Sociology of Education Review Essay

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These three books deal with various aspects of algorithms, datafication and AI in education, and when read together, allow for a series of insights into the effects of these technologies in education today. When illustrating the front cover of books related to technology in education, particularly AI, the 'computer human head', robot or network image seem to be formal requirements, and these tropes are present on the cover of each of these books, pointing to a set of themes around human-nonhuman entanglements in educational settings, which they go on to explore in detail.

Selwyn's pocket-sized book is part of a themed series on 'Digital Futures' from Polity. The title is 'Should Robots Replace Teachers? AI and the Future of Education.'; I found it striking, in that it appears to pose a somewhat simplistic yes/no question, with an image of a rather sinister white humanoid robot on a plain black background, holding a teacher's pointer. It is worth considering this image, as it combines this highly futuristic trope along with the pointer, an artefact which is very seldom if ever used in the contemporary classroom. It might be speculated that the pointer stands here for the human teacher as symbolic of obsolete technology and practices, also a slightly authoritarian implication. Interestingly however, the second sentence of the preface immediately debunks the image, pointing out that '…the deployment of human-looking robots in classrooms remains more of a publicity stunt than a serious educational trend' (Selwyn 2019: vi).

Selwyn's focus is more on how teachers might work alongside AI technologies. He asks 'What aspects of teaching might it soon no longer make sense for humans to perform? Can

automated systems free teachers up to work in different and more rewarding ways? Alternatively, will the humans who remain employed in education settings be compelled to work in an increasingly machine-like manner?' (Selwyn 2019: vi-vii). It is worth considering whether certain assumptions lie behind the first two questions; that there are aspects of teaching which do not require humans, and that there are elements of teaching which take up time which is not well-used by humans; assumptions which seem to rest on a logic of efficiency, but also of the notion of partial human redundancy. Selwyn goes on to demonstrate how the contemporary context of the profit-driven 'Ed Tech' market represents a threat to the professional status of teachers and university faculty. However, his broader intention with the book is to '…engage with the politics of digital automation as much as with matters of design and efficiency.' (Selwyn 2019: viii).

He discusses the choice of the title, emphasising the focus on values and choice over predictions for the future, and in that regard, he provides a welcome riposte to the notion that such a move is inevitable. He broadens his discussion beyond robots to take in machine learning, and particularly AI deep learning in education; (the former refers to algorithms being 'trained' using large data sets to undertake tasks of take decisions, the latter describes a process by which machine learning is applied to artificial neural networks which are modelled on the structure of the human brain). This system then become capable of training itself autonomously, leading to systems of this nature being (contentiously) claimed to approximate aspects of human reasoning. However, although these technologies have already been applied in a range of contexts, he reminds us that they carry with them serious risks including bias, such as failure to recognise the faces of people of colour, among other examples. Turning to teaching, he points out the tendency in AI circles to place emphasis on one-to-one tuition over classroom teaching, a view which is at odds with the assessment of

most educationalists, who also place value on 'human improvement', not only the acquisition of knowledge.

Selwyn advocates a *sociotechnical* approach which recognises that technologies can never be seen as existing apart from human society and agency, critiquing 'technological solutionism' which assumes AI-driven logics can solve complex problems in education. He also describes how corporate assumptions that education is inherently outdated and in need of 'disruption' acts as a powerful driver, alongside political hostility to the teaching profession, and a broader set of assumptions about the future of work leading to the replacement of human professionals with AI technologies. He points out the need for a critical stance in the face of these various commercial and discursive currents, also paying attention to the broader philosophical, ethical and existential questions posed.

He moves on to a chapter on physical robots, looking at 'classroom teacher' robots used in pre-school and primary settings, robot-assisted language learning, humanoid robot teachers, companion and peer robots, and care-eliciting robots which prompt 'help' from children by exhibiting problems or weaknesses; even robot baby seals which have also been used to engage therapeutically with elderly dementia patients, and robot teddy bears to work with children with autism. He discusses the potentials but also drawbacks of robot teachers, concluding it is unlikely that they will be taken up on a large scale as a full replacement for human teachers, also focusing on the range of ethical questions raised by robots in the classroom.

The next chapter focuses on intelligent tutoring and pedagogical assistants, in the form of virtual assistants and software bots, tracing their development form the 1960s onwards. He

describes Intelligent Tutoring Systems which provide coaching and feedback on learners' performances, and pedagogical agents which appear in the form of screen-based animated characters. More recent pedagogical agents deploy advances in AI technology to gather data on students, such as their posture or gaze, with some able to infer emotions and predict actions, using facial recognition, eye-tracking, and mood detection, with agents also designed to be 'plausible' interlocutors with whom student can form 'relationships'. Selwyn discusses the limitations of these tutors in terms of the types of interaction they are likely to elicit, using 'nudges' to influence human behaviour, which could be critiqued as mechanistic, manipulative, infantilising, disempowering and unethical.

The following chapter moves the focus to AI technologies which operate 'behind-the-scenes', such as personalised learning systems, learning analytics, automated essay grading technologies, plus administrative technologies. These systems use a variety of techniques to monitor and trace student activity, or to interact using chatbots. Selwyn provides a thought-provoking analysis of the potential advantages but also implications of these technologies for the teaching profession, and the risks of reducing the complexity and messiness of classrooms, teachers, and students to 'data'. He also raises the issue of the reinforcement of structural inequalities and potential injustices, in addition to the potential downgrading of the role and labour rights of the teacher. His concluding chapter reinforces the point that these are sociotechnical entities that must be considered in terms of the social, cultural and political implications and effect they may have. Refreshingly, in the face of prevalent utopian discourses of Ed Tech, he restates the case for human teachers. He ends with a series of thought-provoking speculative scenarios about the future of AI in education, which draw out the complexities of this fascinating emergent set of practices, concluding that AI is most appropriately applied to repetitive and automated tasks as opposed to attempting to replicate

human behaviour and activity. He calls for criticality, caution, and nuanced decision-making for future development of AI in education.

Holmes et al (2019) also focus on teaching and learning in AI in education (AIED) also setting out to find a balance between hype and reality. They begin by posing the question of 'What should students learn?', looking at the impact of AI on the curriculum. Like Selwyn, they distinguish between areas in which machines might outperform humans, and other activities where humans are more suitable than machines, with a similar breakdown of elements such as repetitive tasks, classification, and handling large amounts of data, versus emotions and relationships and making decision according to abstract values. In the first part of the book, they focus on the question of '*What* students should learn in an age of AI?' and the related questions of 'If you can search, or have and intelligent agent find, anything, why learn anything? What is truly worth learning?' (Holmes et al 2019:3). They advocate for '*deeper learning goals* of a modern education' (Holmes et al 2019:4), which they identify as *versatility*, *relevance*, and *transfer*. They see this as being developed via 'Selective emphasis on important areas of traditional knowledge, the addition of modern knowledge, a focus on essential content and core concepts, interdisciplinarity, using real-world applications, and embedded skills, character and meta learning *into* the knowledge domains.' (loc cit).

The second part of the book focuses on the 'how' of AI in education, posing similar questions as those raised by Selwyn about how it might be used in classrooms, how student privacy might be respected, what the effect might be on teacher roles, what social and ethical consequences ensue. They provide an overview of the historical background of AI and recent applications, followed by a section on the history of AI in education from the early days of behaviourism to adaptive learning, computer-aided instruction, to present-day uses of AI.

They include a substantial, detailed, technically oriented overview of various applications and examples, which is highly informative to any reader new to the area, (but beyond the scope of this piece to review in full). As such, a large part of the book offers a very useful comprehensive resource for a reader to access in order to become familiar with the current range of uses of AI in education, and future possibilities.

Like Selwyn, they also turn their attention towards the ethical and social dimensions of AI in education, pointing to a dearth of research into ethics in particular. They raise some criticisms of intelligent tutoring systems in terms of their tendency to reduce student agency, and to gravitate towards what is easy to automate, rather than what is most valuable. They conclude with a focus on ethics, highlighting the use of facial recognition technology in classrooms, and raising questions about the ethics of collecting large qualities of data about students, and the risk of bias being incorporated into algorithms. They conclude by posing a series of questions regarding the ethics of AI consisting of: 'What are the criteria for ethically acceptable AIED? How does the transient nature of student goals, interests and emotions impact on the ethics of AI? What are the AIED ethical obligations of private organisations (developers of AI products) and public authorities (schools and universities involved in AIED research)? How might schools, students and teaches opt out from, or challenge, how they are represented in large datasets?' What are the ethical implications of not being able to easily interrogate how AIED deep decisions (using multi-level neural networks) are made?' (Holmes et al 2019: 178). These provide an insightful set of challenges for the field to consider.

Moving away from considerations of teaching and learning, Gulson et al (2022) instead tackle the relationships between datafication, AI and policy, focusing on '… how algorithms

of education move among us in the everyday workflows, values and rationalities of educational governance.' (Gulson et al 2022:2). The main conceptual contribution of the book is their notion of *synthetic governance*. For them, this synthetic development '…does not involve direct replacement of human minds and bodies, but rather it produces new ways of thinking about the conjunction of human and nonhuman cognition.' (loc cit). They illustrate this with reference to a 'female' humanoid robot Ava in the film ex-machina, making the point that she is able to move through the city streets undetected in the film scene, drawing a parallel between her presence and that of algorithms in educational governance, in both cases '…a presence shaping human life-words' (loc cit).

The focus on the book is not on general intelligence in AIs, but on task-specific AIs and how they act on the world, citing as examples student information systems, facial recognition systems for taking attendance registers, and systems such as Google Classroom. As they point out, the rise of AI in education is part of a longer process of datafication, and this has changed educational governance in profound ways. Their focus is on '…political rationalizations and questions of knowledge, power, and truth claims'. (Gulson et al 2022: 4), with rationalities being described as more than simply ideologies, but also including ways of thinking and acting. They aim to '…to explore how the fabric of education is changing' (loc cit).

For them, synthetic governance is '…an amalgamation of (1) human classifications, rationalities, values, and calculative practices; (2) new forms of computation, what we might consider to be nonhuman political rationalities, that are changing how we think about thinking; and (3) the new directions made possible for educational governance by algorithms and AI.' (loc cit). This machine-body conjoining takes a range of forms; they focus on data

infrastructures, algorithms, and forms of AI which emerge from both of these. They identify two main approaches to technology: instrumentalist and substantivist, with the first casting technology as a 'tool' at the command of the human, the latter based on a Heideggerian perspective that technology is a force which acts on our 'being'.

With reference to cybernetics, they point out the contribution of insights from the life sciences, in that organisms were akin to algorithms, claiming to break down the 'wall' between the organic and the inorganic. They point out the connections between cybernetics, to systems analysis, to policy sciences, governed by '…a political rationality of control and prediction' which came to predominate in educational policy and governance in the latter half of the 20th century. The book opens with an overview of how networks and AI are used in contemporary education, then sets out their theoretical stall. They also refer to Foucault's *biopolitics* and the use of statistical practices in government, leading to standardisation in education, and governance mechanisms which are designed to control bodies, reinforcing gendered and racialised inequalities. They point out the recursive nature of computation in governance, in which data begins to produce educational settings, as opposed to the other way around, as 'calculable spaces' expand. They also examine the 'regulatory technologies' of performativity and accountability, which include testing, qualifications systems, benchmarks, standards, and so on. Their definition of educational data infrastructure is incisive and comprehensive, and worth quoting in full here: '…an assemblage of material, semiotic, and social flows or practices that (1) enables the translation of things into numbers ("datafication") (2) enables the storage, transmission, analysis, and representation of data using algorithmic logics and computational technologies; (3) embeds data usage into a range of other practices; (4) produces new topological spaces through practices of classification, measurement and comparison and new operations of power *through* the production of these

spaces; and (5) contributes to new social practices, new problematizations of the social, and new forms of governance.' (Gulson et al 26).

Chapter 2 moves on to propose the concept of *synthetic thought*, as a means of considering how AI '…may exceed instrumental rationality, as well as creating new, possibly unsettling, political rationalities in education.' (Gulson et al 2022: 36), which they see as taking place via a cooperation between machine and human cognition. Drawing on the work of Stiegler (1998), particularly his contention that technology and culture are irreducible. This view challenges the notion of technology as a 'tool', instead seeing it as being in a *prosthetic* relationship with human biology. This also moves us away from a stance of technological determinism, rejecting a view of technology as autonomous from the human. This emphasis on *exteriorisation* is proposed as a means by which to theorise '…the emerging political rationalities of anticipation, prediction, and automation' (Gulson et al 2022: 39). This theoretical stance relies on the notion of self-augmenting technical systems, such as machine learning and anticipatory recommender systems. This self-augmenting nature does not remove human agency; but mediates it via networks in which no single agent controls the whole system. This brings about a profound shift in how action and control can be understood in educational governance. For Gulson et al, thought is therefore exteriorised in Stiegler's terms. Crucially, in such a system, the individual is fragmented; they allude to Deleuze's theorisation of societies of control in which populations are rendered into '…samples, data, markets, banks', or 'dividuals', '…numbered bodies of coded 'dividual' matter to be controlled.' (Deleuze 1972: 180, 182 in Gulson et al 2022: 41). Viewed in terms of exteriorisation, three points are raised. Firstly, that technology is a course of contingency, and therefore governance via automation destabilises its subjects. Secondly, previously unseen elements are connected to what they call 'new educational surfaces' (loc cit), new

arrangements of data, codes of systems which access 'dividualised' information. Thirdly, it disrupts how we understand human intentionality in governance. As they sum up, 'In other words, agency and intentionality are no longer interior or intrinsic to human actors, but rather desire is shaped by exteriorised forms of cognition in accelerating networked and self-augmenting technical systems.' (loc cit).

They go on to discuss *accelerelationism*, a concept first associated with the Cybernetic Culture Unit at Warwick University, UK, in the 1990s. which describes time compression taking place as a result of the interaction between commercialisation and industrialisation. It is associated with the notion of a runaway, out-of-control, disruptive modernity which lies outside of human agency. In their overview they refer to the influential work of Nick Land, who has raised questions regarding whether the processes of accelerated technological development are amenable to political intervention. This has led to a school of thought that acceleration will take place regardless of human attempts of intervention, and that therefore it should be accepted as inevitable. They draw on accelerationism to propose four different potential responses to AI: (1) *promotion*, (2) *appropriation*, (3) *acceptance*, and (4) *problematisation*.

They then elaborate on their construct of *synthetic thought* drawing on the work of Katherine Hayles and Luciana Parisi, to elaborate concepts of *nonconscious cognition* and *automated thinking*. Hayles makes a distinction between thinking (which involves consciousness), and cognition (which does not require consciousness). For Hayles, nonconscious cognition is distributed across human and nonhuman agents, and when entangled with technical devices making up infrastructure, '…the cognitive nonconscious also carries on complex acts of interpretation, which syncopate with conscious interpretations in a rich spectrum of

possibilities.' (Hayles 2014: 215), a process she characterises as *technogenesis*, a co-evolution of humans and technics (Hayles 2012). Parisi critiques the conflation of capitalist logics and automation in critiques of instrumentalist rationality. Gulson et al recognise the importance of critiques of data-driven technologies within education as part of a harmful capitalist logic; but concur with Parisi's (2016) point that there are further possibilities for automation outside of this logic, with references to the capacities of machine learning, which extends beyond induction and deduction, to being capable of learning to learn, what Parisi calls its own 'form of knowing' (Parisi 2017: para 8). For Gulson et al, it is the potentials of the 'creative uncertainty of nonconscious cognition and its syncopation with human thinking' (2022: 50) which informs the focus of the rest of the book in which they provide three empirical chapters, focusing on an interoperable national data infrastructure, facial recognition technology, and the use of educational data science in a government education department.

They conclude with a chapter on what they call *synthetic politics*, exploring in more depth the four stances mentioned above, and proposing in conclusion *problematization* as a response which does not assume a division between human and machine, but instead regards their agency as intertwined. As such, they argue against either an anti-technological stance, or a position of 'boosterism'. I found their analysis of the human-technology relationship inherent in the notion of problematization to be convincing. However, a challenge could perhaps be mounted to the assumption that this therefore reflects a *full assimilation* of the two, basing the notion of synthetic politics on a premise that '…there is no outside of algorithmic decision-making and automated thinking' (Gulson et al 2022:144), with the only option remaining a form of 'co-learning', on the basis that '…thought has never been limited to the human' (loc cit). The latter point is undeniable, but I would part company with a discourse of inevitability

or even resignation, which denies the existence of aspects of governance, thought, and politics; and crucially practices and micro acts of resistance - which continue to persist in the interstices outside of the algorithmic gaze.

These three books taken together offer the curious reader a range of resources. Selwyn provides a slim but highly focused, critical, politicised and nuanced consideration of the role of AI in education which is at the same time accessible to the layperson, student, or academic newcomer to the field. Holmes et al offer a detailed, well-informed and slightly more technical overview of recent developments and particular examples, which would be of utility to anyone seeking to develop a more detailed and comprehensive view of what is 'out there', alongside some stimulating provocation regarding ethics in conclusion. Gulson et al present a complex, highly theorised, incisive, and ground-breaking exploration of the effects of AI on educational governance; an impressive intellectual achievement which will, in my view, set the future research agenda for this emergent area. Perhaps what draws these three rather different publications together is their mutual preoccupation and probing of the complexities, technicalities, practices, ethics, and obligations that constitute and trouble the relationships we have as humans with technologies and machines, as AI develops. These tend to centre on questions of power, agency, control, choice, values, and the nature of being. Across the whole field of AI and technology in education, we find ourselves epistemologically, ontologically and therefore ethically in spaces of ambiguity, liminality, and strangeness, which - it might be argued – tempt responses which seek clarity, resolution, and firm binaries. Technologies as tools, or technological determinism? Brave new world, or dystopian visions of robot overlords? 'Disruption' of educational hierarchies, or more monitoring and control? What I found valuable about these three books was that they all, in different ways, resist the lure of these apparently straightforward positions, instead acknowledging the indeterminate, uncanny

and unsure nature of these technologies and how they entangle with us as individuals, educational institutions, and societies, all the while emphasising what is distinctive about the human, even in a more-than-human world. It is this nuanced and watchful stance towards educational practice, governance, and research in this field which will be of utility and value as these technologies accelerate in their capacities and potentials in the world of education, and beyond.

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