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Article abstract

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Article

"We've Tried to Keep the Beast on a Leash": The Domestication of Digital Classroom Surveillance

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Abstract

Students' laptops are subject to growing digital forms of surveillance by their schools. Following the theoretical tradition of media "domestication," this paper examines the incorporation of Student Activity Monitoring Software (SAMS) into the everyday routines of one Australian secondary school. Drawing on two years of fieldwork, the paper details how SAMS was broadly accepted by school staff and students as complementing—rather than challenging—the moral economy of the school. With school leaders keen to increase student surveillance without being seen to diminish teacher professionalism, the paper shows how SAMS was appropriated and objectified in ways that teachers and students perceived as preserving established classroom power relations. At the same time, school leaders could maintain core school values while also projecting an appearance of innovation and being "data-driven." However, rather than this surveillance system being wholly "tamed," we also show how SAMS was leading to subtle shifts within the school—not least the surrendering of governance and accountability to the software company, alongside the further entrenchment of "soft surveillance" logics into classrooms.

Preface

> Over 100 teachers are being talked through the features of a new online system by Tim—Brookdale's "Head of Learning." The large screen by the lectern flicks onto a "dashboard" style display with around 20 student names and coloured squares. Tim gestures upward: "So *this* is what your students are doing on their laptops."
>
> After a moment's pause, this short statement elicits a ripple of laughter from the audience. There are a couple of gasps. The prospect of tracking students' computers has clearly got people's attention. Tim looks amused and mutters into the microphone *sotto voce*, "Evil chuckles from a room full of teachers." He then briskly runs through some more screenshots: "Study-Screen monitors what they are browsing, It measures bandwidth. It measures keystrokes.... If you've asked a room full of students to do work and they're not typing… then they're not doing the work.... So the AI engine uses all this data to work out what they're doing, and if this is relevant to their work." (Fieldnotes from a whole-school training day being held in a large lecture hall at Brookdale High School, January 30, 2022)[1]

[1] All names and identifying features of individuals, schools, firms, and products have been changed to ensure anonymity.

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Introduction

Schools have long been a site of interest for scholars of surveillance and digital technologies (see Monahan and Torres 2010 for an overview). Given their long history as institutions built around processes of disciplining, sorting, assessing, and controlling, it is perhaps unsurprising that schools around the world have taken readily to various successive forms of digital surveillance—from cell-phone and social media monitoring systems to the data analytics produced by "learning management systems" and other educational software.

In particular, the past twenty years or so have seen increased emphasis placed on monitoring and restricting student internet use. As Andrew Hope (2018) notes, in this sense, schools might be seen as simply mirroring wider moral panics around young people's unsupervised internet use—i.e., dual concerns around the passive "child at risk" (vulnerable to cyberbullying and adult predators) and the active "risky child" (initiating "inappropriate" activities). Indeed, monitoring of online activities at school continues to be justified on the grounds of checking in on students' mental health, or even preventing self-harm, radicalisation, or intent to harm others (Hope 2021). Yet, as Adorjan and Ricciardelli (2019) note, internet surveillance discourses in schools are also justified along specifically educational lines—for example, ensuring that students are not engaged in cheating and other forms of academic malpractice or are not distracted from their schoolwork. Against this background, surveillance studies scholars have begun to document the development of a distinct "networked classroom" logic of care and control (Steeves, Regan, and Shade 2018).

One theme in this recent literature is a notable shift away from panoptic forms of the "surveillance school" model of the 2000s and 2010s (Taylor 2013), where school authorities were actively watching students though material forms of vertical surveillance such as CCTV and/or tracking students through smart-cards and RFID tagging. Now, student surveillance is described as increasingly taking the form of horizontal surveillance enacted through schools' digital infrastructures of wireless networks, digital devices, management systems, and other software. This is surveillance based on the continuous background monitoring of school networks and software, feeding into automated-decision-making processes that then push notifications out to school teachers, administrators, and managers to act on (Nicholls and Monea 2022).

As Selena Nemorin (2017) notes, this emergence of "rhizomatic surveillance" logics within schools raises a number of important questions that will be addressed further in this paper. For example, how are these modes of continuous online monitoring implicated in (re)framing the enactment of relations between students, as well as between students and their teachers, school managers, and administrators? What forms of compliance and/or resistance are evident in students' everyday experiences around these technologies? How are these technologies altering the spatial and temporal boundaries of school surveillance beyond the traditional notions of the school campus and/or timetable? To what extent are the conditions of surveillance being dictated by the software companies and system designers responsible for producing this technology? As the nature and scope of these questions attest, while digital surveillance might now be seen as a familiar feature of schools, there is much that needs to be asked about the fast-changing nature of what this actually entails.

The Rise of Data-Driven Monitoring Technology in Schools

This paper examines one such form of horizontal digital surveillance currently being taken-up by schools across North America, Australasia, and Europe—Student Activity Monitoring Software (SAMS). The specific promise of SAMS is to automate the monitoring of students' laptop use during class-time and/or at home. Instead of teachers having to judge whether or not students are actually working on their laptops or not, schools can now invest in SAMS that tracks laptop usage in real-time and calculates whether each student's usage is "educationally appropriate." This software is not without controversy—for example, prompting expert concerns over possible discriminatory deployment and privacy breeches (Kshetri 2021). Nevertheless, use of such systems is fast growing, with one recent survey finding seventy-one percent of

US teachers reporting the mandatory installation of SAMS onto school-issued devices (Hankerson et al. 2021).

The prevalence of such software across contemporary schooling is not surprising. As Roderic Crooks (2019) notes, the push during the 2010s in many school systems for students to "Bring Your Own Device" quickly raised teacher concerns over the disruption and distraction associated with device use, followed by IT industry rollout of attendant technical "solutions" to lend schools greater oversight of how these devices were being used. More recently—as noted previously in this journal—the digital surveillance of student devices was extended and exacerbated during the school lockdowns that were enacted throughout the COVID-19 pandemic and thereafter as schools worked to transition back to "hybrid" forms of classroom and home-based study (Singh, Davis, and Gilliard 2021).

A range of benefits are associated with these various forms of digital monitoring. This includes the expectation for such technologies to bring greater precision and "calculability" to bear on classroom judgements that were previously guided by informed teacher guesswork. As well as enforcing "appropriate behaviours," these technologies also promise to support better "insights" and effective interventions than would otherwise result from a lone teacher tasked with stewarding a class of twenty students (see Selwyn et al. 2023a). This is not to say that SAMS and similar automated monitoring technologies are envisioned as doing away with teachers altogether. Instead, such claims are usually tempered by a sense of technology being able to "free-up" teachers from routine and procedural tasks, allowing them to concentrate on more complex discretionary pedagogic work. As such, it is commonly argued that teachers might soon benefit from working alongside automated software that can provide "intelligent support," take responsibility for onerous classroom routines and duties, and therefore reduce workload and stress (Ideland 2021). Indeed, such scenarios usually anticipate teachers' time being "used more effectively and efficiently, and where their expertise is better deployed, leveraged, and augmented" (Luckin et al. 2017: 11).

Conceptual Background: The Domestication of Surveillance Technologies into School

Such enthusiasms are rooted in highly decontextualized and idealised portrayals of digitised classrooms. Of course, the actual adoption of these systems in schools is subject to local negotiations and (re)configurations that can profoundly influence the ways in which the technology eventually impacts classroom practice. Indeed, the continued take-up of SAMS offers a ready case study of the range of ways in which initial aspirations of surveillance software developers and vendors to deploy "cutting-edge" technologies into schools can bump up against context-specific institutional practices and understandings. In this spirit, the present paper approaches schools' adoption of SAMS from a critical sociotechnical perspective—i.e., seeing the incursion of SAMS technology into classrooms as a confluence of technical matters, scientific innovation, economic and political forces, alongside social concerns (see Law 1987). As such, we are encouraged to pay close attention to the ways in which technical, social, economic, and political factors come together to influence how SAMS end up being implemented in schools, paying particular attention to the contested nature of technological uptake and engagement.

Within this tradition of sociotechnical inquiry, the present paper turns specifically to the media studies concept of the "domestication" of digital technologies. The domestication literature has grown over the past thirty years as a means of unpacking how digital technologies are initially incorporated (often referred to as "tamed" or "house trained"), and subsequently integrated into social settings such as households, workplaces, cafes, care centres, and other institutional contexts (see Berker, Hartmann, and Punie 2006; Henriksen and Tjora 2018; Hartmann 2020; Martínez and Olsson 2021). Although originating in media studies scholarship, the domestication approach has begun to be used in various studies of how surveillance-related digital media and technologies are integrated (tamed) into social settings—such as the adoption of companion robot pets into older adults' homes (Lafontaine 2020), parental adoption of location-tracking applications (Widmer and Albrechtslund 2021), mobile phone surveillance (Vickery 2016), and the framing of smart assistant devices such as the Amazon Echo (Neville 2021).

While specific approaches may vary, all domestication studies detail four distinct stages of technology finding a place within institutional settings:

> (i) "Appropriation": how the technology is acquired and initially incorporated into institutional spaces and practices;
>
> (ii) "Objectification": how the technology is located and arranged within the material, social, and cultural spaces of the institution;
>
> (iii) "Incorporation": how technological practices are integrated into the daily routines of institutional life and the different capabilities that result;
>
> (iv) "Conversion": how the technology is integrated into people's self-identities and the broader social relations between the institution and the outside world.

Key here are questions of how the symbolic meanings of a digital technology are judged within the "moral economy" of institutions—i.e., the dominant values, opinions, and preferences of an institution and its members (Silverstone and Hirsch 1992; Haddon 2007). The domestication approach is therefore well-suited to making critical sense of the take-up of surveillance technology within education institutions such as schools (see Martinez and Olsson 2021). In particular, what might be blithely presumed to be a straightforward case of technology "implementation" or "adoption" can be problematised as a more complex ongoing series of negotiations, compromises, and conflicts over the placement, ownership, and control of these technologies. As such, the domestication approach allows us to make sense of how a SAMS application is "placed" or "positioned" within a school's already-existing set of routines, rules, and other power structures (Martínez and Olsson 2021). At the same time, domestication studies also raise corresponding questions of how institutions "make sense of, give meaning to, and accomplish functions through technical objects'" (Caron and Caronia 2001: 39)—not least the role of technologies as a means of displaying specific values to onlookers (Hartmann 2020). In this sense, domestication theory offers a potentially rich way of understanding how the integration of surveillance technology such as SAMS into the everyday routines of teachers and students is embedded in larger social and institutional structures of schools and schooling.

Research Methods

This paper now goes on to develop a detailed account of the domestication of an Australian-produced SAMS application (given the pseudonym "Study-Screen") into a large secondary school in suburban Melbourne. The paper derives from a large-scale thirty-six-month study of data-driven technologies across three contrasting Australian secondary schools. One of the aims of engaging in prolonged periods of fieldwork within each of these schools was to follow the local procurement and implementation of different data-driven software and systems over time. Brookdale High School's decision during the second and third years of our project to invest in Study-Screen was one such example.

i. Setting

Brookdale High is a large Catholic high school catering for students aged eleven to eighteen years old. The school has around 130 teaching staff and seventy-five non-teaching staff working with around 1,400 students. The socio-economic and demographic make-up of the school is diverse, with around half of Brookdale students having a first language other than English and relatively large numbers of students attending from low-SES households outside the designated school-zone. Brookdale prides itself on its pastoral care coupled with an emphasis on equity. The school motto is "Integritas et Probitas" ("Integrity & Openness").

Brookdale's campus is located in a mid-income suburban area of Melbourne and comprises a collection of buildings from the 1960s onwards, with traditional classroom arrangements where one teacher sits in front of an electronic whiteboard facing rows of student desks. In terms of digital provision, the school runs a "one-to-one" laptop program where families each lease a relatively low-cost PC laptop provided by the school. These laptops are used with a suite of platforms—including the school's learning management system, Google Docs, and other online software. During the second and third years of our research, Brookdale's staff and students found themselves having to switch between periods of face-to-face teaching and prolonged periods of COVID-enforced remote online schooling.

ii. Data Sources

Fieldwork over the three years of our project involved regular repeated visits to Brookdale, allowing us to engage in various forms of in-depth qualitative data generation—including over fifty site visits, in situ observations and general "hanging around," field notes, corridor conversations, and more formally arranged interviews with students, teachers, IT staff, data specialists, school leaders, and other staff (see Thomson and Hall 2016). This gave us a good working knowledge of the school and its use of digital technologies, and a good sense of the dynamics around the school's adoption and deployment of new technologies.

Brookdale's procurement and implementation of the Study-Screen software took place during the second and third year of our research, and was primarily addressed through the following sources of empirical data:

- Repeated individual interviews with the three key members of the school leadership team involved in the Study-Screen procurement and configuration process (Brookdale's Head of Learning, Director of Data Systems and Analysis, and a Lead Teacher). These interviews were in-depth and semi-structured, lasting anywhere between thirty minutes and ninety minutes;

- Participant observation of Brookdale's "start of academic year" planning day—when Study-Screen was first demonstrated to the assembled staff, followed by an all-staff Q&A session;

- Participant observations of four workshops when small groups of staff were given hands-on training to use the software;

- A ninety-minute on-screen "walk-through" session where Brookdale's director of learning and teaching demonstrated the software to the research team, ran analyses, retrieved cached data, and outlined how the software was being configured to fit the school's needs;

- Observation of regular lessons where teachers were making use of Study-Screen, with post-lesson debriefs from teachers reflecting on how they had just engaged with the software;

- Individual interviews with classroom teachers towards the end of our research project, reflecting on their experiences with Study-Screen. Ten interviews were conducted, lasting between thirty minutes and forty-five minutes;

- Two rounds of group interviews with Brookdale students in Years 8, 9, and 10 focusing on the Study-Screen software. One round of interviews during the first term of in-class use of Study-Screen, and another round of interviews towards the end of our research project (fifty students in total);

- Close readings of product patents, product documentation, and marketing materials produced by software developers and the parent IT firm to support the Study-Screen software.

iii. Analysis of Data

All told, these research activities resulted in a corpus of fieldnotes, documentary notes, and around thirty hours of interview data. Analysis of the empirical data was rooted both in the a priori concerns of domestication theory outlined previously and a posteriori issues arising from the interview data. In this sense, analysis took the form of what Fereday and Muir-Cochrane (2006) describe as a "hybrid' process of inductive and deductive thematic analysis that allows us to fully describe the phenomenon being investigated. This involved a number of steps. First was the deductive generation of salient preliminary codes based on the four phases of domestication (the "appropriation," "objectification," "incorporation," and "conversion" of Study-Screen). We then engaged in repeated re-readings of the qualitative data corpus, leading to the inductive generation of data-driven themes—i.e., issues arising from the data that we felt encapsulated the phenomenon of software-based surveillance of laptop use as perceived by school staff, students, and the software designers and vendors. These themes are now discussed in turn—first outlining the initial framing of Study-Screen by its developers, and then making sense of the four phases of the domestication of Study-Screen into the institutional setting of Brookdale High.

Findings

Introducing Study-Screen

Study-Screen is a SAMS developed in the late-2010s by a small Australian company that had specialized previously in medical software and hardware. The product was initially envisaged as a "net nanny" application to allow parents to "remotely supervise" their children's device use. After limited success, the company then pivoted to a school-focused version—described in its product patent as "a method and system for monitoring one or more students' use of computers in an educational environment—outputting data reflective of the totality of students' use of computers" (Study-Screen international patent application).

This latest incarnation of Study-Screen is designed to be installed on students' laptops and then run to continuously track what software, online applications, and webpages are being used. The company describe its software as algorithmically calculating whether the student is engaged in educational ("on-task") work, using a general machine learning model that teachers can augment with bespoke lists of approved "on-task" resources. Whole-class data are displayed on a real-time "live screen" dashboard on the teacher's device, indicating each student's current state of engagement using traffic-light colours descending from green to orange to red. Study-Screen also measures all keystroke and mouse clicks, as well as how often students switch between on-task and off-task activities. This latter metric is displayed to the teacher as "DI" (distractibility index). In addition to this real-time monitoring, school administrators can also retrospectively review recordings of past lessons, with Study-Screen's "Learning Flow" feature visualising how class laptop use has collectively fluctuated over the course of a single lesson, or a whole day, week, or even entire semester.

All told, Study-Screen is sold as "flagging" a number of related student behaviours—notably "engagement," "on-taskness," and "distractibility." Product marketing talks of offering insights into students' educational performance, providing teachers with "learning analytics," "diagnostics of learning," and "targeted learning insight" (Study-Screen website). The company is careful to not present its software as detecting bad behaviour per se, but rather as a tool to support teachers in managing and directing good learning. Study-Screen's marketing tagline proclaims that "laptops should instruct, not distract."[2] One advertisement in an education trade publication shows a teacher in a superhero costume alongside the motto: "if you are not measuring laptop use then you are not managing it!" All of this is deemed achievable through Study-Screen's use of "AI" technology. The most recent marketing is keen to stress the sophistication of Study-Screen's algorithmic-driven decision making—offering "AI for teachers," "applying machine learning," and making use of "algorithms that are cutting edge" (Study-Screen website).

[2] This marketing tagline is used on various websites.

Appropriation

In terms of following the trajectory of this software into Brookdale High School, the appropriation stage of the domestication framework first draws attention to how Study-Screen was acquired and initially incorporated into Brookdale's institutional spaces and practices. In this sense, the implementation of Study-Screen arose as one of the first actions resulting from a reorganisation of the school's technology-related leadership—with the aging senior leadership team passing responsibility for "Technology and Data" (T&D) within the school's hierarchy onto a small team of younger mid-career teachers. While enthusiastic about the educational potential of new technology, these staff were also careful to present themselves as mindful of the excessive digitization of schools. During our conversations, some of the T&D team would occasionally make reference to the "hype" and "solutionism" that surrounded EdTech products, media debates about the commercial selling of personal data, and Shoshana Zuboff's (2018) notion of "surveillance capitalism." As such, Brookdale's intended use of Study-Screen tended to be framed to us along deliberately qualified lines:

> Study-Screen is… their spin or our spin? The way I spin it is Study-Screen lets you know what your students are doing with their laptop during your class time. That's all it does.… Study-Screen's pitch is this lets us work out which subject is our most engaging subject, track students on a distractibility index… they've thrown every buzz-word they can at this thing. They're even working on flagging students at risk of self-harm... I think the company's got an amazing product but they over-reach massively with its functionality. (Tim, Head of Learning, during walk-through demonstration of Study-Screen, June 2, 2022)

Despite their tempered enthusiasm for the software, the decision to implement SAMS had actually been made prior to the formation of the current T&D leadership team. Study-Screen was therefore described to us as a "legacy" of the school's previous (less tech-savvy) senior leaders. The rationale for this original adoption of SAMS was described as a reaction to "real concerns from our aging staff" over worsening discipline in "one-to-one" classes. Given the school's limited budget, one of Brookdale's IT technicians had first been tasked to develop a Java app that allowed teachers to have full view of any student's laptop screen. While this home-made fix had proven popular with teachers, "the problem was it was the biggest security backdoor ever! Very quickly a couple of our techie students worked out that they could basically hack into anything on the [school] system using this thing because the code was installed on their laptops.… So we had to quickly scrap it!" (Initial Interview with Dane, Director of Data Systems and Analysis, March 22, 2021).

With the precedent for laptop monitoring established, the previous school leadership team felt obliged to procure a more robust system, which led eventually to the agreement to purchase Study-Screen. While initially feeling "wary" and "cagey" about having to implement a system that they had not procured, the new T&D team later came to see Study-Screen as proving to have been a relatively unproblematic "fit" with Brookdale's technical and organisational set-ups (Initial Interview with Tim, Head of Learning, March 18, 2021). Key here was a surprising responsiveness on the part of Study-Screen's sales-team and in-house developers. Unlike some of Brookdale's other software suppliers, Study-Screen had proven willing to customise the set-up of the system around the school's requirements. As Brookdale's Head of Learning put it: "they've done lots of things for us… so, given that we're able to manage how it is rolled out in the school and the messaging behind it, I'm comfortable with how it's being used" (Subsequent Interview with Tim, Head of Learning, November 2, 2022).

These initial adjustments included the company agreeing to reconfigure Study-Screen to correspond with Brookdale's central timetabling system and adjust to changes in the daily timetable. Unlike many schools, Brookdale operates a different timing on Wednesdays to accommodate a church service, whereas Study-Screen is programmed to assume the same daily schedule of lessons. Brookdale had also asked for their version of Study-Screen to recognise when a substitute teacher was taking a class, thereby ensuring that the originally designated teacher was not saddled with their replacement's data. Nevertheless, despite this

generally good relationship, Brookdale's T&D team had found themselves quickly reaching the limits of the company's responsiveness: "One of the roadblocks I got with them was asking, 'How does your AI make these decisions?' At that point they said, 'Well, that's commercial information, we're not going to tell you'" (Interview with Shannon, history teacher and Year 12 coordinator, December 1, 2022).

Indeed, as time passed, it became clear that the technical fit of Study-Screen into Brookdale's infrastructure was not wholly unproblematic. For example, Study-Screen's insistence on using a unique log-on procedure caused ongoing confusion for staff accustomed to using the same username and password for all the school's other software. More serious was Study-Screen's difficultly in recognising and tracking the cheap laptops used by Brookdale students. Given the school's socially diverse student population, Brookdale's Principal had been keen to "avoid a device divide" and so had decided on a laptop scheme where all students could lease a low-budget device (Interview with Shannon, history teacher and Year 12 coordinator, December 1, 2022). The underpowered nature of these machines meant that student laptops would regularly fail to return data to Study-Screen, requiring school technicians to remotely re-set the client on every affected student device. In technical terms, then, it was quickly conceded that Study-Screen was not proving to be an especially "stable" system (Initial Interview with Dane, Director of Data Systems and Analysis, November 2, 2022).

Objectification

The objectification stage of the domestication framework moves our focus onto how Study-Screen then began to be located and arranged within the material, social and cultural, spaces of Brookdale High School. Notwithstanding the previously described technical frictions, it was notable during this period how Study-Screen subsequently settled-down in a largely unobtrusive manner into Brookdale's structures, routines, and general ways of doing things. During the initial months of implementation, school leaders were keen to justify Study-Screen as strengthening Brookdale's ethos of having a "duty of care" toward their students. For example, it was reasoned that "we've provisioned students with a device that is very distracting, and Study-Screen is a way of empowering the student to use it an effective way" (Subsequent Interview with Tim, Head of Learning, November 2, 2022). Another teacher justified the monitoring as "we've got a care for students' wellbeing—you get indications of sites they're visiting and that can be used for pastoral care" (Interview with Shannon, history teacher and Year 12 coordinator, December 1, 2022). Elsewhere, a repeated narrative was the idea of using Study-Screen to flag where the school might be "failing" students, such as a hypothetical "high-flier" individual who was increasingly slipping off-task in lessons. Here, Study-Screen was justified as prompting "a conversation to see whether we are doing the best for Benjamin" (Initial Interview with Dane, Director of Data Systems and Analysis, November 2, 2022).

Interestingly, most of the students that we talked with over the two years also tended not to see Study-Screen as particularly at odds with what they perceived as the underpinning moral order of school—i.e., "if you're meant to do your work, do your work" (Year 10 student focus group 1; March 26, 2021). Indeed, many students remained relatively sanguine about SAMS, reasoning that their school technology use was already heavily regulated, restricted, and curtailed. Students reminded us that applications such as Google Docs and Click View would already inform teachers whether students had (or had not) been using them. Moreover, popular "off-task" laptop activities (such as watching Netflix) were already blocked within the school network. As they were using "school" laptops, many students presumed that search and downloading histories would already be visible to IT staff: "they have a chip in there that says your username and all the things you've looked up in the last 24 hours and all that history" (Year 9 student focus group 1, March 25, 2021). In all these ways, then, Study-Screen was quickly accepted as fitting within a context of "blocked and locked" school technology use.

Another area of notable objectification was the T&D leadership team's deliberate messaging around the potential for Study-Screen data being used as a retrospective measure of performance and behaviour. On one hand, it was emphasised to staff that Study-Screen data should be seen as a valid source of evidence when looking for possible patterns in students' performance. However, this was couched in calls for caution and "not blindly following the output" (Subsequent Interview with Dane, Director of Data Systems and

Analysis, October 5, 2022). As the school's Director of Data Systems and Analysis remarked to us, "Study-Screen is a blunt instrument. It's technically called 'AI' but I'm not sure about the 'I' part" (Subsequent Interview with Dane, Director of Data Systems and Analysis, October 5, 2022). As such, Study-Screen was carefully framed as a tentative prompt for teachers to "start a conversation" with their students. As was emphasised during the whole-school staff demonstration of the software, "This app is not to punish [student] X. This app is to have a conversation with X about how their studies are going… the way we use [Study-Screen data] will really determine how our students feel surveilled" (Fieldnotes, April 19, 2021).

On the other hand, Brookdale leaders were at pains to stress that aggregated data from classes would not be used to judge teacher performance. As was conceded at a Year Coordinators' meeting: "if [leadership] has a worry about something going on with your teachers, then there is a temptation to look at teachers' [Study-Screen] data" (Fieldnotes from Year Coordinators meeting, March 24, 2021). Nevertheless, this use of student data as a proxy of teacher effectiveness was promised to be off-limits. As was stressed to staff at the whole-school demonstration meeting: "This will not be used to evaluate, criticise or praise your teaching. This is a tool for you to use. This won't be used for your ARM [annual review meeting] unless you've chosen to use it… Yes, through the Principal dashboard we can look… but we are not doing that. Please be assured that we are not looking at your teaching" (Fieldnotes, April 19, 2021).

Another key set of boundaries emphasised during the initial roll-out was that Study-Screen would be used only in "class time," leaving students free to use their laptops for recreational purposes during breaktimes and while not at school. As we were told during the first months of use, "it only takes data during their class periods. No, we're not monitoring what they do in home!" (Tim, Head of Learning, during walk-through demonstration of Study-Screen, June 2, 2022). Nevertheless, these good intentions subsequently altered, as Brookdale was forced back into further series of enforced periods of remote schooling due to COVID-19 outbreaks. With "classes" again being held remotely in students' and teachers' homes, Study-Screen began to be used as part of Brookdale's home schooling arrangements. As Tim put it, "we've switched on the option to monitor them when they're off-site" (Subsequent Interview with Tim, Head of Learning, November 2, 2022). Tellingly, it transpired that this change of heart was initiated by Study-Screen representatives as a "quick fix" to allow Brookdale teachers to monitor students taking tests and assessment at home: "the people at [Study-Screen] actually reached out to us just before the exam times and said that they developed a new feature, whereby you could set up these ad-hoc sessions for exams and tests and such that happen outside that timetable… so they offered to set it up for us" (Subsequent Interview with Tim, Head of Learning, November 2, 2022).

Given that Brookdale had been forced to abandon exams and testing during previous bouts of remote schooling, this repurposed use of Study-Screen was welcomed as an timely solution—an effective "way of the students feeling like they were under exam conditions" even if they were at home (Subsequent Interview with Tim, Head of Learning, November 2, 2022).

Incorporation

The next stage of the domestication framework focuses on how Study-Screen practices were then integrated into the daily routines of institutional life within Brookdale. Here, as the first full year of use progressed, we found the ways in which Study-Screen was actually being implemented and incorporated into daily classroom routines to vary considerably as time progressed. As students reported back to us: "teachers use it randomly" (Year 8 student focus group, October 5, 2022), "it depends on the teacher. Some might check, some might not care" (Year 9 student focus group 2, October 6, 2022). Similarly, teachers acknowledged varying levels of staff interest and awareness. For example, as one humanities teacher reckoned: "in my staff room consisting of five people, I would say one [teacher] is all over it and the other four probably know of its existence but don't use it" (Interview with Steve, humanities teacher, December 5, 2022). Staff non-use was often couched in terms of professional identity. As some teachers put it: "I certainly wouldn't be sitting there at the front of the room watching [Study-Screen] instead of interacting with the students…. That's not my style" (Interview with Mick, science teacher, December 9, 2022), and "I'd rather rely on

teacher expertise about which students are being distracted in class from my observations rather than use the algorithm" (Interview with Shannon, history teacher and Year 12 coordinator, December 1, 2022).

Of course, the fact that many teachers chose not to engage directly with the system did not stop Study-Screen from continuing to operate in the background of all their classes and collecting data regardless. Indeed, it could be reasoned that these "non-using" teachers had comprehensively incorporated covert laptop surveillance into their classes on an "out of sight, out of mind" basis. Conversely, those teachers who were proactively engaging with Study-Screen tended to be deliberately drawing students' attention to the system. A few would project their "teacher live view" screen onto the classroom whiteboard so that the whole class was confronted with a rolling picture of their state of engagement. Other teachers revelled in "calling out" in-class transgressions—"they call out your names if you're watching YouTube or playing games" (Year 10 student focus group 2, November 1, 2022). Conversely, during lockdown periods of remote schooling, some teachers would remind students that they were running Study-Screen. As one student recalled, "Mr. Jones would tell us: 'Make sure you guys don't do anything you're not meant to besides your work, because I'll be on Study-Screen watching you guys'.… I don't know if he did, but that's what he said, so we just had to take it" (Year 10 student focus group 1, November 1, 2022).

In contrast, other teachers reported what they considered to be more strategic appropriations of the system—for example, using Study-Screen as a prompt to ask "red" students a question "to get them to refocus… I just use it as a 'catch-me-out' kind of tool" (Interview with Susie, arts teacher, December 12, 2022). Another strategy was to encourage students to self-confess to off-task activity: "I'll say to a student: 'You can tell me what you're doing, or I can just go and look at [Study-Screen]'" (Interview with Steve, humanities teacher, December 5, 2022). This was rationalised as a "more human" way of using Study-Screen "with a bit more integrity" (Subsequent Interview with Tim, Head of Learning, November 2, 2022). In this manner, all these teachers felt able to fit Study-Screen within their personal pedagogical philosophies and sense of professional identity. For example, another teacher justified his use of Study-Screen to "call out" students as an act of community-building rather than public shaming:

> The other day I said, "What's the score in the Chicago Bulls match, Joseph?" And everyone went, "Woo." And automatically Joseph came back with "Sorry, sir, sorry, sir." There is a huge community feel in Brookdale, there's a great respect between teachers and students. I haven't had a discipline problem for twenty years and I just talk to students in a common sense way. So, the students are interested—they love to see [Study-Screen] projected up on screen, what's happening. They see it as a valid way of keeping them on track. They don't see it as an invasion of their privacy. (Interview with Steve, humanities teacher, December 5, 2022)

Tellingly, most students expressed only mild annoyance at such surveillant practices. We were reassured that any student who was determined to go "off-task" could still find ways of doing so. During face-to-face classes, for example, most students were aware that any time a teacher was obviously working on their laptop or sharing their screen meant that they would probably not be looking at Study-Screen—these were understood as opportune moments for students to go off-task. Similarly, during periods of remote schooling, we were told: "it doesn't really affect most kids, because they've got separate devices that aren't connected to [the school system], so they just do whatever they want on there" (Year 10 student focus group 1, November 1, 2022).

This sense of teachers' inconsistent use of Study-Screen was reflected in a lack of any apparent teacher use of Study-Screen data for any of the touted "learning analytics" and "targeted learning insight" capabilities. As Brookdale's Director of Learning admitted, "I think at the moment, the number one thing teachers are using this for is surveillance and checking who's doing the right thing… teachers are really busy. There's not a lot of time to sit back and analyse" (Initial Interview with Tim, Head of Learning, March 18, 2021). This also carried over into staff reluctance to input specific websites or activities into Study-Screen to fine-tune the system's algorithm. As noted earlier, "Adding Resources" and listing lesson-specific websites as

"on-task" is a key feature of the system. As Study-Screen's patent puts it, the software is designed to "use example inputs and their desired outputs given by the teacher to refine a general rule that maps inputs to outputs" (Interview with Mick, science teacher, December 9, 2022). In reality, however, Brookdale teachers generally remained content to follow the default settings of the system: "I believe we can change those settings or whatever. But I don't have the time or the need to update stuff" (Interview with Mick, science teacher, December 9, 2022).

Conversion

Finally, the conversion stage of the domestication framework considers how Study-Screen was beginning to be integrated into student and teacher self-identities and the broader social relations between the school and the outside world. All told, by the end of our fieldwork in Brookdale, the T&D leadership team remained generally content that the system had been implemented without excessive disruption and had fitted well within the school's digital infrastructure. The lack of whole-staff use was not seen as a shortfall. Rather, the mere presence of Study-Screen was seen to be a sufficient deterrent: "It's kind of like a speed camera. You don't speed because you know it's there. So the very presence of the thing that catches you stops you doing the thing that you were going to get caught doing" (Year 9 student focus group 1, March 25, 2021).

In this sense, as our fieldwork drew to a close, leaders, teachers, and students appeared to have reached a loose collective acceptance of what the system was and what it allowed them to do. For example, Brookdale's critically aware Technology & Data team were able to frame the implementation of Study-Screen in terms of remaining faithful to the ethos of integrity and openness, while still making innovative use of the system. During our final visits to the school, we were reminded by school leaders that "we're not interested in surveillance of teachers" (Subsequent Interview with Tim, Head of Learning, November 2, 2022). In contrast to the potential extended managerial uses of SAMS, the Head of Learning trotted out a neat aphorism: "we've tried to keep the beast on a leash" (Subsequent Interview with Tim, Head of Learning, November 2, 2022). Indeed, the school leadership team felt able to claim to have implemented Study-Screen in the best interests of their staff and students. As was announced at a staff meeting:

> I just want you to know that there are lots of IT systems waiting to go across the school which would interrupt your work. We've been holding back on these. We've gone through enough during [COVID], so we don't think it is a good thing to be doing. [a brief pause] [Study-Screen] is different. This is a tool for us to use that doesn't interrupt the normal workflow. This is just an optional window that you can turn to during the day, the term… to get a different view on things. (Fieldnotes from staff meeting, December 3, 2021)

That said, one of the main "settlements" was the ability for Brookdale leaders to continue to talk about the future prospects of using Study-Screen for more sophisticated data analytics. While it was conceded that not much had been done with the data so far, Brookdale managers remained keen to speculate on possible future data-driven innovations. During our final visits, the school's Director of Data Systems and Analysis speculated on various "otherwise unseeable insights" that might be gained by correlating students' Study-Screen data with other measures—such as examination data, attendance data, and similar (Year 9 student focus group 1, March 25, 2021). The school's Head of Learning also expressed interest in using Study-Screen data for "a bit of data-heavy work," such as using Study-Screen to provide schoolwide "audits' of which software was being used regularly enough to merit renewing site licences, or encouraging teachers to examine their lesson data on a minute-by-minute basis (Subsequent Interview with Tim, Head of Learning, November 2, 2022).

Yet, ultimately, Study-Screen had settled into Brookdale's technical and pedagogical routines in ways that suggested such future insights and innovations might not be realised. Tellingly, it transpired that the company (rather than the school) retained control over most of the fine-grained data generated by Study-Screen beyond the basic "traffic light" and "labelling" data. In this sense, it had latterly transpired that the school had to request any detailed data from the company. To date, Study-Screen representatives had proven

"more than happy" to do this on the few occasions that Brookdale teachers had requested a more detailed assessment of specific incidents. Nevertheless, this was a clear impediment to what could be further achieved with the data:

> Tim: One of the problems we've got is I don't know how much access we've actually got to this data. We've only got what they feedback to us, so they hold the data.…
>
> Interviewer: So, who owns the data?
>
> Tim: That's a good question… We've not asked that … We should've asked that. That's a black mark against our name. [Shrugs] … Who owns it? (Final Interview with Tim, Head of Learning, Decmber 9, 2022)

Discussion

At first glance, Brookdale's appropriation, objectification, incorporation, and conversion of Study-Screen might seem a relatively straightforward process of domestication. This does not appear to be an especially awkward, disruptively "wild" technology that clashed substantially with the school context. Instead, Study-Screen might appear to have slotted seamlessly into the constrained and messy context of school technology use. For example, Brookdale's leadership team were able to "manage the messaging" around the introduction of Study-Screen to chime with the school's prevailing values, and ensure that the system was understood to be in lockstep with the school's existing arrangements, hierarchies, and goals. Indeed, despite commercial claims of "cutting edge" innovation, this was technology that fitted remarkably well with traditional classroom vernacular—i.e., the practice of a teacher walking around the classroom looking at student screens and the recognisable "traffic ligh"' rubric used in many forms of Australian school reporting (Selwyn, Henderson, and Chao 2017).

Of particular note was the way in which Brookdale leaders took great care to position Study-Screen in a way that did not threaten the primacy of classroom teacher judgement and expertise. Indeed, our findings highlight the key role of teachers in mediating the surveillance regimes that emerged around Study Screen—reflecting what Anna Carlile (2018) terms the teacher practice of "critical bureaucracy" around school surveillance. As such, Brookdale teachers could utilise (or ignore) Study-Screen in their classrooms as much as they wanted, and the non-directive nature of system outputs meant that surveillance and reporting processes could be adapted to fit each teacher's personal philosophy of teaching. Thus, while some teachers made a deliberate spectacle of retaining their professionalism by *not* using Study-Screen, it was striking how the software was easily rationalised by other teachers as a useful support to their professional "duty of care" towards students. As shown by Kumar et al. (2019), the understanding that surveillance tools are a valid means of helping students remain engaged in their schoolwork will often become normalised within schools as part of teachers' sense of professional responsibility to their students. At the same time, the incursion of Study-Screen into Brookdale classrooms was also consistent with the broader conditions of student accountability and "audit culture" that have come over the past few decades to characterise education systems in Anglophone countries such as Australia (see Carlile 2018; Crooks 2019). All told, Brookdale's implementation of Study-Screen was configured in a manner that would have felt very familiar to the teachers being asked to take it on.

At the same time, our findings also show Study-Screen prompting little overt resistance from a cohort of young people well-used to having their online activities monitored across all aspects of their lives (Southerton and Taylor 2021). Moreover, we also found Study-Screen being framed (objectified) by students as simply an additional aspect of disciplinary control at Brookdale that was quickly subsumed into the many other forms of control that attending school entails. As such, students were not resisting in overtly antagonistic ways—i.e., protesting, tactics of sabotage, or obfuscation. Instead, their "resistance" to Study-Screen was simply part of the wider everyday tactics of resistance that students deploy to "work around" and "get by" their time in school—for example, noting when staff were clearly not looking at the dashboard.

This conforms with earlier studies of school surveillance, where student resistance/subversion is found to only arise in specific instances (Fisk 2016), often based on opportunistically working out particular teacher expectations and acting accordingly (Adorjan and Ricciardelli 2019).

Yet, as Martin, Van Brakel, and Bernhard (2009) reason, the *who* and the *how* of resistance stretches beyond the student resisting the surveillance artefact (software). Our findings certainly highlight the role of the classroom teacher as a key additional actor in the resistant/acquiescent relationships around Study-Screen, with some teachers choosing to actively discount and/or passively ignore the system. These might be described as instances of what Crooks (2019) terms **"**interpretive resistance" to digital surveillance—i.e., teachers contesting the validity of Study-Screen's capacity to algorithmically judge off-task behaviour. Yet, this teacher resistance was not straightforward. Regardless of the in-class choice made by any individual teacher, Study-Screen continued to run in the background and record student behaviours that could be replayed, analysed, and retrospectively acted on by school authorities in days, weeks, or months to come. Thus, any avoidance of algorithmic judgement was only ever temporary.

At the same time, our findings also highlight how SAMS allowed Brookdale's "technology and data" leaders to display values of being data-driven. In the short-term, these leaders saw the software as fulfilling mainly symbolic purposes—mollifying anxious teachers and deterring students from device misuse. In the longer-term, these leaders could continue to anticipate more sophisticated forms of "knowing" the school by using Study-Screen data to "make visible what might otherwise be hidden or missed" (Bayne et al. 2020: 185). At the same time, Brookdale staff were at pains to reframe Study-Screen in ways that dialled back the commercial claims of "AI" and "algorithmic" efficiencies, and instead configured the expectations around Study-Screen in a professionally respectful and human-centred manner. All told, we might see this as a case of a younger, more tech-savvy school leadership team that was working hard to steward a potentially problematic technology in a circumspect, critically aware, and contextually sensitive manner. Nevertheless, even this approach to "taming" Study-Screen involved some subtle—but significant—changes and adaptions to Brookdale's practices and conditions as a school. As Sørensen (2006: 46) reminds us, domestication is never a one-way socialisation of technology—instead, it is "a coproduction of the social and the technical" (what Roger Silverstone [2006: 231] describes as "a question of give and take"). Thus, it is important to consider how Study-Screen created new relations and dependencies within Brookdale, despite the best intentions of the T&D leaders to "manage the messaging" and "keep a leash" on the technology.

One notable shift in this sense was the extent to which Study-Screen required the school to cede control to the software providers. In light of the school's failed efforts to build a SAMS system themselves, Brookdale was notably beholden to Study-Screen's sales team and developers. While Study-Screen staff seemed amenable to adjusting their product to fit Brookdale's set-up, it was notable that the company retained access to the detailed data, as well as refused to disclose the basis on which its outputs were calculated. Indeed, any criticality amongst the T&D leaders when mulling over abstract concerns such as "surveillance capitalism" contrasted with their lack of practical insight into who had proprietary rights over the data being generated by Brookdale students—what has been reported elsewhere as a common blind spot in schools' adoption of digital surveillance technologies (Nicholls and Monea 2022).

We also found subtle shifts in school governance, such as Brookdale's willingness to follow Study-Screen's suggestion of running online proctored examinations in student's homes—a form of education technology that is currently attracting considerable controversy (see Selwyn et al. 2023b). While these might seem to be minor adjustments, they illustrate the capacity of even a small local software provider (with limited educational experience) to significantly influence how "school" is conducted and experienced. This echoes other domestication studies in education that point to the ways in which digital technologies are embroiled in ongoing renegotiations of the boundaries between the public and the private (Martínez and Olsson 2021).

Another notable shift was the ways in which Study-Screen established new conditions of what might be termed "soft surveillance." Despite teacher and student perceptions of Study-Screen being a system that

could be used with discretion during class time, the system was continually recording student activity and providing data that were available for retrospective analysis at any future time. As such, these conditions of continual background data monitoring can be seen to constitute new surveillant conditions across every class that was timetabled in Brookdale. Thus, despite claims of supporting teachers to direct "good learning," it could be argued that Study-Screen establishes a primarily administrative gaze—what Bayne et al. (2020) term a "surveillance pedagogy" that impinges on the fragile conditions of trust that most educators see as underpinning the teacher/student relationship. Similarly, despite the school's concern over the possible "device divide" arising from mandatory laptop use, Study-Screen introduced what might be termed a "second device divide"—allowing students with an additional off-network device the luxury of going off-task. All told, there is much about Brookdale's adoption of Study-Screen that could be seen as altering fundamental aspects of the school.

Looking beyond the implications of Study-Screen for understanding the ongoing adoption of digital surveillance technologies in school, we are also in a position to reflect on what this case study adds to our broader understanding of the domestication of digital technologies in education. First, is the significance of a few key "champions" of the technology—staff responsible for championing and stewarding Study-Screen into the school. In this sense, Study-Screen illustrates the role often played by middle managers within a school tasked with brokering the wider reception of technology by colleagues in light of their personal interpretations of what any new system is and how it might best fit within the moral economy of the school. These intermediaries take on significant elements of the work implicit in the taming of any technology—not least the symbolic work of interpreting the artefact and working to align its inscribed meanings with the symbolic universe of the school (Berker, Hartmann, and Punie 2006). In this sense, the nature of how a technology such as Study-Screen is taken-up is shaped as much by the individual characteristics of these individual champions as any characteristics of the technology.

Second, one of the key moral negotiations that Brookdale leaders framed Study-Screen within related to how the technology corresponded with notions of teacher judgement and professional expertise. Our case study differs from other educational studies of technology domestication where teachers' professional agency is often found to be afforded relatively little consideration in the appropriation and objectification stages (Martínez and Olsson 2021). Instead, the relatively uncontested response from Brookdale staff toward Study-Screen undoubtedly stemmed from how the technology was framed by school managers as not threatening teachers' expertise and authority. This raises a third point regarding the significance of teacher identity in the eventual incorporation and conversion of any technology. As Widmer and Albrechtslund (2021: 80) put it, this relates to how "the use or the non-use of a technology can also participate in the performance—or in the attribution—of a certain identity." The ease with which Study-Screen fitted with various types of teacher identity (i.e., whatever different staff perceived as "their style") was therefore an important aspect of its acceptance across the school.

Conclusions

The integration of SAMS applications into schools such as Brookdale offers an opportunity to critically examine the politics of the ongoing digital reconfiguration of contemporary education through such data-driven "background" surveillance technologies. Above all, we have shown that what appears to be a straightforward case of technology domestication—where Study-Screen might be seen to have been "house-trained" and "tamed," where teacher and student status remained unchallenged, and the school's moral economy remained intact—actually masks some significant shifts in how schooling is subtly reshaped by surveillance software and the companies that produce it. All told, there is clear value in continuing to chart the domestication of different instances of technologies into schools.

In one sense, Study-Screen might be seen as simply just one of many small acts of automated surveillance that now are regularly entering modern-day classrooms and accepted (by teachers and students) as part of what Damien Page (2017) terms a "hyperreality of normalised visibility"—i.e., the shared understanding that everything that takes place within a school needs to be seen and known in order to be manipulated into

successful forms of "learning." Viewed on a case-by-case basis, each of these different forms of monitoring might seem to be of minor importance, and something that quickly fades into the background of any school's day-to-day operations. Yet the significance of the issues raised in this paper suggests that more attention needs to be paid to the cumulative effect associated with the ongoing domestication of these types of surveillance technologies and automated decision-making across our school systems. As more aspects of schooling are infused with data-driven monitoring, how are the fundamental conditions and character of schools and schooling being altered? Despite their confidence to do so, to what extent are schools actually able to manage and "leash" these technologies, and what is irrevocably being given up in return?

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