Technology: Learning and computing from home in lockdown

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Abstract

Students' levels of out of school access to computers, peripherals and the internet was investigated by surveying Singleton High School students and parents in 2020 both pre and post the covid-19 pandemic lockdown. Though only 54% indicated unrestricted access to a device, 89% accessed at least one of their classes in the first week online. The restraints impacting student completion of learning within the 'learning from home' period are discussed within an intention to achieve equity in learning opportunity.

The context

In 2019 Singleton High School (SHS) decided to investigate the level of technology available to students outside of school. The education environment at SHS had become increasingly reliant on technology for delivery of lessons, with multiple opportunities to use devices and the internet at school, however there was concern about the technology available to students at home. According to the Australian Bureau of Statistics (ABS), 87% of Australians have access to the internet at home (2018). This figure is lower in regional Australia, and for those from a lower socio-economic background. SHS being located outside a metropolitan area, and with more than half the students from the lowest SEO quartile (ACARA, 2020), the fear was that SHS students would have a lower access to the internet than most schools. As this could affect both student opportunity to learn, and staff teaching methods, this survey was considered important.

The Principal, and the Teacher-Librarian, decided to initiate this survey (Survey 1 - Students) in Term 2 of 2020. A Google Form was prepared by the Teacher-Librarian and reviewed by the school computer teacher and senior executive. With the threat of the Covid 19 pandemic rising, the Executive decided to move the survey to early March 2020. Surveys were conducted in class, since surveys emailed home could only be completed by students who already had access to the internet. Before students were advised to stay home at the end of week 8 (March 20th), 190 students, or 17% of the school was surveyed.

After the lockdown had commenced a second survey (Survey 2 – Parents) was sent out by the Head Teacher of Administration to parents in hope of getting better and more accurate results. This second survey was completed by 106 parents, representing 144 students or 13% of the school.

This information was used to help direct the school's efforts to ensure all students could access learning while offsite. An administrative attempt to make sure that the least well off within the school community, would not be left behind in a 'time of trial'.

On return to face to face teaching at Singleton High School, some staff were curious to know how the students had fared during the period of learning from home. The teacher-librarian designed a short survey (Survey 3 – Students – post-lockdown) to gauge some aspects of the students' experience. In particular issues with technology.

> *"the fear was that SHS students would have a lower access to the internet than most schools. … this could affect both student opportunity to learn, and staff teaching methods"*

Survey results

Participants - Which year* ?

Both the student (Figure 1) and parental survey (Figure 2) sought recognition of the Year a student was enrolled in, the parental sampling providing more equal numbers from each year. Consequent analysis of the data by Year could reveal grouped results, particularly how much overall access the seniors had, which was of specific interest.

Circumstances – Student and parent responses

The frequency and frequency percentage of student responses for questions common to both surveys are summarised in adjacent columns within the following tables, each addressing a specific question.

The second question (Table 1) enquired whether internet connected devices were available

to the student outside of the school. The type of device potentially limited the student's after school interaction. For example, a work video or podcast could be accessed on a phone, but attempting to write an essay response on anything smaller than a tablet would be very difficult.

The third question (Table 2) was included due to internet speed/data concerns. If a student had only

> *The type of device [accessible] potentially limited the student's after school interaction*

Figure 1: Student sampling by Year

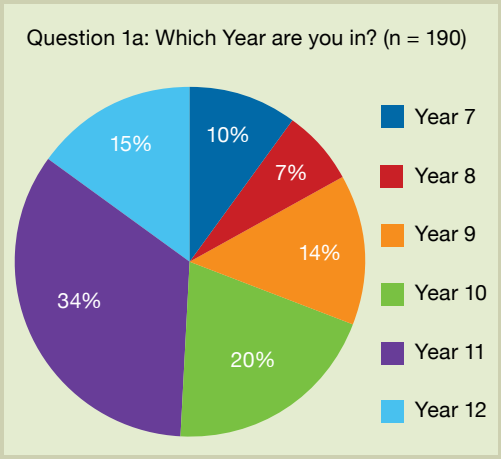

Figure 2: Parental survey sampling by Year

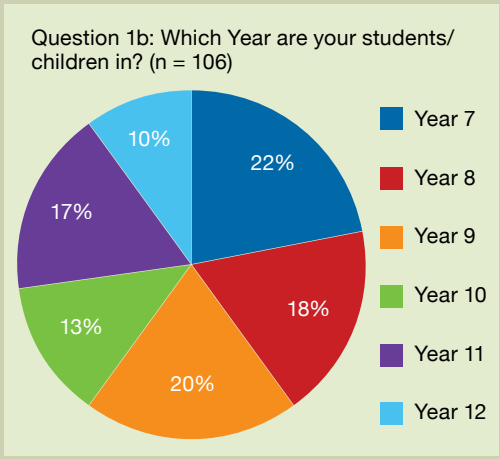

Table 1: **Accessible devices for after school access to the internet**

Question 2: What internet connected devices do you have easy access to outside of school? (Tick all that apply)

QUESTION	SURVEY 1 - STUDENTS		SURVEY 2 - PARENTS	
	Frequency	Frequency Percent	Frequency	Frequency Percent
Desktop computer at home	82	43.2	30	28.3
Laptop computer at home	136	71.6	78	73.6
Tablet (iPad, android)	93	49.3	43	40.6
Smartphone	165	86.8	77	72.6
I have access, but only at a friend or family member's house.	9	4.7	N/A	N/A
I have access, but only at a public place, e.g. youth venue, town library.	9	4.7	N/A	N/A
I have no easy access to a device outside of school hours.	9	4.7	N/A	N/A
I have no access to a device outside school hours	2	1.1	6	5.7

a mobile phone plan for internet access, data heavy work would not be feasible.

This fourth question (Table 3.) was designed to check limitations on the internet. An example of a potential limitation would be an old device that may not be able to access newer websites, had lower data quota specifications or slow speed that could prevent accessing videos or distractingly disrupt viewing.

Parents were also asked about their student's access to peripherals (Table 4). A final unique enquiry, Question 6 (Figure 3) asked each student whether they had access to the Singleton Library, and specifically the advantages gained through membership.

Third survey: Post-lockdown student responses

From the approximately 1,100 student enrolment of the school, a sample of 175 (16%) completed the post-lockdown survey. One younger than expected student was included (See Table 5). Responses to questions could consequently be analysed in terms student age grouping.

Questions 8-12 examined coping with learning in the lockdown, including dealing with disruption (Table 6, Question 8, Figure 4), technology restriction (Table 8, Question 11), need to purchase computers (Table 9, Question 10), learning at home as compared to face-to-face classes at school (Table 7, Question 9) and accessing hard copy support from the school (Table 10, Question 12). Finally, some comparisons between contexts before and after the home learning period are sought (Table 11).

Analysis

First survey: Student response

While responses were received from only a small sample, if assumed representative of the whole school, the results would have a dramatic effect on how work was delivered during social distancing. For example, two senior students (Stage 6, year 11 or 12) said they had no internet/device at home. If this was extrapolated across the two year groups, staff could expect 11 students in the senior school to need hard-copy work packs, this was slightly under the actual number requested for printing by senior students. While only 6 respondents said they had zero access to technology out of class hours, this number would increase rapidly when lockdown conditions came into place. Students who could access the internet or devices from a friends/relative's house, or from the town library, would no longer have access. Other complications would likely to occur, students who had been limited by a lack of devices would only have this barrier amplified once all family members, including parents, were working from home.

During the increased use of the internet in the first week of school students staying home, some senior students called teachers as their internet had either slowed down dramatically or had failed completely.

Ultimately though, despite only 54.7% of the respondents saying they were unrestricted in their internet use (Table 3), by the end of week 10 term 1, the second full week of offline learning, 89% of students had accessed at least one of their classes

> *"students who had been limited by a lack of devices would only have this barrier amplified once all family members, … were working from home"*

Table 2: After school internet access

Question 3: What type of Internet access do you have outside school? (tick all that apply)

QUESTION	SURVEY 1 - STUDENTS		SURVEY 2 - PARENTS	
	Frequency	Frequency Percent	Frequency	Frequency Percent
Landline/NBN internet	126	66.3	63	59.4
Satellite or wireless internet	89	46.8	33	31.1
Mobile device internet only, (e.g. hotspotting a phone, internet only on tablet)	49	25.8	22	20.8
I have no access to internet outside school	4	2.1	5	4.7
I have access but not at home, e.g. family member's house, town library	9	4.7	N/A	N/A

> *To ensure equity of learning the school was planning to provide older, internet capable notebooks to students in need of devices*

on CANVAS (the school learning management system). This high figure would suggest students and their parents had been making a concerted effort to use technology access they did have for school work. Anecdotal evidence from local computer sellers suggested that new computers were selling faster than usual in the last month, some of these may have ended up in the hands of students now forced to access online work.

While the school and community technology were working well at the end of March, a much larger than indicated proportion of junior students collected hard copies of work in the first week of enforced absence, week 9 (March 23rd to 27th). Across the Junior school, 317 students collected hard copy work. This was explained by office staff as dealing with parents to address their initial panic, or fear students would work better with paper than screen tasks. In week 10 (March 30th to April 3rd), this figure dropped off and online class access increased. Students who had not logged into classes or contacted the school, were called by year advisors or classroom teachers to see if there was any way the school could assist in making sure students had access to learning while in isolation.

Second survey: Parent's response

While the results of the first survey were useful, and were passed on to the Department of Education, the school executive felt that a more accurate picture would be required to respond optimally. To ensure equity of learning the school was planning to provide older, internet capable notebooks to students in need of devices, and the Department of Education was looking into providing mobile wifi dongles with data subscriptions to 'at need' students (Dizdar, 2020).

It was decided in Week 11 to send out the survey link again, but this time to parents via SMS, and through the school android and Apple applications. The hope was that parents would provide a more accurate picture than students, and that more responses would be completed. The survey was slightly modified to consider the number of students in a family. Reference to using the town library or other services was dropped due to the isolation conditions already imposed and reference was made to peripheral devices, such as printers and scanners, which had taken on greater importance in a time of remote learning.

Although there was a drop in the number of houses saying they had a laptop or Desktop, no year 11 or 12 students in this sample were without a device, and only 1 senior (yr 11) student was without internet access at home. However, with less than half unrestricted, this placed limitations

Table 3: Internet access limitations

Question 4. Are you restricted in how you use your internet? (tick all that apply)

QUESTION	SURVEY 1 - STUDENTS		SURVEY 2 - PARENTS	
	Frequency	Frequency Percent	Frequency	Frequency Percent
Yes, by internet speed. (e.g. can you watch Youtube without buffering?)	52	27.4	24	22.6
Yes, by internet data quotas	16	8.4	7	6.6
Yes, by poor service	26	13.7	16	15.1
Yes, by an old/faulty device	2	1.1	5	4.7
Yes, by parent/carer limits	17	8.9	18	17.0
Not enough devices (e.g. 1 computer for 3 children)	11	5.8	18	17.0
No, I am not restricted	104	54.7	50	47.2
No internet/device at home	6	3.2	5	4.7

Table 4: Access to computer peripherals

Question 5: Do you [your student] have access to a printer or a scanner?

QUESTION	SURVEY 2 - PARENTS	
	Frequency	Frequency Percent
Printer	83	94.3
Scanner	60	68.2

Figure 3: Membership of the Singleton Library

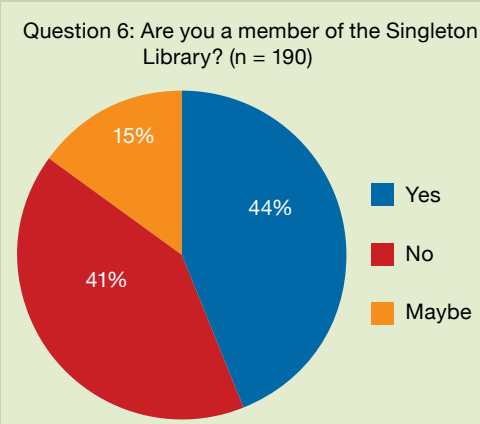

Table 5: Post-lockdown respondent age distribution

Question 7: What age group are you in?

Age Group	Number
11	1
12	4
13	27
14	33
15	40
16	57
17	10
18	3
Total	**175**

Table 6: Technology disruption during learning at home

Question 8: During learning from home, was your access or ability to use technology disrupted?

Response	F	F%
Yes	53	30.3
No	99	56.5
Unsure	18	10.3
No access to technology at home	5	2.9
Total	**175**	**100.0**

*f = frequency
f % = frequency as percentage of the sample

> *"with less than half unrestricted, this placed limitations on what could be sent over the internet"*

Table 7: Learning during isolation

Question 9. Compared to face-to-face learning, how well do you think you learnt during isolation?

1 - Much worse		2 - Worse		3 - The same		4 - Better		5 - Much better	
*f	f%	*f	f%	*f	f%	*f	f%	*f	f%
24	14.3	46	26.3	55	31.4	33	18.9	16	9.1

*f = frequency, f % = frequency as percentage of the sample

> *Zoom meetings could happen, but if more than 1 student in a household needed a device at a time, problems could occur*

Table 8: Technological restrictions during learning in isolation

Question 10: During isolation/learning from home, were you restricted in using technology for learning by any of the following?

Restriction	F	F%
Not having access to the internet at home	12	6.9
Not having access to a device at home	17	9.7
The internet at your house not being reliable (prior to isolation)	26	14.9
The internet being slower than usual (during Isolation)	59	33.7
Having to stop the internet due to financial pressure	3	1.7
Your modem or internet provider breakdowns	12	6.9
Not having an internet enabled device at home (prior to isolation)	2	1.1
Restricted access to an internet enabled device due to other family members needing to use it members needing to use it	24	13.7
Device breaking down	13	7.4
Device being too old to access the required websites or applications	15	8.6
Device being unsuited for the task? e.g. trying to write an essay on a phone	18	10.3
Lack of access to a printer	35	20
Lack of access to a scanner	24	13.7
Lack of a camera	15	8.6
Lack of a microphone	18	10.3
Lack of a space in the house to study	22	12.6
No interruptions to my technology use	76	43.4

*f = frequency, f % = frequency as percentage of the sample

Note: Students indicated multiple restrictions so the sum of frequencies and of the percentage of frequencies exceed 175 and 100% respectively.

on what could be sent over the internet. Livestream or heavy use applications would be difficult. Zoom meetings could happen, but if more than 1 student in a household needed a device at a time, problems could occur.

Table 9: Acquiring new technology

Question 11: During or after isolation, did your family acquire new technology? Tick all that apply.

Purchases	F	F%
A new computer	32	18.3
A new tablet or smartphone	16	9.1
A new periphery device (printer, scanner)	12	6.9
A new accessory (mouse, headset, webcam)	10	5.7
New FREE software (e.g., Zoom, Google Chrome, free school Office 365)	42	24
New PAID software or applications	9	5.1
New computer desk/chair	12	6.9
Paid for any other extra to aid with learning from home?	8	4.6
We have made no changes	109	62.3

*f = frequency, f % = frequency as percentage of the sample

Table 10: Accessing hard copy for learning

Question 12: Did you access hard copy work from the school?

Response	F	F%
For all subjects	28	16.0
For most subjects	23	13.1
For some subjects	64	36.6
A new accessory, (mouse, headset, webcam)	10	5.7
For no subjects	60	34.4

Without access to friends, youth venues or libraries, the number of students with no access to the internet/device increased from 3.2% to 4.7%, meaning across the school some 50-55 students would need a 'loan' computer or paper copies.

A significant jump was seen in restrictions due to not enough devices. In the initial survey, only 5.8% of respondents believed they did not have enough devices, however after 2 weeks of working online from home, this had jumped to 17%. There was also an increase in students limited by old or faulty devices from 1.1% to 5.7%, presumably faced with a requirement to use devices, many had found their device no longer up to the task. There was also an increase in the number of students facing parental limitations on use, which was surprising as now students had a legitimate need to use their device. Possible explanations could be the need to share devices amongst the whole family more regularly.

Ultimately some 32 senior students requested paper copies of work, a much higher percentage than was indicated by either survey. Again, this was put down to a preference for paper over screen, but also to issues with increased demands on home internet and devices.

Only 30 computers were loaned out across all years. This lower than expected number may be due to parents buying more devices when the lockdown started, or a reluctance to travel to school to pick up laptops after lockdown had commenced, or it may be a result of the majority of the school population, who did not respond, not needing the laptops. No mobile internet dongles were supplied to the school for distribution and so none were available to be given out.

In junior years 176 students asked for hard copy work packs. Parents reported to office staff that there had been difficulties using technology. Many households had faced greater restrictions due to greater demand from all family members for access to devices; Several parents reported that it was easier to monitor their children's work on paper than on technology. Many parents reported that their children found using the technology too difficult. The school was finding that the myth of the digital native, was just that, a myth; not just in terms of what students could do with technology, but also in terms of how little access to technology many students actually had.

Third survey: Post-lockdown

Of the students surveyed, 104 (59.4%) said that they learnt just as well, if not better with offsite learning than they did with face to face learning (Table 7). There was only a slightly greater number of students who suffered no interruptions in this group, suggesting that technology access was not the main factor influencing whether students learnt well in this time. Better learning could be accounted for by preferred learning styles, not questioned here, or the large number of hard copy work packs handed out by staff; 64.7% of students surveyed had accessed physical copies of work at some stage during lockdown (Table 10).

When asked about their technology at home, 77.7% thought their set up was adequate before

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Table 11: Comparisons of before and after context

Before and after comparisons	Yes		No		Maybe	
	F	F%	F	F%	F	F%
Before isolation/learning from home, did you think your home access to internet/computer devices was good enough for your school needs.	136	77.7	11	6.3	28	16.0
Before isolation/learning from home, did you think your technology skills were good enough for your school needs?	133	76	17	9.7	25	14.3
During isolation/learning from home, did you think your technology skills were good enough for your school needs?	129	73.7	15	8.6	31	17.7
Do you think your technology skills have improved during the learning from home period	87	49.7	42	24.0	46	26.3
After isolation/learning from home, did you think your home access to internet/computer devices was good enough for school needs?	121	69.1	13	7.4	41	23.4

*f = frequency, f % = frequency as percentage of the sample

lockdown, dropping to 69.1% after lockdown (Table 11). Of the remainder who made changes, 32 (18.3%) bought new computers, not an insignificant number (Table 9).

When asked to think about their own technology skills, both before and after lockdown, 76% believed their skills to be adequate, dropping to 73.7% after a return to school (Table 11). This would show the need for continued explicit teaching of the technologies used in lockdown, in post-lockdown classes. Matching the individual results in spreadsheet data, indicated a slightly higher proportion of students who believed they had sufficient skill and technology, also believed they learnt better from home than at school. Age did not appear to be a significant factor. The practical exercise in needing to use technology did yield some benefits in technological skills learning. Almost half the respondents believed their technology skills had improved while learning from home, though 26.3% asserted only "maybe" (Table 11).

Given they now understand the need for technology and have had to use it consistently, there may be more motivated eagerness to learn with technology in face-to-face environments

Conclusion

The difficulties experienced at SHS were seen mirrored in other schools worldwide. The Winter edition of the Australian Educator published reports from teachers across Australia, explaining the technology difficulties at their schools; The very first mentioning internet blackspots for country kids (Australian Education Union, 2020, pp. 17-19). The Wall Street Journal reported that "The problems began piling up almost immediately. There were students with no computers or internet access. Teachers had no experience with remote learning. And many parents weren't available to help" (Hobbs & Hawkins, 2020). The same inequity in access was occurring in America as in Australia.

While over 90% of the Singleton High School population had access to the internet and devices, a far higher percentage than would have been suggested by the ABS figures for a low SEO area, the technology was not equal and not adequate. Once there was a need for everyone to use technology at home, the previously acceptable resources could not cope, and in many cases neither could the parents or students.

What this global pandemic has done, is show once again that the least amongst us are currently last when it comes to accessing the opportunities they need to succeed. Students with no access to the internet or internet enabled devices, have the potential to be left behind in a schooling 'world' which required remote access and assumed that it was affordable and available to all, if not already possessed. The response of teachers has shown us, once again, that the profession has an opportunity and responsibility to work for the less fortunate and if not provide them with what is missing, doing their best to provide a workable alternative. In this, educators can lead by example, and follow the example of the great teachers who have gone before, acting to eliminate or at least reduce inequity.

Moving forward educators will have to understand two important points which will have to shape how they teach. Just because students have access to technology, or are 'tech' consumers, does not mean they are 'tech' creators or digitally literate (Duggan, 2020, pp. 14-15). Furthermore, students may not be digitally literate, because they actually don't have easy or reliable access to technology. School teachers will have to explicitly teach the skills they want students to have and be ready with differentiated lessons for those without home access.

This post lockdown period may provide an opportunity to improve the students' use of technology at school. Given they now understand the need for technology and have had to use it consistently, there may be more motivated eagerness to learn with technology in face-to-face environments where it can be more readily supported. Teachers also would now be more familiar with a variety of technology, such as Canvas, which was only introduced last year, and can see how useful and usable it is, consequently utilising it when it provides a an appropriate pedological application. TEACH

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