Towards a sociology of education and technology

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INTRODUCTION

Without doubt, one of the defining features of the past thirty years has been the on-going development of digital technology. The scale and pace of innovation in technologies such as computing and mobile telephony has prompted many commentators to portray societal development (at least in the overdeveloped regions of North America, East Asia and Europe) as being more technologically-driven than ever before. Manuel Castells (2006, p.3) for example, puts it as follows: "we know that technology does not determine society: it *is* society". While a good case can be made for approaching such statements with some scepticism, it is nonetheless undeniable that digital technologies are deeply implicated in contemporary social life.

In this context, then, it is hardly surprising that digital technologies of all shapes and sizes are embedded into the everyday fabric of contemporary education. Digital technologies now play an integral role in many aspects of teaching and learning across the lifecourse - from the growing use of iPads in school classrooms, via online learning systems in schools and universities, to the use of open resources and social networks in the workplace (Melhuish & Falloon, 2009; Allen and Seaman, 2011; Cook & Pachler, 2009). Digital technologies have also come to underpin professional work practices and effectiveness indicators in education, through tools such as performance management systems and international league tables (Facer, 2012; Grek, 2009). Images of students learning happily with the latest laptop or smartphone also continue to play an important discursive role as a symbol of modernity in the marketing brochures of institutions and nations. Indeed, despite its complexity, digital technology use is now an expected but largely unremarkable feature of the educational landscape.

In this chapter we argue that the increasing normalisation of digital technology within the mainstream of contemporary education urgently requires sociology of education to pay close attention to the technological. Indeed, as the 2010s creep ever closer to the 2020s, one could argue that it is increasingly difficult to lay claim to understand *any* aspect of education without giving serious consideration to the technological.

THE NEED FOR A DELIBERATE 'SOCIOLOGY OF EDUCATION AND TECHNOLOGY'

Given the ways in which digital technologies are implicated in the day-to-day practices and structures of education, the fact that the topic of technology continues to be a relatively marginalised feature of the sociology of education is perhaps surprising. Of course, there have long been small pockets of authors producing critical sociological analyses of digital technologies in education. In North America, for example, a modest lineage can be traced from the work of Michael Young (1984) and David Noble (1984), Stephen Kerr (1996) and Steven Hodas (1993) through to Hank

Bromley (1998), Gary Natriello (1995) and Torin Monahan (2005) in the 1990s and 2000s. It must also be noted that technology has occasionally captured the attention of a few relatively 'big names' within the sociology and philosophy of education such as Michael Apple, Joel Spring, Michael Peters, Douglas Kellner, Andrew Feenberg, Jane Kenway, Roger Dale and others. Yet few of these critical scholars have maintained a focus on the topic of education and technology for more than a small proportion of their careers. At the same time, the well-established fields of 'Sociology of Technology' and 'Science and Technology Studies' have directed their attention towards the spectacular epistemological and ethical debates promoted by nuclear, genomic and fertility technologies, or the day to day use of technologies in workplaces (Williams, 2006; Heath, Knoblauch, Luff, 2000). Very rarely have scholars working in these areas turned their attention towards the complexities of the education arena. We still, therefore, remain a long way from being able to point towards a deliberate and sustained 'sociology of education and technology'[1].

This low profile is disappointing on a number of levels. In particular, it is problematic because the analysis of technology in education continues to be dominated by psychological processes concerned primarily with understanding the relative merits of different uses of technology for learning (see, for example, the contents pages of highly ranked journals such as Computers and Education). The notable exception to this emerges from the media and cultural studies perspective, which, while giving greater recognition to the complexities of context, is often occupied disproportionately with discerning practices of empowerment through informal participation in digital cultures outside the school (see, for example, the field-shaping concerns of the Macarthur Foundation Series on 'Digital Media and Learning' (2007)). Indeed, despite longstanding acknowledgement of the need for theoretical expansion and sophistication (e.g. Hlynka and Belland 1991, Oliver 2011), research into education and technology as a whole is too often characterised by technocratic discourses of 'effectiveness' or captured by the search for emerging practices beyond formal educational settings.

It is our contention in this chapter, therefore, that a deliberate sociology of education and technology is critical for two reasons. First, it is essential for the continued capacity of sociology of education itself to contribute to contemporary educational debates; and second, it is an important means of developing the complexity and insights of analysis in the educational technology research field. This deliberate sociology of education and technology would proceed from the insights borne out of sociology of technology. It would work from the position that: technologies are not neutral but political; that they are carriers for assumptions and ideas about the future of society; that their design, promotion and use are all sites in which struggles over power are conducted. It would also draw on the traditions of critical sociology to focus explicitly on the fact that technologies are deeply implicated within unequal relations of power elsewhere in education and society, within the lived realities of dominance and subordination that are currently on-going, and within the conflicts that are generated by these relations (see Apple 2010).

One of the key strengths of a sustained and deliberate sociology of education and technology therefore, would be its willingness to approach the understanding of technological change in education as a contested political project rather than as a matter for technocratic debate over efficiency. Such a perspective would remind us

that the use of digital technology in education should be understood in long-standing and entrenched terms of struggle over the distribution of power. As the wider sociology of education reminds us, these are struggles that take place across a number of fronts - from the allocation of resources to the design of curriculum, from the maximising of profit and political gain, to attempts to mitigate patterns of exclusion. Thus a sociology of education and technology would draw attention to linkages between technology use in classrooms and 'macro' elements of the social structure of society such as global economics, labour markets and political and cultural institutions. Similarly, at the 'micro' level of the individual, it would remind us that education and technology also needs to be understood as being entwined with the 'micro-politics' of social life. In approaching education and technology as a site of intense social conflict, a deliberate sociology of education and technology therefore moves beyond the search for novel forms of teaching and learning to also interrogate broader questions of how digital technologies (re)produce social relations and in whose interests they serve.

MATTERS OF CONCERN FOR THE SOCIOLOGIST OF EDUCATION AND TECHNOLOGY

We hope that we have already impressed upon the reader a need for greater numbers of sociologists of education – regardless of specialisation – to engage with digital technology as a serious and significant element of their study. However, we are under no illusions that this will be a straightforward task. One of the main challenges in applying these sociological concerns to education and technology is to work within the fast moving, rapidly changing and often ephemeral nature of the topic. The new media landscapes of Facebook, Twitter and 'cloud computing' are deceptive in their ability to appear too shallow and fast moving to merit serious sociological scrutiny. Jodi Dean, for one, has bemoaned the intellectual 'challenge' faced by any academic who attempts to think critically and politically "about media practices in a setting where they are fast, fun and ubiquitous" (Dean 2010, p.1). As a result, this is an area of educational research that has tended traditionally to attract researchers who are personally as well as professionally enchanted by digital technology and a digital way of living. Certainly, it is understandable that researchers and writers who are *less* personally interested in the digital might perceive these technologies as too slippery a target to merit the analysis that one would afford to, say, seemingly more straightforward and stable issues such as class differences in educational outcomes or the gendered nature of the curriculum.

Yet if one looks beyond the seemingly shallow and ephemeral nature of the surface features of digital culture, then a number of entrenched issues of central importance to the contemporary sociology of education are soon apparent. Given the endurance of these issues, the case can therefore be made for sociologists of education adopting a more de-accelerated, detached and disinterested perspective on education and technology than is usually the case in popular discourses of digital technology. Indeed, we would contend that one of the first steps when taking a sociological approach to technology and new media is being able to move beyond the never-ending 'noise' of technical upgrades and product re-versioning, and instead identify the often obscured but nevertheless substantive social issues that persist beneath (Wessells 2010). Viewed in this manner, then, we would suggest that there are a

number of key issues and debates that will continue to be associated with the on-going mobilization of digital technologies in education over the next two decades or so, and therefore merit particular sociological attention. In order to advance our argument for a deliberate sociology of education and technology, we can now spend a little time considering four of these issues in turn.

i) Virtualising education and personalising learning

The first issue that merits attention is the way in which digital technologies are being mobilised as a ready rationale for - and ultimate means of achieving - the disaggregation of the education institution. In other words, for the break up of education institutions into multiple functions where students 'access' teaching, learning, peer support and accreditation from multiple sites and sources distributed between different social settings. This can be seen in stark terms, for example, in the ways in which the individual and their 'personal learning networks' rather than the school, the university or the locality, is being promoted as the pre-eminent site of education. Of course, these shifts are not driven wholly by digital technology. The sociology of education has a long and distinguished track record in documenting and analysing the wider ways in which the neo-liberal market reforms in education serve to construct students and parents as consumers and to construct education as a positional rather than a public good (Brown 1997, Holmwood 2011). It has also documented how the rhetoric of the 'unfinished cosmopolitan' (Popkewitz 2006, 2008), constantly adapting herself to the changing demands of liquid modernity has become a dominating metaphor for education in contemporary conditions. What has gone relatively unremarked within these broader sociological analyses, however, is the way in which the libertarian traditions of computing and the democratic narratives of co-production via digital networks are potentially enabling and fuelling these trajectories of hyper-individualisation and de-institutionalisation.

The last decade, for example, has seen a massive growth in online and informal learning environments that seek to cut the umbilical cord between educational practice and institution, and to put 'into the hands of learners' the means to construct their own 'learning journeys'. These developments are driven by multiple and often conflicting agendas which include, for example, those who are fundamentally concerned to disrupt existing concentrations of educational and economic power. This includes those universities inspired by the 'Free, Libre and Open Source' traditions of Richard Stallman seeking to 'make information free' by publishing all course material and scholarly activity online. There are community educators inspired by the democratic education traditions of Ivan Illich and Paulo Friere, who are constructing new learning networks and encouraging ideas of 'Do It Yourself' learning. There are education policy makers inspired by the social network and civil society analyses of Putnam and McKnight, as well as by the Ostrum's analysis of the co-production of public services, who are attempting to recast learners as active collaborators and co-developers of learning. There are also those who see the capacity to disaggregate educational resources from costly institutions as a means of constructing 'cost-effective' education as a process of peer learning, online resources and on-demand assessment available to whoever will pay for it. For many of these groups, virtualising and personalising learning is understood as potentially challenging existing inequalities and opening up educational practices to the distinctive needs and resources of much more diverse student groups.

The specific *educational* merits of these various forms of technologically-enhanced individualism have tended to be expressed through a set of articulations concerning the empowerment of individual learners within networks of opportunities to 'do' education. For example, the internet is often described as reversing the logic of education provision "so that it is the system that conforms to the learners, rather than the learner to the system" (Green *et al.* 2006, p.3), with learners (re)positioned at the centre of networks of learning opportunities. In many of these accounts, digital technology use is generally celebrated for what Ruckenstein (2010, p.7) describes as its "individualistic ethos … characterised by a firm belief in the emancipatory potential of new information technologies, free-wheeling bohemian creativity, and goal orientated entrepreneurship". Crucially, digital technologies are seen as liberating the individual from the traditional formal institutions that would previously have structured their education, and recasting educational arrangements and relations along more informal, open and, in the eyes of their advocates, more democratic and ultimately empowering lines.

This potential is understandably appealing to educationalists concerned with the welfare and development of the individual learner and equally alluring to those who have long desired to counter the longstanding inequalities reproduced by traditional education. Nonetheless, the hyper-individualised rhetoric of transformation that often dominates analyses of these developments urgently needs to be scrutinised by the traditions of critical sociology. In particular, there is a need to unpick the uneasy and often unconvincing amalgam of theoretical agendas that currently propel much educational thinking towards an unwarranted valorisation of the individual 'rational' learner operating within an efficient technological network.

One obvious challenge that sociology presents to this rhetoric is the extent to which the promise of online connectivity to (m)any places and people obscures the continued importance of immediate 'local' contexts in framing learning processes and practices. In this sense, sociology reminds us that it is perhaps erroneous to perceive technology-based learning as somehow "detached from the spatial condition of common locality" (Thompson 1995, p.32). Furthermore, the idea of the self-responsibilized, self-determining learner also places an obvious focus on the capabilities of individuals to act in an agentic, empowered fashion – in Bauman's (2000) terms to act as empowered individuals *de facto* rather then individuals *de jure* who have individualism 'done to' them. Of course, as the past thirty years of late/liquid modern social theory reminds us, this positioning of technology-supported individualization as a biographical solution to systemic contradictions is not without its potential problems (see Beck 1992; Popkewitz 2006).

These contextualized perspectives therefore raise important questions addressed too rarely in the public and policy education debate on the role of digital technologies and education. For instance, just how equal are the networks between individuals that digital technologies actually support? How/are individuals' educational freedoms resulting in enhanced 'unfreedoms' (such as the intensification and extension of educational 'work' into domestic settings)? To what extent is there evidence that 'personalised' technology systems is in fact conservative, simply facilitating the 'mass customisation' of homogenous educational services and content? How/do digital technologies structure 'commodification' of educational action rather than

diversity of practice? Are digital technologies undermining or even eroding notions of education as a public good? Which of the many new configurations of people, technologies, information resources and institutions can be understood to really offer new forms of agency and new challenges to inequalities?

ii) The growth of institutional technologies and data-driven accountability

As these latter questions illustrate, many instances of technology use in education are perhaps understood more accurately in terms of organisationally-centred 'institutional technologies' rather than individually-centred 'instructional technologies'. Further attention therefore also needs to be paid to the technological systems that are used to support the "formalised, technically developed, and rationalised procedures that regulate the everyday operations of institutions" (Griffith & André-Bechley 2008, p.43). Indeed, there is ample evidence of the role of digital technologies in supporting and strengthening schools, colleges and universities in fulfilling their role of "core institutions of capitalism" (Garnham 2000, p.142) – a trend exacerbated by recent increases in the availability and accessibility of computer-based data. We are now seen to be living in an era of 'Big Data' where computerised systems are making available "massive quantities of information produced by and about people, things, and their interactions" (Boyd and Crawford 2012). As such, organisations in many areas of society are developing institutional applications of such 'naturally occurring' big data. Outside education, for example, Big Data is understood as a potential driver for radical democratisation of local governance and accountability (Davies and Edwards, 2012). It is being mobilised by socially engaged academics and activists to track the impact of policies on traditionally excluded groups (Bates, 2012). Combined with new visualisation technologies, Big Data is also being lauded as a potential resource for engaging citizens in the redesign of cities and social practices.

In education – the trend towards the use of Big Data (if not its democratising tendencies) is exemplified in educational management and administration by the growing use of data-driven 'learning analytics'. These technology-based shifts also have clear linkages with the increasing importance of data production and management within education – not least the move towards what Jenny Ozga (2009:149) terms 'governing education through data' and the shift from central regulation to individual self-evaluation. Of key interest for sociology of education, then, is the role of digital technology as an underlying intellectual and material system in this data-work. We therefore need to pay close attention to the apparently rational digitally-based techniques and processes that support these new forms of governance, and question their underlying values and assumptions. Of particular interest are the likely links between digital technology and the on-going 'reformation' and re-casting of educational institutions along neo-liberal lines of 'new managerialism' and 'new public management'. Technologies such as 'management information systems' and 'virtual learning environments' are clearly aligned with these new managerial practices – with managers and administrators using the digital data to audit, check, normalise and measure. Of key concern to the sociologist of education, therefore, are how these systems render social power and control through a succession of highly symbolic data-driven processes.

One particular point of interest are the 'new' intensifications of inequalities of power

and control that may well be associated with these potential institutional technology systems. Take, for instance, these systems' intensification of an unequal and often undemocratic 'politics of representation' in many educational contexts – not least in terms of the consequences of how individuals (re)present themselves online, coupled with what is also recorded about that individual by others online (Facer, 2012; Fuery 2009). One of the main functions of digital technologies in this guise is to collate and intensify personal data into publicly accessible profiles. These profiles can have the disempowering effect of displacing learners and teachers as knowing subjects, and reducing education to a set of digitally-based "textually-mediated work processes" (Griffith and Andre-Bechely 2008, p.43). Research shows, for example, how institutional technology systems allow for the implicit (if not explicit) forms of 'predictive surveillance' where teachers and school managers use data relating to past performance and behaviour to inform expectations of future behaviours (see Knox 2010).

A number of critical questions therefore present themselves from these particular forms of educational technology. How, then, do these digital technologies support the connection, aggregation and use of these data in ways not before possible? What are the social practices required to render the use of such technologies democratic and humane? In compulsory education, for example, how/do these systems support an intensification and extensification of school-work and school practices of surveillance beyond the temporal, spatial and organisational boundaries of the school building and the school day, and into the domestic settings of teachers, students, managers and parents (c.f. Gregg 2011)? How/does institutional 'dataveillance' function to decrease the influence of 'human' experience and judgement in the face of an individual learners' 'administrative identity' and 'data profile'? Conversely, to what extent are these institutional technologies being resisted or subverted at the individual level? Indeed, the prevalence of student and teacher 'sousveillance' within educational settings has begun to be noted by some authors, where individuals make subversive use of monitoring tools and techniques to surveil the organisation themselves (e.g. Hope 2010). In this sense, there is clearly a need for further sustained sociological work that begins to explore what it means to live and work within the technology-supported conditions just described.

iii) Increased forms of commercialisation and privatization associated with education and technology

This focus on institutional as well as instructional technology, highlights the need to approach the use of technologies in education from the perspective of a range of actors and interests – not just individual learners and educators. As such, it is also important to recognise the role of commercial and private actors in the social construction of digital technology in education. In particular, digital technologies should be seen as lying at the heart of contemporary privatisations of education - i.e. what Ball (2007, p.13) terms "the fundamental re-design of the public sector [where] the state is increasingly re-positioned as the guarantor, not necessarily the provider ... the state is very much a market-maker or broker".

The technology-based privatisations of education are certainly varied - implicated in the selling *of* education as well as selling *to* education (Molnar 2005). For example, in

terms of technology's role in the selling *of* education it is estimated that the education/technology market is worth upwards of $7trillion, with multinational commercial interests such as Pearson, Cengage and McGraw-Hill involved in the lucrative business of e-learning and online provision of teaching and training. In terms of technology's role in the selling *to* education, private sector interests are already responsible for providing a range of digitally based or digitally-enhanced products to education systems and schools. As well as the usual digital hardware and software, private interests also sell a range of technology-based services to educational institutions – from the management of individual institutional IT infrastructures, information management and payroll systems to a range of monitoring and surveillance technologies. Attention should also be paid to the increasing role of private interests in the governance of educational technology use. Take, for instance, the role of multinational interests such as Microsoft, Apple and Google in the global policy networks pushing concepts such as 'twenty-first century skills' and 'innovative teaching and learning'. Indeed, many national education technology policy programmes are decidedly 'public/private' affairs, with multinational corporations such as Cisco, Microsoft, Apple and Sun involved heavily in the educational technology agendas and plans of countries around the world – from China to Chile.

From all these perspectives, then, digital technology appears to be involved in altering relationships between education and private sectors. In this sense, digital technology can be argued to be centrally implicated in the movement of public/private partnerships beyond notions of the state entering into a 'purchaser-provider' relationship with the IT industry. Indeed, the past twenty years have borne out the predictions of Kenway *et al.* (1994) of the emergence of a 'markets/ education/ technology' triad. Here, these authors foresaw digital technology allowing private interests to be involved in the initial formulations and reconfigurations of policy ideas and imperatives, and then playing a key guiding role in their eventual promotion and implementation. Seen in this light, educational use of digital technology during the 1990s, 2000s and 2010s has been informed overtly both by educational and market values – thereby encapsulating the growing influence of market and technological forces in education over the last thirty years.

Thus any beneficial issues notwithstanding, there are a number of reasons to question and challenge the growing influence of private interests in shaping the schools technology agenda in these ways. For example, how does the 'realpolitik' of business influence the commitment of IT producers and vendors to the public good of educational technology above and beyond matters of profit and market share? What are the practical outcomes of private interests being allowed to 'manage' and 'maintain' technology services within educational institutions? How are digital technologies reshaping education along the lines of market-forces and commercial values, as well as the perceived needs of the digital economy?

iv) The persistence of digital inequalities

All of the issues highlighted so far reflect the importance of considering the various unequal power relations and hierarchies that are entwined with the use of technology in education. As such, one of the perennial issues that should underpin any sociological consideration of education and technology is the continuing inequalities

and injustices associated with the use of technology in education. Indeed, there is a growing body of evidence suggesting that educational uses of digital technology are differentiated along a number of lines that reflects a process of cumulative advantage by which socio-economic status and class hierarchies are reproduced. This is not to deny the role of individual agency in exercising choice within wider structures, but simply to point out the entrenched and largely unchanging inequalities of opportunity and outcome associated with technology access and use.

For example, according to survey data across the world, people's engagements with digital technologies such as computers and the internet have remained significantly differentiated over time – even in high-tech regions such as North America and Europe. These digital inequalities are especially pronounced in terms of socio-economic status, social class, race, gender, geography, age and educational background - divisions that hold as true for younger generations of learners as they do for older generations of educators (Helsper and Eynon 2009, White and Selwyn 2012). While no longer a popular term, the spectre of the 'digital divide' in terms of access to technologies still looms large over any discussion of the potential benefits of digital technology in education.

Aside from inequalities of access, there is also growing evidence that digital technology use is not the equitable and democratic activity that it is often portrayed to be. Even when able to access the technology, the *types* of social media tools that an individual uses, the *ways* in which they are used, and the *outcomes* that result are all compromised by sets of 'second order' digital divides (echoing the distinction between engaging meaningfully as opposed merely to 'functioning' with technology). There is considerable evidence that these 'second order' inequalities are found to persist along familiar lines. For example, a recent survey of over 6400 Australian high school schools portrayed a highly divided picture of students from higher-status independent and faith-based selective schools being more inclined than state school students to be making better 'academic' use of the internet - therefore leaving academic use of digital technologies "a function of broader processes of social reproduction" (Smith et al. 2012, p.19). In a less formal context, clear socio-economic differences have been found in individuals' propensity to produce (rather than consume) online content – be it posting to blogs, sharing resources or creating profiles (see Schradie 2009). Other studies of US college students have reported that social media environments are no more socially integrated than offline contexts. For example, race has been found to remain the over-riding predictor of whether college students are Facebook 'friends' or not (Mayer and Puller 2008). Similarly, social media do not necessarily overcome issues of offline disabilities but instead often exacerbate the boundaries of disability (Lewthwaite 2011). All in all, it is idealistic and unhelpful to imagine social media as providing a necessarily democratised or de-segregated educational experience.

Thus it is clear that despite substantial efforts to overcome 'digital divides' it appears that there are still some people who are 'superserved' and many others who are 'underserved' by the technological environment. It appears that technologies often seem to fit around (and be shaped by) the existing patterns of people's lives. This tendency to augment what has gone before suggests that digital technologies in themselves have to-date done little to disrupt or radically alter pre-existing inequalities. From this perspective, a number of questions remain. For example, how

are people's technological access, engagement and outcomes patterned according to individual factors such as age, gender, class, geography, ethnicity and disability? Under what circumstances does meaningful engagement with digital technologies in education arise? To what extent are the new mobile platforms and hacker culture being celebrated in the global South creating a new disruptive paradigm for technology appropriation or simply mitigating existing infrastructural inequalities between North and South? What factors contribute to people to be substantial users of digital technologies and others to revert to becoming peripheral users? What types of social, economic, cultural and technological capital are people able to draw upon when using technology in education? What are the short and long-term consequences of engagement with technology in terms of individuals' participation in education and society? What other mitigating factors and circumstances can be identified as having an impact on different social groups' propensity and motivations to engage with technology and education?

TOWARDS AN ENGAGED SOCIOLOGY OF EDUCATION AND TECHNOLOGY

We hope that these four brief examples begin to suggest the many ways in which technology use in education is associated with a range of wider sociological concerns over social relations, social control, inequality, identity, power and so on. As such it would seem clear that sociologists of education are in a strong position to explore a range of important questions about education and technology. For example, how are educational technologies implicated in reproducing or unsettling wider patterns of educational, social and economic inequality? Who benefits from the introduction of technology into educational contexts? Conversely, what evidence is there of genuinely disruptive technology use in education? All of these questions therefore point to the over-arching need for digital technologies and education to be approached in a *problematic* light. Indeed, many of the awkward questions raised so far in this chapter are the fundamental questions faced by all aspects of education and society – i.e. questions of what education *is* and, it follows, questions of what education should *be*.

As this last point implies, we should not forget that the ultimate purpose of problematizing what is being presented currently to us as 'educational technology' is not simply to point out problems from the side-lines but is, instead, to give serious thought to alternative, fairer ways of making future use of digital technologies in education. Indeed, Michael Young's 1984 reflections on 'sociology and information technology' caution against the risk that sociology might become associated 'at least implicitly, [with] an anti-technology argument which would offer nothing to teachers or anyone else' (207). Despite this early caution, the sociological stance of recent years has been characterised primarily by description and critique and, in a context in which educational change is being driven primarily by design disciplines (in other words by those who are actively engaged in experimenting and constructing alternatives), has therefore had only limited purchase in constructing more equitable alternatives. Equally, in a context in which many advocates of technological change in education are themselves inspired by aspirations towards more equitable and democratic education practices, a disciplinary tradition that has been characterised by external and often disengaged critique rather than committed collaboration to build

alternatives, has often been met with suspicion and scepticism.

Any new sociology of education and technology, therefore, needs to bring its sociological imagination to the service of on-going and extensive dialogue with learners, educators, developers and civil society groups in order to identify, imagine and to explore how things might be 'otherwise'. This implies a sociology of education and technology that builds upon Ann Oakley's (2000) notion of social science research that is democratic, interventionist *and* emancipatory. It implies, in Burawoy's (2005, p.324) terms, an avowedly *public* sociology of education and technology, committed to the defence of the social and of humanity, which moves "from interpretation to engagement, from theory to practice, from the academy to its publics". It implies, after Erik Olin Wright (2010), the need to imagine and build 'real utopias' to counter the hegemonic futures constructed by the marketeers of the education technology industries. These calls for a more engaged and interventionist sociology of education and technology are certainly in tune with wider shifts in academic sociology as a whole. As is being argued with increasing frequency and force, one of the core strengths of academic sociology is its ability to express a 'defiant' rather than 'compliant' imagination, and therefore engage in the production of 'really useful' knowledge that is capable of enabling radical social change (Kenway & Fahey 2008, Boden & Epstein 2011). In the wake of recent macro-economic and macro-social changes, it may well be that sociologists find themselves in a better position than ever to effect such changes. As Hugh Lauder and colleagues have argued with regards to a more defiant sociology of education, "we live at a time of economic crisis when the possibilities for fundamental change are at least notionally open, and therefore it is a crucial juncture for voices within sociology of education to be heard" (Lauder *et al.* 2009, p.13).

How then, might the sociology of education and technology build such 'really useful knowledge' and begin to make a difference to the nature of education in the digital age? As is often the case with book chapters such as this, the brief space that we have remaining makes it possible only to allude to some of the areas that could well be worth pursuing further. At its heart, though, we would propose that an engaged sociology of education and technology would take advantage of its understanding of the inherently political and social processes of technology production and use. It would detail and then test the opportunities available to educators, learners and other interested parties to intervene in the processes of commissioning, developing, design and appropriation of technologies to tip the balance of these processes towards more equitable and democratic outcomes. We can therefore conclude this chapter with a number of suggestions along these lines:

- Firstly, understanding the processes of driving technological change in education as *political*, as subject to *processes of contestation and debate*, and as *discursive,* would seem to suggest a number of potential sites of resistance for the publicly engaged sociologist. One line of inspiration can be taken from the last three decades of computer 'counterculture' and 'hacking' – not least the activities of games enthusiasts, amateur software modifiers and the rise of open-source software and hardware production (Kirkpatrick 2004). How might the engaged sociologist 'hack' the processes of policy design and deliberation? How might s/he mobilise digital technologies to enable writing and research in education and technology to span the boundaries between academic work and public

engagement, and therefore become more publically-facing and 'deliberative' in character (see Evans and Kotchetkova 2009). What scope is there for academics working in the area of education and technology to engage in critical forms of public scholarship that provide "a disruptive but necessary voice in democratic debate" (Lauder *et al.* 2009, p.580)? How can a critical 'public understanding of education and technology' be stimulated and supported?

- Secondly, understanding the *appropriation* of technologies in education as *a process of contestation, practice and resistance* also opens up potential sites for action by the engaged sociologist. In this spirit there is certainly room for sociological analyses that address the tensions that exist between the rhetoric and reality of technologies in education, and thereby look for opportunities to force difference where there is homogeneity, force unity where there is fragmentation and division, and encourage equality where there is hierarchy (Lefebvre 1981). In this process, it is therefore important that sociologists do not focus solely on the deep-rooted continuities of education in a 'digital age', but also take time to consider the potential discontinuities of digital technology use in education. For instance, how can uses of digital technologies be encouraged within educational settings that challenge or disrupt existing social relations and inequalities? Where do opportunities exist for learners and educators to make concrete the otherwise abstract rhetorics of democratisation and empowerment that surround digital technology? What digital spaces exist where resistance and degrees of freedom for otherwise marginalised groups might be achieved?

- Thirdly, understanding the *design and development* of technologies to be a process of *social construction* also opens up potential points for the engaged sociologist to intervene in the design process. Critical participatory design – where usually excluded 'end users' are involved in the development and production of technological artefacts and practices in ways that better reflect their interests, needs and values (Iversen *et al.* 2012, Eubanks 2011) – is providing a clearly articulated set of methods that demonstrate how design processes can be challenged and reoriented towards the interests of students and communities.

These three sites – in the design, the public debate and in the appropriation and use of technologies – offer important points of intervention for the engaged sociologist in which the tools of sociology can clearly make critical interventions. There is clearly much work that we can be getting on with. However, it is worth not being too self-congratulatory and over-confident of having the means to develop a critical understanding of the technological well within our grasp. One of the perennial caveats to any claim of current technosocial understanding is that new domains of technological development are always emerging in areas that non-technological experts find it difficult to respond quickly to. In developing a contemporary sociology of education and technology, we therefore need to maintain at least half an eye on the (near)future. Indeed, one of the main reasons that sociology was relatively slow to respond to the 'digital revolution' of the 1970s, 1980s and 1990s undoubtedly stemmed from the discipline's reluctance to move on from confronting the major 'political technologies' of class struggle throughout the first half of the century – i.e. what Rainie and Wellman (2012) call the 'big machines' of the industrial era such as factories, mills and military machinery. It has taken sociology perhaps thirty years to

recognise fully the political, social, cultural and economic significance of the small devices of the post-industrial 'technosphere' – i.e. the digital devices and gadgets that now permeate our everyday lives. Most of this chapter has therefore made a case for sociology of education 'catching up' with *these* technologies and the issues associated with them – as these are the socio-technical conditions of contemporary education. However, there is a corresponding need to begin to also consider what the *next* wave of technological change may mean for sociology of education. If we can be sure of one thing, then the education of the twenty-first century will not be influenced and shaped only by our present technologies and practices.

As such, if we wish to develop useful knowledge in respect of the four substantive issues that we have raised in this chapter then an engaged sociology of education and technology will also need to address socio-technical practices that are only now in the earliest phases of development. For example, debates on the disaggregation of the institution and the learning networks of the individual will need to grapple with the issues of power and equity raised by networks that will soon include the pharmaceutical companies selling cognitive enhancement, the technologies that offer collaboration with non-human-like intelligence, and the increasing interpellation of the individual within large-scale complex 'systems of systems'. What issues of fairness and social justice are raised, for example, by the routine use of drugs to enhance concentration in revision and exams? What issues of identity and belonging are raised by unthinking dependence on search engine algorithms that return different results based on the individual who has submitted the search query? What ideas of agency, autonomy and citizenship are adequate to our growing dependence for infrastructure security on the underwater cables, circulating satellites and servers of the internet that are owned and controlled by countries yet located beyond national boundaries?

Similarly, debates on the data infrastructures that increasingly underpin education will need to engage with the proliferation of bio data and the designation by the World Economic Forum (2011) of personal data as a 'new economic asset class' with its corresponding proliferation of intelligent data-mining tools. What issues of identity and privacy, for example, are raised by students and teachers having access to real-time brain scans combined with location information combined with social media updates? What issues of power and equity are raised by the use of predictive data analysis based on neurological scans, genomic indicators, and aggregations of 'typical' student performance to forecast student attainment in test scores or in different forms of employment?

Equally, debates on the relationship between private benefit and public goods will need to confront the growing involvement of the biosciences and pharmaceutical industries in education. As neuroscience and genomics increasingly seek to present explanatory frameworks for educational attainment, what sorts of ethical frameworks and what sorts of student involvement in decision-making will be required? Finally, and over the longer term, any attempt to address issues of equity, fairness and access to education will need to address the challenges to the idea of the 'human being' posed by the intersection of radical economic inequalities with the capacity for the substantial bio-technical and prosthetic augmentation of the body. The capacity to 'upgrade' the individual, not only through the currently (semi) detachable tools of mobile technologies, but through embedded digital and biological enhancement, for

example, raises fundamental questions about the person at the heart of the education process and the values that should drive their development. It is perhaps in this area that the need for an engaged sociology that promotes education as a resource for humanity, democracy and equity rather than a competitive race for positional goods, will play its most urgent role over the coming decades.

CONCLUSION

These questions raise important challenges for academic sociologists. Not least, they suggest that sociologists of education seeking to provide a critical analysis of these developments will need to develop at least a passing familiarity with the intricacies and practices of biological sciences, quantitative as well as qualitative methodologies and the ethical, environmental, economic and political dimensions of on-going globalisations of contemporary society. Above all, however, we would argue that the implications of our analysis here are fundamentally concerned with the identity and role of the academic sociologists of education and technology. If the sociology of education is to play a role in shaping these debates rather than commenting from the side-lines, academic sociologists will need to relocate themselves away from the familiar and comfortable positions of critique and analysis, towards less familiar roles of being co-producers, developers and designers of educational technologies. In other words, a sociology of education and technology needs to be developed that acts not only *against* but also *in* and *beyond* the dominant field of education technology. Our future starts here.

FOOTNOTE

[1] It should be noted that much of the sociological critique of education and technology over the past thirty years has come from authors working outside of the sociology of education. These include historians such as Larry Cuban and Neil Postman, as well as scholars working with the media education and new literacies traditions such as David Buckingham, Bill Green, Colin Lankshear, Mark Warschauer and others.

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