Left to their own devices: the everyday realities of one-to-one classroms

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Left to their own devices: the everyday realities of ‘one-to-one’ classrooms

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Abstract: The past decade has seen the expansion of personal digital technologies into schools. With many students and teachers now possessing smartphones, tablets and laptops, schools are initiating ‘one-to-one’ and ‘Bring Your Own Device’ (BYOD) policies aiming to make use of these ‘personal devices’ in classrooms. While often discussed in terms of possible educational benefits and/or organizational risks, the actual presence of personal devices in schools tends to be more mundane in nature and effect. Drawing upon ethnographic studies of three Australian high schools, this paper details ways in which the proliferation of digital devices has come to bear upon everyday experiences of school. In particular, the paper highlights the ways in which staff and students negotiate (in)appropriate technology engagement; the ordinary (rather than extraordinary) ways that students make use of their devices in classrooms; and the device-related tensions now beginning to arise in schools. Rather than constituting a radically ‘transformational’ form of schooling, the paper considers how the heightened presence of personal technologies is becoming subsumed into existing micro-politics of school organization and control.

Keywords: *school; digital; classroom; computer; BYOD; student; ethnography; laptop; iPad; smartphone*

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INTRODUCTION

The past decade has seen an increasing prevalence of personal digital technologies across school campuses. In part this arises from mass levels of smartphone, tablet and laptop ownership amongst students and teachers. By recent reckoning, 80 per cent of 14 to 17 year olds in Australia use a smartphone (ACMA 2016), mirroring similar majority rates in Europe and North America. The fast changing nature of personal technology ownership and use has certainly altered the ways in which digital technologies are now being appropriated within education. In particular, schools are moving away from institutionally-provided ‘shared’ forms of technology use and, instead, developing ways of utilizing the individually-owned forms of computing now being brought into school.

Many commentators therefore view the use of technology in schools as changing rapidly in nature and form. In particular, most schools now boast a ‘ubiquitous’ state of access to digital technology - i.e. the school ensuring that every student and teacher has a computerized device. Schools are initiating official ‘one-to-one’ policies in efforts to guarantee that personal technologies are on hand to support teaching and learning. Often this involves ‘managed’ programs where students’ families are required to purchase or lease a school-approved device. Recently, this has expanded into expectations of BYOD – i.e. ‘bring your own device’. Some schools even are beginning to develop expectations of ‘Bring Your Own Devices’ (plural), ‘Bring Your Own Connectivity’, ‘two-to-one’ and ‘three-to-one’ computing – all conveying expectations of students, teachers and administrators attending school with an array of personally-provided devices and mobile connectivity.

Such developments clearly have implications for the core tenets of schools and schooling – from the regulated nature of school time and space, to the bounded nature of the information and knowledge that is accessible while in school (see Selwyn 2003, Philip & Garcia 2015). Some commentators have been keen to herald these developments as transforming contemporary schooling. For example, one-to-one access has been celebrated along lines of democratizing classroom processes, diversifying pedagogical practices and fostering forms of student-centred learning (see Ng 2015, Janssen and Phillipson 2015). As is often the case with educational technology, a number of less desirable institutional ‘risks’ and ‘challenges’ have also garnered attention in terms of the technical and infrastructural challenges of implementing such policies (Bruder 2014, Haßler *et al*. 2016). In addition, concerns continue to be raised over ‘inappropriate’ uses of devices amongst students for bullying, sexting, cheating and various other anti-social and transgressive acts. Overall, the increased presence of personal technologies has tended to be framed in terms of significant ‘transformational’ changes to the nature of school … be this for better or for worse.

RESEARCH AIMS AND METHODS

This paper explores how these assumptions and claims are being played out across real-life high schools – i.e. schools that might be considered ordinary (rather than exceptional) sites of technology use. Drawing upon in-depth ethnographic studies of three such schools, the paper details the extent to which the proliferation of digital devices is altering everyday educational experiences for students and staff. The three case study schools were government-run high schools catering to students aged 11 to 18 years in the state of Victoria, Australia. These schools were chosen to provide contrasting institutional contexts (see Table One).

	School characteristics	Location
Mountview	1170 students, 97 teaching staff, 51 non-teaching staff 20% language other than English 36% progress to university Students encouraged to bring their own network compatible digital devices into school	Rural area in East Victoria, with the school bi-located in two small towns (populations: 13700 and 4500) Median household income: $900/weekly 10.4% unemployed
Lakeside	1190 students, 102 teaching staff, 27 non-teaching staff 30% language other than English 65% progress to university Students required to bring approved network compatible laptop computers into school	Inner-city suburbs, Melbourne Median household income: $2200/weekly 3.7% unemployed
Middle borough	360 students, 31 teaching staff, 17 non-teaching staff 43% language other than English 66% progress to university Students required to bring network compatible iPads into school	Outer-city suburbs, Melbourne Median household income: $1285/weekly 5.7% unemployed

Table one. Details of the three case study schools

As with all ethnographic research, our approach was deliberately exploratory. As Paul Atkinson reasons, if there is ever a specific 'research question' for ethnographic investigation then it is simply: 'What is going on?' (2015, p.65). Thus in the specific terms of this paper we were interested in asking simply: 'What is going on in schools with one-to-one devices?'. The remainder of this paper examines the 'one-to-one' presence of personal digital devices through extended fieldwork within the school settings. This fieldwork saw three of us (Nicola, Selena and Scott) take residence in Mountview, Lakeside and Middleborough over a twenty-five month period. This involved the research team doing all the things implicit in classroom research and school ethnography – including over 300 site visits, 500 hours of observations, interviewing and general 'hanging around', participating in lessons, meetings and other school activities, taking photographs, making video and sound recordings, as well as exploring the schools' online systems and other digital spaces. These activities generated a substantial corpus of empirical data, only a fraction of which is presented in this paper. Suffice to say, the presence of personal devices was a key element of all three schools and an aspect of technology use that merits specific consideration.

Theoretically, this paper seeks to contribute to the growing body of socio-technical analyses of digital technology use in schools (see Selwyn 2012). The starting premise of the paper is that there is no fixed standard form of 'one-to-one' device use *per se*, rather the mass presence and use of personal devices in schools is the result of social actions and social organization. In developing a socio-technical analysis of the enactment of one-to-one device use in Mountview, Lakeside and Middleborough, the

paper therefore pays attention to how students' personal devices were being used in class-time - focusing on the materialities of these activities, their organizational underpinnings, and broader shaping influences throughout the school. Across all these areas of investigation, our analysis takes due account of how classroom enactments of 'one-to-one' were shaped by broader economic, political, cultural and social structures of schooling. Thus we are able to describe the 'one-to-one' presence of students' personal digital devices from a micro, meso and macro level of analysis, thereby giving consideration to a range of factors implicit in local enactments of this technology-related innovation and change.

RESULTS

i) How personal devices were being 'brought' into school

During our period of fieldwork each school arranged students' personal device use in notably different ways. Mountview adopted what appeared to be the most permissive approach to fulfilling its 'one-to-one' ambitions. Here students were directed to bring 'any device' that was compliant with the school's computer network. In contrast, Lakeside had opted for a 'managed BYOD program', with students expected to purchase or lease one of four specified models of laptop (all manufactured by Dell computers). Middleborough operated a tablet program where students could purchase a discounted Apple iPad, or else be loaned a school iPad free of charge during term times. Administrators in all schools saw these policies as sustaining the impetus of a well-funded Federal government program at the beginning of the 2010s - the grandly titled 'Digital Education Revolution'. This policy initiative had supported a 'Netbooks for Schools' program which briefly had demonstrated the feasibility of providing computerized devices for every student. Yet as a senior IT teacher explained, "suddenly the funding dried up, and they stopped it dead ... it meant that schools have had to pick up from where they left off" [1].

Lakeside's laptop program was described in the school prospectus and website as a 'managed BYOD solution'. This was the only of the three schools that continued to take a strong lead from state government advice around student devices. In line with the state government's preference for 'managed' programs, Lakeside's leadership had chosen to favour laptops (rather than tablets) in the expectation that these devices allowed students to 'do more'. Lakeside's Principal and one Assistant Principal had drafted an initial policy with regular advice from an interested "tech-savvy teacher" [2]. This group of staff commissioned Dell as a preferred supplier and contracted the education division of a nationwide electronics retailer (JB Hi-Fi) to manage the program. JB Hi-Fi was judged to have proposed "the best plan in terms of a purchase portal and aftermarket service" [3].

The decision-making behind the other schools' approaches was more speculative. The consensus amongst staff in Middleborough was that their school's involvement in the Federal netbook program had been successful mostly with older students. When the school leadership was faced subsequently with settling on a whole-school preference it was reckoned that tablet computers (specifically the iPad) might stand a better chance of being used by younger *and* older students. Mountview's approach was more protracted. After the cessation of 'Digital Education Revolution' funding, the school first opted to implement a low-cost tablet program that was soon deemed as

inequitable ("we've got a lot of poor people in our community" [4]). This had then prompted recourse to "full open BYOD" [1], thereby sanctioning use of smartphone devices which the school hoped would be more accessible for 'struggling families' …

> *First the kids were encouraged to purchase these really cheap surface tablets. They were only between 150 to 200 dollars for the tablet and we could get those in bulk from the school. But most kids couldn't afford that and a lot of the kids already had the smartphones so that's what led* [school leadership] *to say "Alright yeah, your phone can be a device as well*". [5]

While the over-arching intentions of these 'one-to-one' and 'Bring Your Own Device' policies might appear straightforward, the initial influx of personal technologies into Mountview, Lakeside and Middleborough quickly prompted further clarification and refinement. Once implemented all the schools' one-to-one programs were bolstered by various rules and guidelines that were developed as students begun to bring devices into classes. For example, Middleborough had developed a suite of rules relating to students' iPads. These were set out in full within the school prospectus and website, as well as being restated regularly in newsletters and internal reminders. Students' device use while on campus was restricted to 'education purposes only' and could not involve the use of headphones. More specifically "iPads must be password protected, taken home each night, not taken outside at recess and lunchtimes, have protective casing". It had also been recently decided that students in Years 7 and 8 were required to have two hands on their device when carrying or picking it up. Rulemaking in Lakeside and Mountview was less prescriptive. Nevertheless, students in Mountview were prohibited specifically from playing games while in class, and were expected to use their devices in lieu of paper text-books or writing materials. Meanwhile, Lakeside had instated a 'No Screens' policy that was enforced during recesses and lunch breaks. Unlike the two other schools, Middleborough stipulated that smartphones should not be brought into school. In all three case study schools, stipulations such as these acted to frame the promise of 'Bring Your Own Device' very much as a narrow instruction rather than a broad invitation.

These restrictions were all rationalized within the schools as stemming from particular local circumstances and specific incidents. For example, Lakeside's 'No Screens' policy was said to have arisen from concerns amongst library staff over what was perceived as groups of male students 'excessively' playing 'anti-social and unintelligent' [6] computer games (recounted by the students concerned as Minecraft, Halo and Call of Duty). Similarly, Middleborough's list of specific protocols and prohibitions was triggered by some students' 'misuse' of personal devices during the Federal government netbook scheme [7]. Mountview's 'no paper' rule was driven simply by motivations to reduce expenditure in light of reductions to the school's general budget.

While each school required all students to bring a device, this was not practiced (or enforced) consistently. During our time in the schools, the presence of devices varied between classes, corridors, playgrounds and other communal spaces. For example, Lakeside's 'No Screens' policy meant that personal devices were not seen commonly outside of classrooms. In contrast, nearly every classroom was replete with students' devices and associated paraphernalia. As noted during an initial walking tour at the beginning of the school year: "every table has five or six laptop cases of all colours,

laptops either open or closed. lots of cables and chargers. There are a few books, pens and pencils. But mostly *heaps* of technology" [8].

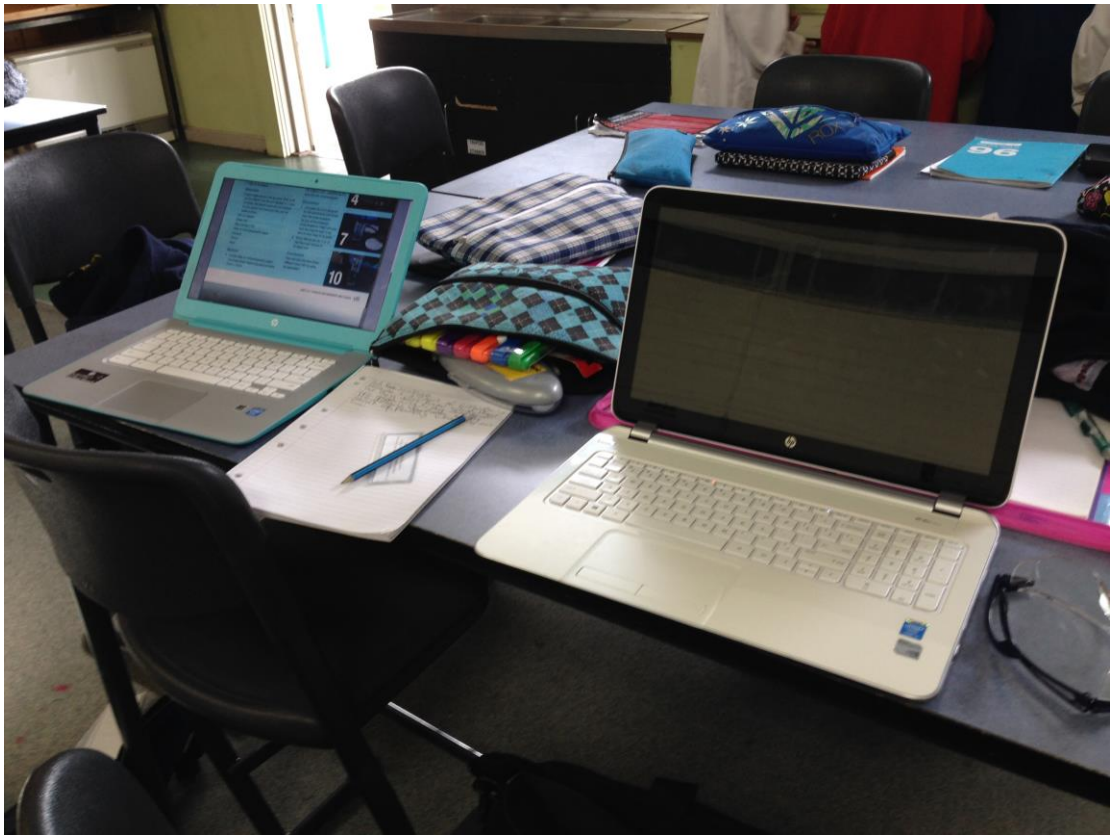


Figure one: Desks with devices, cases, chargers and connectors (Mountview)

Students' devices were well evident when walking around the Middleborough campus. The school's classrooms were notable for the number of iPads and iPad minis strewn on desks. The school's encouragement of out-of-class tablet use (at least when 'inside' school buildings) had prompted newly arranged communal areas and spaces for device use. Many students could be seen carrying iPads, with students who did not appear to have devices often carrying iPad minis. These smaller devices were favoured by some students on the grounds of portability and convenience being only a little larger than smartphones. As a senior teacher observed, in spite of official school policy the presence of smartphones in classtime was also tolerated:

> [Smartphones] *are banned, but students sneak them in anyway. They're supposed to leave them in their lockers but they don't. Sometimes we see them walking down the corridors talking to someone on their phone. They know they're not supposed to do this.* [9].

Despite Mountview's free-for-all approach, the presence of devices throughout the school was less consistent, with students' adherence to the official requirements to bring a device acknowledged by some staff as "dodgy" [10]. Outside of class, many

students could be seen with headphones on tapping smartphones – mainly cheap Android phones and occasionally more expensive iPhones. In-class use of devices was less widespread. As one teacher bemoaned: "you will go in there and over 90 per cent of the kids will have a device in that classroom. Then you can go into other classrooms and 90 per cent of students *don't* have a device" [11].

ii) The use of personal devices for teaching and learning

Devices were a prominent aspect of how many lessons were conducted in the three schools. We observed (and occasionally participated in) what could be described as 'best practice' examples of trouble-free device-based teaching and learning. In these classes, technical problems were minimal, students often worked with one another, moved around the room, and generally appeared enthused and 'engaged' in teaching and learning tasks. These lessons might not have all been wholly successful, yet certainly embodied many of the benefits associated with one-to-one schooling. One of the Mountview Principals described a 'memorably successful' device-based class:

> *Year 9 [social studies] classes … the vast majority of kids had machines with them. They were all using them, sometimes they were sharing them and the kids were helping each other. There was one or two appointed experts in the class supporting the other kids to sit down and load other Apps to be able to perform the learning tasks that the teacher was wanting. The work was all uploaded onto Compass* [school's learning management system] *… kids were accessing it at their own pace and time.* [12]

Instances such as these remained 'memorable' primarily because they surpassed the typical pattern of device-based lessons in the three schools. Usually classes were focused more on the logistics of engaging classes with school work rather than stimulating individualized learning *per se*. Of course, a central promise of one-to-one computing is that students take responsibility for arranging and directing their own learning regardless of the limitations of school work. As such, we remained alert to the possibility of devices allowing individualized learning to occur 'under the radar' of teachers, set classes and expected outcomes. Yet these forms of what Mimi Ito and colleagues (2010) describe as student-driven 'geeking out' were certainly not raised in the conversations we had with students or during our more formal interview discussions. Only rarely, if we had spent long enough hanging out in a class, might we observe a student actually moving beyond the prescribed content to 'learn for themselves'. As these field notes from a Year 11 Woodworking lesson in Lakeside recount:

> *I notice a boy off to one corner playing around on Facebook – the interface is recognizable even from a distance. I approach him and ask him about what he is doing. He looks surprised. I feel like the Internet Police all of a sudden. I say I'm curious about how students work around school regulations, what tactics they use to challenge the rules. The boy relaxes a little and tells me he is looking for visual art sites while he waits for the teacher to help him with his woodwork. He is working on some art projects in his spare time and wanted to check out what local professional independent artists are doing. He has nothing to do presently other than surf the internet.* [13]

We found little evidence of students being deliberately let loose with devices in the manner just described. Instead teachers' preferred mode of device use across the three schools was getting students to engage with predetermined whole-class tasks. Here, most teachers conformed to the 'one-to-one' arrangement with few lessons deviating from the model of each student using their own device. Only rarely did we observe teachers encouraging students to work together in pairs or groups around shared devices.

This solitary model of working was reckoned by teachers to result in ready evidence of students' work, particularly via the analytic functions of individualized different applications and systems that the students were using. Some teachers would base lessons around the use of applications that would allow them to monitor (and on occasion take control of) students' devices. The 'NearPod' application, for example, was used by a few Lakeside teachers to access detailed real-time reports and usage statistics of each students' device use. As one substitute teacher reasoned, when working with this particular application "students can't escape you anymore" [14]. As another teacher put it, having the students use this application on their devices allowed him to:

> … *monitor what students are doing in real-time. You know how part of classroom management means walking around the class to keep students on task? Well I don't really have to walk around with this application to be able to know what they're doing. I can see what students are doing as they're doing it. If they're not on task, I'll know and I'll call them on it*. [15]

One of the prominent teacher-related benefits of personal devices, therefore, was to render students' work visible and enforceable. On a rudimentary basis, teachers found it relatively straightforward to conduct visual sweeps of a class of thirty students to gauge who was (and who was not) using their device. Many teachers were content to presume that having a laptop lid open or swiping a screen was an indication of 'work' of some sort. One interesting consequence of this was the heightened importance of students' gaze within the dynamics of classroom management. In many lessons, students looking toward their screens relatively quietly could safely assume they would be left alone. Conversely, teachers would regularly cajole and reprimand students for looking up, turning around or leaving their seats.

Besides these disciplinary benefits, students' actual work in these classes largely appeared routine and unremarkable. Of course, we also observed (and participated in) unproductive classes that did *not* involve any device use. Yet device-centred classes were certainly no more industrious or productive than device-free classes. Indeed, even teachers who were technologically confident and well-resourced were hampered regularly by the (im)practicalities of whole-class device use. This is evident, for example, in our notes from an 'accelerated learning' class in Lakeside (for what was deemed 'gifted and talented' students). While ostensibly a successful session of video rendering …

> *… the longer the lesson progresses, the clearer it is how little progress is being made. Students are getting frustrated, and the teacher resorts to*

> *projecting a countdown timer from his laptop to focus their efforts. The class teacher later explains that while many of the students are skilled with using technology, they tend to forget the most basic aspects like connecting cables. For this task, many have used their phones to make their films but have no way of transferring the data to their laptops because they do not have the required USB cords. Others misjudge how long it takes to upload data from digital devices. This teacher suggests that the only guarantee for a successful class is to 'stick to basic and simple' tasks - "like pulling images off the internet and making a project that way".* [16]

As the excerpt suggests, lack of productivity often stemmed from the variable capabilities of devices being brought into class. Students often found it difficult to type at length on smartphones and tablets. Many devices were not functioning particularly well. Cracked screens, missing keys and slow processing speeds were common complaints from students and teachers, prompting one Mountview teacher to dismiss BYOD classes as "lowest common denominator" [17]. Yet, there was also a sense that even a classroom full of fully-functioning devices would fail to mesh well with the common format of a 50 minute directed school lesson. As another teacher put it, lessons with devices "don't seem to flow" [18]. Some staff attributed this to a lack of standardization associated with personal device use. As one science teacher described:

> *The productivity is not great. 50 per cent of the kids at any one time are disengaged, on their phone doing something else and they do some work but it's all kind of happening invisibly, it's all in cyberspace and so on. And there's a danger that that becomes just a mode of operation and there's no explicit teaching, there's no time pressure and everyone's in a different spot or everyone's doing a different task … everyone's doing something different so there's sort of no reason to it*. [19]

This teacher talked of deliberately introducing artificial 'pressures' in his classes in an attempt to "keep people being more productive". He described "chunking down the work I want them to do" in an effort to ensure that every student was working on the same task, often projecting a large 15 minute digital countdown "ticking away" on the classroom whiteboard, at the end of which "one of you will be randomly selected to report to the class" [19] (see Figure Two).

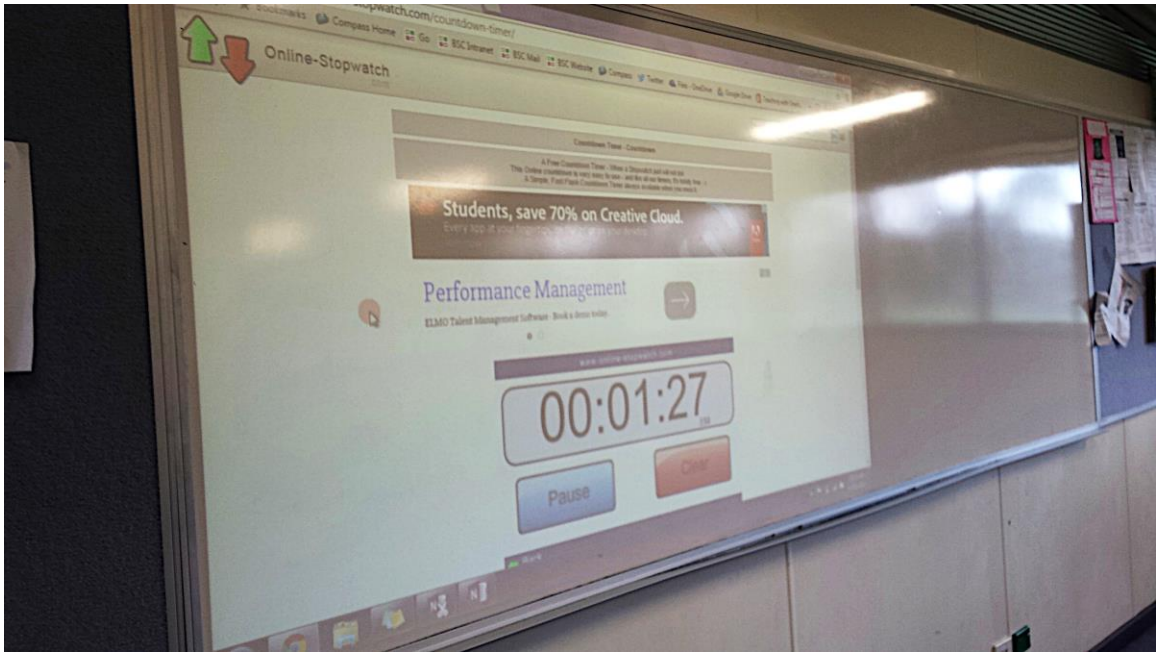


Figure two: Projecting a countdown onto the classroom whiteboard to direct students' device use (Mountview)

iii) Other uses of personal devices

Of course, no teacher is able to enforce complete compliance and full productivity across a class of thirty students. As noted above, students' in-class device use was not a guarantee of immersion in their work. This is not to say that students were constantly using devices to disengage from classwork. Instead, students' off-task use of devices in lessons was more complex than simply 'working' or 'not working'. For example, devices were often used by students in ancillary roles. These practices were not disruptive or disengaged *per se* but part of a multi-tasking mode of working. Laptop-using students would work in class with an array of open Windows that were work-related *and* non-work related. These different windows would be flicked between from tab to tab. Similarly, students using smartphones and tablets would swipe between a variety of different Apps that often included work-related applications such as online dictionaries, translators, calculators, Wikipedia and messaging tools. In most lessons we observed, a few students would be seen using additional devices for episodic checking and clarification practices. Often this involved little more than checking messages or confirming the time, as the following field notes demonstrate:

> *Year nine art lesson – what could be described as a 'lively' class – eleven students engaged in various drawing activities, although chatting quietly and idling as much as sketching. A few phones and tablets in evidence on the desks but only one student is actually making any use of a device. Sporadically throughout the 30 minutes of the class he is sneaking looks at his camouflage clad tablet to check the time. Although it is around ten minutes before noon*

> *and coming up to the lunch break, the hands of the analogue clock hung at the back of the classroom are stuck on 4.25. However, the student doesn't seem aware of this piece of old technology (and nor did it seemed that anyone had looked closely at it for some time). As the time approaches midday he begins announcing each minute to nearby classmates, and by around 11:56 at louder levels to the whole group. The teacher and students seem to take these interruptions in good spirit, and as soon as the bell goes for lunch the performance is complete.* [20]

Whereas timekeeping, spell-checking and basic calculations might be considered relevant to studying and school-work, other instances of device use appeared to be more 'off-task' in nature. Smartphones, tablets and laptops enabled various popular leisure practices that students would pursue during our time in the schools. As students become familiar with our presence they would become less guarded (and sometimes more demonstrative) in these uses. For example, Year 7, 8 and 9 classes in Lakeside were notably enthusiastic places for games playing and watching gaming videos (Figure Three). In Mountview, Year 9 and 10 boys (and a few girls) often passed the time watching anime videos, usually managing to work around the school's efforts to block the genre through network filters. All three schools saw students engaging in regular (but rarely constant) uses of social media. This tended to be tolerated by staff, many of whom also used smartphones to check their own Facebook and personal email accounts between classes. Students' enthusiasm for social media was rationalized by some teachers as "the new way to pass notes I guess" [21].

The exact nature of students' off-task uses varied between different schools, classes and times of the day. Commonly, however, these activities were relatively surreptitious and subdued:

> *We are in a large teaching room a converted gym. This is meant to be a combined class, with a Year 10 IT class sharing the room with a Year 11 art class. Despite this, the class is very still. There is little noise besides low-level chatter. The art class has definitely wound down – some students are sat around tables working, but the majority are sat around the carpeted floor. Many of these are holding phones, most with ear buds. Pairs and trios of students are idly flicking through screens and occasionally showing each other photos. A few boys are sat on their own. Only a few boys have laptops or tablets, and these are either playing games and watching videos of games. For a class that is so clearly not doing much work, the atmosphere is subdued and low-energy.* [22]

As these field notes suggest, a prominent in-class use of devices was listening to music. Staff would often question the usefulness of this – as one teacher put it, "does it block chitter chatter and allow them to focus … or is it for their enjoyment?" [11]. Nevertheless, during the six semesters that we spent in the schools, the presence of ear buds became a more embedded and less contentious part of the schools' routines, even within Middleborough with its official 'no headphones' rule.

Another recurring off-task practice across all three schools was the use of personal devices for family contact. Lessons were punctuated sporadically by students

responding to text messages and very occasionally taking calls. These communications almost always were initiated by parents and carers. Policing this practice was acknowledged as an on-going and largely unresolved problem for school authorities. As a Middleborough Assistant Principal described, "the parents think they can call their kids at any time, even during class. They don't bother going through us. They call the student directly. Sometimes students call their parents and tell them they're sick and want to go home. We've had the occasional student go home without telling anybody" [23]. All three schools were reluctant to impose outright bans, but felt obliged to 'discourage' parents and students from contact [24]. School newsletters and websites would carry reminders and warnings after notably disruptive incidents (see Figure Four). All told, an underlying concern for school leaders and administrators was that student devices were allowing families to 'bypass' official systems - "they've got to go through the correct channels" [24].

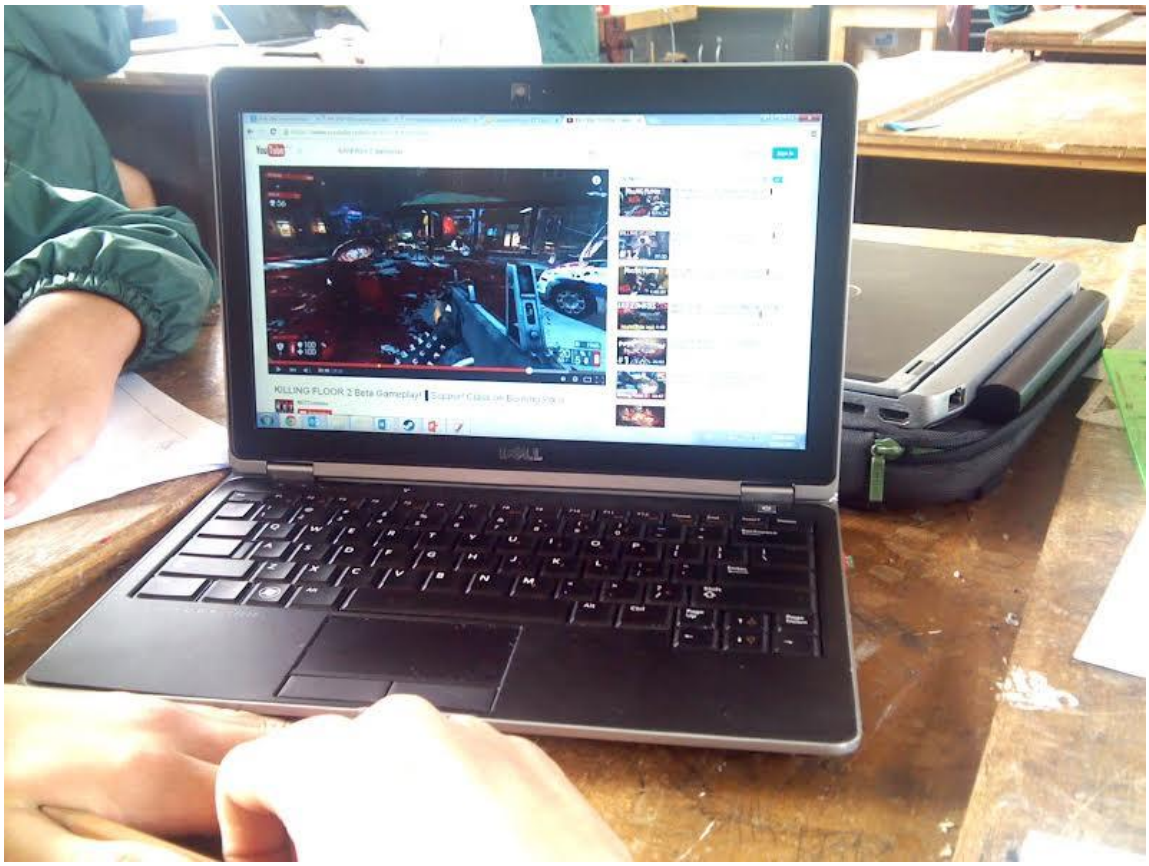
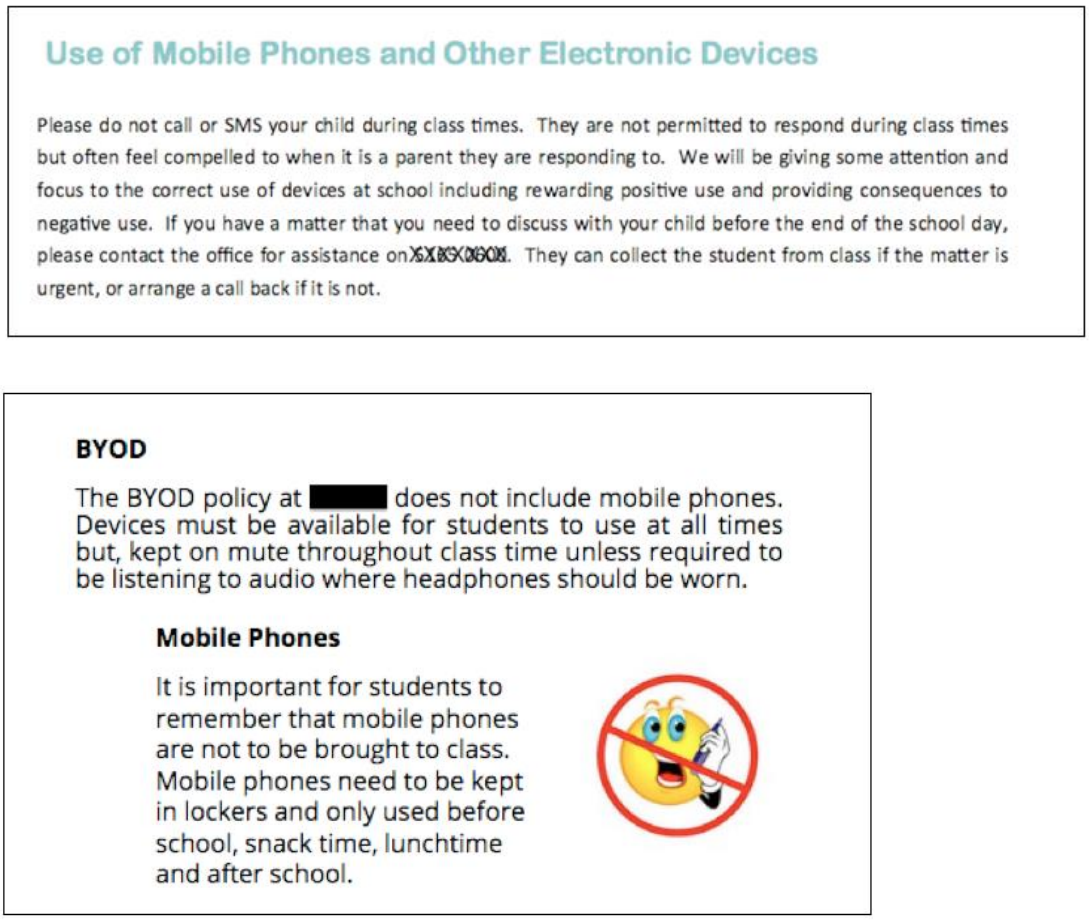


Figure three. Year 9 – Killing Floor2 video on YouTube (Lakeside)



Use of Mobile Phones and Other Electronic Devices

Please do not call or SMS your child during class times. They are not permitted to respond during class times but often feel compelled to when it is a parent they are responding to. We will be giving some attention and focus to the correct use of devices at school including rewarding positive use and providing consequences to negative use. If you have a matter that you need to discuss with your child before the end of the school day, please contact the office for assistance on [redacted]. They can collect the student from class if the matter is urgent, or arrange a call back if it is not.

BYOD

The BYOD policy at [redacted] does not include mobile phones. Devices must be available for students to use at all times but, kept on mute throughout class time unless required to be listening to audio where headphones should be worn.

Mobile Phones

It is important for students to remember that mobile phones are not to be brought to class. Mobile phones need to be kept in lockers and only used before school, snack time, lunchtime and after school.

Figure Four: School efforts to curtail parental use of phones and other devices to engage with students (Mountview newsletter August 2015, Middleborough newsletter April 2016)

iv) Consequences of having personal devices in schools

In many ways the presence of devices in Mountview, Lakeside and Middleborough could be seen as having a minimized impact on the core processes of school. Classes progressed very much 'business as usual'. It might be argued that students were perhaps a little *less* outwardly disaffected and disruptive, although device-based classes were still punctuated by backchat, mild resistance, time wasting and other non-digital displays of dis-engagement. Similarly, there was evidence around the schools of verbal and physical aggression, graffiti, low level vandalism and other 'traditional' forms of resistance. These were not wholly plugged-in and 'digitally immersed' cohorts of students. Yet the presence of hundreds of digital devices had clear implications for the everyday conditions in each school. One small but immediately noticeable outcome were changes to the materiality of classrooms. Some of these changes were *ad hoc* and homespun. For example, a few teachers had small baskets and boxes on their desks where temporarily confiscated devices could be

stored. Spaces outside of classrooms – such as in the library areas and communal student areas – had dedicated ‘laptop zones’ and ‘device-only’ desks.

Another noticeable outcome was student disgruntlement over the lack of accessible power points where devices could be recharged. Students would become noticeably reluctant to work on a personal device that was nearing the end of its battery capacity. Conversely, school leaders in the three schools were unable and/or unwilling to allow students to recharge devices in school. Very few classrooms had more than five or six power sockets, and school leaders were quick to express concerns about the likely cost of recharging hundreds of devices each day. Students in Lakeside were prohibited from bringing power cables into school. Some teachers would improvise by taping extension cables onto carpets and under student desks (Figure Five). Toward the end of our fieldwork some classrooms were refurbished and reequipped with additional power points. Significantly, in Lakeside these power sockets were positioned strategically in difficult to access and/or observable parts of the rooms (e.g. in the centre of ceilings or under whiteboards by the teachers’ desks – see Figure Six).

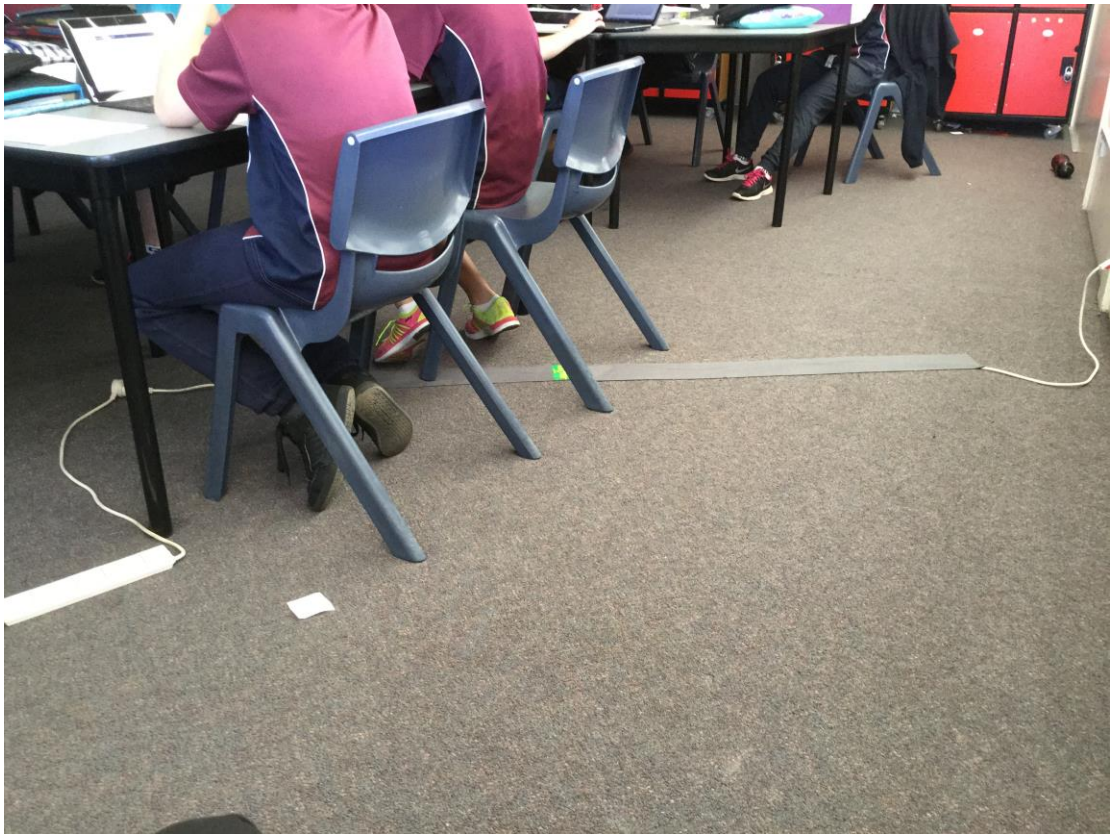


Figure Four. Improvised power supply for students in Mountview classroom.

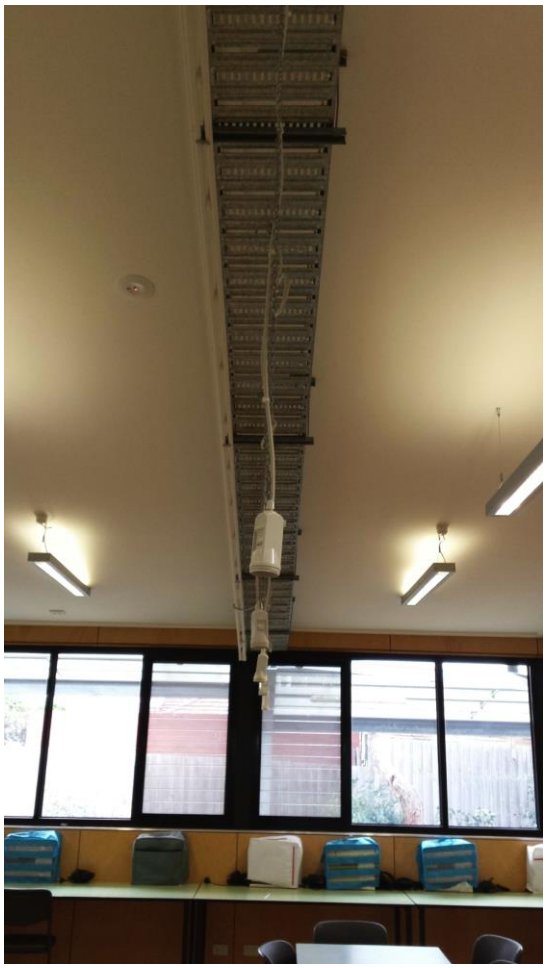


Figure Five. Newly installed power sockets in refurbished classrooms. These are located in ceilings and under whiteboards, meaning that they can only be used in full sight of a teacher. (Lakeside)

Besides these heightened tensions over re-charging, another notable consequence of one-to-one and BYOD was the regular device 'wrangling' that teachers had to perform whenever they wanted students to start or finish making use of devices. Many lessons we observed followed a common routine where the opening five minutes or so were taken up by protracted negotiations between teachers and students regarding devices. These performances were often reprised in the closing minutes of a lesson. Classes would start with teachers repeating well-worn mantras along the lines of: "Screens down, ear buds out"; "Dip your screens"; "Turn over your devices"; "Phones on desks". Classes that were planned to *not* involve device use almost always involved an initial period of device suppression. Teachers spoke of a regular "first five minutes of fire-fighting" [25] - cajoling, confiscating and chastising, after which "I'll often have a row of about five or six phones on my desk" [24]. These altercations were a common feature of all but the most draconian of teachers' classes (where students tended to meekly remove their devices out of sight without prompting). Lessons that *were* intended to make use of devices were similarly truncated. As a teacher in Lakeside described:

> *It's the first 10 minutes of the period you're constantly lending out laptops to kids, and it's the last 10 minutes of the period when they bring them all back again. And then you've got to return them to get them ready for the kids going to borrow them in the next period. So that can take a big chunk of time out of your day, just doing that.* [26]

As these instances suggest, personal devices were certainly a source of various low-level tensions within the school communities. Sometimes these antagonisms were enacted between different groups of students. For example, one favourite pastime amongst some Year 8 and 9 boys in Middleborough was to 'lock down' classmates' iPads so they could not be operated. Often this involved little more than keying in deliberately incorrect passcodes when owners where not watching, thereby locking the device for a period of time. Nevertheless, these low-level annoyances were considered to be amusing diversions in the school day. In Mountview, girls in Years 7 and 8 went through a phase of not bringing in personally owned devices. It transpired that this was due to a perceived spate of "Year 9 girls stealing things from our bags, deodorant, perfumes and that … phones … it just makes us feel unsafe bringing smart phones" [27].

The most obvious tensions lay between students and teaching staff. Teachers bemoaned "the constant battle with kids doing the wrong thing on their devices" [28]. This centred regularly on students' refusal to bring and/or get out devices, running battery power down or feigning an inability to access required applications. Some students took offence at having their device use impeded. As a student in Middleborough boasted, "why would I allow [teachers] to take something this expensive just because of their own problems?" [29]. Indeed, many staff recognized the heightened tensions associated with regulating students' personally-owned devices: "You can't [demand compliance] when it's their own stuff … It doesn't work. They're so protective of it" [28]. It was also acknowledged that staff concerns related to maintaining professional status and authority:

> *A lot of staff just lose the plot. "Oh all these different devices, we don't know what to do". Instead of listening to the leaders like myself saying, "you don't*

> *need to have an absolute specific program, let the kids decide what they need to have to do the work. It doesn't matter what they do the work on, as long as they get it done". They want control all the time. So one of the factors there is control. That's a big issue. The teachers just want control all of the time, they won't let go*. [1]

These tensions reflected the close relationship between personal devices and the micro politics of classrooms, and specifically the role of personal devices as a site of struggle and conflict between students and schools. During class time, devices were a focus for various forms of low-level resistance. Students relied on elaborate ruses to conceal unauthorized device use - obscuring ear buds with hair, running cables up shirts and jumper sleeves, piling books on desks, minimizing screen contrast to appear blank. In Lakeside it was reckoned that "everyone secretly uses their phones in classes" [30] through one-handed texting, having devices set to silent mode and so on. All told, these rudimentary tactics were often surprisingly successful.

Other students would simply use their devices in plain sight, visibly inviting a reprimand which often was not forthcoming. One teacher explained, "they just don't care" [28]. This brazenness was confirmed by students. As one Mountview student described, "if someone does something inappropriate on their device, and the teacher decides to take the device off the student, they just refuse to give it to them, argue or blame it on someone else" [31]. Indeed, many staff and students maintained tacit truces where unauthorized use of devices would be permitted until they proved too disturbing. Students acknowledged, "some teachers don't care if you have your computers out, but others really do" [32]; "a fair few teachers are not fussed about it" [33]; "literally the teachers don't care" [34]. Some students would carefully schedule their technology use "around teachers who also do not agree with the rule" [35].

While most students were keen to avoid direct confrontation, a few were clearly using their personal devices as a site of resistance and conflict with school. For example, while Lakeside provided standardized devices to students, various aspects of these devices could be configured by students – such as screensavers, backgrounds and other 'personal system preferences'. This made a student's device a potent site of self-expression. At first glance, our attention was drawn to the device depicted in Figure Seven by the short-cuts to applications such as Spotify which wrestled for attention amongst the virtual 'Post-It' reminders and 'to-do' lists emanating from the school's learning management system. More telling, however, was the student's self-designed desktop background. This was a wallpapered message in faux-Hebrew lettering, intended to reflect the student's ethnic background - "I'm Jewish. I think it's funny" [36]. This schoolboy humour continued with an inverted message that the design conveyed to any patrolling teacher peering over the laptop from behind.

Figure seven. Year Eleven student device displaying self-designed wallpaper, school reminder notes and various open windows (Lakeside)

Device-related tensions were also apparent between students the schools' technical staff. These issues were not manifest during class times but were of concern for the schools' technical staff who tended to be tucked away in window-less rooms in far-flung sectors of the school campuses. These staff were responsible for a range of technology-related work within the schools, including maintenance of hardware and software infrastructures, ensuring that school networks were running, monitoring use of school systems and generally ensuring that IT functioned. The influx of student devices had undoubtedly complicated the work of technical staff in the three schools. In particular IT technicians (only a few individuals in each school) had become inundated with students wanting personal devices maintained and fixed.

This was clearly a cause of frustration among technical staff. Middleborough's technical team of one fulltime and one part-time technician had blocked off four hours each week to deal with students' devices, and had also enlisted "a few geeky kids" [37] who were entrusted with triaging some of the straightforward requests for assistance. The situation in Lakeside was a little more complicated, with the private contractors responsible for overseeing the school's technical support reluctant to be seen relying on unpaid student labour. The small technical room in Lakeside was crowded with benches of malfunctioning laptops that had been handed in by students for repair (see Figure Eight). While these were generally low-level problems (most commonly arising from downloaded viruses), backlogs of dozens of devices were evident whenever we visited the technicians' room. Technical staff in Mountview faced similar problems, exacerbated by the variety of devices that students were bringing into the school. Here, technical staff struggled to maintain boundaries

between their professional responsibility to maintain ‘school IT’ and personal inclination to try to support students’ education:

> *A lot of students come in to ask for my help and I’m not obliged to help them. I still do because that’s the right thing to do, you can’t really deny a student for helping small issues to get them back on track … but I had a flood of students come in to me with their phones and say “Hey look my phone’s not working”. And I say, “Well look sorry guys, I don’t fix Telstra* [Australian telephone network] *stuff, you know, I fix the devices of the school … With [school-owned equipment] it’s simple I can pull apart a computer completely, do whatever I want to it, and it’s fine. But a student’s one, we wouldn’t ever dare open it up because if something was misplaced or not put back in the right way then we can be held accountable for any damage*. [38]

Figure Eight. Backlog of student devices waiting to be fixed by JB Hi-Fi technicians (Lakeside)

DISCUSSION

Our research differs from most other studies of one-to-one and BYOD in that it has not focused simply on known instances of ‘best practice’ or successful use. One central observation of this paper is that personal devices (as with any educational technology) impact on *all* aspects of schools and classroom life, not just the occasions when students are engaged in learning activities and immersed in their studies. Indeed, the use of personal devices is shaped considerably by pre-existing structures of school and schooling. These range from the highly bounded nature of school ‘time’

and school ‘work’ to pre-established (unequal) social relations between students and staff. In particular, the paper highlights the intensely negotiated nature of personal device use, with students continuing the intimate but ordinary ways that they make use of their devices elsewhere in their lives (such as listening to music, playing games, and checking social media) in forms that do not significantly interrupt the classroom context. As such, rather than constituting a radically ‘transformational’ mode of schooling, our investigations illustrate how the mass presence of personal technologies quickly becomes subsumed into existing conditions and arrangements of school organization and control.

Before we consider the implications of this paper in earnest, there are obvious limitations to our study that should be acknowledged. Firstly, this paper is focused on three case-study schools. As with all qualitative research, we make no claims for the generalizability of our analysis but would certainly consider our accounts to be ‘trustworthy’ (Guba 1981). In particular, we have striven to produce accounts that are *credible* (having been reviewed and commented on by our key contacts in each school), leading to the development of main points that are *transferable* to other high school settings (at least in comparable Anglo-Saxon systems such as the US, Canada and the UK). Secondly, this paper is concerned mainly with what takes place within classrooms**.** The paper therefore has little say about device use in students’ homes, break times, before/after school. This was a deliberate decision on our part, given the surfeit of recent work that has been carried out on young people’s uses of personal media devices at home and at leisure (e.g. Ito 2010, Boyd 2014). As such, there are clearly many additional aspects of one-to-one schooling that need to be investigated further.

These limitations notwithstanding, there is much that can be taken from our investigations. Above all, it is important to recognize the ordinary and often mundane nature of device use in schools and classrooms. The ‘novelty effect’ (Philip and Garcia 2015) that was associated with personal devices in schools during the first half of the 2010s had certainly faded in our three schools. Whereas school leaders and teachers now waxed lyrical about newly acquired 3D Printers and ‘augmented reality’ technologies, the presence of students’ personal devices provoked no such enthusiasm or wonder. Instead, laptops, tablets and smartphones were now routinized aspects of school procedures at Lakeside, Mountview and Middleborough. As such, students’ device use was certainly not an individualistic free-for-all. Instead, in many instances, device use was highly ordered and patterned - determined through dominant aspects of the social organization of school such as rulemaking, hierarchical relations between teachers and students, material arrangements of classrooms and spatio-temporal organization of the school day. Viewed in these terms, then, the implications of one-to-one in Lakeside, Mountview and Tower High were understandably constrained within the day-to-day ‘business’ of schools and schooling. Far from being a source of substantially different practices, the one-to-one presence of personal digital devices seemed largely to support the reinforcement of established ways of ‘doing’ school.

This continuation of the *status quo* was certainly evident in terms of how devices were being used for teaching and learning. One of the notable silences in our data were sustained accounts of how devices were supporting and/or stimulating students’ learning. Tellingly, many of the ostensibly ‘on-task’ uses of devices reported in this paper relate to school work and ‘study’ rather than matters related directly to ‘learning’ *per se*. Devices are clearly being used in classrooms in order to complete

assignments, coursework, homework and other planned learning activities set by teachers. Devices were clearly integral to students' ability to prepare, write up and then submit their work. These task-based activities are understandably core elements of the 'job' of being a school student, but have little correspondence with the dynamic practices that often drive enthusiasms for the highly social, collaborative and connected learning potential of digital devices (Ito *et al* 2013). Thus much of what students were using devices for in classrooms related to the rather mundane practices that are required to be 'successful' at school, not least taking individual responsibility for completing set work (Blanco and Rodríguez-Martínez 2015).

Certainly, in most classrooms any notion of device-supported 'learning' was framed in terms of 'instrumental' rather than 'inherent' benefits – i.e. with regards to procedural rather than creative or critical outcomes (Griffiths 2012). As such, students were using their devices in ways that replicated a dominant 'transmission' culture of teaching and learning, i.e. what Lawson and Lawson (2013, p.445) characterize as "something that is inherently passive and needing to be stimulated by a teacher". Devices were used most for 'getting on' with set work with little of the spontaneity and/or flexibility of often associated with personal digital technology use.

One welcome difference that devices *could* be said to be bringing to students' class-work was the ability to engage in contemporary screen-based ways of working. This was most noticeable in terms of students' use of devices for multitasking – working between screens and/or between devices, switching between their main task of work, supporting applications (such as dictionaries and calculators), and background checking of messages, newsfeeds and so on. Devices also gave students a means of punctuating lessons with episodes of downtime – listening to music, playing games and generally tuning out for brief periods. Jesper Aagaard refers to this as 'inside-out' activities – i.e. "escap[ing] educational activities in favour of off-task activity", as opposed to the more valorised (but less evident in our research) 'outside-in' practices of "bring[ing] relevant information into the space of the classroom" (2017, n.p). Students' enthusiasms for 'inside-out' practices were tolerated by most teachers, and clearly part of how many students felt most able and willing to work. Rather than being an affront to traditional classroom arrangements, these could be seen merely as modern work practices being imported into the school context. After all, such 'dual use' practices combining personal and professional device use constitutes the basis of how most desk-bound office workers now perform their jobs (Disterer and Kleiner 2013).

Devices in classrooms were also understandably impacting on the work of teachers. Many teachers saw themselves as struggling with the disruptions and disjunctures that devices were bringing into classrooms. These included making sure that students either had (or did not have) a device to hand, as well as maintaining a semblance of student engagement with work. Yet the extent to which device (non)use was significantly upsetting the order of classrooms is questionable. In terms of maintaining discipline, teachers might have been inconvenienced but were certainly not incapacitated by the distractions posed by students' devices. Most teachers were able to direct and dictate students' use of the devices, usually through judiciously turning a blind eye toward practices that were less outwardly disturbing. Moreover, in terms of actual teaching with device-laden classes, most teachers appeared reasonably successful in making sure that students were 'getting work done' through the regimented use of devices. The practice of setting each student the same work to

complete on their device within an imposed time limit might seem to contradict the promises of personalized and self-directed learning that are often associated with digital technologies, yet was clearly a strategy that 'worked' for some teachers. In this sense, devices might have altered peripheral elements of classwork, but "traditional teacher-centred practices were still prevalent" (Peck *et al*. 2016, p.14)

Our time within the three schools also revealed much about the shaping influence of school leadership and management on technology use. 'One-to-one' could not be claimed to have been an area of sustained leadership *per se*. In theory, small groups of leaders in all schools had initiated official definitions of what 'one-to-one' was expected to be – ostensibly setting out terms of reference and any specific organizational restrictions that were felt necessary. Yet in practice the implementation and embedding of personal devices into the schools' processes and practices had proven to be a largely bottom-up, *ad hoc* process. These led to a variety of understandings, practices and modes of use being adopted by different teachers. Yet few of these practices were scaled up in a coordinated or 'leveraged' manner. Instead, how devices were being used and understood throughout the three schools was a site of on-going (re)negotiation amongst individual teachers and their students.

The under-determined nature of device use was also evident in the rulemaking that had taken place in the three schools. The default response to one-to-one within all three schools had been to regulate and restrict - what was referred to earlier as reframing the *invitation* of 'bring your own device' into an *instruction* to 'bring your own device'. This clearly had an 'othering' effect of framing students' devices when used on school premises as not 'their' device *per se*. (see Philip and Garcia 2013). Yet it is worth noting how these restrictions were quickly renegotiated and/or worked tentatively around. For example, none of the three schools had satisfactorily addressed the tendency for students to feel socially obliged to respond to parental interruptions. The 'cat and mouse' arrangements over students being (un)able to recharge their devices during school hours was also clearly an unresolved struggle. All these issues reflect an absence of sustained leadership in the three schools around developing students' uses of personal devices. Personal devices were not the focus of dynamic, responsible planning and policymaking in the three schools. There were few systematic efforts to strive actively to better integrate personal devices into the day-to-day machinations of school life. Instead, students' personal devices were mostly being subsumed quietly into the milieu of school life.

CONCLUSION

These discussions certainly cast a different light on the heightened presence of personal technologies in school, highlighting some pertinent questions that merit further exploration and discussion in future work. Above all our research raises serious challenges to the on-going tendency for digital devices to be discussed in terms of significant school reform and/or radically different 'powerful learning'. Clearly these changes are *not* occurring through the altered circumstances of students bringing devices into schools. At best, our research concurs with recent US studies that conclude that the presence of personal devices in school is associated at best with moderate "incremental change" (Peck *et al*. 2016).

At present, perhaps the most notable change is that of bringing contemporary working practices into classrooms. Students' classwork can be completed while multi-tasking and multi-screening. In the meantime, the bounded world of classroom learning is able to continue, as is the directed, hierarchical nature of schooling. The question that now needs to be addressed is whether these are a satisfactory state of affairs and, if not, how might things be otherwise? With personal technologies set to become even more tightly woven into the fabric of everyday school life, how might students be supported to make more meaningful and empowering uses of their devices? What can school authorities learn from students' informal uses of these personal devices? What implications might the ever-increasing presence of personal technologies have for the forms and nature of 'school' as we enter the 2020s? The need to begin to rethink what 'one-to-one' could (and should) be is clear. Now devices are embedded into the everyday machinations of classrooms what more needs to be done?

ENDNOTES

Numbered attributions to data sources used in text:

1	Interview with senior teacher (IT) - male	Mountview
2	Interview with IT teacher - female	Lakeside
3	Interview with Assistant Principal - male	Lakeside
4	Interview with Principal (Senior campus) - male	Mountview
5	Interview with junior teacher (generalist) - male	Mountview
6	Interview with assistant librarian - female	Lakeside
7	Interview with IT teacher - male	Middleborough
8	Field notes – March 2016	Lakeside
9	Interview with Acting Principal - female	Middleborough
10	Interview with senior teacher (English/history) - male	Mountview
11	Interview with Assistant Principal - female	Mountview
12	Interview with Executive Principal - male	Mountview
13	Field notes – observation of Year 11 woodworking lesson	Lakeside
14	Interview with substitute teacher	Lakeside
15	Interview with teacher (Accounting/humanities)	Lakeside
16	Field notes – observation of Year 8 humanities class	Lakeside
17	Interview with teacher (Maths) - male	Mountview
18	Interview with junior teacher (Design & Technology) - male	Mountview
19	Interview with teacher (Science) - male	Mountview
20	Field notes – observation of Year 9 Art lesson	Mountview
21	Interview with newly qualified teacher (Maths/Science) - male	Mountview
22	Field notes – observation of combined Year 10 IT and Year 11 art lessons	Mountview
23	Field notes – walking tour of school with Assistant Principal - female	Middleborough
24	Interview with senior teacher/Year 10 coordinator - female	Lakeside
25	Field notes – conversation with senior teacher (Art) - female	Mountview
26	Interview with librarian - female	Mountview
27	Group interview with Year 8 students - females	Mountview
28	Interview with newly qualified teacher (Art & Visual Communication) - male	Mountview
29	Comments from: Year 11 student - male	Middleborough
30	Comments from: Year 10 student - female	Lakeside
31	Comments from: Year 8 student - female	Mountview
32	Comments from: Year 9 student - female	Lakeside
33	Comments from: Year 11 student - male	Mountview
34	Comments from: Year 10 student - female	Mountview
35	Comments from: Year 11 student - female	Lakeside
36	Field notes – conversation with Year 11 student - male	Lakeside
37	Field notes – conversation with technical support staff - male	Middleborough
38	Interview with IT technician - male	Lakeside

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