particularly interventions like voluntary reading assignments over summer periods, typically don't produce any outcomes at all. [102] [103]And, by and large, where interventions applied over the summer holiday period — like tutoring programmes and study groups — are found to be effective, there's no evidence this is generally more or less effective if the intervention is carried out over the summer holidays or integrated into regular schooling. [104] This can mean that, in effect, some 'summer' programmes are not substantively different to small group tutoring interventions conducted within school settings.

In any case, meta-analyses of academically-based summer school programmes has found relatively small positive improvements in student achievement. One meta-analysis of mathematics programmes recorded an average effect size of +0.17[105] and another found an average weighted impact estimate of +0.09 standard deviations on mathematics achievement outcomes. [106] Others have observed academic achievements as well as improvements in engagement.[107]

Reading programmes, on average, appear to have a slightly higher impact — with one meta-analysis finding a positive effect size of +0.23.[108] Summer school programmes specifically aimed at phonics-based reading instruction appear to be among the most effective. One study found an effect size between +0.47 to +1.35 on reading comprehension and decoding.[109] Another found effect sizes of +0.60 for kindergarten and +0.78 for first grade.[110] However, there is also some evidence that there can be reversion in positive effects without sustained attention after the summer school.[111]

Table 7. Summary of research in extending school days and implementing summer school.

Author(s)	School system	Context	Effect size
Carlsson et al (2015) [112]	Sweden	The association between extra days spent at school or in non-school settings on achievement in generalised cognitive intelligence tests	10 days of additional schooling raises achievement in knowledge tests by 0.01 standard deviations. It would take around 60 additional school days to result in around a 0.06 standard deviations improvement.
Dobbie and Fryer (2011)[113]	New York City	Comparing instructional time among NYC charter schools	An additional 26% instructional time (around two hours per week) is associated with a gain of 0.06 of a standard deviation in math.
Figlio et al (2018) [114]	Florida	The effect of lengthening school days for low-performing students on their reading achievement.	0.05 standard deviations of improvement in reading test scores (around one-month worth of instruction) are associated with an extra hour each day for reading instruction, 180 hours over the course of a year, at a cost per student of $800 per student, or $300,000-$400,000 per school.
Schachter & Jo (2005)	United States	The effectiveness of summer school on reading skills is tested for first-grade students who are economically disadvantaged.	Seven-week summer reading camp had a significant effect on reading achievement gains, with effect sizes ranging from 0.47 to 1.35. Student's comprehension increased around 41% and decoding skills increased around 33% after the intervention.
Zvoch & Stevens (2013)	Canada	A field-based randomised trial assessed the effect of summer school for kindergarten and first-grade students at moderate risk of reading difficulties.	Five-week intensive literacy program during summer vacation improved reading fluency for early elementary students. The program occurred 3.5 hours per day, four days per week in small-class size environments. While it led to an increase of 0.6 of a standard deviation for kindergarten students, 0.78 of a standard deviation gain was found among first grade students.
Borman & Dowling (2006)	United States	A 3-year study examining the impact of a multiyear summer school in counteracting the cumulative effects of the summer slide on low SES students' reading ability.	7-week summer program of intensive reading and writing instruction were offered to kindergarten and first-grade students from high-poverty, urban schools. Students who attended summer school with enough regularity showed approximately 0.5 to 1 standard deviation higher than their peers from the control group. However, the effect was not statistically reliable for students who had low attendance rates.
Lavy (2015) [115]	United States	Additional instructional hours measured by PISA	On average, a one-hour increase per week in math, science, or language instruction raises the test score in these subjects by 0.06 of a standard deviation of the distribution of test scores.

Small group tutoring is reasonably effective, but the programmes being implemented appear outsized

Small group and intensive tutoring programmes were initiated in Term 1 of 2021 (to be implemented across the 2021 school year) to provide additional assistance to students requiring catch-up support following home-based learning in 2020.

In NSW, a $337 million funding package was introduced, with the recruitment of 5417 tutors to government schools — including more than 3200 allocated to regional, rural, and remote schools [116] (59%, though only around 25% of NSW government school enrolments are in regional and remote schools[117]) — and expected to reach around 290,000 students, around 2600 schools with around 1700 tutoring hours per school, at a cost of around $130,000 per school.[118] Accountability for the implementation and evaluation of the programme has been scarce to date. Nonetheless, the NSW government has recently announced that it plans to expand the programme following the extended home-based learning period of 2021.

In Victoria, the Tutor Learning Initiative is costed at around $480 million to recruit around 6400 tutors to support around 200,000 students during 2021 and 2021

According to public announcements, it would be expected that around one in five students have, or will receive, small group tutoring — which is higher than the rates identified in this study as being likely to require additional assistance, on account of their time in home-based learning.

In any case, the evidence on small group tutoring is relatively sound and suggests it is an intervention worth pursuing. It is more cost-effective than summer schooling and has a lower risk of student attrition — since it can be conducted within existing school hours.

However, like summer school programmes, there can be wide variation in the implementation of tutoring programmes: who delivers instruction, how, in what setting, and what dosage (how often sessions are provided, how long each session is, and the period of time that sessions are provided, to name a few). Broadly speaking, tutoring programmes are generally most effective for younger students in reading and older students in maths — and best when conducted at school rather than after school. [119]

Meta-analyses suggest tutoring programmes — including 1:1 interventions — can enjoy a positive effect size of around 0.31[120] and up to around 0.37[121] [122], though there's also some evidence to suggest effect sizes declining to around 0.2 for small group tutoring.[123]

However, the research presents a range of findings about the size of tutoring groups. Some research suggests no significant differences in effectiveness between 1:1 and 1:3 groupings[124] (even up to 1:5 can be similarly effective to 1:1[125]), but also that a larger group of 1:8[126], 1:10[127], or 1:15[128] are less effective in some,[129] but not all,[130] cases.

An important caveat on effectiveness is around proper screening of participants for the tutoring intervention and that high quality instruction is provided. The most effective programmes are those delivered by trained tutors and with a special expertise in teaching struggling students. It is not clear that the design of the tutoring interventions in NSW and Victoria have necessarily provided the support for high quality instruction and training of the tutors engaged.

Similar educational improvements can be delivered at little or no additional cost by lifting teaching quality

It is well established that the quality of teaching is the greatest controllable in-school factor explaining student achievement.[131] [132] While it's true that 'quality teaching' requires adopting the right approaches for the right students, at the right time, it's also the case that there's a greater emphasis on inquiry-based teaching approaches, in many contexts, than is warranted by the research.

Explicit instruction is often characterised by step-by-step demonstrations, repetition and memorisation, frequent practice opportunities for students, and timely feedback from teachers.[133] On the other hand, inquiry-based learning is a student-centred approach in which learners are encouraged to actively think and discover knowledge for themselves, instead of having clear direction from a teacher.

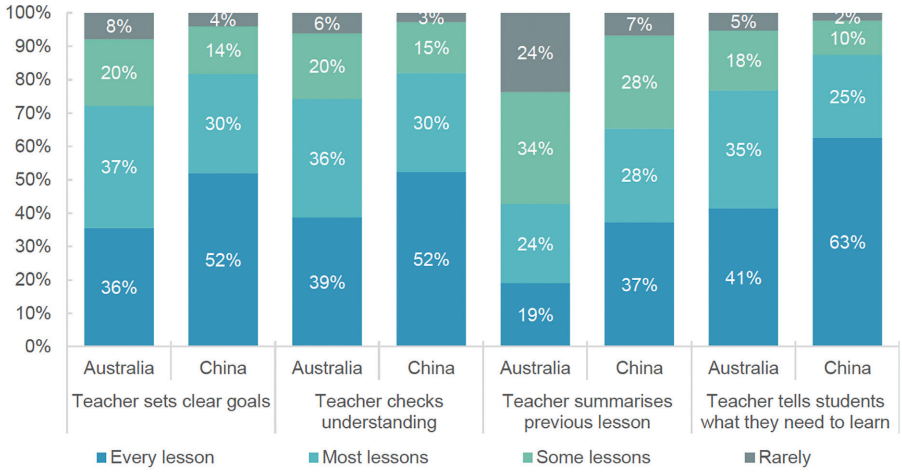
Many studies demonstrate that explicit, teacher-led instruction is significantly associated with high student achievement, while excessive use of inquiry-based learning can have significant negative effects on student achievement.[134]

Various meta-analyses have shown that inquiry-based learning was less beneficial than explicit teaching[135], suggesting that student achievement can be adversely impacted with minimal teacher guidance. Direct and explicit forms of instruction have consistently revealed positive effects on student outcomes, with substantial improvements in student performance and exam scores.[136] Implementing explicit instruction programmes in all classrooms would be more effective in delivering educational improvements than other costly new interventions.

PISA data shows that Australian teachers, on average, are less likely to employ evidence-based explicit instruction practices, compared to high-performing Chinese school systems, for example.

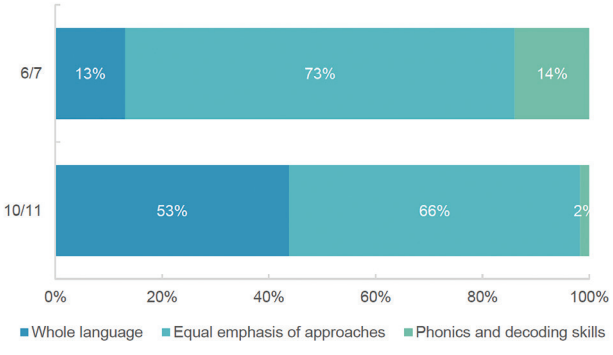
The vast majority of teachers report that they employ a mixed emphasis of approaches — between explicit and inquiry-based — in teaching reading and maths. However, relatively large proportions also employ strategies that are not generally supported by evidence.

Figure 28. Indicators of teacher-led instruction, reported by 15-year-old students, Australia vs participating Chinese school systems.



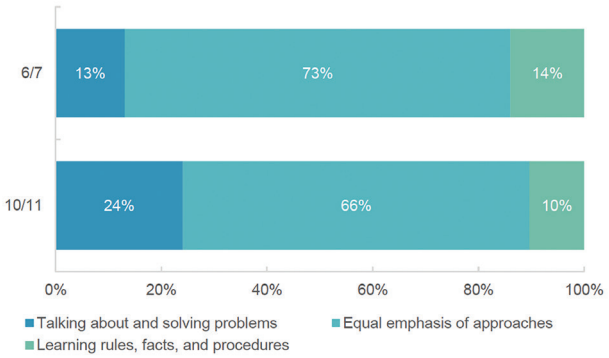
Source: OECD (2013). PISA 2012 Results: Ready to Learn (Volume III) Students' Engagement, Drive and Self-Beliefs, OECD Publishing, Paris.

Figure 29. Teachers' reported emphasis in teaching reading, students aged 6-7, 10/11.



Source: Longitudinal Study of Australian Children (LSAC); K cohort; Wave 2, Wave 4.

Figure 30. Teachers' reported emphasis in teaching mathematics, students aged 6-7, 10/11.



Source: Longitudinal Study of Australian Children (LSAC); K cohort; Wave 2, Wave 4.

Implications for policymakers

Take a precautionary principle toward possible learning loss

To date, all available evidence suggests Australia's educators and policymakers have been somewhat successful in avoiding adverse educational impacts overall from school closures, compared to similar countries.

However, while preliminary NAPLAN 2021 results at the national and state/territory level are promising, it would be premature to presume there remains no risk of learning loss for Australian students. Experience around the world has consistently observed negative effects on students' outcomes. Many students have experienced longer and more restrictive conditions in 2021 than in 2020, meaning negative impacts may not yet be observed — particularly for the youngest students in critical learning periods in Foundation and Year 1. In addition, academic measures available to date are limited to literacy and numeracy, not necessarily wider subject knowledge and capabilities.

The research in this study shows that at least 6% and as many as 14% of students likely did poorer than before the pandemic. More data would be needed to determine if this same finding is observed for other age groups and against more robust assessment measures. In addition, closer analysis in the months ahead should consider the learning progress of educationally vulnerable students, as well as other indicators, such as attrition rates and engagement levels.

There are not clear relationships between student outcomes during home-based learning and past achievement or socio-educational disadvantage

This research shows that it may not be a straightforward matter to identify students who may have been most adversely impacted (and, equally, those who achieved better than normal) during home-based learning.

There's little evidence that disadvantaged students have been disproportionately impacted during home-based learning. This can likely be credited to the response of policymakers and educators in rapidly responding to students' needs.

However, there is evidence that some pre-existing academic factors — such as students' engagement in face-to-face classes — are a significant predictor of achievement during home-based learning, and are correlated with students' past achievement in NAPLAN. By extension, this suggests observations of student engagement on their return to school could help in assessing how they may have fared during home-based learning.

Unsurprisingly, students' ability to concentrate on their studies and their motivation to study during home-based learning are important predictors of achievement during this period, but are not correlated with past achievement in NAPLAN. In fact, after accounting for these factors, among others, past achievement alone does not predict student achievement during home-based learning.

This research suggests that screening students' performance should prioritise their engagement, ability to focus, motivation to study, time commitment to study, and coping levels as clues to which students may require intervention. If indicators of past achievement and socio-educational disadvantage alone are used, this could fail to identify the right students.

Mental health concerns are validated but the best approach is to return students to regular schooling, not sustained and costly interventions

There is some evidence to suggest that returning students to school and enabling resumption of normal routines will help stabilise elevated levels of psychological distress and mental ill-health.

There is some evidence to suggest that social skills may generally be slower in stabilising after the return to schooling. In this study, some negative social outcomes had not stabilised after coronavirus restrictions had eased and students resumed regular face-to-face schooling for several months. However, because there is little baseline data, the exact effects are difficult to determine. More data would be instructive to assess this longitudinally, especially in school systems in Australia that have not suffered from additional coronavirus restrictions throughout 2021.

Some stakeholders have lobbied to introduce additional school-based programmes to tackle mental health and social concerns on the return to school. While there is merit in identifying potentially at-risk students through a screening process — particularly due to the elevated levels of ill-health observed in this research — it is less clear what interventions schools can reliably implement to effectively redress these concerns.

While well-intentioned, there is not a sufficient, independent evidence base demonstrating efficacy of implemented programmes to support students' social, emotional, and mental health. Some international research reviewed in this study suggests the effectiveness of school-based programmes may be limited. Interventions may be more successfully implemented through out-of-school programmes instead.

Catch-up small group tutoring is suitable but appears to be poorly targeted and possibly outsized

Small group tutoring programmes can be an effective approach in providing supports for students who need it. However, the temporary and potentially permanent objectives for this approach should be made clearer.

As a temporary measure, the programme — at least in theory — is intended to support students at risk of falling behind *due to the experience of home-based learning* (as distinct from redressing pre-existing educational gaps). Against that particular objective, the research in this study suggests that the small group tutoring policies in NSW and Victoria may be larger in scale than necessary, and poorly targeted.

For instance, around 20% of students are expected to receive, or have received, additional tutoring in 2021, despite this study suggesting that between 6 and 14% of students are likely to have been negatively impacted during home-based learning. That implies that the programmes could be much larger than the intended purpose. Moreover, in NSW, there is a very disproportionate number of tutors allocated in regional and remote schools — around 2.4 times the share of the student population. That is despite evidence in this research that suggests students in inner regional locations actually performed better during home-based learning than metropolitan students, after accounting for all relevant factors.

But as a potentially sustained and permanent policy approach, the objective is to support struggling students more broadly (not just those whose progress was adversely impacted during home-based learning). This is perfectly justified, particularly if the programme is well designed — such as with specialist, highly trained tutors engaged on an ongoing basis — and resourced largely within existing funding commitments.

Summer school may offer both academic and social benefits to students who need it, but it could be costly

There is some evidence to suggest that a summer school option could benefit both the academic and social needs of students. This could be justified because students who have suffered extended school closures during 2021 may not have sufficient time after they eventually return to school in Term 4. This is a key difference for students in NSW, in particular, who were able to resume face-to-face schooling in May in 2020.

Given that there is some evidence of students' social skills being negatively impacted, and not particularly quick in recovering, this could make this intervention suitable for some students. However, it would be quite expensive to implement and it may be difficult to ensure that students most in need of intervention are the ones who attend.

The best approach to promote academic catch-up is to promote evidence-based practice in all Australian classrooms

Though large programmes are popular in promoting educational recovery, it's not clear the benefits exceed the potential benefits of investing in lifting the implementation of evidence-based practices consistently in all schools and classes. A robust evidence base shows that phonics-based reading programmes — including those that are implemented in conjunction with small group tutoring — deliver more additional learning than other interventions, particularly for younger students.

The Australian Education Research Organisation lists explicit instruction among its 'tried and tested' practices. However, there is evidence to suggest that teacher-led instructional approaches remain under-used in Australian schools. Given the robust evidence that inquiry-based approaches may be harmful for novice learners,[137] there is reason to believe some students could benefit almost overnight by shifting teaching practices in some schools. While changing teaching practice is not necessarily straightforward, there are existing resources — such as professional development and supports already available to help enable changes to practice.

The Australian government is currently reviewing the quality of training of teachers. This is a welcome intervention and could help to improve long term educational outcomes. In the more immediate term, promoting greater use of evidence-based practices (and providing the support to enable this) is the most cost-effective and impactful intervention available.

Beware of potential white elephants coming out of Covid

As with many other public policy measures being implemented in the wake of the pandemic, there is a risk that programmes could become white elephants.

So-called 'catch-up funding' to support short-term initiatives should not be folded into the permanent funding envelope. If programmes such as small group tutoring are to be continued beyond the short term, the costs should be offset against existing commitments. More than $66 billion of public funding is already spent on running schools each year, and this is expected to continue to grow.[138]

Costly infrastructure upgrades are being considered for some schools to promote extra ventilation. There is some evidence to suggest that such interventions may be unwarranted and expensive. Recent education policy history is instructive on how large school-based infrastructure projects can result in white elephants. The Building the Education Revolution resulted in costly — and in many cases, unnecessary — construction in schools across Australia.

In addition, many additional protocols and regulations have been proposed for schools. Australian teachers are already overburdened and schools are already mired in red tape. Ongoing regulations will only add to this existing strain on school operations. To date, there is not clear evidence that many of the proposed regulations are justified.

Ensure merit-based tertiary application for school leavers

The group of students believed to be most heavily impacted by home-based learning are students who are preparing for their school exit exams. A number of stakeholders have urged the NSW government, in particular, to abandon HSC examinations amid the educational disruption of school closures. At least in part, proponents of cancelling formal exams cite concerns of student stress levels. However, as this study suggests, these concerns may be overblown.

Alternatives to hosting school-leaving exams are worse. Full reliance on teacher and school-based assessment can be biased and tend to result in grade inflation. There is evidence that A-level results in the UK in 2021 are an example of what could be expected in Australia if HSC and VCE exams were replaced with school-based marks, as some have proposed.

The evidence suggests stress levels were actually lower during the coronavirus restrictions period than after returning to school. This could suggest that concerns for the stress levels of school-leaving students during home-based learning may be unfounded.

There is also no significant relationship between students' stress levels and how they reported their achievement during home-based learning. This suggests that efforts to provide academic relief and special consideration for school-leavers may be unjustified. While it may be the case that some students achieved better or worse during home-based learning, there doesn't appear to be any justification for adjustments to academic expectations, such as tertiary entry requirements.

Moreover, how students progressed during home-based learning is likely to be a good indicator of their potential success or otherwise in post-school education, particularly at university. Students who struggled with motivation and concentration for independent study during home-based learning will be unlikely to successfully navigate university study, irrespective of any changes to admission policies for the Class of 2021. It is well established in research that lowering standards for tertiary entry does not provide long-term benefits to students. All efforts should be made to ensure merit-based pathways for tertiary entry are maintained for the Class of 2021.

While relaxing the entry requirements to tertiary education can broaden and increase student access, evidence suggests that this can still have negative longer term academic success and labour market outcomes. According to the Productivity Commission, students admitted to university through special entry schemes typically fared poorly and struggled academically. The evidence suggests that this is largely because these students tend to enter university ill prepared (particularly those with either no ATAR or ATARs below 70), lacking the foundational skills to be academically successful. Despite the academic support such as bridging courses provided by universities, it has been insufficient to help overcome the challenges faced by these students. University completion rates are much lower for students who entered university with lower school achievement. Of those who successfully complete university, only 58 per cent of the graduates ultimately find placements into professional and managerial occupations.

More research is required on how to develop students' coping strategies

After accounting for all relevant factors, students with greater coping ability reported greater achievement during home-based learning. These students also report more positive social and mental health outcomes (such as lower stress levels and the like), compared to students who say they were not able to cope.

There is a high, but not perfect, positive correlation between coping levels during home-based learning compared to after the coronavirus restrictions period. This suggests that greater coping abilities are not unique to the episode of the coronavirus restrictions conditions.

There is, however, no statistically significant correlation between coping ability and past achievement, nor regular school engagement. This implies there is more to learn about any potential academic relationship with students' coping ability. Nonetheless, the consistent and strong correlation between coping levels and the experience of psycho-social factors implies that, even if there is little overall academic benefit, interventions to equip students with greater coping levels may be justified. More research on efficacy of interventions to promote students' coping levels would be beneficial.

Conclusion and recommendations

Home-based learning due to pandemic-induced school closures is the greatest educational disruption impacting on school systems in recent history. To date, Australian students appear to have mostly weathered this storm successfully. But there is still more to learn about this extraordinary period — including things that worked well and not so well. The effects of the pandemic on education, good and bad, are not likely to have been fully realised as yet. It remains an important task of policymakers, educators, and researchers to ensure that lessons are learnt — not only for posterity, but also to inform ongoing policy and practice as Australian school systems adapt to post-Covid conditions.

This research adds to the evidence base by not only assessing whether students' learning may have been impacted during home-based learning, but also *why* students may have performed better or worse, as well as *which* students may have performed differently. By bridging academic, non-academic, and demographic factors, it provides a rounded evidence base to help inform policy and practice, as well as research learnings from the pandemic period.

By and large, the analysis shows that student achievement during home-based learning has some consistencies with past, or regular, in-school achievement factors, but also was influenced by idiosyncratic factors. While the study specifically analyses data collected from current Year 12 students (mostly Year 11 at the time of data collection), there is reason to believe findings can be generalised.

The research here suggests that policymakers should:

1. **Anticipate that at least 6 per cent, and as much as 14 per cent, of students may have progressed more slowly during home-based learning**. This may be fewer than initial expectations. To screen for students who may have progressed more slowly, educators should consider factors like engagement in regular classes, as well as students' ability to concentrate on studies, motivation to study, coping ability, and time spent on studies during home-based learning. Prior academic achievement and socio-educational disadvantage indicators do not prove to be very accurate alone in identifying student progress during home-based learning.
2. **Small group tutoring programmes should be better targeted than they currently appear to be**. Identifying students who would benefit most from small group tutoring differs between the short-term goal (assisting students who progressed more slowly during home-based learning) and the potential long-term goal (to provide consistent additional support for students who need it).
3. **Ensure that special consideration schemes for school leavers are limited to students who faced significant adverse conditions**. On the whole, there's evidence that most students sitting HSC and VCE exams may be better prepared than has been widely feared. The key motivating factor for providing additional accommodation to these students, such as favourable adjustments to ATAR scores, was due to expectations of high study-related stress. The data do not suggest that study-related stress was related to students' achievement.
4. **Anticipate that students may have experienced adverse mental and social impacts during home-based learning**. It is likely that social skills may be slower to rebound than mental health. This could be further impaired if school-based regulations and precautions surrounding Covid-19 exacerbate these effects. Promoting greater coping abilities of students would better prepare them for potential future disruption.

Australia's policymakers have boasted the success in achieving better health and economic outcomes than most similar countries. While it is too early to conclude that educational success can be declared, there are promising signs.

Appendix A: School closures timeline

2020 VIC school closure
1 week: school holiday brought forward to 3/24/2020
8 weeks: term 2 (14/4/2020–9/6/2020)
10 weeks: term 3 (13/7/2020–18/9/2020)
3 weeks: term 4 (5/10/2020–26/10/2020)
2021 VIC school closure
3 days: term 1 (15/2/2021–18/2/2021)
2 weeks: term 2 (27/5/2021–10/6/2021)
1 week: extended holiday for Year 7 to Year 9 (12/7/2021–18/7/2021)
1 week and 2 days: term 3 (19/7/2021–27/7/2021)
6 weeks: term 3 (5/8/2021–17/9/2021)
5 weeks: term 4 (4/10/2021–5/11/2021)
2020 NSW school closure
3 weeks: term 1 (23/3/2020–9/4/2020)
4 weeks: term 2 (27/4/2020–26/5/2020)
2021 NSW school closure
10 weeks: term 3 (12/7/2021–17/9/2021)
3 weeks: term 4 (4/10/2021–25/10/2021)
2020 QLD school closure
1 week: pupil free days (30/3/2020–3/4/2020)
5 weeks: term 2 (20/4/2020–22/5/2020)
2021 QLD school closure
4 days: term 2 (29/3/2021–1/4/2021 *Greater Brisbane only)
5 days: term 3 (31/7/2021–8/8/2021 *Southeast Queensland only)
3 days: term 3 (9/8/2021–11/8/2021 *Cairns only)
2020 ACT school closure
3 weeks: pupil free days (24/3/2020–9/4/2020)
5 weeks: term 2 (28/4/2020–2/6/2020)
2021 ACT school closure in ACT
5 weeks: term 3 (13/8/2021–17/9/2021)
4 weeks: term 4 (5/10/2021–1/11/2021)
2020 NT school closure
1 week: pupil-free free days (6/4/2020–9/4/2020)
2021 NT school closure
N/A
2020 TAS school closure
1 week: pupil-free free days (6/4/2020–9/4/2020)
6 weeks: term 2 (27/4/2020–9/6/2020)
2021 TAS school closure
N/A
2020 SA school closure
1 week: pupil free days (3/4/2020–9/4/2020)
2021 SA school closure
N/A
2020 WA school closure
1 week: optional home-based learning (23/3/2020–27/3/2020)
1 week: (6/4/2020–9/4/2020)
2021 WA school closure
1 week: (1/2/2021–5/2/2021)

Appendix B: Empirical methodology

Much of the empirical analysis contained in this paper is from the Longitudinal Study of Australian Children (LSAC). The LSAC follows a representative sample of around 10,000 children and families and is conducted in partnership between the Department of Social Services, the Australian Institute of Family Studies, and the Australian Bureau of Statistics. Data are collected from two cohorts every two years. The first cohort of 5,000 children was aged 0–1 years in 2003–04 (the 'B' cohort), and the second cohort of 5,000 children was aged 4–5 years in 2003–04 (the 'K' cohort). Data are collected on or from the child (now aged in their late teens or around 20 years of age), their parents, carers, and teachers. The study links to administrative databases, such as the ABS Census, NAPLAN, MySchool, and others.

Data analysed in this paper is based on the B cohort aged 16–17 in Wave 9C1 (in field October–December 2020), and to a lesser extent Wave 8 (collected in 2017 and 2018, when children were aged 14–15). In addition to regular data collection, Wave 9C1 contains data relevant to the experience of participants during the coronavirus restrictions period of 2020, including their experience of home-based learning. Wave 9C1 replaced the planned Wave 9, which was intended to involve mostly face-to-face interviews. Instead, Wave 9C1 was conducted fully online. Overall, the response rate was lower for Wave 9C1 than in Wave 8 — around 52%, compared with around 78%. [139]

Most data come in the form of survey responses on ordinal scales, with a few continuous and binary variables (see Appendix C). This data structure has implications for the statistical analysis throughout the study. Where appropriate, variables are reverse coded in order to ease interpretation. In most instances, this is done without specific reference, however the completed statistical tables largely report the original values before reverse coding.

Analysing correlations between variables is a key part of the analysis. Correlation analysis is widely used to both test whether there is a statistically significant two-way relationship (significance test) between two variables and also to measure the strength of that association (reported in a correlation coefficient). Correlation coefficients, of all forms, report a value between -1 and +1 — with 0 indicating no correlation, -1 a perfect negative correlation, and +1 a perfect positive correlation.

The most common correlation measure is the Pearson correlation coefficient (r). While this is entirely suitable when data are continuous and there are linear relationships among variables, it is not suitable for calculating correlations among ordinal or binary variables. Instead, a non-parametric test is needed to assess the statistical strength of correlations. Kendall's tau (τ) provides a measure of association where at least one variable in a two-way relationship is ordinal (and is flexible enough to handle one variable being continuous, where applicable). Calculations are made quite differently to those of r, because it is based on the agreeable (concordant) and non-agreeable (discordant) pairs between variables. As is conventional with τ, adjustments are made for ties. Generally speaking, τ is more accurate than its more popular alternative, Spearman's rank correlation (ρ) coefficient.

Because most data are in the form of rating scales, the correlation measures the similarity of orderings between variables. That means highly correlated variables share (dis)similar patterns in how their responses are ordered — that is, a strong positive (negative) correlation is recorded when high (low) ratings in one variable are matched with high (high) ratings in another variable, and vice versa. And small or no correlation value implies that how respondents order their responses between two variables are unrelated.

However, one relevant feature in the interpretation of τ is that generally produces a smaller magnitude coefficient, compared to alternative correlation coefficient methods. To allow for more ready comparison, particularly with the popular Pearson's r, τ can be converted to r as follows:

$$r = sin(0.5 * \tau * \pi)$$

It is also conventional to consider a standardised effect size measure, such as Cohen's d, as a way of comparing correlations that may have been produced with different approaches. The simplest way to do this is to calculate d from r, as follows:

$$d = \frac{2r}{\sqrt{1 - r^2}}$$

As a rule of thumb, d values smaller than 0.2 are small, while those up to 0.5 are moderate size, and those over 0.8 are large effects. Higher values reflect larger effects. By way of interpretation, the simplest case is to describe an effect size relating to a specific intervention (one group exposed, one group not exposed). In this context, an effect size of 0.5 means that the score of the average student in the intervention group is 0.5 standard deviations higher than the average student in the control group. By extension, that means the average in the intervention group exceeds the scores of 49% of the similar group of students in the control group.

Calculating correlation coefficients of binary data is sometimes disputed in practice. While correlations between two binary variables are simply calculated by the phi-coefficient (Φ, based on counts of contingency tables), this is not suitable for other variable forms. The rank-biserial correlation coefficient is appropriate for measuring correlation between binary and ordinal data and is approximated by the Somers' delta (δ) statistic.

The mixed — mostly ordinal — data structure also has implications for conducting factor analysis, because it is sensitive to normality assumptions, which require continuous data. Exploratory factor analysis is

commonly applied when assessing the intercorrelated relationships among sets of variables. Factor analysis is a very popular multivariate practice, usually used for dimension reduction purposes. Simply put, factor analysis reduces a full set of potentially correlated variables and summarises them into several 'factors'. The factors represent latent variables which are linear combinations of the observed variables. Factor loadings of each observed variable quantifies how much each variable is related to the factor, in absolute values. The factor loading plot geometrically represents the loadings of each variable on the first and second factors. Items that are grouped together generally share an underlying correlational structure, especially where virtually all variation is explained by the first two factors.

In order to overcome the limitation of factor analysis in handling binary and ordinal data, the factor analysis is conducted on a polychoric correlation matrix. Polychoric correlations are flexible computations of correlations among sets of variables that can take a range of forms (other than non-ordered nominal data). [% explained by first two factors, scree plot justification]

Because the primary dependent variable of interest in this study is students' perceived level of achievement (an ordinal variable), an ordered logistic regression is used to model effects of the independent variables. The general form of this model is as follows, where j is the number of categories for the dependent variable (students' reported level of achievement during home-based learning); j=5 (very high to very low):

$$logit[P(Y \leq j)] = \propto_j - \sum \beta_i X_i$$

Coefficient estimates from ordered logistic models come in the form of log odds. However, these coefficients aren't interpreted in the same way as binary logistic models — where coefficients largely represent the likelihood of an event occurring. In the case of ordinal logistic regression, coefficients indicate the association between values of the independent variable and the likelihood of a stepwise increase in the ordinal ranking scale (in this case, the likelihood of increasing one unit in the five-point scale between very high to very low achievement during home-based learning).

Log odds coefficients lack intuitive appeal, but can be converted to a meaningful probability measure, by exponentiating. Odds ratios in an ordered logistic model estimate the change in odds for a unit increase in the dependent variable associated with a unit change in the independent variable (be it continuous, binary, or ordinal). Similar to above, logs odds ratios can be converted to the more standardised form of Cohen's *d*, particularly to provide a comparable effect size measure, as follows:

$$d = log \frac{(oddsratio) * \sqrt{3}}{\pi}$$

Because the interpretation of coefficient estimates can be less intuitive in ordered logistic models, a common approach is to assess marginal effects (especially, average marginal effects) to more closely consider the association between independent variables of interest and the dependent variable. To do so, all values across the model are suppressed at the mean value in order to fully isolate the effects of changes in a single independent variable.

It's important to note that this qualitatively different to common 'holding everything constant' assumptions when interpreting coefficients. Instead, average marginal effects simulate the relative probabilities of outcomes, based on an assumption that all other variables are held at the mean observed value (rather than holding constant per se, meaning values are held at zero — which may not actually be meaningful in terms of interpreting relative probabilities). Accordingly, analysis of an independent variable (and the ordinal dependent variable) means that you compare the relative probabilities of falling in different categories of the dependent variable, by each category of the independent variable — at the same time, assuming that the probabilities are based, effectively, on the average observation (since all variables are held at the mean).

Because the ordered logistic regression model is non-linear (and thus, generate maximum likelihood estimates), goodness of fit is not computed in the same way as in linear regression models, like ordinary least squares (OLS). McFadden's pseudo R^2 provides a suitable indicator, but is qualitatively different to the coefficient of determination (R^2) that is routinely used in linear models. McFadden's pseudo R^2, like similar measures, is generated by the ratio of the log likelihood of the intercept model and the full model.

A particular concern in this modelling is the risk of potential multicollinearity. As the factor analysis revealed, there are clear associations in the correlational structure of some of the data. Multicollinearity is an empirical problem for conventional regression approaches when the relationship among independent variables impairs the estimates of model coefficients — which are intended to represent the independent effects of each individual coefficient. In practice, many data and models exhibit some degree of multicollinearity, and a small to moderate degree of multicollinearity is generally tolerated — particularly if multicollinearity mostly is founded among control variables, rather than key explanatory variables. In any case, the conventional approach to test for multicollinearity is to assess the model's variance inflation factors (VIFs) — which examines the level of correlation among the independent variables included in a model. A rule of thumb in practice is that VIFs recorded between 1 and 5 represent moderate, but tolerable, levels of multicollinearity. VIFs above 5 require dropping of variables that are highly correlated. A number of modelling approaches or changes to the data structure can reduce the effects of multicollinearity where necessary. The largest VIF values recorded from the model employed are 3.3 — while this indicates some multicollinearity, it does not warrant changes to be made to the model.

Appendix C: Data dictionary

Academic variables	Measure	Definition/Survey question
Students' perceived achievement	1=Very high; 2=High; 3=Average; 4=Low; 5=Very low	Currently, how would you rate... your level of achievement in your studies?
Child fallen behind (t-2)	No=0, Yes=1	Teacher reported that this student has fallen behind in school work in their class? (t-2)
Academic self concept (t-2)	Mean of three items (1-4 censored): 1 Strongly agree; 2 Agree; 3 Disagree; 4 Strongly disagree	Mean of the following (reverse coded) (a) How much do you agree or disagree with each of the following? I learn things quickly in most school subjects (b) How much do you agree or disagree with each of the following? I'm good at most school subjects (c) How much do you agree or disagree with each of the following? I do well in tests in most school subjects
Student engagement (t-2)	Mean of seven items, reverse coded where necessary (1-5 censored): 1 Never; 2 Rarely; 3 Some of the time; 4 Most of the time; 5 All of the time	Mean of the following, with c,e,f,g reverse coded (from two years prior), reported by main English teacher: (a) How often does this student demonstrate the following behaviours in your English class? Usually works hard for good results/grades (b) How often does this student demonstrate the following behaviours in your English class? Seems to relate well to other students (c) How often does this student demonstrate the following behaviours in your English class? Exceptionally passive or withdrawn (d) How often does this student demonstrate the following behaviours in your English class? Disruptive (e) How often does this student demonstrate the following behaviours in your English class? Late (f) How often does this student demonstrate the following behaviours in your English class? Absent (g) How often does this student demonstrate the following behaviours in your English class? Completes homework assigned
Hours	Continuous	During the coronavirus restriction period, approximately how many hours did you spend each week in online learning?
School avoidance index (t-2)	Mean of three items, reverse coded. 1=Yes; 2=Sometimes; 3=No	Mean of the following, all reverse coded (a) Do you... like maths and number work at school? (b) Do you... like reading and writing activities at school? (c) Do you... like learning about science and science activities at school?

Y9 NAPLAN	Continuous	Average of Year 9 NAPLAN across reading, writing, and numeracy (sat in 2018 for most students)
Sufficient space	1=Never; 2=Rarely; 3=Sometimes; 4=Often; 5=Always	During the coronavirus restriction period, how often did you have sufficient space for my work, education and leisure?
Sufficient devices	1=Never; 2=Rarely; 3=Sometimes; 4=Often; 5=Always	During the coronavirus restriction period, how often did you have sufficient electronic devices for all my needs (e.g., computers, iPads)?
Reliable internet	1=Never; 2=Rarely; 3=Sometimes; 4=Often; 5=Always	During the coronavirus restriction period, how often did you have reliable internet access for all my needs (e.g., work, education and leisure)?
Likes to read (t-2)	1=Yes; 2=Sometimes; 3=No	Child likes reading at home
Additional time study	1=Increased; 2=Remained the same; 3=Decreased	Did the amount of time you spent on your studies increase, decrease or remain the same during the coronavirus restriction period, compared to what you would normally do?
Learning difficulty (t-2)	0=No, 1=Yes	Which medical conditions or disabilities does the study child have? Difficulty learning or understanding
Motivation to study	1=Very high; 2=High; 3=Average; 4=Low; 5=Very low	How would you rate your motivation to study?
Ability to focus	1=Very high; 2=High; 3=Average; 4=Low; 5=Very low	How would you rate your ability to concentrate on your studies?

Demographic variables	Measure	Definition
Remoteness	0=Majority city; 1=Inner regional; 2=Outer regional/remote	ABS Remoteness area classification; remote and very remote consolidated with outer regional.
Lives in capital city metro area	0=Rest of state (not capital city); 1=Capital city	Australian Statistical Geography Standard (ASGS) - Edition 2016 - GCCSA
Educational Index of home SA2	Continuous	SEIFA - Index of Education and Occupation - 2016 - SA2 - Score
SEIFA decile of home SA2	0-10	SEIFA - Index of Relative Socio-economic Advantage and Disadvantage - 2011 - SA2 - Deciles - National
School average ICSEA	Continuous	The Index of Community Socio-Educational Advantage score for the school. This score is derived from a number of variables including parental school and non-school education and occupation, the school's geographical location and proportion of Indigenous students.
Parent school completion	1=Year 12 or equivalent; 2=Year 11 or equivalent; 3=Year 10 or equivalent; 4=Year 9 or equivalent; 5=Year 8 or below; 6=Never attended school	Primary parents' school attainment
Parent post-school attainment	1=Postgraduate degree; 2=Graduate diploma/certificate; 3=Bachelor degree; 4=Adv Diploma/Diploma; 5=Certificate; 6=Other	Highest level of primary parents' post-school attainment
Single parent household	1=Single parent household, 0=otherwise	Primary parent lives with spouse or partner
ATSI status	0=Not Aboriginal or Torres Strait Islander; 1=Aboriginal or Torres Strait Islander	Self-reported status as Aboriginal or Torres Strait Islander
Students speaks language other than English at home	0=Main language at home is English; 1=Main language at home is not English	Child speaks a language that isn't English
No of people in household	0-10	Number of people living at household with child

Home-based learning risk factors	Measure	Definition/Survey question
Reliable internet	1=Never; 2=Rarely; 3=Sometimes; 4=Often; 5=Always	During the coronavirus restriction period, how often did you have reliable internet access for all my needs (e.g., work, education and leisure)? b. Sufficient electronic devices for all my needs (e.g., computers, tablets). c. Sufficient space for my work, education and leisure.
Sufficient devices	1=Never; 2=Rarely; 3=Sometimes; 4=Often; 5=Always	During the coronavirus restriction period, how often did you have sufficient electronic devices for all my needs (e.g., computers, iPads)?
Sufficient space	1=Never; 2=Rarely; 3=Sometimes; 4=Often; 5=Always	During the coronavirus restriction period, how often did you have sufficient space for my work, education and leisure?
Change in time spent on study	1=Increased; 2=Remained the same; 3=Decreased	Did the amount of time you spent on your studies increase, decrease or remain the same during the coronavirus restriction period, compared to what you would normally do?

Non-academic variables	Measure	Definition/Survey question
Coping level	1=Not at all; 2=A little; 3=Fairly well; 4=Very well; 5=Extremely well	During the coronavirus restriction period, how well did you cope?
Unmet support need	1=Very often; 2=Often; 3=Sometimes; 4=Never	Thinking back to the coronavirus restriction period, how often did you feel that you needed support or help but could not get it from anyone?
Stress level	1=Very high; 2=High; 3=Average; 4=Low; 5=Very low	During the coronavirus restriction period, how would you rate your level of stress related to your studies?
Optimism for the future	1=Much more optimistic ; 2=Slightly more optimistic ; 3=Neither more nor less optimistic; 4=Slightly less optimistic; 5=Much less optimistic	Compared to one year ago, how optimistic do you feel about your future?

Difficulty of life	1=No problems or stresses; 2=Few problems or stresses; 3=Some problems or stresses; 4=Many problems or stresses; 5=Very many problems or stresses	Difficulty of life during CRP
Parents met support needs	1=Completely; 2=Mostly; 3=Partly; 4=A little; 5=Not at all	To what extent did your parent(s) or other family members meet your need for support since the beginning of the coronavirus restriction period? Lower scores indicate a greater perception that needs were met.
Felt isolated	1=Never; 2=Rarely; 3=Sometimes; 4=Often; 5=Always	During the coronavirus restriction period, how often did you feel isolated from others? Higher scores indicate greater feelings of loneliness and social isolation.
K10+ Depression	1 All of the time; 2 Most of the time; 3 Some of the time; 4 A little of the time; 5 None of the time	Group category based on average score of the following In the past 4 weeks, about how often did you feel tired out for no good reason? In the past 4 weeks, about how often did you feel nervous? In the past 4 weeks, about how often did you feel so nervous nothing could calm you down? In the past 4 weeks, about how often did you feel hopeless? In the past 4 weeks, about how often did you feel restless or fidgety? In the past 4 weeks, about how often did you feel so restless you could not sit still? In the past 4 weeks, about how often did you feel depressed? In the past 4 weeks, about how often did you feel that everything was an effort? In the past 4 weeks, about how often did you feel so sad that nothing could cheer you up? In the past 4 weeks, about how often did you feel worthless?
Felt lack of companionship	1. Never; 2. Rarely; 3. Sometimes; 4. Often; 5. Always	During the coronavirus restriction period, how often did you feel that you lack companionship?

Felt left out	1. Never; 2. Rarely; 3. Sometimes; 4. Often; . Always	During the coronavirus restriction period, how often did you feel left out?
Single parent	1=Single parent household, 0=otherwise	Primary parent lives with spouse or partner
Felt lonely	1. Never; 2. Rarely; 3. Sometimes; 4. Often; 5. Always	During the coronavirus restriction period, how often did you feel lonely?
Self control (t-2)	Continuous	Self-Control calculated from Pearsons SSIS input items

Appendix D: Statistical tables

Correlation tables

Students' perceived achievement correlation	τ_b	Somers' δ	*r*	Cohen's *d*
Ability to focus	0.48	-	0.69	1.90
Motivation to study	0.46	-	0.66	1.77
Additional time study	0.22	-	0.34	0.73
Coping level	0.21	-	0.32	0.67
Academic self concept (t-2)	0.19	-	0.30	0.63
Student engagement (t-2)	0.18	-	0.28	0.58
No of hours studying	0.17	-	0.26	0.53
School avoidance index (t-2)	0.15	-	0.24	0.48
Y9 NAPLAN	0.14	-	0.22	0.46
Sufficient space	**0.12**	-	0.18	0.37
Sufficient devices	**0.12**	-	0.18	0.37
Self control (t-2)	0.11	-	0.18	0.36
Parents met support needs	0.10	-	0.16	0.33
Optimism for the future	0.09	-	0.15	0.30
Dislikes to read (t-2)	0.08	-	0.12	0.25
Reliable internet	**0.07**	-	0.11	0.23
Non-govt school	-	0.07	0.11	0.22
Parent school completion	0.07	-	0.11	0.22
Parent post-school attainment	0.05	-	0.08	0.16
School ICSEA	0.04	-	0.06	0.11
Capital city or not	-	0.03	0.05	0.09
No of people in household	0.02	-	0.03	0.06
Remoteness	0.01	-	0.01	0.02
SEIFA deciles	0.00	-	0.00	0.01
Educational Index	0.00	-	0.00	-0.01
NESB	-	-0.01	-0.02	-0.04
Stress level	-0.03	-	-0.05	-0.09
Parents' confidence homework	-0.06	-	-0.10	-0.20
Single parent household	-	-0.08	-0.13	-0.26
Difficulty of life	-0.10	-	-0.16	-0.31
Felt isolated	-0.11	-	-0.17	-0.35
Self-control	-0.11	-	-0.18	-0.36
Depression scale score	-0.11	-	-0.18	-0.36
Unmet support need	-0.13	-	-0.20	-0.41
Felt lack of companionship	-0.13	-	-0.21	-0.42
Felt left out	-0.13	-	-0.21	-0.42
Felt lonely	-0.14	-	-0.22	-0.44
ATSI	-	-0.17	-0.26	-0.55
Learning difficulty (t-2)	-	-0.23	-0.35	-0.74
Child fallen behind (t-2)	-	-0.29	-0.44	-0.98

Ordered logit modelling output

Depvar: Students' level of achievement during home-based learning (1=Very high; 2=High; 3=Average; 4=Low; 5=Very low)	β	P>|z|
Ability to focus		
Very high	(base)	
High	**1.56**	0.02
Average	1.94	0.01
Low	**2.86**	0.00
Very low	**3.76**	0.00
Motivation to study		
Very high	(base)	
High	**0.64**	0.33
Average	**1.57**	0.03
Low	**1.57**	0.03
Very low	**2.01**	0.01
Changed study time		
Increased		
Remained the same	0.11	0.70
Decreased	**0.53**	0.07
Academic self-concept	-0.22	0.17
School engagement	**-1.03**	0.00
Weekly hours studying	-0.01	0.22
School avoidance	0.08	0.73
NAPLAN	0.00	0.25
Sufficient space for needs		
Never		
Rarely	-0.34	0.84
Sometimes	-0.70	0.67
Often	-1.38	0.42
Always	-1.64	0.32
Sufficient devices		
Rarely		
Sometimes	1.04	0.45
Often	1.35	0.32
Always	1.24	0.35
Self-control	0.04	0.23
Child likes reading		
Yes		
Sometimes	-0.03	0.93
No	0.37	0.13

Reliable internet access		
Never		
Rarely	2.35	0.12
Sometimes	1.79	0.19
Often	1.72	0.20
Always	1.51	0.25

Has difficulty learning		
No		
Yes	-0.90	0.20

Has fallen behind		
No		
Yes	-0.49	0.19

Level of coping		
Not at all		
A little	**-2.54**	0.00
Fairly well	**-2.81**	0.00
Very well	**-3.19**	0.00
Extremely well	**-3.30**	0.00

Parents met need for support		
Completely		
Mostly	-0.27	0.24
Partly	-0.08	0.83
A little	0.02	0.96
Not at all	**-1.55**	0.06

Optimism about my future		
Much more optimistic		
Slightly more optimistic	0.53	0.13
Neither more nor less	**0.88**	0.01
Slightly less optimistic	**0.65**	0.08
Much less optimistic	-0.13	0.80

Level of stress related to studies		
Very high		
High	-0.07	0.83
Average	-0.25	0.49
Low	-0.34	0.37
Very low	0.07	0.88

Difficulty of life		
No problems of stresses		
Few problems or stresses	**-1.00**	0.02
Some problems or stresses	**-0.99**	0.03
Many problems or stresses	**-1.01**	0.05
Very problems or stresses	**-1.19**	0.09

Felt isolated from others		
Never		
Rarely	0.25	0.55
Sometimes	0.27	0.53
Often	-0.16	0.74
Always	-0.01	0.99

K-10 depression scale group		
Low probable serious mental illness		
Moderate probable serious mental illness	-0.16	0.57
High probable serious mental illness	0.10	0.75
Very high probable serious mental illness	0.57	0.13

Needed support but couldn't get it		
Very often		
Often	0.32	0.62
Sometimes	0.32	0.60
Never	0.11	0.86

Felt lack of companionship		
Never		
Rarely	0.25	0.47
Sometimes	0.03	0.94
Often	0.28	0.55
Always	0.16	0.80

Felt left out		
Never		
Rarely	-0.25	0.50
Sometimes	-0.40	0.34
Often	-0.35	0.47
Always	**-1.90**	0.01

Felt lonely		
Never		
Rarely	0.14	0.73
Sometimes	0.76	0.11
Often	0.50	0.35
Always	0.84	0.21

School completion of parent		
Year 12		
Year 11	0.38	0.33
Year 10	**1.05**	0.01
Year 9	-0.16	0.85
Year 8	-17.86	1.00

Post-school completion of parent		
Postgraduate degree		
Grad dip/cert	-0.40	0.32
Bachelor	-0.01	0.97
Adv diploma/diploma	-0.14	0.70
Certificate	-0.31	0.34
Other	0.19	0.81
ICSEA	0.00	0.55
No of people living in home	-0.14	0.11
Metropolitan		
Inner regional	**-0.50**	0.04
Outer regional/remote	0.10	0.78
NESB	0.24	0.62
ATSI	-0.12	0.90

Appendix E: Changes to school leaving credentials in NSW and Victoria

Special arrangements for Year 12 school-leaving credentials, Victoria and NSW.

State	Year	General support for all students	Changes to test administration	Curriculum and assessment	Other special consideration schemes	Student %applied for special entry
VIC	2020	Consideration of Educational Disadvantage (CED)	The General Achievement Test (GAT) rescheduled; Term 4 extended; The Victorian Certificate of Education (VCE) exams rescheduled	Course content reduced	Derived Examination Score (DES); Special Entry Access Scheme (SEAS)	30,532 (60%)
	2021	Consideration of Educational Disadvantage (CED)	The General Achievement Test (GAT) rescheduled	No amendment	Derived Examination Score (DES); Special Entry Access Scheme (SEAS)	N/A
NSW	2020	N/A	HSC (High School Certificate) Trial exams conducted remotely	No amendment	Educational Access Scheme (EAS); Illness/Misadventure Application Procedure	-
	2021	COVID-19 Special Consideration Program	HSC Trial exams to be held remotely; HSC minimum standard exams waived; HSC exams rescheduled;	No amendment	Educational Access Scheme (EAS); Illness/Misadventure Application Procedure	N/A

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