Abstract

The pervasiveness of personal technologies has promoted several debates in education. Current debates centre upon - but are not limited to - personal learning environments, mobile gaming and touch screen tablets, and their potential to transform learning and teaching. A number of new theories are emerging to explain how students are using new digital tools for learning, and these require evaluation. Questions are raised over whether new technologies can promote and support new pedagogical strategies, or merely perpetuate old methods. The extent to which personal devices can actually support and encourage personalised approaches to learning must also be ascertained. Furthermore, issues exist around the impact and validity of personal tools in education, and to what extent new forms of assessment of learning will need to be implemented within these new contexts. This paper reviews the current literature and identifies several of the key issues, theories and debates arising from recent adoptions of personal devices across whole schools and institutions.

Introduction

Increasingly, the pervasive nature of mobile and personal technologies is impacting upon professional practice across all sectors of education. Many of the current debates centre upon - but are not limited to - the 'Bring Your Own Device' (BYOD) movement, personal learning environments (PLE: Johnson & Liber, 2008), mobile gaming (Spikol & Milrad, 2008) and e-books and e-readers. Reductions in price have ensured that Kindle Readers and other similar digital reading devices are now increasingly popular and are regularly used devices for all age groups. Perhaps most significantly, the potential to transform education through touch screen tablets such as the iPad has been a feature of recent research (Webb, 2012). Many of the above debates are beyond the scope of this paper, but PLEs, personal technologies and associated pedagogical theories will be explored, examined and evaluated.

Taking an overview of the educational trend for technology integration, some researchers and practitioners debate whether new technologies can promote new pedagogical approaches, or merely serve to perpetuate old methods. McRae (2012) for example is doubtful, and has argued that a technological pedagogical symbiosis is required before technology can transform current teaching and learning practices. He explains that the symbiotic relationship between pedagogy and technology has yet to be fully realised. Using new technologies in the same context as old technologies, he suggests, merely perpetuates old practices and approaches. Other questions are raised over what extent personal devices can actually support and encourage personalised approaches to learning. Further questions exist over the impact and validity of personal tools in education, and to what extent new forms of assessment of learning will need to be implemented within these new contexts.
The Personal Learning Agenda

The personalised learning agenda is currently highly visible in many schools and universities. In an organisational sense, its history can be traced back to the 1940s health and social care provision, but more recently the ethos has been extended to other public sectors, including education. In the 1980s, during a resurgence of interest in the cognitive sciences, psychologist Howard Gardner proposed a new theory of learning that identified individual learner characteristics, or ‘multiple intelligences’. Gardner’s theory (1983) was a response to the limitations of the standardised psychometric testing that was prevalent at the time. He admitted that the technological revolution influenced his thinking when he stated ‘the advent of the computer changed psychology forever and spawned the cognitive sciences.’

Further theories appeared that placed the learner firmly at the centre of the education process, and focused upon individual differences, styles of learning, personal preferences and study orientations. Such theories challenged the traditional, industrial models of education, where standardisation and homogenisation of provision, subject compartmentalisation, and synchronisation of behaviour were key components of the school system (Toffler, 1980). Knowledge was centrally developed and controlled, organised into rational components and delivered in ‘batches’ of instruction. Now referred to as the ‘factory model’ of education, this approach to schooling owes much to the industrial revolution of a previous, long gone age.

Learning Management Systems

The emergence of the World Wide Web in the 1990s provided scholars with new opportunities to explore personalised learning. Yet many education providers saw a need to maintain control over content, and developed centralised tools that perpetuated the factory model of knowledge production, organisation and delivery. Learning Management Systems (LMS) were developed as institutional platforms to organise, deliver and manage knowledge content. A tension clearly exists between the personalised learning agenda and centralised provision of content and communication through the LMS. There is a widely held belief among education professionals that the LMS is a useful learning tool. The LMS provides universities, colleges and schools with a common platform that simplifies the provision of programmes, delivers homogenised content and provides equalised, gated access to shared resources.

There is also a counter movement of educators who believe that a loose aggregation of personal learning tools is more effective in supporting the individual needs and requirements of learners. Recent debate has challenged the validity of such beliefs, suggesting that delivering institutional content management via the Learning Management System limits student opportunities to explore, create and repurpose existing learning content, and that homogenisation of content militates against personal learning, creating more barriers than benefits for learners (Johnson & Liber, 2008). One viable alternative to the LMS is the Personal Learning Environment.

Personal Learning Environments
In the broadest sense, a Personal Learning Environment (PLE) can be described as the range of devices, experiences and environments each individual learner adopts to achieve their own personal learning goals and trajectories (Severance et al., 2008). PLEs are environments that are constituted from a range of tools, chosen by individual learners, where people, resources and services can interact in a loose manner (Wilson, 2008). The term Personal Learning Environment is relatively new (van Harmelen, 2006) but describes a concept that ostensibly has existed for some time. PLEs can promote the integration of formal and informal learning episodes into a single experience (Attwell, 2009), and draw heavily on a number of social networking tools to bring together diverse resources, people and experiences into a self managed space. Attwell suggests that the PLE ‘offers a portal to the world through which learners can explore and create, according to their own interests and directions, interacting as they choose, with their friends and the learning community’ (Attwell, 2009, p. 120).

**Personal Technologies and Education**

Almost two decades ago, Gilder (1994) predicted that personalised media would liberate us from the ‘tyranny of mass media.’ His prediction was based on the premise that a number of trends such as miniaturisation, cost reductions, portability and wider choices of device would make it easier to access information. In many ways these predictions are being realised. We are indeed witnessing a ‘feast of niches and specialities’, where multiple satellite television channels, endless online shopping choices and a bewildering variety of social networking tools are revolutionising our experiences of entertainment, commerce and communication. Clearly, one size does not fit all, and personal devices are evidence of a preference by many members of society to personalise their consumption of digital content and experiences.

Traxler (2009) argues that personal handheld devices such as the mobile telephone have been instrumental in changing our perceptions of space and place. Traxler goes farther, arguing that our conception of knowledge is also changing, and that this change extends to the way we generate, share, own, value and use content. He further argues that mobile personal devices can provide students with in vivo rather than in vitro learning, by which he means that personal technologies enable them to transgress the wall of the traditional, formal learning spaces, to enter the ‘noise and the mess of the outside world’ (p. 26). Traxler’s claims, if true, clearly have pedagogical implications, and challenge previously cherished notions of classroom, curriculum, the assessment of learning and traditional teacher roles. Jenkins (2006) for example, believes that a new knowledge culture has emerged as a result of the proliferation of personal technologies. He suggests that this has fomented a reduction in the importance of older notions of social community, and a diminishing of the significance of physical space and place. Jenkins further holds that the new communities that are emerging in the knowledge culture are held together by the mutual production and reciprocal exchange of knowledge. In effect, Jenkins has defined a new world in which the act of knowledge production and sharing has become the new social and cultural capital. Such reconceptualisation is clearly a departure from the old models of education that have become prevalent in post-industrial society.
Learning Theories for the Digital Age

Learning in the industrialised world can now be contextualised within a largely digital landscape, where the use of technology is assuming increasing importance. Much of this learning is informal, and is generally location independent. The present technology rich learning environment is characterised by a sustained use of digital media, their integration into formal contexts, and a shift toward personalisation of learning. These facets of modern life in combination have led educators to question the validity of pre-digital age learning theories. In recent years a variety of new explanatory theories have been generated that can be applied as lenses to critically view, analyse and problematise new and emerging forms of learning.

One highly visible theory is Connectivism (Siemens, 2004). Connectivism has been lauded as a ‘learning theory for the digital age’, and as such seeks to describe how students who use personalised, online and collaborative tools learn in different ways to previous generations of students. The essence of Siemens’ argument is that today, learning is lifelong, largely informal, and that previous human-led pedagogical roles and processes can be off-loaded onto technology. Siemens also criticises the three dominant learning theories, namely behaviourism, cognitivism, and constructivism, suggesting that they all locate learning inside the learner. His counterargument is that through the use of networked technologies, learning can now be distributed outside the learner, within personal learning communities and across social networks.

Perhaps the most significant contribution of Connectivist theory is the premise that declarative knowledge is now supplemented or even supplanted by knowing where knowledge can be found. In a nutshell, knowledge is now more distributed than it ever was, and it is now more important that student know where to find the knowledge they require, than it is to internalise it. This places the onus firmly upon each student to develop their own personalised learning tools, environments, learning networks and communities within which they can ‘store their knowledge’ (Siemens, 2004). In McLuhan’s view, as we embrace technology, ‘our central nervous system is technologically extended to involve us in the whole of mankind and to incorporate the whole of mankind in us’ (McLuhan, 1964, p. 4). Clearly our social and cultural worlds are influenced by new technology, but are there also biological implications?

21st Century Learners

Is learning in the 21st Century significantly different to learning in previous years? One of the more controversial theories of the digital age is the claim that technology is changing (or rewiring) our brains (Greenfield, 2009) whilst others claim that prolonged use of the Web is detrimental to human intellectual development (Carr, 2010). It could be argued that these theories stem back to the seminal claim of Marshall McLuhan (1964) that ‘we shape our tools and thereafter, our tools shape us.’ This belief was also the basis for the in Digital Natives and Immigrants theory (Prensky, 2001), a persistent discourse that has greatly influenced the thinking of educators in recent years. A significant body of work has arisen around the Natives and Immigrants theory, including characterisations of younger students as ‘the Net
Generation’ (Tapscott, 1998), ‘Screenagers’ (Rushkoff, 1996), ‘Born Digital’ (Palfrey and Gasser, 2008), ‘Millennials’ (Oblinger, 2003), and ‘Homo Zappiens’ (Veen & Vrakking, 2006). The latter theory suggests that younger students learn differently, through searching rather than through absorbing, through externalising rather than through internalising information, are better at multitasking, and see no separation between playing and learning (Veen & Vrakking, 2006).

If these theories are true, and younger students do learn differently, the implications for education are profound, demanding changes to the way formal learning content is developed, delivered and organised, and a reappraisal of our conception of knowledge and what it means for education. There are, inevitably, objections to the Digital Natives position.

All of the above theories tend to characterise younger learners as being different to previous generations in their use of technology. These positions are countered by researchers who maintain that such claims are largely based on anecdotal and intuitive arguments, and that there is no significant difference in the way younger or older students manage their online learning activities (Crook & Harrison, 2008; Ito et al, 2009; Kennedy et al, 2010) and that the current generation of learners is far from homogenous (Bennett et al, 2008; Jones & Healing, 2012). Bennett et al (2008) assert that there is no clear evidence that multi-tasking is a new phenomenon and exclusively the preserve of younger learners. Jones and Healing (2010) criticise the Digital Natives and Immigrants theory as too simplistic, and point out that a greater complexity exists in the way students of all ages use technology, based not on generational differences, but on agency and choice. There is yet further dissent. Vaidhyanathan (2008) argues that ‘there is no such thing as a digital generation.’ He suggests that every generation has an equal distribution of individuals with low, medium and high levels of technology competency. Vaidhyanathan is uncomfortable with the erroneous misclassification of generations and associated assumptions of technology competency levels, and warns: ‘We should drop our simplistic attachments to generations so we can generate an accurate and subtle account of the needs of young people – and all people, for that matter.’

Perhaps the most sensible advice comes from Selwyn (2009) who argues that contrary to the popularist beliefs expressed in the Digital Natives discourse, young people’s engagement with technology is often unspectacular (Livingstone, 2009). According to Selwyn, accounts of Digital Natives are often based on anecdotal evidence, are inconsistent or exaggerated, and hold very little in common with the reality of technology use in the real world. The Digital Natives discourse tends to alienate older generations from technology, and teachers can make dangerous assumptions about the capabilities of young people (Kennedy et al, 2010). Selwyn counsels: ‘Whilst inter-generational tensions and conflicts have long characterised popular understandings of societal progression, adults should not feel threatened by younger generations’ engagements with digital technologies, any more than young people should feel constrained by the “pre-digital” structures of older generations’ (Selwyn, 2009, p. 376).

Arguably the most useful explanatory framework for current online activities is offered by White and Le Cornu (2011), who argued that habitual use of technology develops sophisticated digital skills regardless of the age or birth date of the user.
They call these users ‘Digital Residents’ and suggest that those who are ‘Digital Visitors’ are less likely to be digitally adept because of their casual or infrequent use of digital tools.

**Social Dimensions**

It is clear that very little learning occurs in a vacuum, and that social contexts are vitally important for education. This was acknowledged many years ago with the formulation of the theory of social constructivism, which challenged many of Piaget’s notions of the child as a solo explorer. First proposed by Vygotsky (1978), social constructivism proposed that learners could extend their learning capability when they were situated in social contexts, where access to more knowledgeable others was possible. This so called Zone of Proximal Development (ZPD) relied entirely upon the ability of others to expand the otherwise limited horizons of the learner. In the digital age, the Web is socially very rich. Through the use of personal technology, access to more knowledgeable others is increased to such an extent that students are now connected with hundreds of their peers. This is achieved via popular social media services such as Facebook. It could therefore be supposed that social media provide a bridge from individual learners to their communities of practice (Wenger, date). We might also conclude that learning communities are no longer as location dependent as they were in pre-digital times. The digital ZPD thus reaches considerably beyond the confines of traditional spatial and temporal boundaries, and can encompass any number of others who have knowledge and skills to share. Social constructivist learning is thereby realised through PLEs that encompass social networking tools, which can be used as mediating mechanisms between learners, especially where they are geographically dispersed (van Harmelen, 2008).

**Postmodern Perspectives**

Postmodernist views of society can be appropriated as lenses to view and analyse the personal use of digital technology. Consumers of Web based content tend to search randomly and nomadically, due to the multilayered, multidirectional nature of hyperlinked media and this aligns neatly with some post modern theory. The writings of Deleuze and Guattari (1980), for example, feature the nomadic thought processes that characterise contemporary perceptions, and portray the chaos of modern life. They employ the botanic metaphor of rhizomatic root systems to describe multiple, chaotic non-hierarchical interpretations of knowledge. Rhizomes resist chronology and organisational structures, thereby more accurately represent the unstructured but purposeful manner in which many people now use the Web.

Significantly, because rhizomes are open ended, the importance of Deleuze and Guattari’s rhizome explanation is not invested in individual components, but rather in the direction of motion the entire organism can adopt at any given time. This is reminiscent of the participatory Web, which consists not so much of the insights and offerings of individuals, but rather of what Surowiecki (2009) has termed ‘the wisdom of the crowds’ – the seemingly random folksonomic directions chosen by entire communities of users as having meaning and importance. The community decides what is important to learn, so in effect, the community becomes the curriculum.
According to Cormier (2008) a rhizomatic interpretation of education is useful because it embraces the ever changing nature of knowledge, is open ended, and is not driven by specific curricula whilst learning is ‘constructed and negotiated in real time by the contributions of those engaged in the learning process.’ This form of negotiated meaning more clearly represents the knowledge acquisition processes that occur within the transient discussion threads and ephemeral collaborative spaces on the World Wide Web.

The colonisation of knowledge spaces by communities is self sustaining, and in Deleuze and Guattari’s terms, we see individuals assuming the roles of nomads, maintaining a constant state of becoming and transformation. Again, this is reminiscent of the random searching, scanning and jumping around content through hyperlinking that learners participate in when they traverse the digital landscape. In effect, students participate as flâneurs, acting as individual agents, investigators and explorers of their own personal digital terrains. Their seemingly aimless behaviour belies their essentially purposeful wandering, as learners interrogate their environment in attempts to make sense of it, understand it, participate in it, and ultimately portray it (Baudelaire, 1964).

**Self Regulated Learning and Heutagogy**

Informal and self regulated learning are defining characteristics of 21st Century education. Various commentators suggest that as much as seventy percent of learning occurs outside of formal educational settings (Cofer, 2000; Dobbs, 2000; Cross, 2006). If these are accurate statistics, they present significant challenges to schools, colleges and universities. One challenge for education providers is to decide whether they will support the desire of students to self regulate their learning activities using personal technologies. Institutes that discourage the Bring Your Own Device (BYOD) movement may be perceived by their students as anachronistic. Those who do support BYOD for students and staff will need to invest significant time and resources into ensuring cross platform operability and seamless delivery to students’ personal technologies.

Self regulation of learning is thought to be a characteristic of individual students (Beishuizen, 2008) but increasingly can be contextualised within social learning environments. A number of collaborative and social networking tools regularly play a role within the average student PLE. Self regulation has been shown to enhance and improve learning outcomes (Paris & Byrnes, 1989; Steffens, 2008), enabling learners to achieve their full potential (Delfino et al, 2008). Personal technologies are thought to enable self-regulation at a number of levels, including the ‘object’ and ‘meta’ levels of learning, supporting maintenance, adaptation, monitoring and control of a variety of higher level cognitive processes (Nelson & Narens, 1990). By using personal devices as ‘mindtools’ to offload simple cognitive tasks, students can extend their own memories (Jonassen et al, 1999), build their confidence, and increase their motivation levels (Goldsworthy et al, 2006). Further, personal devices enable individuals to gain access and to participate at many levels within their communities of practice, from ‘entering by learning’ through to ‘transcending by developing’ (Ryberg & Christiansen, 2008). All of this is often achieved by students outside the formal surroundings of school or university, with no time or location constraints.
Moreover, there is a sense that personal technologies encourage learners to be self-determined in their approach to education. Hase and Kenyon’s (2007) conceptualisation of self determined learning - or heutagogy - places the emphasis on non-linear, self-directed forms of learning, and embraces both formal and informal education contexts. The central tenet of heutagogy is that people inherently know how to learn. As Illich (1971) once pointed out, ‘learning is the human activity which least needs manipulation by others’ (p. 39). The role of formal education in this instance is to enable learners to confidently develop these self study skills, encouraging them to critically evaluate and interpret their own personal reality according to their own personal skills and competencies. The ethos of heutagogy extends to learner choice, where students can create their own programmes of study, a feature often seen in the loose and unstructured aspects of some Massively Open Online Courses (MOOCs). In many ways, heutagogy is aligned to other digital age theories, in that it places an importance on ‘learning to learn’, and the sharing rather than hoarding of that knowledge. It is not difficult to see that such sharing of knowledge can be easily achieved through social media and the use of personal digital technologies.

Peer Learning and user generated content

Another notable feature of 21st Century learning is peer learning. Highlighting the fast paced nature of the web, Thomas and Seely-Brown (2011) suggest that peer learning can be timely yet transient. They show that never before has access to information and people been so easy and so widespread, and that we make connections with people who can help us manage, organize, disseminate and make sense of the resources. Such interconnectedness and willingness to share creates a new kind of peer mentoring that operates at multiple levels and many degrees of expertise, supporting learning in all its complexity. The notion of ‘paragogy’ (Corneli and Danoff, 2011) relates to the peer production of learning but as Corneli (2012) warns, such an agenda may be at odds with established educational systems in some respects, and may even be opposed by some. This is due to the challenge that ‘students teaching themselves’ might pose to the privileged knowledge and power structures many formal educational institutions continue to hold in such high regard.

In essence, Corneli and Danoff’s paragogy thesis is premised on the argument that online environments are now sufficiently developed to support peer production of content which can be shared freely, and can promote learning for all within any given community. Again, this echoes the connectionist and heutagodic ideals earlier discussed, whilst at the same time presenting a challenge in terms of the quality, reliability and provenance of content. The user generated content currently available on the web has been criticised for its inconsistent quality (Carr, 2010) and its potential to encourage plagiarism, piracy and a host of other nefarious practices (Keen, 2007). User generated content has also attracted criticism over issues of mediocrity, lack of accuracy and superficial scholarship (Brabazon, 2002; 2007). Notwithstanding, many are now turning to web based user generated content to educate themselves and to share their learning. In many ways, the ability to use personal technologies to create, organise, share and repurpose content, in many formats across the global web environment has become a democratising, liberating factor in education. There are now a variety of new ways we can create peer networks, learn from each other and share our ideas. In so doing, we are building
what Illich (1971) once termed ‘the learning webs’ that will enable each of us to defines ourselves by both learning, and contributing to the learning of others.

Conclusion

It is clear to any observer that digital tools are increasingly personal, and that they can support the learning needs of contemporary students, providing access to learning on the move and on a global scale. There is also a sense that students are creating, organising and sharing their own content on a regular basis, forming their own online communities, teaching themselves, and using their own portable technologies as vital portals for the implementation of their own personal learning strategies. It falls to institutions to make choices about how, and to what extent they will support personal technologies. Moreover, there needs to be wider acknowledgement that regardless of whether or not learning is changing, technologies are enriching and extending the experiences of learners. Thus, new explanatory frameworks will be required to justify and advance new pedagogical methods that will be relevant and effective in supporting the 21st Century learner.
References


