DIGITAL ALETHEIA: TECHNOLOGY, CULTURE AND THE ARTS IN EDUCATION

Oh I am a handweaver to my trade
And I fell in love with a Factory maid
And if I could but her favour win
I'd sit beside her and weave by steam.

The Handweaver and the Factory Maid (Trad).

This piece of history may seem a long way from the digital revolution and the classroom. It may reveal, however, some telling questions about the relation between technology and society which, with a little teasing-out, we can apply to the question of how education shapes and is shaped by technology, and what this means for educators in the arts in particular.

The song tells of the disastrous effects of mass mechanical weaving on the cottage industry of handloom weavers in the late eighteenth and early nineteenth century. It split communities, drove country-dwellers into towns, and stripped out much of the craft of weaving. It deprived workers of ownership of the means of production, and exemplified the dire consequences of mass industry for working people and their landscape, a chapter in a narrative elaborated by critics of the social consequences of the industrial revolution from Blake to Dickens. This narrative persists into the media age, as we know. In Adorno's version, the mass industry of popular music is used to blunt the sensibilities of the people (Adorno, 1941). In Benjamin's influential essay, the mechanization of art proves profoundly ambiguous, apparently destroying the aura of the individual artwork, yet oddly democratising it (Benjamin, 1938). It adroitly constructs the ambiguity of technology and art in the post-industrial world: and this ambiguity characterises debates, research and practice in education today.

The narrative in the digital age has shifted. Critiques of inexorable corporate power over the lives of individuals have given way to an unstable mix of pessimisms and optimisms. Postmodernist pessimism about the empty and depthless simulacra seen to constitute contemporary cultural forms; optimistic celebration of the apparent shift of power from media producers to those who used to be thought of as an undifferentiated audience. The latter view can cite in support instances such as the work of video editors who, able for the first time to buy affordable tools such as Macromedia's Final Cut Pro in the early 21st century, could leave their production companies and set up as solo freelancers working from home. In short, some sectors of industry gave way again to cottage industries, and the digital descendant of the handloom weaver set up shop. More recently, the shape of SME's in software development may be seen to have a similar trajectory, now obliged by austerity economics to abandon high-rent studios in city centres to work from homes and even

– in one instance I know of – garden sheds. This development represents a curious mix of small-scale agency and the big corporations' exercise of a hegemonic power, controlling large-scale publishing and distribution (in the games industry, for example), and catering for our creative and communicative needs in return for our content, our submission to advertising, and our compromises over privacy.

In the case of education, the celebratory rhetoric is tempting and ever-present. In my own work as a teacher and researcher, I concluded an article in 1999 on digital video editing by 16-year-olds with the following paragraph:

> The digital revolution in some ways recalls the past - a profusion of the visual before the spread of print literacy; the splicing together of image and sound in film; the sociocultural shifts accompanying earlier technological revolutions in communication. But it also brings new possibilities previously unknown, the most important of which, perhaps, is the rapidly increasing access, in schools and homes, to the textual technologies which for much of this century have belonged only to the giant industries of popular culture. The distinction between author and audience is at least partially dissolved by digital interrogation, appropriation and transformation. This audience is out of its seats. (Burn and Reed, 1999)

I still believe this is true; and that digital making in school formed another kind of cottage industry, except that it countered a double disenfranchisement: not only that of working people disenfranchised by mass industry; but of young people whose creative endeavours were typically disregarded by the adult world as inadequate by adult standards, trapped in an eternal mode of apprenticeship. Today, then, I would be a little more cautious, balancing the celebratory mode with due recognition of the limits on what is possible, as I'll suggest later in this chapter. In particular, we have been warned by others of the dangers in simplistic views of the transformative powers of technology in education: the dangers of technological determinism (Selwyn, 2008), critiques of Prensky's (2001) 'digital natives' trope (Jenkins, 2007), and challenges to popular assumptions and academic arguments about gamification (Buckingham, 2007). As my argument unfolds, then, I will look for the kinds of balance which researchers and practitioners might strike.

However, the handweaver and the factory maid prompt other questions pertinent to the question of technology in education. What exactly *is* the value of the craft the handweaver was so skilled in? And, by extension, what kinds of craft, skill, artistry do educators in the arts attempt to develop in their students, and what part might digital technologies play here? Some might believe that they threaten the pre-digital skills of hand, eye and ear; some believe they extend, complement, augment them.

Another question is prompted by the history of this song. Like all folksongs, it exemplifies a mode of oral transmission we might consider to have died out. It became popular in the British folk revival; was performed and recorded by a range of

contemporary folk singers and bands, including Martin Carthy, with the band Brass Monkey. The sleeve notes say:

> … the present song has not yet been found in printed sources. It was collected from a William Oliver of Widnes and partially refurbished by A.L. Lloyd from the "chambermaid original." Martin [Carthy] learned it from the actor Roger Allam.

This narrative raises a number of interesting questions for debates about the arts: the nature of authorship, the transformation over time of cultural texts, the nature of creativity involved at the various stages of composition, revision, collation, collection, transcription, performance.

But, equally signficant for this chapter, this cultural object is now digital in a variety of ways. Although I own the Brass Monkey album, the quotation above is copied and pasted from a web page. The album itself is now on my i-phone, and my car plays it automatically through bluetooth. However, these types of text remain editable, fluid, auditory, mobile across different social and cultural contexts. They are examples of the retention of oral sensibilities in the digital age which Walter Ong described as 'secondary orality' (Ong, 1982).

All of this reminds us, then, that the relation between the digital arts and education is not only a question of innovation, newness and the future; it is also a question of history, another chapter in the metamorphosis of cultural resources over time, across generations, over successive tools of composition, performance and distribution.

These are some of the questions this chapter will explore, then: what kinds of creative making do the digital arts in education make possible? What are their histories? What constraints and opportunities do they offer? What human endeavours lie behind the gleaming surfaces of new media, and how can we relate the material properties of hardware and software to social and cultural purposes, and to the processes of teaching and learning?

I will aim to separate out 'real-world' technologies of the digital arts from 'ed-tech'; consider technology's relation to culture; emphasise the role of technology in practices of creative production and processes of learning; and consider the implications of virtual worlds and bodies for the arts in education.

REAL-WORLD TECHNOLOGIES AND ED-TECH

'Educational technologies' have their own domain of practice, policy, commerce and research, their own conferences, journals, marketing practices and forms of deployment in classrooms. They are not the focus of this chapter. It is true that there are many areas of overlap between technologies specifically designed for education and those used in the wider society; yet the distinction is important. It can be simply summarised by the difference between learning through a technology and learning

with or about a technology, a distinction made by David Buckingham to which I will return.

On the one hand, using an interactive whiteboard in combination with a modern foreign language software package is clearly an instance of ‘learning through’. On the other, using Cubase or Adobe Premiere for making music or film is clearly learning with and about. These softwares have not primarily been designed as learning tools: they are for making, just as a chisel, lathe or paintbrush are technologies for making in the pre-digital age – and, significantly, remain with us. To be sure, the use of Cubase, Premiere, chisel, lathe or paintbrush all enable learning: the tools complement the pedagogies of school, home or apprenticeship. But the point is that they are authentic instruments in the wider world, used by creative communities in common.

By contrast, interactive whiteboards, drill-and-skill softwares, virtual learning environments and classroom presentation tools lack cultural authenticity. Despite their novel appeal and digital affordances, they are the descendants of overhead projectors and blackboards. I do not mean to demonise such instruments; they have their place, have always been with us, and require deft use as part of the pedagogic toolkit. We may see them, perhaps, in terms of what Heidegger, in his influential essay on the question of technology, referred to as ‘the instrumental and anthropological definition of technology’ (Heidegger, 1954/1977). Heidegger’s move beyond this is to amplify the Greek conception of *techne*, relating the sense of craft and skill to society, knowledge and truth, an amplification I will consider in the next section. In the same way, we can argue that the technologies of presentation in the classroom – the *contrivances*, to use Heidegger’s word – of the pedagogic toolkit – are less important than the real-world technologies of artist or scientist. These present the real value of the digital revolution: that it pulls education into the world of digital culture, and puts into the hands of teachers and children the same tools that professional artists, craftspeople and engineers use. The implications of this are profound: the potential inversion of the usual relation between producer and audience; the productive erosion of adult-child hierarchies; a wholesale revision of the agency of children and young people in the arts, and the quality and value of their work.

I have indicated the need to balance celebratory accounts of digital media and learning with cautionary notes; and one is required here. While the digital era provides transformative possibilities in education as in society at large, it does not provide magic solutions. A student faced with a video-editing software, a game-design program, a music editing tool, may well be overwhelmed by their complexity. We cannot assume that this student is somehow magically equipped with native digital skills, or able to transfer his or her uses of Facebook, SMS texting or online gaming into specialised design tools. Time and time again, the research reminds us of the importance of pedagogy: the skill of the teacher in building on young people’s experiences of digital culture, building bridges from the tools they are familiar with to

those they have not encountered, plugging the various versions of the digital divide that still bedevil all societies to some degree.

TECHNOLOGY, SOCIETY AND CULTURE

Heidegger's account of *techne* makes a bold set of connections. His first move is to relate the traditional notion of *techne* as craft to the notion of *episteme*, or knowledge. Technology is not just about tools; the tools require knowledge to be used effectively; and, as we shall see later, the tools can shape the knowledge just as the knowledge can shape the tools. How this might relate to the Vygotskyan conception of tools in the service of learning is considered in the following section. Heidegger's next move is to relate this double structure – *techne* and *episteme* – to the notion of *poiesis*, the antecedent of our word poetry, often translated as 'making'; thus recapturing the connections between craft, artistry and poetry that obtained in Ancient Greece. This connection is of evident value to us as arts educators, encouraging us to see aesthetic purpose in the use of technologies; and it has often been invoked by arts educators (eg Swanwick, 2001; Connolly, 2014). In my own field of media education, it is sometimes the case that a narrow focus on the tools of filming and editing, along with the rhetorical functions of critical analysis, can obscure the poetics of media-making: attention to aesthetic form and cultural value. If episteme can be seen as a broad critical knowledge and understanding about the role of the arts in society, in short its critical and rhetorical functions, then poeisis might remind us of the related aesthetic functions of art, media, text (Burn, 2009a).

Heidegger has one more move to make, however. He proceeds from this triple synthesis to the notion of *techne* as *aletheia*, or truth:

> But where have we strayed to? We are questioning concerning technology, and we have arrived now at *aletheia*, at revealing. What has the essence of technology to do with revealing? The answer: everything. For every bringing-forth is grounded in revealing. ... *techne* is the name not only for the activities and skills of the craftsman, but also for the arts of the mind and the fine arts. *Techne* belongs to bringing-forth, to *poiesis*; it is something poietic. (1954/1977: 212)

The implications of this are twofold. Firstly, 'bringing-forth' suggests that whatever truths are constructed in artistic practice do not come from nowhere. In some way, they were already there, in the material substances of the artefacts, or in the disposition of the tools themselves, or in the cultural resources deployed in the making of the artwork. This notion contributes usefully to the vexed debate about 'originality' as a criterion for creativity in education, and arts education particularly – a question explored in the next section.

This in turn asserts the importance of the physical tools and material media in the arts. A similar argument is made in relation to how the art of visual design creates meaning in Kress and van Leeuwen's *Reading Images* (1996). Their point is that theories of signification – linguistics and semiotics – typically attend to abstract systems of grammar, lexis, signifier and signified rather than to the material media

employed by sign-makers. They propose that the material medium, whether of paint, stone, paper or pixel, contributes to the meaning made. They later develop the notion of *provenance* for this – that the selection of an appropriate material for communication brings with it semiotic baggage – potential meanings embedded in its substance, ready for shaping or re-shaping. They refer to this theme as the 'technologies of inscription', and make a further point relevant to this book: that such technologies can be seen across human history in three eras. The first they call technologies of the eye and hand: paintbrush, chisel, pen and so on. The second, from the 19th century, is the era of recording technologies – photography and sound capture, whose ontologies are referential: their offer seems to be to capture or represent the 'real' world. The third, of the digital age, they call synthesising technologies, in that the referential ties are loosened, and they may build meaning-systems out of the material of previous texts. This third argument echoes contemporary images of remix culture, a metaphor rooted in musical practice, and now applied generally to media mash-up practices (Ito, 2008). It also echoes the now-familiar postmodernist proposal of reproduction and the simulacrum, though avoiding its pessimism.

The general significance of all this for the digital era in education is, as I have suggested above, a transfer of agency from the producers of text and artwork in the professional, industrial and commercial spheres to the vast bulk of the population previously thought of in media theory as the audience. This shift from the mass deployment of technology in the interests of institutional power and capital in the industrial age has given way to a kind of democratisation of the tools of making. As educators, we are in the happy position of being able to deploy such tools with our students.

In the world of academic Cultural Studies, this kind of optimism increasingly characterised studies of youth culture during the 1980's and '90s. It was justifiable in many ways; but inevitably led to a critique of what McGuigan called 'cultural populism' (McGuigan,1992). The object of study here was more broadly concerned with young people's agency in engaging with popular culture than specifically with digital tools; but the same celebratory tone persists in accounts of young people's digital culture (Tapscott, 1998; Prensky, 2001).

A middle ground was needed; and one such argument is proposed by David Buckingham in *Beyond Technology* (2009), a sharp critique of the excessive claims of digital technologies to transform education. Buckingham's argument is worth quoting at length:

> Like many media educators, I have been both excited and dismayed by the contemporary enthusiasm for digital technology in education. I am excited, because I feel there is considerable potential here for students to take control of the 'means of production' – to use this technology to communicate, to become creative producers of media, and to represent their perspectives and concerns. I also believe that it is vital for schools to address the cultural experiences that young people have outside the classroom – and many of these experiences are now intimately connected with digital media. Yet I am dismayed, because so many uses of technology in education seem to me to be unimaginative, functional and misguided. The critical questions that media

> educators have been concerned with for many years – questions about who controls communications media, and about how those media represent the world – have been marginalised in favour of a superficial infatuation with technology for its own sake. Ultimately, I believe that we need to be teaching *about* technologies, not just *with* or *through* them. (Buckingham, 2009: viii)

There are a number of points here to develop. Buckingham's positive angle, that digital media can enable students to take control of the means of production, echoes the popular Marxist aspiration, of course; and in general terms captures the points made above about a shift of power from the producers of (in this case) media, music or artworks more generally to the former consumers. A caveat made by John Fiske in his account of popular culture and the media (1989), is that while people may make their own media and meanings, they do not always do so with materials of their own choosing (an adaptation of another famous Marxist dictum). We can consider how this applies to the arguments rehearsed above: to Kress and van Leeuwen's argument about the semiotic provenance of the material media we employ; to Ito's discussions of remix and mashup cultures; to my own accounts of young people's unstitching of digital film to make their own texts (Burn and Durran, 2006). In concrete terms, to digitally remix cultural resources, whether through the layering of Photoshop, the stratified timelines of Adobe Premiere, or the track-mixing of Garage-Band, is to create new texts, but also to be constrained by the generic and specific patterns of the source material. Is this a newly-depthless simulacrum, as postmodernism would have it? Or is it simply the digital version of the constraints which artists have always made the most of, from Michelangelo's imposition of Greek statuary on to the tropes of late mediaeval Christian iconography, to Joyce's reworking of the Odyssey? We must all choose our view; mine inclines to the latter.

Buckingham's dismay is provoked by the unimaginative, functional use of digital media in education. This may be teased into three categories, under further inspection. One quite general category might be the instrumentalist notion of technology I have discussed above, and associated with Heidegger's notion of technology as contrivance, an *instrumentum* (1954/1977, p290). A second might be what we could call the bureaucratic use of professional technologies – literally, in the case of Microsoft Office. While my argument here is for the creative use of mainstream creative technologies in the arts, on the basis of a parity between adult artist and child artist, to import a digital version of an office imposes serious constraints upon the kind of adult world into which we are inducting our students. A third category of 'unimaginative use' might be poor quality educational software. Buckingham himself has conducted a study of 'edutainment' software, finding generally that it suffers from inauthenticity, at its worst masking regressive pedagogies of drill and skill behind superficial offerings of game and play (Buckingham and Scanlon, 2002).

A final point to amplify in Buckingham's argument is contained in the last sentence, to which I referred above: that we should be teaching *about* technologies, not just

with or *through* them. Buckingham's argument here is relatively straightforward from the point of view of media education. It means that, rather than treating the medium of film, or more recently videogame, as a way of teaching history, science or geography, we should teach about these media as cultural forms in their own right. Film and videogame can be treated as cultural forms in the curriculum in much the same way as literature, music, drama, and arguably should be. What they should not be used as is transparent vessels into which curriculum content is poured in the service of dubious claims of transformation.

However, the case is less straightforward if we consider digital tools. What might this mean? What would it mean for media teachers to teach about digital editing softwares, or for music teachers to teach about Sibelius or Pro-Tools, or for art teachers to teach about Photoshop? What would it mean to make these technologies objects of study, not just means to an end? In media education, it is certainly the case that teachers and researchers have recognised that the softwares have become a distinctive part of the learning process. They might, for example, carry metaphors of older technologies, such as the 'razor tool' of Adobe Premiere, with its reference to the cutting of celluloid film. They might, by contrast, introduce new ideas distinctive to the digital medium, such as filters, timelines, export formats. In both cases, these concepts and their associated terminologies become part of the metalanguage of the subject in question, sitting alongside other conceptual apparatuses specific to the domain: shot distance, camera angle, narrative; or melody, harmony, rhythm, tempo; or frame, colour, line.

Two further distinctions should be noted. The razor tool in Premiere is specific to the practice of film editing: a historical metaphor, profoundly connected with the users' perceptual engagement with film editing, cutting and shot creation. By contrast, tools to extract and manipulate individual frames have something in common with visual design practices, while tools for the manipulation of the soundtrack, controlling volume, sequence, duration and audio-layering have something on common with audio and music softwares.

Finally, tools like filters, export formats, timelines, copy and paste functions and so on are generic across all composition tools. They exemplify what Manovich proposed as five principles of digital media: numerical representation, modularity, automation, variability, and transcoding (Manovich, 1998). In practical terms, they mean that we can create texts which pull together different modes and media – images, sound, film, music, spoken language, written text and so on; that we can make provisional combinations of these, view them in real time, then remake them as much as we need to; and that we can transform media content across different modes of representation. This has wide-ranging implications for the arts, but perhaps the broadest is that we need to attend to the multimodal nature of contemporary culture (Kress and van Leeuwen, 2000). Film and videogame are good examples: they are a synthesis of image, action, gesture, speech, sound, music, designed space and so on (Burn, 2013). To effectively analyse them we need to take all the 'grammars' of

these design traditions into account. To deploy them with young people in schools, the best way forward is to involve the art teacher, media teacher, English teacher, music teacher, computing teacher, a mix which characterised a recent project of mine in which 11-year-olds made machinima films of their own devising[1]. Figure 1 shows two shots from the film depicting a fantasy visit to Cleopatra's palace, the written and spoken language of the script, and the music track composed by the children with the composer-in-residence to signify 'Egyptianness'. This can be seen as 'connected learning' (Sefton-Green, 2013); or as multimodal literacy (Jewitt and Kress, 2003); but it will also involve, if we follow Manovich's argument, paying explicit attention to the softwares that pull these expressive modes together.

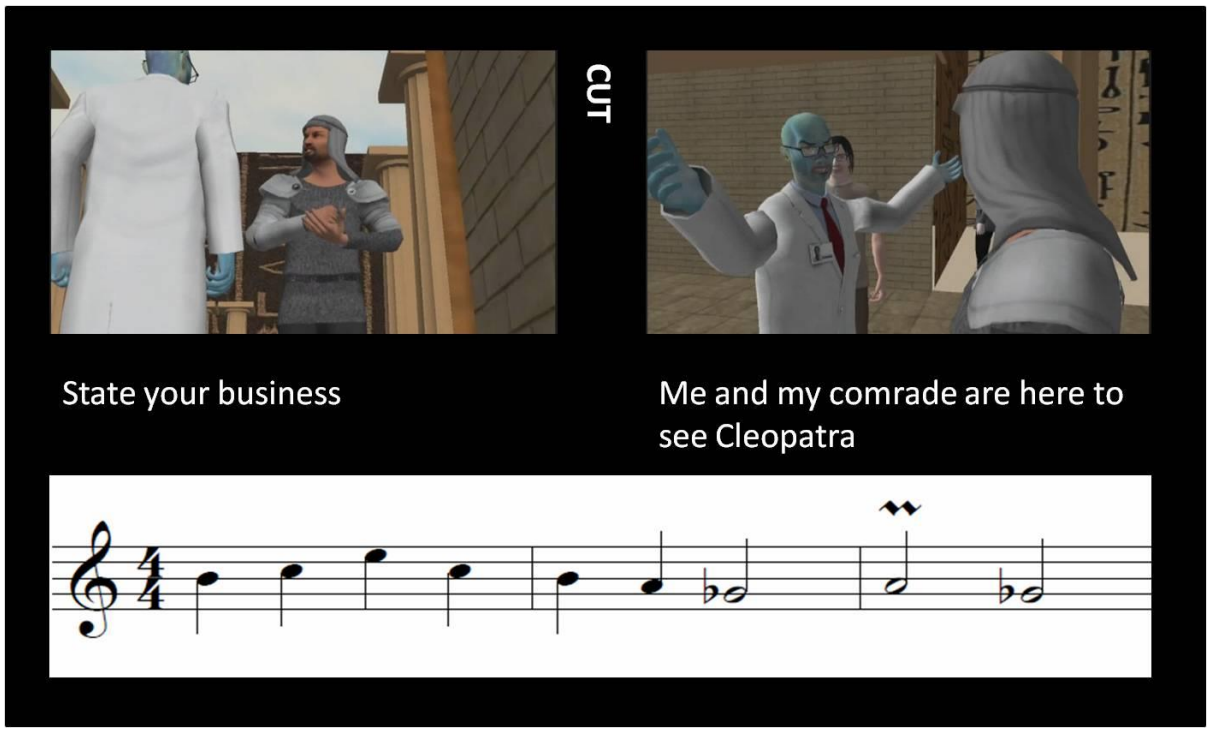


FIGURE 1

CAPTION: Screen shots, script and music from a machinima film made by 11 year-olds.

The argument here is for a school version of Manovich's more recent proposals for software studies (Manovich, 2008). He makes the case for explicit attention to what he calls the cultural softwares, because they represent remix culture: they enable us to participate in such a culture because we have shaped them to accomplish this function:

[1] Machinima is animated film made from games or virtual 3-D environments. This project, 'Montage, Mash-up, Machinima, was conducted by the UCL Institute of Education, the university of Leeds, and the British Film Institute, and funded by First Light.

> At the first approximation, we can think of these mechanisms as forms of remix. This should not be surprising. In the 1990s, remix has gradually emerged as the dominant aesthetics of the era of globalization, affecting and re-shaping everything from music and cinema to food and fashion. (If Fredric Jameson once referred to post-modernism as “the cultural logic of late capitalism,” we can perhaps call remix the cultural logic of global capitalism.) Given remix’s cultural dominance, we may also expect to find remix logics in cultural software. (Manovich, 2008: 24)

We might, then, consider how the arts curriculum can teach about digital media in two senses. Firstly, about digital art-forms, such as digital film in all its guises, born-digital music, digital visual design, digital games. Secondly, about how the digital tools for the making of these art forms themselves encode meanings about the knowledge and skills involved, and produce the metaphors of making distinctive to each art form, but also to the multimodal synthesis of modes and media, and the artistic traditions that lie behind them.

Furthermore, we can consider how Manovich’s argument is in certain ways an extension of those rehearsed above which suggest how the material medium of tool and artefact contribute to the meanings made. In remix culture, new meanings do not come from nowhere, but are reshaped from inherited cultural resources. We might consider how this could be an example of Heidegger’s revelation or ‘bringing-forth’ – latent meanings are there to be made, earlier utterances contain the seeds of later ones, meaning-making tools are systems of potential meaning, encouraging some kinds of shape and pattern, inhibiting others.

This argument is compelling; but it is useful to recall here the example I began with: the Handweaver and the Factory Maid. This song was already a remix before the radical folklorist A L Lloyd remade it with new combinations. The oral tradition is a tradition of patchwork, improvisation, recombination, transformation. ‘Bringing-forth’ works equally well as a metaphor for the revelation of historic meanings recast anew as it does for the remix practices of contemporary youth culture.

The argument for an attention to tools of making, however, can apply across these histories. The specific question we face as educators is how the argument might relate to learning, the subject of the next section.

MENTAL AND PHYSICAL TOOLS: CREATIVITY AND LEARNING

How are learners inducted into the use of technologies for making, representing, communicating? Which kinds of induction happen in the wider society, through peer cultures and families; and which happen in formal sites of learning? What is the status of the learner, and what kinds of learning progression can be mapped? And what purpose or end does the learning serve?

In my own field of English, media and drama education (and arts education more broadly), the best way to think about technologies in relation to learning is to apply and adapt the Vygotskian notion of tools, which challenges mental-physical dualism (Vygotsky, 1978). He sees tools as both psychological/internal (we can think of language, semiotics, musical notation, algebra, visual grammar) and technical/external (and here, amongst other artefacts, we can think of digital tools). The interdependence of internal and external tools helps us to consider how conceptual development occurs in tandem with the use of tools in the physical world.

Two examples of realtime digital composition might help to concretise this notion. In digital video editing, a learner might 'scrub' through the timeline of a sequence of film she has created. This was not possible in analogue editing – the digital representations of the temporal sequence of the film, and the pointer tool allowing the realtime scrub, with the algorithm in the software controlling the media database of digitised video, are particular affordances of the digital medium. At the same time, the user must operate a series of conceptual understandings: the narrative sequence, or rhetorical purpose, of the video being made; the grammatical links being forged, visible on the screen, such as the shot transitions (cut, dissolve, fade, wipe, etc); and the relation between visual and audio tracks. In Vygotsky's schema, the conceptual tools prompted by the external physical actions become internalised, so that understandings of narrative, sequence, duration, synchronisation and so on are developed and reinforced. Reciprocally, the next time the learner uses the software, these concepts are applied outwards to manipulate the tools and create the desired artefact.

A musical composition software would follow a similar pattern. A learner using a software such as Finale would obtain realtime feedback on the notes being dragged onto the staff: on their melodic value, their time value, their harmonic value, their rhythmic value. As in the video editing tool, the dialectic toggling between external use of the tool and internal conceptual understanding, mediated by linguistic terminology, symbolic notation, and midi or sampled sound, would enact the interdependence of mental and physical tools.

These two examples exemplify the Vygotskyan notion of tools; but they also represent his account of creativity in childhood and adolescence (1931/1988). His view of creativity involves the imaginative adaptation of cultural resources through the use of internal and external tools, subordinated to rational processes of conceptual thought. As in the discussion above of remix culture, then, we can have the best of both worlds on the question of originality. The creative work of our students will always engender new artefacts, new representations, new aesthetic patternings which have never existed before; but also be built out of the fabric, imagery, soundscape of earlier works by others. They will be, in Bakhtin's term, dialogic, responding to earlier utterances, and addressing future ones (1981).

However, two questions remain about the trajectory of learning and the status of the learner, especially in the digital arts. The first concerns the differences there might be between the cultural dispositions of teacher and student toward new media. The deployment of digital tools in popular culture to dream, fantasize, role-play, listen to music, engage with narrative, gossip inconsequentially with friends, engage in subversive and disruptive practices – all these are practices which formal education finds hard to tolerate, preferring to construct more conventional epistemologies and trajectories of civic participation. Yet the function of the arts in society is not to endorse conventional behaviours, rational modes of civic engagement, or dutiful vocational trajectories – or at least, not exclusively to do so. The function of the arts has always been also to challenge, articulate alternatives, disrupt, subvert, tell the irrational counter-narrative to the Enlightenment rational ideal. In this respect, educators do not lack competence with digital tools; but they need to have the courage to build on their students' engagements with popular cultural forms. Many Art teachers know that dynamic and creative work must include graffitti art, pavement art, pub signs, cartoon and manga, and videogame fan art as well as classical art from the Renaissance to modernism. Many music teachers know that the social energies of rock, pop and hip-hop, the urban mix of bhangra, the 'nu-folk' indie culture, are as productive of learning as the classical repertoires, and not culturally or formally inferior to them. Similarly, the social practices of improvisation, learning by ear, being in a band, can be the real engines of musical learning as much as playing in the school orchestra (Green, 2014). To be sure, all these practices existed before the digital revolution. But they have found, created and exploited new tools in the digital era: informal technologies of tuition, composition, recording, performance and cultural exchange.

Being in a band raises a related question about learning trajectories. Education invariably inserts learners into a developmental scale, even progressive learning theories such as Vygotsky's Zone of Proximal Development. But all teachers can point to moments when their students' work outstrips their own competence: when the learner can achieve something the teacher cannot. How do we think about the student whose Hendrix tributes on a Fender Stratocaster leave the teacher open-mouthed? Or the student who creates their own app, sets up a company, and is earning substantial sums while still in the sixth form? Or the student who is a Wikipedia editor at the age of 14? Or the child chorister, a professional musician at the age of 11? These examples may be atypical, but they are by no means rare. They remind us that educators in the arts are constantly managing a daily paradox: that the act of creating for the young people they teach is what the new sociology of childhood refers to as both being and becoming (James, Jenks and Prout, 1998). It is simultaneously a creative act in the moment, sufficient for and adequate to that moment; and a developmental process. This paradox is intensified by the tools and cultures of the digital age.

VIRTUAL LEARNING, WORLDS AND BODIES

In arts education, tools have been perhaps the most visible sign of technological innovation. Most recently, perhaps, the advent of tablets which unify the filming and editing processes of the media classroom (Cannon, 2014), and offer virtual painting-by-finger to the art classroom (Crescenzi et al, 2014); or the app version of Garageband, in which students (and teachers) might be editing yesterday's recording of their composition, multi-tracking, adding virtual keyboards, drums or guitars, managing volume, adding reverb, all on the bus or train. These examples all suggest new dispositions of space, time and cultural context in relation to learning. To think of learning on the train or bus challenges the limits of the classroom, and expands the notion of mobile learning (mobile students, mobile phones, mobile media).

The other contexts to consider are those apparent in virtual spaces: online communities, sites of performance, exhibition and play, virtual worlds and online games. These contexts again reconfigure space and time, and offer challenges and opportunities in several respects, including the possibilities of online commentary and critique, and how these might relate to discursive processes in arts education. Here, though, I will confine myself to three themes: online learning; virtual embodiment; and virtual performance and exhibition.

Online learning: space, time, culture

The online learning process may take many forms: online tutorials, how-to Youtube videos, peer-learning in informal communities, fan art and fan fiction self-help groups, and other phenomena. One music education researcher, for example, documents the experience of learning to play the mandolin in nine months entirely from online resources (Kruse, 2013). Similarly, in my own experience, I have been able to rapidly view and compare Youtube videos of three different interpretations of a Northumbrian air (The Bonny Pit Laddie) by different performers of the Northumbrian small pipes, and make my own interpretation out of them. In another example, a recent study of primary school children's musical play in Sheffield, UK, found that while the musical rhythms, melodies, words and physical actions of handclapping games were indeed passed from child to child and generation to generation in the traditional manner, they were also being learnt from Youtube videos, often from America (Bishop, 2014). In these different ways, then, the spatial and temporal distribution of learning sequences are expanded and reordered through online exchange, the traditional hierarchies of teacher and learner are subject to variation, and global and local cultures are brought into dialogue. At the same time, as observed earlier in this chapter, these digital practices recover something of the sensibility of oral cultures, and can be characterised as Ong's 'secondary orality' (1982).

Virtual worlds, virtual bodies

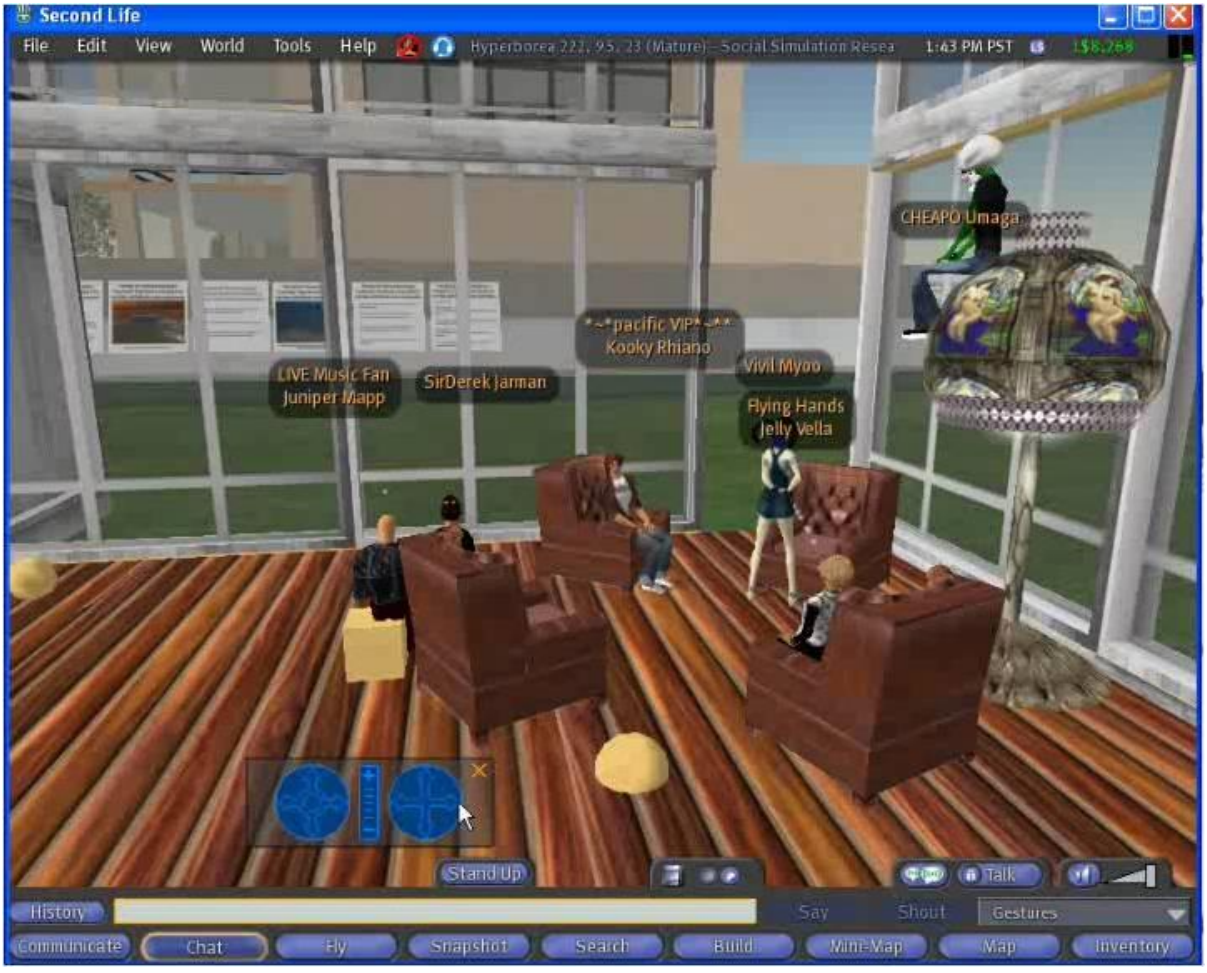
A second set of challenges and opportunities is posed by the question of virtual embodiment for learners and educators. My examples here is drawn from a small piece of research into the work of an art teacher who ran a machinima club within the Open University's Schome Park, an experimental enclosed learning space in the virtual world Second Life (Burn, 2009b). This teacher organised a drop-in club for teenagers to make animated films in the form of machinima, a kind of animation derived from game culture, in which the narrative is acted out by avatars in the virtual world, captured, and edited as a film. The teacher and the students arrived in the space as avatars, with the names they used in Second Life, and the visual style they had chosen to adopt. This had various quite practical effects on the learning process. Firstly, it eradicated natural signifiers of identity, for teacher as well as student (Figure 2): names, skin colour, physical appearance, size, weight, gender, replacing these with the elements of role-play the students had chosen: perhaps a different gender, ethnicity, dress style and so on. In this respect, the students exercised more control over their identity as learners than is usually the case in school – though it does raise interesting questions about dress, hairstyle, jewellery, physical action and gesture and so on in students' performance of selfhood in everyday life, to paraphrase Goffman's dramaturgic model of social identities (1959).

FIGURE 2

CAPTION: The teacher as Second Life avatar, interviewed by the author

Secondly, the mode of communication was different. Avatars in Second Life type their ‘speech’ in the form of text-based chat, which appears in a scrolling box on-screen. During the project, spoken voice was introduced in Second Life, but the project decided to abandon it after a short trial. In brief, it produced chaos, with students talking over each other, and difficulty in attributing voice to avatar. By contrast, the text-based chat produced order and quiet. The texts appeared on-screen in the order they were submitted, so an equitable turn-taking was produced, and everyone was equally heard.

Another example, drawn from an HE project on teaching and learning in virtual worlds, involved a series of MA seminars held in Second Life at the Institute of Education in London. On our first visit, we noticed that, while the students were finding somewhere to sit, one student seemed to be missing. He was, in our usual seminars, a quiet, studious, compliant student, eager to carry out assignments and reluctant to challenge or question. Suddenly, we saw a (virtual) knife fly through the air, narrowly missing one of the tutors. Looking up, we saw the missing student sitting on top of a standard lamp, wearing a Mexican Day of the Dead skull as his head. He had found a knife-throwing animation in Second Life, and was entertaining himself and his fellow students by ‘attacking’ his teachers (Figure 3).



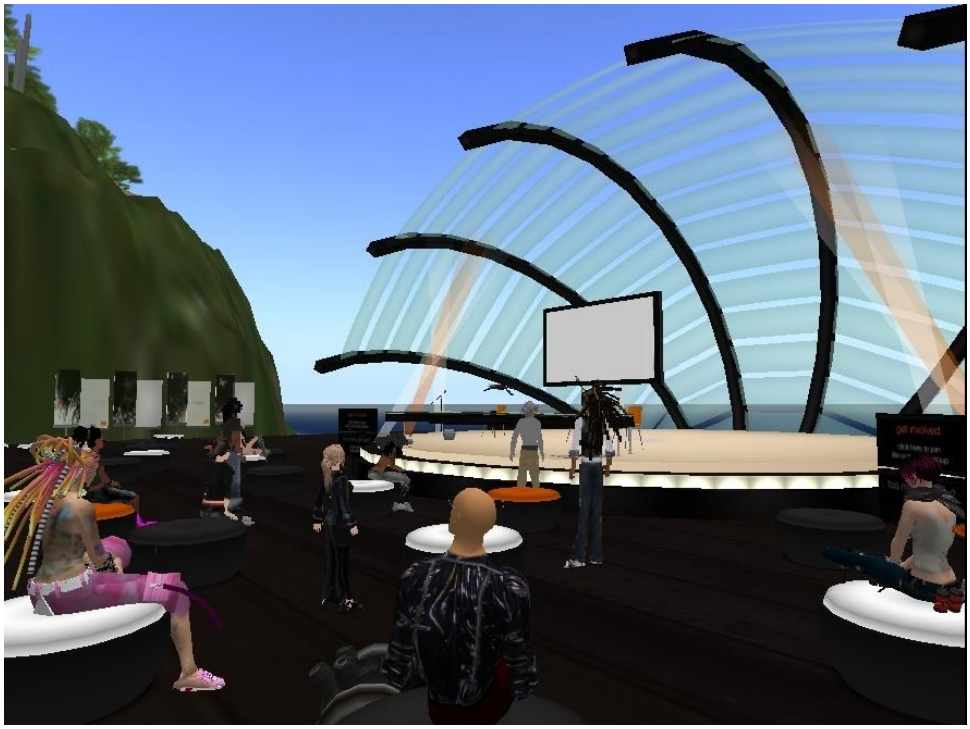


FIGURE 3

CAPTION: MA student avatars in Second Life: the ‘knife-throwing episode’

We noted also that his identity as a student seemed to have changed – he raised questions, challenged visiting lecturers (in Second Life), and generally employed a playful, productively disruptive mode of engagement. We discovered that he had once been a keen player of the shooting game Counterstrike, and had earned a reputation as a subversive gamer by shooting one of his allies. Here, he seemed to have drawn on this cultural background – and its experiences of virtual spaces, bodies and tools – to transform his identity as a learner from compliant student into class clown.

These environments and virtual bodies, gestures, actional repertories and communicative conventions may challenge our comfortable experiences of educational settings and pedagogic performance. They may cause learning to spill messily into social genres other than narrowly-conceived educational ones, leaking into worlds of fantasy, play and popular culture. They may feel as if our serious business of education has been besieged by a permanent fancy-dress day, locked into a videogame adventure, or violently re-situated in a Tom and Jerry cartoon. But it may also be the case that these environments are ones in which teachers are increasingly at home, where they too can wear fantasy outfits instead of the business suits required by their school, display their gaming prowess, deploy the expressive tools of virtual worlds in the service of their particular art-form or subject domain, as was the case in these two examples.

Virtual performance and exhibition

To continue with the example of Second Life, virtual worlds can be spaces of exhibition and performance in the arts, as well as spaces of learning and pedagogy. The art teacher mentioned above began her life in Second Life by exhibiting her own paintings. She hired a virtual gallery space, digitised and uploaded her paintings, and held private views complete with virtual glasses of champagne.

In the world of drama, Second Life is replete with examples of plays enacted in virtual form, including Shakespeare performances. There is even a virtual version of Shakespeare's Globe theatre (though, truth be told, it is often empty these days).

In music, it is possible to obtain, or buy, with the virtual currency provided by Linden Labs (the company which owns and manages Second Life) musical instruments of various kinds. These are typically made by other citizen-entrepreneurs, using the open access scripting language of Second Life. They range from instruments which play pre-recorded tunes to ones in which the user can control the production of notes and chords by key-presses. My avatar, Juniper Mapp, owns two instruments: an accordion and a set of Highland pipes, which roughly correspond to my real-life playing of the melodeon and the Northumbrian small-pipes – though with a very limited repertoire!

Such performances have their precedents in cultural life and history. The adoption of public roles, and their concomitant styles of performance, gestural repertoires, dress codes and so on has always been a feature of performance, and online extensions of these practices in many ways continue their functions, while adding, as we have seen, new forms of identity play and spatio-temporal expansion. Similarly, the online spaces of performance and exhibition often mimic real-world spaces, even to the extent of building simulacra of them, as in the case of the Globe. However, such spaces, under the skin, have distinct affordances: a common compositional scripting language in which digital citizens make their assets; opportunities for the exercise of fantasy in the audiovisual environment; and navigational functions which do not obtain in the real world. One of our MA seminars, for example, involved a visit to a Second World advertising studio, which we reached in seconds through the 'teleport' function of the virtual world.

These three online contexts produce evidence, then, of new kinds of *techne*: tools of scripting code, of software manipulation, of digital navigation in (cyber) space and time; of interaction and communication. They also exemplify new kinds of *episteme*: knowledges of digital cultures and communities, of appropriate etiquettes and social repertoires; of archival practices and resources. And finally, to complete Heidegger's triad, they display new kinds of *poiesis*: the aesthetic practices of online performance, character design, world-making, and the social meanings these practices carry.

CONCLUSION: TOWARDS CONNECTED LEARNING IN THE DIGITAL ARTS

The argument I have propounded through this chapter seems to me to produce three clear consequences for the deployment of digital technologies in relation to education and education research.

The first is that digital technologies, despite the neophilism that often characterises discussions of practice, research and policy, are not technologies of rupture. They offer distinctive new opportunities in the plasticity of compositional processes, the remixing of earlier texts and artefacts, the distribution of artworks across space and time, and the conflation of global and local cultures. They invoke new genres, narratives, imagery and social practices in digital culture; they provide new spaces, bodies, tools, fantasies, soundtracks in which we can spin our stories, play our tunes, create affective experiences, represent our world to ourselves and our communities. Yet all of this has a history. All of it is grounded in pre-digital stories, images, and artistic endeavour. The debate about art and the machine runs from the Industrial Revolution to our deliberations about the digital tools of music, media and image making in twenty-first century classrooms. Away from the abstractions of cultural theory, we are all aware that the experiments of young people with digital instruments bear some relation to our own early efforts with guitar or violin; that online role-play in World of Warcraft in some way resembles the superhero costumes of our own childhood; that the building of virtual structures in Minecraft has something in common with the sandpits, Lego and Meccano of earlier generations. Perhaps most importantly, the research tells us repeatedly that the most productive online experiences are those strongly linked to offline life and practice.

The second consequence is the need to avoid, in our understanding of learning, a bifurcation of material technologies and conceptual learning. Vygotsky's insight that the two are intimately connected, that semiotic tools depend on artefacts and events in the material world, and act upon them, helps us to avoid the more crass effects of technological determinism. It helps us to see that it's not (just) the technology, it's the pedagogy and the generative collision of imaginative and rational thinking of the learner that's important – but that these can internalise the properties of material artefacts and develop in responsive complexity through the manipulation of tools.

The third consequence returns us to Heidegger's yoking-together of techne, episteme and poeisis. This synthesis of craft and its tools with knowledge and aesthetic shaping elevates technology beyond the instrumental, as we have seen. It also locates it socially and culturally. The emergence of such a synthesis into aletheia, a 'bringing-forth', is a sociocultural process. When a child decides that a particular combination of pink and green on an i-pad art package will be adequate to represent her father in the composition she is making, the swipe of finger across pixels *brings forth* an image in dialogue with her life and earlier representations she's seen in picture-book, film and animation. But it also makes something out of the material substance offered in the art-package; something very similar to what she might have made with paint and paper; but also qualitatively different to the touch, smell, eyes; and capable of different futures and forms of durability and exhibition.

The more practical implications of all this may, perhaps, be summarised in a small number of watchwords. These may be contentious; but they have worked for me. The first is to focus on authentic digital craft tools of the digital arts, rather than on educational technologies and 'edutainment' softwares.

The second, to conflate Manovich and Buckingham's arguments, is to teach *about* the technologies: about their properties, symbolic systems, histories, industrial provenance, value in the arts.

The third is to work with the multimodality of new media: the synthesis of image, sound, action, language, music in videogames and thus videogame design, for example. To realise the full potential of this, we need to relax the boundaries of the individual arts, and explore their connections and commonalities, work for a collaborative, permeable arts curriculum, with a porous flow of expertise between educators and artists in different disciplines (Cannon, 2014; Sefton-Green, 2013).

The fourth is to attend to the cultural contexts of the tools and artefacts we work with. In particular, how does their use change in the contexts of artistic practice on the one hand, and young people's home lives (Marsh, 2006), peer cultures and 'third space' learning (Potter, 2011) on the other? What kinds of cultural experience, affiliation, taste, critical judgment, pleasure come from such contexts?

The final consequence is to do with the paradox of learning. It is difficult, but while it is sometimes necessary to work in a developmental mode, where learning occurs in steps, and such steps may be modelled, auto-logged, supported by digital tools, it is also sometimes necessary to acknowledge the value of a composition, production, performance for the moment. These moments may also be made more possible through the communicative functions of online tools, the output formats of composition softwares, the audiovisual capacities of multimodal design packages. These moments may profitably disrupt the inexorable march of learning progression; they may undo the teacher-learner hierarchy, if only temporarily; they may threaten the neat boxes into which the curriculum is shoehorned; they may connect classrooms with global audiences; they may reveal meanings the curriculum had never intended or foreseen. These may be the kinds of bringing-forth that the arts aspire to, and if the digital arts can make a contribution, then our new classroom cottage industries can have the best of hand and steam.

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