Less work for teacher? The ironies of automated decision-making in schools

Neil Selwyn
Monash University, Melbourne

**

October 2021

**

ABSTRACT: As in many areas of society, educational institutions are beginning to adopt all manner of automated decision-making (ADM) technology. This chapter examines one such example – a facial recognition system that promises to automate the registration of students' in-class attendance. The chapter explores how this seemingly innocuous system foregrounds a range of ways in which initial aspirations of ADM designers and developers can bump up against context-specific practices and understandings. In particular, the chapter explores how the ADM technology is designed around a simplified codification of classroom processes which itself leads to the insertion of new rationalities and ontologies into teachers' workplaces. With teachers and students tending to be sidelined in this process, the ADM constitutes a subtle 'de-professionalising' presence in the working lives of educators. While ADM usually promises to overcome a number of human-related frictions, in the case of the automated 'roll call' these frictions are a key element of the relational work that make classrooms continue to function relatively smoothly on a day-to-day basis.

Less work for teacher? The ironies of automated decision-making in schools

INTRODUCTION

As in many areas of society, educational institutions are beginning to adopt all manner of automated decision-making (ADM) technology. While educational applications and systems have not tended to feature in critical accounts of AI and automation, they offer rich examples of emerging impacts (and tensions) associated with ADM in everyday social settings. This chapter examines one such example of an ADM system marketed recently to Australian schools. This product promises to automate the registration of students' in-class attendance – what is referred to in Australian schooling as the 'roll call'. Instead of teachers reading through alphabetical lists of names and deciding which students are present (and which are not), schools can now invest in 'AutoRoll' - a facial recognition 'solution' for classroom attendance management. As we shall see, this seemingly innocuous system foregrounds a range of ways in which initial aspirations of ADM designers and developers can bump up against context-specific practices and understandings. All told, there is a lot more to ticking students' names from a list than might be first assumed.

A BRIEF OVERVIEW OF CLASSROOM ADM

There is now a steady growth of ADM technologies designed for educational use. Perhaps most prominent are technologies intended to support student learning, such as personalized learning systems designed to direct students' engagement with online learning resources. These systems use sophisticated data-driven analytics to support decision-making regarding what students should be learning next. Perhaps more prevalent are administrative and organizationally-focused forms of AI-driven technology – mostly designed to support routine automated decision making for institutions, teachers and other staff. Many of these technologies support what Gulson and Witzenberger (2021) term 'automated education governance' – ranging from in-school bureaucratic decision-making to the management of national education systems. Elsewhere, AI-driven technologies have been adopted by schools to support the initial stages of teacher recruitment, purchasing and resource procurement, predicting patterns of likely student enrolment and retention, and informing various other 'business decisions' faced by school administrators.

Alongside these institutional forms of ADM, a number of other AI-driven technologies have been developed to support classroom decision-making tasks that previously would have fallen to teachers. These tasks range from judging the quality of student work through to identifying students who cheat, or perhaps are de-motivated and disengaged from their studies. For example, there is growing interest in the use of AI systems which monitor students' attention levels and emotional states. Popular essay plagiarism tools such as 'TurnItIn' are now bolstered by the use of AI-based 'language stylometrics' to assist teachers in deciding on instances of academic malpractice and cheating. School systems and individual schools are also beginning to make use of automated test-scoring and essay assessment (what is sometimes described as 'robo-grading') to support grading decisions (Shermis and Lottridge 2019).

Yet, perhaps the most pervasive form of ADM being taken up by schools are technologies that support 'gatekeeping decisions' – managing the flow of people in, through, and out of school spaces. Most prosaically, this has seen the rise of automated 'visitor management systems' to support the signing-in process of students, staff and other on-campus personnel and visitors. The rise of facial recognition and object detection technology has seen the adoption of facial recognition systems by thousands of US schools in efforts to identify unauthorised and potentially-harmful intruders. During the return to face-to-face schooling after COVID shutdowns, reports surfaced of US schools using pandemic relief funding to purchase new facial recognition systems, with intruder detection, attendance monitoring and added thermal imagining capabilities (Barber 2020). Similar biometric systems are being used to authenticate the identity of online students – in other words, confirm that the people engaging in off-campus online learning activities are actually who they claim to be. In many ways, having a clear idea of who is 'in attendance' at any particular time is a prerequisite to anything else taking place.

THE PROMISES AND LOGICS OF EDUCATIONAL ADM

The claimed benefits associated with these different technologies will be familiar to general observers of ADM. For example, commonplace promises of ADMs leading to greater precision are evident in hopes of bringing a formal mathematical logic of 'calculability' to bear on classroom processes that are traditionally guided by informed teacher guesswork or speculative planning. Similarly, promises of ADMs leading to enhanced 'insight' and informed action are evident in hopes of the technology-driven 'customization' and 'personalization' of education provision (see Bulger 2016) – therefore countering criticisms that 'cookie-cutter' mass schooling has proven unable to cater for diverse individual needs.

This idea of ADM acting as a corrective to specifically educational shortcomings is perhaps most evident in promises of ADMs leading to greater

efficiencies by reducing (or removing) the number of 'humans in the loop'. Here, such discourses are often framed in terms of ADM technology acting as a corrective to teacher frailties, such as fatigue, bias, and scarcity of attention to individual students. Indeed, while ADM in all walks of life is justified along lines of "avoid[ing] the biases, prejudices and irritations of human [actors]" (Lisle and Bourne 2019, p.682), this is seen to be a particular consideration when it comes to teachers dealing with large numbers of students. School teachers around the world are acknowledged as over-worked, worn-out and burnt-out (Fitzgerald et al. 2019, Saloviita and Pakarinen 2021). In response, AI-driven systems are imagined as driven by dispassionate, objective and impartial decisions - what Edwards and Cheok (2018, p.5) describe as "the ability of machines … to interact with human learners without human emotions getting in the way".

This is not to say that these technologies are envisioned as doing away with teachers altogether. Instead, such claims are usually tempered by a sense of ADM relieving teachers – 'freeing-up' teachers from routine and procedural tasks, allowing them to concentrate on higher-level pedagogic work. Mirroring broader claims of ADM 'freeing up' knowledge workers to engage in more complex discretionary work (McIntyre 2019), AI technologies are described as taking responsibility for onerous classroom 'routines', 'duties' and 'drudge' work associated with teaching. As such, it is commonly argued that teachers might soon benefit from having AI-driven 'assistants' that provide 'intelligent support' and reduce workload and stress (Ideland 2021). Such scenarios therefore anticipate:

> "…a future in which the role of the teacher continues to evolve and is eventually transformed; one where their time is used more effectively and efficiently, and where their expertise is better deployed, leveraged, and augmented" (Luckin et al. 2017, p.11).

Implicit in the drive to integrate ADM into schools is a sense of schools being perceived with concern and bewilderment by those responsible for designing, developing and marketing the technology. In this sense, development of classrooms ADMs chimes with ideas of school institutions and systems that are woefully 'unfit for purpose' for digitally-driven societies. The argument is often made, for example, that conventional schools are 'broken', 'nineteenth century' and frustratingly 'cookie-cutter' in nature and form – i.e. outmoded and obsolete products of a bygone era. Commentators speak with exasperation of 'industrial era classrooms', schools resembling factories, 'ivory tower' educators and so on. In tandem with these frustrations are ambitions to engineer the 'corporate reform' of educational institutions – in short, the imposition of business models, logics and processes on schools and those who work in them (see Selwyn 2021). ADM therefore fits well with wider appetites for technology-driven reforms that imbue business management ideals of efficiency, effectiveness and standardization. Thus, any promises of 'freeing-up' and 'assisting' teachers are cut through with a

sense of ADM adding a dose of much-needed corporate backbone to failing public institutions and rapidly fading workforces.

THE CASE OF 'AUTOROLL' AUTOMATED CLASSROOM ATTENDANCE MONITORING

We now go on to consider a modest example of the rise of school-based ADM - the development by a small Australian start-up of an 'automated attendance taking' system that uses facial recognition technology to automatically mark the class register at the beginning of each lesson. Here, we examine this technology through a close reading of patents, developer blogs, marketing materials, and a series of interviews with key actors across the education sector. These empirical data provide insights into this particular ADM technology's technical functions, broader organizational logics, and ways in which it is understood to (re)shape classroom actions and relations.

i). Technical arrangements

In the dry terms of its product patent, AutoRoll (pseudonym used) is "localised self-learning for recognising individuals at locations" [1]. In more shrill marketing terms, AutoRoll is a "revolutionary technology that automates roll call … it does automatically what school staff do manually" [2]. All told, AutoRoll is best described as a facial recognition system designed to automate a tightly bounded moment of decision-making that takes place at the beginning of each school lesson – i.e. recording which students are in attendance. As one of the start-up founders describes:

> It is a very specific outcome that we are looking to solve which is just being able to say, "Who is in this room at this time? Okay, these students are expected to be here, they are". So let's just automatically mark that roll for the teacher. They can then log in, say "Yes, I can see all these data points are correct, I will submit that roll" [3]

Initial iterations of the product involved wall-mounted iPads and an 'off the shelf' cloud-based facial recognition service. However, the company has moved quickly to a complex arrangement of self-contained custom-built hardware and 'software as service'. As such, AutoRoll now involves the classroom installation of small wall-mounted devices that streams video from 4K cameras. In addition, the company produces a 'visitor management' version integrated into a kiosk located in reception areas which "may also be interfaced with other external physical devices to provide access control, such as controlling the magnetic lock of a door" [1].

Both these devices are configured as 'things' in the Internet of Things (IOT). This means that all communication, authentication, and security takes place through the IOT framework in AWS (Amazon Web Services). The company has developed its own 'purpose-built' real-time models which are stored onboard each device for 'extracting the points of interest, doing a quick identification, and then, if it can't be figured out or we haven't seen that person before, off to Rekognition [Amazon's computer vision cloud service] we go to get that final answer' [4].

ii). Framing the 'educational' problem

These technical specifications reflect distinct framings of the real-life 'problems' being addressed that AutoRoll founders have pursued since the inception of their product. In the solutionist rhetoric of start-up culture, one favoured 'elevator pitch' for the product is: "how can we solve people management and attendance at schools?" [3]. Interestingly, when addressing IT industry audiences, AutoRoll founders are keen to play down the 'bland' nature of their task-of-choice. In this sense, automating the roll is justified as relieving schools of a boring but mandated aspect of schooling, a point of 'compliance' and something that "schools are legally required" [3].

Nevertheless, also evident is what AutoRoll's developers identify as a problem of scale:

> When you think about it, schools are a very complicated problem. We've got the teachers needing to mark the roll at least every hour … But then you've got the issue of visitor management and compliance around there as well. Schools have got people visiting their campuses all day every day and we need to verify who those people are. … if you think about the size of schools, this is really a problem of scale … a lot of these things are easy to do manually when you've got a small number of students or a small number of classrooms, but when you introduce scale to that problem, it just gets harder and harder and harder. [4]

Elsewhere, AutoRoll's developers describe schools as places with "about 10-20% of their population who are either absent or sign in late or leave early" [4]. Drawing on terminology from transportation management and webpage design, this is seen to cause a problematic escalation of 'dwell time'. All told, from a software engineering point of view, "it's quite a large amount of data that you've got to process" [4].

3. Overcoming 'technical' challenges

Indeed, AutoRoll's main technical concern had initially been conceived in terms of this 'problem of scale'. The small development team saw large classrooms as requiring at least three 4K cameras in order to get full visual coverage at sufficient pixel density "needed to do a good recognition event" [4] This meant that AutoRoll's imagined school ("with say 80 – even 100 – classrooms"[4]) produces large streams of data. This volume of data traffic was seen as the primary technical challenge:

> You can imagine that we have hundreds and hundreds of devices at a customer's site running during the day. They're firing data at our cloud relentlessly. We're horizontally scaling out as big as we can, and then the clock hits 4 o'clock … everyone goes home and everything goes dead. It's all quiet. [4]

However, the company's initial piloting foregrounded an additional problem of school expectations around children and data privacy. The product's pilot phase quickly revealed that any school ADM is subject to a number of regulatory frameworks – various state 'Privacy & Data Protection' acts, the 'Federal Privacy' act, and even niche regulation such as a 'Surveillance Devices' act. As one educational legal advisor put it, the application of this legislation in schools was 'pretty broad' and 'not well tested' [5]. As such, AutoRoll's initial forays into schools prompted considerable push-back from local policymakers, parents and media – even prompting one state government Education Minister to declare a temporary moratorium on the implementation of any facial recognition technology in government schools. As AutoRoll's UX research put it:

> Parents and teachers feel uncomfortable and concern with the idea of having an AI-based attendance system in the educational space as well as privacy governance. [6]

Issues of privacy therefore formed a key subsequent technical problem for the AutoRoll team to address - "this is where we spent a lot of engineering time and a lot of effort" [4]. This involved AutoRoll products being redesigned to be completely self-contained – with AI algorithms running on specifically manufactured hardware devices which did not produce or store images of people or whole-class activities. Ironically (given marketing claims of teachers being overwhelmed by administering large classes) AutoRoll's product patent describes this as a modest data-load – "processing by the local device remains fast and computational (sic) efficient, as it only needs to remember a small group of people" [1].

Technically this is a difficult and profit-limiting approach to take – not least because manufacturing their own hardware restricted export opportunities as compared to solely selling software. Nevertheless, the founders are keen to be able to claim that their products "can't be misused. Even innocently, they

can't be misused" [4]. In this sense, complex societal debates around facial recognition, ethics and discrimination that peaked while AutoRoll was coming to market were able to be tamed in bounded terms of schools' 'legal requirement' to address matters of 'privacy'. This was a 'requirement' that AutoRoll could claim to have addressed through its custom-made technology:

> It is a lot more expensive in terms of up cost to actually get hardware products rolled out … but we realised it was an absolute requirement … we went down the path of doing that R&D because it is the requirement for schools. Other companies might be looking at using AI and facial recognition for broader use-cases and scopes, but for us it was very much focused on how is this appropriate, and how is this ethical for the use, and comply with legal requirements for use in schools? [3].

iv). Perceived benefits

Despite the 'specific' nature of the decision-making task, this considerable technical work underpinned various exuberant claims of AutoRoll "helping schools" [4]. First, are familiar claims of efficiency - "we've developed the solutions to streamline and improve the efficiency of [attendance] processes for schools" [3]. These efficiencies are described in terms of precision ("accurate attendance records" [2]) and time-saving ("instant roll call" [2], "real time knowledge" [7], and overcoming the problem that "those few minutes add up and can equate to two and a half hours of lesson time lost per week for every student" [8]).

Second, are associated benefits of "eliminat[ing] human error" [3]. The system is framed as "completely foolproof" [4], even when faced with students dishonestly attempting to register absent classmates. Similarly, teachers are framed as fallible - "even with the best of intentions, mistakes can happen" [2]. As AutoRoll's patent put it, "manual attendance tracking is labour-intensive, time-consuming, and prone to circumvention and inaccuracy". Taking the class roll is therefore framed as an unreasonable task to expect teachers to undertake manually:

> When you're asking a teacher … to check 20-25-30 names off a list once an hour of every day, while keeping a classroom engaged, while not getting distracted because someone's walking in ten minutes late, while trying to get a lesson running and not being able to just stop and then log into a computer and check off the digital register, which might take two or three minutes, and by that time the classroom gets rowdy again and they start throwing paper planes at each other and then it takes another five minutes to get their lesson on track. That happens all the time, and therefore there is human error. There's always human error around that attendance taking process. [3]

In this sense, the use of facial recognition is justified as a failsafe means of managing these potential risks and ensuring a provision of safety. Indeed, over time AutoRoll's marketing has increasingly promoted issues of care and safety - "AutoRoll's all about helping organisations deliver great care to their communities … provid[ing] environments that all people can feel safe and trust" [9]. In the words of the company founders and wider biometrics industry, anticipating issues of care are framed in extreme terms:

> No parent wants to drop their child off at school in the morning and have a thought that the school doesn't know where their child is during the day or, God forbid, even lose them. [4]

> if there's high risk of bad people being in the area of the school and you want to protect your children, then [with AutoRoll] you might start feeling more comfortable. [10]

All told, AutoRoll was justified as fulfilling a public service – reflecting best industry principles of 'ethical AI' and 'AI for good' by selflessly focusing on the explicit task of classroom attendance, rather than more 'powerful' AI-driven impacts:

> It comes down to an ethical view of technology development … Realistically, AI is such a powerful tool that can be deployed to solve so many different problems … We get approached quite frequently from different potential customers, asking us to produce different aspects of our AI that could have really positive impacts to do with what our attendance taking solutions can do. Things like being able to support with potential mental health effects, depression, anxiety. There are off-the-shelf algorithms that can be used to do that … But then your consideration needs to be around … is it going to be used in the right way? So, we take all of that into consideration, and right now we say 'No, we're not going to do that'. Because we haven't done enough analysis, and we haven't done enough of a product scope to actually understand what the specific outcomes are to make sure that then the technology is used for good? So, it's AI for good and not with the potential to be detrimental or biased. [3]

v). Feared diminishments

Finally, then, it is worth contrasting these commercial framings of educational 'problems' and automated 'solutions' with the views of education professionals. Despite its commercial bluster, the AutoRoll system has been taken up only in a handful of schools – with the company remaining tight-lipped about its customer-base. This is understandable, given the scepticism that we noted in our interviews with various key stakeholders from across the

education community. The majority of these respondents were notably underwhelmed by the idea that using facial recognition technology to automate the roll-call addressed a notable problem. This included observations that "it can be pretty well assumed that most schools will know exactly who's on the premises" [5], and "I've not heard of any school that couldn't run without a biometric system" [11]. All told, AutoRoll was generally seen as a disproportionate use of a controversial technology on a vulnerable population. As one government data privacy official concluded: "there is no necessity in the end for the use of [facial recognition] – the balance isn't right" [12].

Key here, then, was a sense that AutoRoll was predicted on an 'outsider' view of schools and classrooms – "it depends on whether you're looking at schools from the outside or the inside" [13]. Doubts were raised that the technology would operate smoothly – incurring additional work for teachers: "we know who the people are who are going to have to reboot it, reset it, all of that sort of stuff. That's just another job for somebody in the school to do" [13]. Perhaps most significant was this concluding discussion from a group of teacher representatives and trade union officials – expanding on the significance of the roll-call in the context of teachers' professional judgement and classroom management:

> A: The assumption that taking the roll is lost time, and the assumption that the roll is not teacher work is a false assumption
> B: Yes, it's a pretty perfunctory process, but as a teacher you can use it in a whole range of ways that are actually about ensuring that the students are in the best place to learn, are focused. It is a commencement activity that has all the norms that sit around it. It's an institutionalised activity, and in that context teachers either use it in a very procedural way – get through it, get it done, move on … [but] other teachers use it in a very creative way as a tool to get students ready to learn.
> A: Sometimes you do get it wrong, and it can be a bit annoying, you can stuff it up … but at the same time it actually has a ceremonial process that can be very very useful to a teacher.
> C: … and the interactivity that it creates between you and the students
> A: … but also between the students in a classroom. Because they are hearing the other students' names so they're actually being reminded that it's not just a physical presence – it's the symbolism of a name. It's going to put them in a different sort of mindset.
> B: And teachers will use it not just as a way to check if a child's in a classroom, but to actually greet the child – to welcome them. It does cue the other kids. And it also has that dynamic that when a student is absent the other kids will tell you, which might then lead to a conversation as to why that is the case
> D: What about the new teacher? For a new teacher the roll is a crucial process to get to know who is there. With the repetition, by the end of term you do get to know their names.

B: Also, it's your first assessment of the day. Depending on how a student actually answers you that's the first indication of what you have to do in that classroom.

E: It is also a chance to show a bit of discretion, if a kid was having troubles and was persistently late you might opt to delay taking the roll until 10 minutes into the lesson so they don't show up as being late yet again. If the roll is taken automatically in the first minute, then you don't have that leeway.

C: It's around the belonging … that whatever stage a student is at, they are part of this class in a way that is equal to all the other students

A: So to narrow [AutoRoll] to it being efficient to decision making absolutely sidelines a whole bunch of the relational processes … and that can't be discounted.

[13]

DISCUSSION

In contrast to a surgeon deciding whether to operate, or a pilot deciding how to land a plane, a teacher taking the classroom roll might appear a decidedly inconsequential instance of professional decision-making. Yet, the example of AutoRoll highlights the significant subtle tensions that can arise when any form of ADM is introduced into a professional work context. Indeed, AutoRoll raises the contention that there is no such thing as wholly routine professional decision-making. While taking the roll is something that outsiders (such as AutoRoll's developers) understandably might see as a waste of professional expertise and time, this is a 'duty' that some education professionals nevertheless consider to be a significant element of their autonomy and authority. This echoes a tension that runs throughout studies of ADM in other contexts – i.e. attempts to automate "practices that operators do not consider automatic" (O'Grady 2021, n.p).

While it might appear to be a prosaic application of AI technology, AutoRoll raises a number of broader issues relating to the nature of ADM-infused classrooms, alongside automations of professional work in general. First, it is worth considering how the imperative for AutoRoll arose from – and is sustained by – broader socio-technical conditions that have come to define contemporary education. On its own, the promise of cutting-back on time taking to register the class is likely not enough to ensure the widespread take-up of this technology. Instead, AutoRoll only continues to be perceived as a commercially-viable possibility (at least by its industry and federal government supporters) because it fits neatly with broader logics and conditions of contemporary school reform.

For example, this is technology that aligns well with the extensive existing digital infrastructure of schools. Contemporary schools are now laden with digital devices, sensors and CCTV cameras, along with the continuous

dataveillance through school platforms, learning management systems and other classroom apps. Perhaps more significantly, AutoRoll also 'fits' well with a number of broader prevailing logics of school improvement that help it ride out any initial push-back from concerned parents and politicians. For instance, the prospect of 'disrupting' a clerical practice stretching back to the late nineteenth century articulates well with discourses of the outdated and 'broken' industrial era school, as well as discourses of the over-worked, over-stretched teacher.

All told, the slightly 'over-tooled' imposition of real-time facial scanning technology is a totem of corporate reform – bringing business-related logics and efficiencies to bear on school organization through the imposition of tech-driven business solutions. In a broad sense, then, AutoRoll begins to give shape to a long-standing sociotechnical imaginary amongst school reformers – the 'smart school':

> "… embedded with complex sensor networks that regulate learning environments through context-aware building management systems. These systems are capable of collecting and processing continuous streams of biometric and environmental data from school buildings and their inhabitants, including data collected from fingerprint scanners, facial recognition software, surveillance cameras, movement sensors, light sensors, and wearable biosensing technologies" (De Freitas and Rousell 2020, p.11)

It is therefore understandable that education 'outsiders' continue to be prepared to lend credence to AutoRoll's commercially-motivated claims of the 'problem' of the manual class roll, and the associated benefits of its automation. However wide of the mark they might be, claims of being able to save up to 2.5 hours a week of 'lost lesson time' clearly appeal to ambitions to instil business-like efficiencies into classrooms. Similarly, AutoRoll's promotion of anticipatory anxieties over 'losing children' and harms arising from an absence of 'care' also correspond with dis-satisfactions over distracted, overworked and inattentive teachers. As is the case with other forms of security-related ADM, these echo "private firms' reliance upon the conjuring of risk-laden futures" (O'Grady 2021, n.p.), and their desire to promote technologies as an opposing force for 'public good'.

Yet, notwithstanding such hyperbole, this chapter also highlights significant tensions in terms of how the technology diminishes the value of monitoring student attendance. In short, the underpinning logics of AutoRoll could be seen as rooted in what Wajcman terms an 'engineering model' of classroom processes and teaching tasks. As is the case with any ADM technology, the codification of the class roll process results in a finite, bounded model that inevitably constitutes "a simplistic view of the tasks it supports and the structures it represents" (Fischer and Wunderlich 2021, p.5770). On one hand, AutoRoll's design configures the act of taking a class-roll as

educationally unproductive, and therefore inefficient human work that it is desirable to eliminate. On the other hand, this clearly contrasts with many teachers' actual enactment of this task in ways that are pedagogically and/or socially generative.

Indeed, the 'engineering mindset' framing of AutoRoll does not strictly consider the roll to be a 'decision' at all. AutoRoll presumes an objective act of recording – a student has simply entered the room or they have not – rather than a matter for discretion. Yet, an opposing sense arose from some of our teacher interviewees that what AutoRoll might codify as a simple and routine act should actually be acknowledged as complex and non-routine. Here, educators spoke of taking the classroom roll as a process of judgement, sense-making, and assessing the situation. Crucially, then, calling the class roll can be a moment of considerable discretionary power based on professional judgement and expertise.

From a teacher point of view, then, talk of automating the class roll needs to be set against a relational understanding of classrooms and teaching as relational work. In this light, the act of taking the roll is a key instance of tacit knowledge and social action, with each teachers' discretion when calling the roll enabling a significant moment of 'street level' classroom governance (McIntyre 2019). Teacher discretion when calling the roll is necessary to make classrooms continue to run smoothly – smoothing over contradictions, allowing flustered children to calm down, late-arriving students a chance to recompose themselves. In contrast, the AutoRoll ADM curtails this professional judgment and relational work. Rather than 'freeing-up' teachers, this form of classroom ADM works to disintermediate their interactions with students, as well as diminishing the student as subject (e.g. describing a present child as a 'correct data-point'). As such, AutoRoll's codification of the roll process sidelines the capacity of professional knowledge workers to "tak[e] good decisions and solving problems, and that the abilities to do so derive from knowledge professional's individual creativity and deep experience" (Fischer and Wunderlich 2021, p.5770).

CONCLUSIONS

Much of the AutoRoll case reflects a familiar story of the realities of ADM integration into professional workplace settings. First is the idea that delegating responsibility for what seems to be a simple act of decision-making to ADM technology foregrounds the beliefs, views and logics of 'outsider' entrepreneurs, software developers and marketers responsible for the emergence of this technology. These delegations are not wholly unwelcome – rather they fit with a range of broader conditions of school reform, improvement and efficiency. Nevertheless, these technologies inevitably lead to a simplified codification of workplace processes which itself leads to "the insertion of new rationalities and ontologies" into workplace settings (O'Grady 2021). With teachers and students tending to be sidelined in this process,

AutoRoll constitutes a subtle 'de-professionalising' presence in the working lives of educators. While ADM usually promises to overcome a number of human-related frictions, these frictions are a key element of the relational work that make classrooms continue to function relatively smoothly on a day-to-day basis.

As such, the key conclusion to draw here is not really a matter of whether the continued development of ADM-driven roll-call technology is necessarily 'a good thing' or 'a bad thing' in schools. Rather, more thought needs to be paid to addressing (and perhaps reconciling) the differences in the ontological and epistemological grounds upon which the implementation of this technology is based (Lisle and Bourne 2019). This chimes with a key theme running throughout this edited collection – i.e. how futures integration of ADM technology might be reimagined along 'people-focused' and 'humanistic' lines. For example, what would a 'AutoRoll' co-designed by teachers and students look like? What might ADM look like if it was designed to support teachers' relational work in classrooms? As Sarah Pink contends earlier in this volume, "if we are to bring people into the process of ADM technology design, then we need to ensure that the conceptual categories that frame theory and practice in innovation account for people". Therefore, a first step in reimaging re-humanized forms of AutoRoll might be re-examining the ways in which notions of 'care' are being used – i.e. the 'care' of automatically knowing a child has entered a room, as opposed to the 'care' of taking time to ask how the child is feeling. In this sense, for example, what might classroom ADM look like if it was designed around relational (rather than corporate) notions of 'care-full' work and 'caring' relationships, rather than notions of care as statutory duty?

Of course, it might be argued that refocusing ADM around the interests of teachers and students is not straightforward. While a number of possible inclusive and participatory directions might be co-opted from fields such as design, anthropology and HCI, all of these run a risk of being thwarted by the current hegemonic conditions of educational institutions and educational work. Even after the educational upheavals of the COVID pandemic, the dominant model of compulsory schooling looks set to remain remarkably unchanged, with little appetite to switch over to online tuition, 'hybrid teaching' or similar technology-related shifts seen in the higher education sector. In particular, as Teräs et al. (2020) note, the 'post-pandemic' forms of educational technology that look set to dominate schools in the 2020s continue to be those that reinforce capitalist instrumental view of education rather than alternate values of promoting holistic human growth. In this sense, any efforts to involve teachers and students in the design, delegation and implementation of educational ADMs need to also address the challenges of re-humanizing the broader institutional conditions and logics within which educational work take place. In this sense, any re-imaginings of classroom ADM need to go hand-in-hand with broader educational reforms which strive to wholly re-establish schools as sites of cooperation and codetermination. This type of institutional

renewal is a design challenge well beyond the scope of this book, but should not be ignored in any attempt to imagine 'better' forms of educational ADM.

.

ENDNOTE

Data sources quoted:

1	AutoRoll international patent application (Nov 2020)
2	AutoRoll promotional video
3	Interview: co-founder of AutoRoll start-up
4	Interview: co-founder and technical lead of AutoRoll start-up
5	Interview: Legal advisor – Independent Teaching Union
6	AutoRoll contracted UX research brief
7	AutoRoll recruitment advertisement - Linkedin
8	AutoRoll FAQ
9	AutoRoll website
10	Interview: chairperson – biometrics industry consortium
11	Interview: chairperson – biometrics in schools lobby group
12	Interview: data/technology lead - state government Department of Education
13	Group interview – national teaching union – executive & teacher representatives x4

ACKNOWLEDGEMENT

REFERENCES

Barber G (2020) Schools adopt face recognition in the name of fighting COVID. *Wired*, 3 November, www.wired.com/story/schools-adopt-face-recognition-name-fighting-covid/

Bulger M (2016) Personalized learning. Report, Data and Society, New York, July.

De Freitas E and Rousell D (2020) Relational architectures and wearable space. *Research in Education* 107(1): 10–32

Edwards B and Cheok A (2018) Why not robot teachers? *Applied Artificial Intelligence* 32(4): 345-360.

Fischer L and Wunderlich N (2021) Datafication of knowledge work. In: *Proceedings of the 54th Hawaii International Conference on System Sciences* (ed Bui, T), Hawaii, 4-8 January 2021.   pp.5769-5778. Honolulu: HICSS.

Fitzgerald S, McGrath-Champ S, Stacey M, Wilson R and Gavin M (2019) Intensification of teachers' work under devolution. *Journal of Industrial Relations* 61(5): 613-636.

Gulson K and Witzenberger K (2021) Repackaging authority. *Journal of Education Policy* Epub ahead of print 11 October 2021. DOI: 10.1080/02680939.2020.1785552.

Ideland M (2021) Google and the end of the teacher? *Learning, Media and Technology* 46(1): 33-46.

Lisle D and Bourne M (2019) The many lives of border automation. *Social Studies of Science* 49(5): 682–706.

Luckin R, Holmes W, Griffiths M and Forcier L (2017) *Intelligence unleased*. London, Pearson.

McIntyre C (2019) Exploring public sector managers' motivations in deploying decision support tools to the street level. *Policy Quarterly* 15(1): 61-67.

O'Grady N (2021) Automating security infrastructures. *Security Dialogue* 52(3): 231-248.

Saloviita T and Pakarinen E (2021) Teacher burnout explained. *Teaching and Teacher Education* 97: 103221.

Selwyn N (2021) *Education and technology*. London: Bloomsbury.

Shermis M and Lottridge S (2019) Communicating to the public about machine scoring. Paper presented to *National Council of Measurement in Education annual meeting*, Toronto, 7 April. Available at: www.air.org/sites/default/files/CSSC_Communicating%20with%20the%20 Public_White%20Paper.pdf (accessed 11 October 2021).

Teräs M, Suoranta J, Teräs H and Curcher M (2020) Post-Covid-19 education and education technology 'solutionism'. *Postdigital Science and Education* 2: 863–878.