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Ch 4 The new shape of the student

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This chapter critically examines student characteristics in light of the popular discourse which describes students as part of a net generation of digital native young people. Digital and networked technologies have clearly changed the possibilities for students to learn and the ways in which teaching and learning can be conducted. It is also claimed that new technologies change what students are able to learn. However the claim that there is a new generation of learners characterized by a new mentality has to be careful assessed in the light of recent empirical evidence. The idea of a generation gap between digitally native students and their digitally immigrant teachers is challenged, as are claims that pressure from this new generation forces radical institutional change on educational institutions. The chapter argues against the generational nature of the argument and separates the technological changes that are taking place from the determinist rhetoric they have been couched in. This rhetoric suggests that changes amongst students are already well understood and that their educational implications are already known and lead to generally applicable if not universal consequences. The chapter concludes by arguing that there is no one shape for students and that digital technologies open up a range of opportunities and choices at all levels of education.

4.1.Introduction

This chapter critically investigates the relationship between students and new technologies. It has become commonplace to describe students as digital natives part of a net generation. These ideas first developed in the late 1990s and early 21st Century and have an almost viral character in the way that they circulate in academic literature gathering force from anecdotal connections with personal lives. Many adults have had the experience of being dumfounded by the apparent technological ease of sometimes extremely young people. This chapter looks for the theoretical foundations and empirical evidences that support the idea of a new generation of young people. In particular the focus of the chapter is on education and learning. If there are changes taking place in relation to new technology what are they and how do they affect students? The easy solution would be simply to repeat the widely disseminated version of students being part of a net generation

composed of digital natives. The task this chapter undertakes is to critically examine these ideas and to assess whether they can be useful to educators.

The ideas that became popularized in terms of the net generation and later the idea of the digital native largely began with the work of Tapscott (1997) and the book *Growing Up Digital: The Rise of the Net Generation*. The term that has become most associated with young people and new technology, digital native, was introduced in two articles by Marc Prensky (2001a, 2001b). One of the earliest terms used to describe this group of young people was the generational term Millennials first developed by Howe and Strauss (2000). Alongside these 3 main terms there have been a plethora of other terms such as 'Generation Y' (Jorgensen, 2003; Weiler, 2005; McCrindle, 2006); the 'IM Generation' referring to the Instant Message Generation (Lenhart, Rainie, and Lewis, 2001); the 'Gamer Generation' (Carstens and Beck, 2005); and 'Homo Zappiens' (Veen, 2003) amd most recently Google Generation (Rowlands et al. 2008, JISC-Ciber 2008) and the i-Generation (Rosen 2010). Although there are a wide variety of alternatives this chapter will focus on the two main terms, net generation and digital native, and treat them all as roughly interchange.

4.1.1 The implications of the generational argument for learning

In general the claims that have been made about the a new generation of young people are held in common and they argue that that because young people are growing up immersed in a world permeated with networked and digital technologies an entire generation thinks differently, learns differently, exhibits different social characteristics and has different expectations for learning. Prensky has gone further in claiming that the brains of students today are 'physically different' (Prensky, 2001b). The new generation of students are portrayed as having a common set of preferences including: wanting to receive information quickly; relying on communication technologies; often multitasking and having a low tolerance for lectures; and preferring active approaches to learning (see for example Tapscott 1999; Oblinger, 2003; Oblinger and Oblinger, 2005).

A key assertion associated with the idea of Digital Natives is that "today's students *think and process information fundamentally differently* from their predecessors." (Prensky 2001a p1 emphasis as in original). These changes to students preferences are said to be the direct consequence of technological changes which have had an impact on ways of thinking.

> Digital Natives are used to receiving information really fast. They like to parallel process and multi-task. They prefer their graphics before their text rather than the opposite. They prefer random access (like hypertext). They function best when networked. They thrive on instant gratification and frequent rewards. They prefer games to "serious" work. (Prensky 2001a p2)

Prensky (2001a) also argued that there is a sharp generational divide, a 'singularity', that separates digital native students and their teachers. The net generation

argument whilst similar is couched in slightly different way allowing teachers the ability to learn the new skills.

> Needless to say, a whole generation of teachers needs to learn new tools, new approaches, new skills. This will be a challenge…
> But as we make this inevitable transition, we may best turn to the generation raised on and immersed in new technologies. Give the students the tools and they will be the single most important source of guidance on how to make their schools relevant and effective places to learn. (Tapscott 1999 p 11)

The net generation argument leads to a set of prescriptions for teaching and learning including a change from being 'teacher-centered' to becoming 'learner centered'. The role of the teacher is to facilitate, creating and structuring what happens in the classroom, including the tailoring of an individualized experience for the student (Tapscott 1999 p10). The learning preferences of these students include: bite size learning, new media and high levels of social interaction including collaboration. These prescriptions for teaching and learning were not particularly new even in 1999, and the idea that new technologies led to new kinds of learning interactions was popularized after the first wave of Internet technologies were applied to education (see for example Harasim 1990, Harasim et al 1995, Hiltz and Turoff 1978). What was new was the central position specified for the new generation of students as the agent of change in education.

The generational nature of the argument also leads to a deficit model of professional development for teachers because they have grown up in a different world and enter the new environment as strangers. In the strong version argued by Prensky these teachers are required to try and imitate their digital native students but however hard they try they will always retain a digital immigrant 'accent'. In Tapscott's version teachers can learn new skills under the guidance of their students. In both cases the characteristics of digital native students and their digital immigrant teachers are already established and relatively fixed. These arguments describe an unusual deficit model in which teachers are required to change and learn new skills and approaches, even though, especially in Prensky's strong version of the argument, they can never be fully successful in this endeavor and it is the students who are the source of guidance for their teachers.

The broad argument found in the discourse is that students' ways of thinking have changed, for example Dede (2005) and Dede et al (2007) claimed that technology was reshaping the mindset of students of all ages and creating a 'neomillennial' learning style. Prensky (2001b, 2011) makes a stronger claim, that students exposed to digital technologies develop different brain structures. Prensky's account relies on largely non-human studies of animals and a limited number of studies focused on brain changes in humans (2001b). There is a growing literature in the field of neuroscience and a review of this can be found in Bavelier et al. (2010). Overall I take the view with Ellis and Goodyear (2010) that there is currently no evidence of either a fundamental shift in learning processes or in the structure of the brain associated with growing up with digital technologies. The argument being put here is not trying to prejudge claims about the plasticity of the

brain but to reject notions of the hardwiring of characteristics in students as a consequence of their early exposure to digital technologies.

It is because of these assumed changes among students that teachers were told that they had to modify their teaching practices to accommodate the learning needs of their technologically sophisticated students. The thesis argues that the pressure for change is from students but the proponents of the digital native thesis have noted that after almost a decade the change in schools and universities has been slow:

> It is inevitable … that change would finally come to our young peoples' education as well, and it has. But there is a huge paradox for educators: the place where the biggest educational changes have come is not our schools; it is everywhere else but our schools. (Prensky 2010 p 1)

Despite the slow pace of educational change Prensky still clings to the idea that it remains an inevitable outcome of generational change (2010). Tapscott (2009) also places education as one part of a broad wave of social and institutional change. The prescription for education that Tapscott and Williams (2010) provide situates educational reform in wider neo-liberal arguments by locating students as customers and universities as value creating centers of production.

> Change is required in two vast and interwoven domains that permeate the deep structures and operating model of the university: (1) the value created for the main customers of the university (the students); and (2) the model of production for how that value is created. First we need to toss out the old industrial model of pedagogy (how learning is accomplished) and replace it with a new model called collaborative learning. Second we need an entirely new modus operandi for how the subject matter, course materials, texts, written and spoken word, and other media (the content of higher education) are created. (Tapscott and Williams 2010 p10)

This relationship to market forces has led several authors to point out how commercial interests have been active in perpetuating the idea of a new generation (Buckingham and Willet 2006, Bayne and Ross 2007, Herring 2008). This suggests that the arguments presented in the digital native and net generation discourse as simply an inevitable outcome of generational change are in fact deeply political and implicated in major social choices about the place of education in contemporary society.

All the authors involved in advancing the idea of a new generation of technologically sophisticated students have argued that education is forced to change because there has been a generational shift caused by a process of technological change. In this determinist outlook technological change is seen as arising independently from society and then having an impact on other dependant domains, yet little theoretical work has been presented to support such a link. Furthermore the development of the ideas about digital natives and the net generation did not lead to the development of a research agenda and a related program of empirical work to assess the claims being put forward. This weakness in the argument was noted in Bennett et al. (2008) who conducted a review of the literature and called for empirical work to be undertaken to describe the student population and their

relationships with new technologies and learning. Since Bennett et al (2008) came to that conclusion there has been a considerable growth in empirical research in a variety of national contexts and the following section briefly reviews the outcome of these.

4.2 Empirical research on students and technology

The findings from published empirical research examining the claims of the discourse surrounding a new net generation of digital natives shows that while the technological and material context is present in most of the advanced and the newly emerging industrial economies, this context does not translate in any simple way to a generational change in attitudes and natural skill levels related to the technology. Rather than supporting the idea that there is a net generation of digital natives who are naturally proficient with technology the evidence from a variety of contexts and sources shows a great variety in students' experiences with technologies.

There are several reviews of recent research available (Jones and Shao 2011, Livingstone et al 2005, Luckin et al. 2009, Pedró 2009, Selwyn 2009 and Schulmeister 2008, Staksrud et al. 2009). Jones and Shao, Pedró and Schulmeister concentrate in students in Higher Education whereas Selwyn, Livingstone, Luckin and Staksrud et al. focus on school age students. Perhaps significantly there is a marked separation between work on school age and university age students and it is rare for an author to cover both age groups unless their work spans a wide age range (Selwyn provides an exception e.g. Selwyn 2008 and Selwyn 2011). Selwyn (2009) reviewed published literatures on young people and digital technology with a particular focus on information sciences, education and media/communication studies. Selwyn showed that young people's engagements with digital technologies were varied and often unspectacular. He also highlighted the misplaced determinism that underpins many current portrayals of young people and digital technology. He concluded that while there is a need to keep in mind the changing lifeworlds of young people it would be helpful to steer clear of the excesses of the digital native debate.

Selwyn went on to state that there was no evidence of a serious break between young people and the rest of society. Selwyn argued that educationalists should approach the digital native literature with caution and that adults should not feel threatened by younger generations' engagements with digital technologies. He suggested that academic communities should promote more empirically grounded and socially aware portrayals of the complexity of the lives that young people develop through their engagement with digital and networked technologies. Livingstone et al (2005) found that young people expressed confidence in their Internet use and information searching in particular but when probed more closely a nuanced picture emerged with students admitting to a range of difficulties suggesting

that self-report may exaggerate both confidence and skills. In related work Staksrud et al (2009) concluded that there were significant gaps in research and the quality and reporting of work in this area was uneven and often weak. Much of the non-academic work was quantitative and conducted by market research organizations and without more qualitative and mixed methods research they argued that the picture of children's' use of new technologies and the Internet would remain incomplete.

Pedró (2009) carried out a meta-analysis of studies from Organisation for Economic Co-operation and Development (OECD) countries. There were differences in students' technology adoption and use and that digital divides between different kinds of students still existed. Furthermore, there was not sufficient empirical evidence to support the claim that students' use of digital media had transformed the way in which they learn or their preferences and perceptions concerning teaching and learning in higher education. Neither was there enough empirical evidence to support claims about the effects of technology on cognitive development. Schulmeister (2008) concluded that many of the claims were overstated or unsupported and that users proved to be a mixture of groups rather than a single group with common characteristics. He noted that studies examining the use of computers did not always distinguish between the types, contents or functions of the media activities or include anything about the motives of the users. The age distribution of young people's preferences suggested that their actual interests were influenced by socialization and their behavior in relation to media was related to the same questions that occupied young people before the advent of contemporary media.

Jones and Shao (2011) concluded that there was no empirical evidence that there is a single new generation of young students entering Higher Education and the terms net generation and digital native did not capture the processes of change that were taking place. They argued that the complex changes that empirical work identified had an age related component, particularly with regard to newer technologies such as social networking site use (e.g. Facebook), the uploading and manipulation of multimedia (e.g. YouTube) and the use of handheld devices to access the mobile Internet. They found that demographic factors interacted with age to pattern students' responses to new technologies and that the most important of these were gender, mode of study (distance or place-based) and the international or home status of the student. They went on to conclude that the gap between students and their teachers was not fixed, nor was the gulf so large that it could not be bridged and there was little evidence that students entered university with demands for new technologies that their teachers could not meet (see also Salajan et al 2010, Waycott et al 2009).

Jones and Shao's review (2011) showed that students persistently reported that they preferred moderate use of Information and Communication Technologies (ICT) in their courses and argued that universities should be confident in the provision of what might seem to be basic services (see also Schulmeister 2008, Smith and Caruso 2010). Students appreciated and made use of the basic infrastructure

for learning such as that provided by Learning or Course Management Systems and university library online services. Students were not found to not make extensive use of Blogs, Wikis and 3D Virtual Worlds but students who were required to use these technologies in their courses were unlikely to reject them and low use should not be taken to imply that they were inappropriate for educational use. They found no obvious or consistent demands from students for changes to pedagogy at university or evidence of a pent-up demand for greater collaboration. They also found no evidence of a consistent demand from students for the provision of highly individualised or personal university services and advice derived from generational arguments should not be used by government and government agencies to promote changes in university structure designed to accommodate a supposed net generation of digital natives. The review concluded that young students did not form a generational cohort and they did not express consistent or generationally organised demands. A key finding of this review was that political choices should be made explicit and not disguised by arguments about generational change.

Examining the detailed empirical studies showed that students were not all equally competent with technologies and their patterns of use varied considerably when they moved beyond basic and entrenched technologies to newer emerging or recently introduced technologies (Jones et al., 2010, Kennedy et al., 2008, Kennedy et al 2010, Van den Beemt, et al., 2010a). There were variations among students even within the net generation age group and young people cluster into different user groups with different interests, preferences, and lifestyles (Bullen et al., 2011, Jones et al 2010, Jones and Hosein 2010, Kennedy et al. 2010, Schulmeister 2010, Van den Beemt, et al., 2010b). Variation was related to other characteristics, including age, gender, socio-economic background, academic preference (major) and year of study (grade) (Brown and Czerniewicz, 2008, Caruso and Kvavik, 2005, Hosein et al. 2010a, Jones et al. 2010, Kvavik, 2005, Krause 2007, McNaught et al., 2009, Selwyn, 2008, Smith et al 2009, Smith and Caruso 2010, Van den Beemt, et al., 2010a).

While there was considerable growth in students' access to computing technologies and online tools this was often for social and entertainment purposes rather than for learning (Oliver and Goerke, 2007; Selwyn, 2009) and students' use of technology for social and leisure purposes was different to their use of technologies for academic purposes (Corrin et al 2010, Jones et al. 2010; Jones and Ramanau 2009, Hosein et al. 2010b). Furthermore empirical studies showed that high levels of general use and skill with new technologies did not necessarily translate into preferences for increased use of technology in educational contexts. A large number of students still held conventional attitudes towards teaching (Kennedy et al. 2009, Gabriel and MacDonald, 2009; Garcia and Qin, 2007; Lohnes and Kinzer, 2007; Margaryan et al. 2011) and research shows a consistent and long-standing finding that students would prefer moderate use of technology in the classroom (Jones, 2002, Kennedy et al. 2009, Kvavik, 2005, Salaway and Caruso, 2007, Smith and Caruso 2010). Care needs to be taken with this finding

because 'moderate use of ICT' in 2004 may have been quite different to moderate use of ICT in 2010 (Smith and Caruso 2010).

Evidence for the changing technological context comes from students use of the newer technologies, often bundled together under the term Web 2.0 (O'Reilly 2005). There was little evidence that students were significant users of either Web 2.0 or the most recent or most advanced technologies (Kennedy et al 2007). Indeed there is some evidence that certain kinds of use of new technologies are against student wishes (Jones, Blackey et al. 2010). Age only seemed to be one of several interrelated factors, rather than the sole factor, in students' use of web 2.0 and social networking sites (Jones and Hosein, 2010). Furthermore students had a pragmatic and instrumental way of using technologies, only using those technologies that were useful in terms of communication and information searching (Schulmeister 2010). Nagler and Ebner (2009) found common use of Wikipedia, YouTube and social networking sites while social bookmarking, photo sharing and microblogging were much less popular. However while the evidence of students' natural take-up of such technologies is limited the evidence also suggests that students will make use of technologies that are requirements for their studies (Jones et al 2010, Smith and Caruso 2010, Kennedy et al 2007). Taken together this evidence shows significant change in technology and in students' use but it contrasts with net generation and digital native rhetoric in which a uniform generation of students is portrayed as advanced users of new technology.

There is good evidence to suggest that there is no simple generational divide and the divisions between students and teachers have also been overdrawn (Kennedy et al. 2010, Kennedy et al. 2008, McNaught et al 2009, Pedró 2009, Salajan et al. 2010, Waycott et al 2009). Yet while this divide dissolves under scrutiny other digital divides show persistence (Schulmeister 2008, Hargittai 2010). Hargittai (2010, Hargittai et al 2010) has shown the complexity and variation in people's use of the Internet and demonstrated considerable variation in students' online skills related to students' socioeconomic backgrounds. Broad demographic influences affect students' interaction with technology including gender and ethnicity as well as social class (Hargittai 2010, Jones et al 2010, Smith and Caruso 2010, Kennedy et al. 2010, Selwyn 2008). Access to technology is still unevenly spread and it relies on digital literacies rather than simple availability of new technology (Schulmeister 2010, Palfrey and Gasser 2008). A persistent problem with the idea of a net generation of digital natives is that it directs attention towards divides that are not found in empirical work, and away from those divides that persist in education.

4.3 Revisions to the original thesis

Since the original net generation and digital native thesis was launched there have been a number of revisions, some from the original authors. Prensky (2009, 2011) recognizing that the digital native-digital immigrant distinction might have

become less relevant as an increasing proportion of society has grown up exposed to digital and networked technology proposed a new term 'digital wisdom'.

> Although many have found the terms useful, as we move further into the 21st century when all will have grown up in the era of digital technology, the distinction between digital natives and digital immigrants will become less relevant... I suggest we think in terms of digital wisdom. (Prensky 2009 p 1)

Unlike the strict native-immigrant distinction in which digital immigrants could never become natives, Prensky now argues that it is at least possible to acquire digital wisdom through interaction with technology. Prensky defined wisdom as '…the ability to find practical, creative, contextually appropriate, and emotionally satisfying solutions to complicated human problems.' (Prensky 2011 p20). However Prensky still retains the still largely unsupported idea that the 'brains of those who interact with technology frequently will be restructured by that interaction' (2011 p18).

The move which Prensky makes has the effect of softening his previous position, which he described as a singularity separating the generations, and the idea of digital wisdom has the effect of allowing everyone to move towards digital enhancement.

> Homo sapiens digital, then, differs from today's human in two key aspects: He or she accepts digital enhancement as an integral fact of human existence, and he or she is digitally wise, both in the considered way he or she accesses the power of digital enhancements to complement innate abilities and in the way in which he or she uses enhancements to facilitate wiser decision making. Digital wisdom transcends the generational divide defined by the immigrant/native distinction. (Prensky 2011 p20)

Prensky still retains many of the features of his previous arguments. He retains the claim that use of digital technologies changes the brain of the user and he remains deterministic suggesting that digital enhancement is required for success. He argues that: '…in an unimaginably complex future, the digitally unenhanced person, however wise, will not be able to access the tools of wisdom that will be available to even the least wise digitally enhanced human.' (Prensky 2011 p18). What Prensky has done is to move from a hard form of technological determinism, in which the divide between natives and immigrants is a necessary outcome of their exposure to technology, to a softer form of determinism in which digital enhancement is a necessary development for everyone if they are to succeed.

Palfrey and Gasser in their book *Born Digital* (2008) mounted the most sustained attempt to reclaim the term digital native as a useful academic term. Palfrey and Gasser suggest that the term generation is an overstatement and prefer to call the new cohort a 'population' (2008 p14). They amplify this argument in a recent publication (Palfrey and Gasser 2011). While their intention is to reclaim the term digital native and they accept many of the criticisms of generational framing, their arguments lead to some confusion. Firstly they identify the digital native population by their access to technology, so it ceases to be a universal condition. Secondly they argue that access to new technology depends on a learned digital literacy. This argument clearly leaves a lot to be desired. From a generation who are

born digital, because they grew up in a world infused with new technology, they have moved to a sub-group, a population who depend on access to technology which is itself conditioned by a digital literacy that can only be acquired through some form of informal or formal learning. The attempt to re-claim the term Digital Native has significant weaknesses and it is not clear what benefit remains in retaining the idea. The term Digital Native is at best misleading, and the authors agree that the idea of a generational change needs to be abandoned.

An alternative to the Digital Native/ Digital Immigrant dichotomy was suggested by Stoerger (2009) who proposed a new metaphor, 'the Digital Melting Pot'. The aim was to redirect attention away from 'assigned' generational characteristics to the individual's diverse technological capabilities and to focus on the digital skills they might gain through experience. The Melting Pot metaphor emphasized the integration rather than the segregation of digital natives with the digital immigrants. Stoerger's (2009) aim was for to suggest that by gaining technology experience, those with low levels of competency could be transformed and educators could play a significant role in guiding individuals to acquire and enhance their technological skills. More recently another replacement metaphor has been proposed to replace the terms natives and immigrants with 'visitors' and 'residents' (White & Le Cornu and 2011). This revised metaphor replaces the 'immigrants' and 'natives' generations with an experiential divide between 'residents' and 'visitors'; resident being someone who spends a proportion of their life online, whereas a visitor is someone who uses the Web as a tool to address their specific needs. All these approaches raise questions about the causes of such a change.

4.4 Students, technology and causation

Writing recently Prensky (2011) has put the following case forward with regard to the causes of the new generation:

> … being a Digital Native is about growing up in a digital country or culture, as opposed to coming to it as an adult… It's not so much of 'facts' about hardware or software as having experienced so much of digital devices and interfaces that their use comes naturally and intuitively." (Prensky 2011 p17)

He also argues that his original use of the term was metaphorical and claims to have been shocked both by literal interpretations of the distinction and by those who criticized the term for being a broad generalization. Prensky adopts an idea about causation that links growing up with digital devices to a natural and intuitive stance towards the new technology. One aspect of this argument is its particular understanding of the relationship between technologies and change. Tapscott (1998 and 2009) takes a similarly determinist position in relation to the net generation suggesting that an entire generation of young people is different to previous generations because of their experience of the bits and bytes of networked and digital technologies. Tapscott argues that because of changes in technology there

have been some 'inevitable' consequences for learning. Essentially both Prensky and Tapscott argue that there has been a generational change caused by a process of technological change.

In this technological determinist account technology behaves as an independent and external structural force acting on social forms but not being conditioned by them. Selwyn (2003) writing about children's use of technology argued that that determinist discourses fundamentally fail to reflect the diversity and complexity to be found in real lives and 'the framing of children, adults and technology within these determinist discourses tends to hide the key shaping actors, the values and power relations behind the increasing use of ICT in society.' (Selwyn 2003 p 368). Criticism of technological determinism has been longstanding (e.g. Buckingham 2006; Herring 2008) and it has been repeated in the current context (Jones 2011, Jones 2012). One of the oddities of this way of thinking is that the technological environments experienced by digital natives were designed and developed by previous generations.

> Someone had to design, build, and upgrade the technologies that have evolved into the electronic spaces that the natives now inhabit. Interestingly, very few educational technology advocates mention that the digital immigrants were the creators of these devices and environments." (Stoerger 2009 Online).

Stoerger's contention points to two key arguments. Firstly digital technologies do not stand outside of society they are implicated in social change and secondly they embody previous social conditions in their design. This point is even more striking given the supposed divide between digital natives and the supposed immigrant nature of previous generations.

Bennett et al. (2008) are probably the most quoted critics of the original thesis and they argued that the discourse surrounding technology and generational change resembled an academic 'moral panic'. That is the digital native and net generation discourse restricts critical and rational debate and identifies the new generation a positive but threatening presence in relation to the existing academic order. The discourse provides a series of binary distinctions: new generation or old generations; technically capable and inclined or technically challenged; and finally between students and their teachers. These authors do not dismiss the potential for change related to developments in digital and networked technology, rather they argue for the collection of evidence and the adoption of a cautious attitude when advocating technologies as a vehicle for educational reform.

Educational institutions are portrayed as threatened by new Internet based technologies. Change ceases to open up a range of possibilities and becomes 'inexorable' and an 'imperative' instead:

> Universities are losing their grip on higher learning as the Internet is, inexorably, becoming the dominant infrastructure for knowledge—both as a container and as a global platform for knowledge exchange between people— and as a new generation of students requires a very different model of higher education… The transformation of the university is not just a good idea. It is an imperative, and evidence is mounting that the consequences of further delay may be dire. (Tapscott and Williams 2010 p 18)

This rhetoric displays the characteristics of the moral panic identified by Bennett et al. (2008). In a moral panic an identified group in society is portrayed as a threat to social values and norms and the identified group are often described in sensational terms as a threat to the status quo. Digital natives and the net generation are used in education to advance otherwise contestable claims in way that suggests they are a necessity and not open to rational choice.

The determinist argument is contested by a range of alternative accounts which understand young people as active agents in the process of engagement with technology (Czerniewicz et al. 2009). Agency can also be understood to include the structural conditions that students face in educational institutions which are, like the design of digital technologies, the outcomes of decisions made within the institutions and express a form of collective agency. Research in universities reported by Jones and Healing (2010b) illustrates this process at several levels. Staff members designed and re-designed courses, embedding requirements for the appropriate use of technology, universities and the faculties and departments within them made decisions about what kinds of technology to deploy and the kinds of access students would have to these technologies. These arguments suggest expanding the notion of the agent to include persons acting not on their own behalf, as individuals, but enacting roles in collective organizations and institutions.

A further issue arises with the use of new technologies and agency within education. Students are increasingly working in settings which include active technologies that replicate some of the characteristics of human agency. Jones and Healing (2010b) point to the interactive nature of the digital networks through which education is mediated and note student reports of distraction, caused by the intervention of automated processes such as notifications from social networking sites. They conclude that there is an increasing likelihood that students will interact with humans and machines in similar ways. In addition Säljö (2010) argues that the kinds of digital devices being introduced have a different character to previous artifacts and technologies which reified and externalized information because they externalize cognitive processes.

These issues direct attention to another aspect of causation in the digital native and net generation arguments. They both assume that there is something distinctive and known about the new technologies at a general level. The term digital can be used to reference the entire collection of digital devices and their effects, and this is the way it is generally used in the digital native debate. However it can also refer to a particular category of technological devices. Digital devices are potentially different to other kinds of artifact in the way that they can incorporate computer processing. However the digital can also point to particular devices because while the Internet and Web depend on digital technologies, the digital extends beyond them. Many if not most digital devices are available both on and off-line in terms of a network connection. Both Prensky and Tapscott have provided accounts which suggest that it is because young people have grown up with digital technologies that they form a new generation. Prensky argued that digital natives are comfortable with digital technology because they had grown up with it and that

"having experienced so much of digital devices and interfaces that their use comes naturally and intuitively" (Prensky 2011 p17). In his account Tapscott argues that the reason for young people's natural facility with technology was that: 'they were the first to grow up surrounded by digital technology' (2009 p2). All these accounts assume that digital technologies have uniform and general character. Someone growing up with digital toys in one period is believed to develop skills and aptitudes that can be applied to the technologies of another period and appropriate to another level of social development. Since the digital native and net generation arguments were first developed new technologies and services have become mainstream, including wireless broadband, smartphones, social network sites (e.g Facebook) and participatory social media (e.g. YouTube). Much of the empirical research effort in recent years has identified the varying ways students have appropriated these different technologies. On the face of it the overall claim that simply growing up with digital technologies leads to a general facility with future technologies is not supported by the evidence and it requires further clarification and research.

4.5 A generational fallacy?

Ellis and Goodyear (2010) argue that Prensky's analysis fails with regard to what they call a demographic fallacy, that is treating generations of people as if everyone in a generation shared common characteristics and that there were sharp breaks between generations. The idea a specific net generation composed of digital natives has a strong relationship to explicitly generational arguments. Howe and Strauss wrote *Millennials Rising* (2000) several years after the book *Generations: The History of America's Future and The Fourth Turning: An American Prophecy* (1991). They place the Millennial generation in cyclical view of history based on the history of the United States since the 16th century. In this generational account the Millennials are simply the most recent expression of an historical process. Indeed Millennials are the most recent form of the what is called the 'Civic' generational type which is said to have core values that include community and technology. For Howe and Strauss exposure to digital technology takes second place to a general historical cycle. The idea of a Millennial generation was introduced into the discussion of the net generation and education in the work of Oblinger and Oblinger (2005).

The authors who use the terms net generation and digital native do not generally advance this cyclical argument about generations but their arguments do have a strong generational component. Oblinger and Oblinger (2005), for example, are careful to state their claims cautiously and although they associate the new generation with the work of Howe and Strauss they define the net generation in terms of its exposure to technology (Jones, 2011). As we noted earlier research has shown significant diversity when looking beyond the basic and entrenched technologies and patterns of access to, and use of other technologies varied considerably amongst students of a similar age. Thee empirical evidence suggests that the net

generation age cohort is divided internally and while age is clearly a factor differentiating students, there is no generational gap and students of a similar age are diverse. Kennedy et al (2010) and Brown and Czerniewicz (2010) both found that those students displaying net generation characteristics were in a minority. Brown and Czerniewicz also draw attention to the character of student contexts in emerging economies that have different technological and arguably generational characteristics.

Thinyane (2010) who also reported on South African students portrayed a heterogeneous student population that had varied levels of access to a range of technologies and as with many other studies noted that students' use of web 2.0 technologies weren't actively used either in general daily life or for study. These results confirmed a more general picture of university students in South Africa (Brown & Czerniewicz, 2010, Brown & Czerniewicz, 2008, Czerniewicz et al 2009). South African research showed that mobile phones were the most accessible tools among students. Tasks involving the use of mobile phones ranked the top in both students' daily activities with technologies and use of technology particularly for their studies. The technological context of students in South Africa is clearly different to that envisaged in the digital native and net generation arguments, but the generational discussion also focuses on other factors. The end of apartheid and the 'born free' political generation arguably having more importance than technology.

Overall the net generation and the idea of digital natives seems to be very focused on a view of students based on North American experience in relatively wealthy and educated families. The South African case is a clear contrast to this but so is the example of China. There is a research that suggests variations in information searching (Li and Ranieri 2010, Li and Kirkup 2007). Shao's (2010) report on Chinese university students' use of technologies indicated that there was diversity in use of technology and the use of Web 2.0 technologies were relatively low. Shao (2010) also found a large number of students whose computer skills levels were far from what one might expect of digital natives and like Li & Ranieri (2010) found big disparities among participants in their digital competences. Jones and Shao (2011) report other relatively small scale surveys that showed variations from surveys in the USA, Australia and Europe but found that there was a similar lack of consistency in students in information searching and that much of the students' online experience was in activities such as watching news and movies and in playing games rather than for educational purposes. Overall these studies show that the context in China is different from the context assumed in the net generation and digital native thesis. Once again we should also note that the generational discussion in China is more related to national and social conditions than to technology (Chen, 2008). Generation is discussed in relation to the single child policy and the emergence of the 'Little Emperors' and in terms of the year or decade of birth, in particular in this context the post-80 generation (Liu and Zhao 2008).

Apart from diversity in terms of national and regional variation there has been little discussion of variation of experience in relation to access and disabilities. Lewthwaite (2011) argues that:

> accessibility was frequently an afterthought or bolt-on within e-learning, rather than integral to new design. This is compounded by the normative views of an 'average' or proto-typical student expressed in much e-learning commentary (e.g., Prensky's [2001] 'Digital Natives').

Seale et al (2010) comment on the way the digital native and net generation characterisation of students have rendered disabled students 'invisible'. Seale et al. noted the range of strategies that disabled students adopted and devised to make use of technologies in their learning.

> Students described on average about seven strategies each. The most common types of strategy adopted by students tended to be related to computer or information access, and ways of coping with written work. (Seale et al 2010 p 451)

These strategies involved both the use of specialist assistive technologies and generic technologies and encouragingly while these students do not fit the standard picture they do show a marked 'digital agility'.

> Digital inclusion in higher education, therefore, will not always be about practitioners opening the door and/or teaching disabled students how to step over the threshold. Sometimes, digital inclusion might be about disabled students using their considerable digital agility to 'break and enter' on their own terms. (Seale et al 2010 pp 458-9)

Overall Lewthwaite (2011) sums up an important lesson about generational stereotypes from the perspective of disability and access when she argues that a first step must be to abandon assumptions about who the learner is and engage with the uncertainties that abandoning generational descriptions give rise to.

4.6 Concluding points

The main problem with the idea of a net generation of digital natives is that it encourages a way of understanding students that directs attention towards a divide that is not found in empirical work, and away from those divides that persist in education. In particular the idea that there is a single generational change related to digital technologies needs to be abandoned. There are age related changes but these are not generational in character and it is important to abandon generalized assumptions about the nature of a generational cohort of students and engage with the uncertainties that abandoning these simple generational descriptions give rise to. The argument that technologies have affected an entire age cohort obscures those age related changes that are taking place which give rise to a diverse student population exhibiting a variety of responses to the various digital and networked technologies in their environment. I have argued previously that there are potentially two different arguments about the changes taking place amongst young peo-

ple (Jones 2011). The first argument is the one most associated with the idea of the Net Generation and Digital Natives which claims that:

- The ubiquitous nature of certain technologies, specifically gaming and the Web, has affected the outlook of an entire age cohort in advanced economies.

The second argument is that:

- The new technologies emerging with this generation have particular characteristics that afford certain types of social engagement.

It is this second argument that holds the most promise for understanding the future shape of the student.

In addition there is a problem in the view of causation found in digital native and net generation arguments. These arguments assume that at a general level there is something distinctive and already known about the new technologies; whereas empirical research in recent years has identified the variety of ways students have appropriated a range of digital technologies. Affordance suggests a more relational approach in which different technologies, although all digital in form, present different possibilities to students who can then interpret these possibilities in diverse ways. The ubiquitous nature of social network sites and the growth of mobile technologies including smartphones, tablet computers and e-book readers are all recent developments. However it is not clear that there are common affordances to this variety of digital technologies, nor will the available possibilities be appropriated in the same ways by students in different contexts.

Students are active agents in the process as noted by Czerniewicz et al (2009) and in relation to accessibility by Seale et al (2010). One good reason why the net generation and digital native arguments have persisted is because they draw attention to real changes that are associated with age. The mistake is to believe that either we already know the nature of the digital native student or that the student population can be reduced to a proto-typical average - the net generation student. The task for educational researchers is to develop a rich picture of the range of student types emerging with new technologies and to be alert to all the factors that influence these, including age.

If the idea of the digital native and a net generation of students is to be replaced by a richer understanding of the changes that are taking place then the patterns of student engagement with technology will need to described in ways that are accessible to educators. There have been several attempts using cluster analysis of survey data to provide some further detail. In a recent study, Kennedy et al. (2010) found that within the population of young students there were disparities in how students used technologies. They identified four types of student users:

- power users,
- ordinary users,
- irregular users and
- basic users.

They indicated that power users made use of a wide range of technologies whilst ordinary users used mainly web and mobile technologies. Irregular users

were similar to ordinary users but their frequency of using web and mobile technologies were lower and were less likely to use emerging technologies except for Web 2.0 publishing. Basic users were irregular users of new and emerging technologies but were regular users of standard mobile phones. Kennedy et al (2010) suggested that the advanced user were a subset of students who might fit in with Prensky's idea of the digital native.

Jones and Hosein (2010) identified four groupings amongst English first year university students the composition of which was relatively stable over the period of one academic year. Van den Beemt et al. (2010a) showed a relationship between interactive media use and educational level, and between use and gender. Van den Beemt et al. (2010b) distinguished four factors of interactive media activities among a varied age range of students and labelled them: interacting, performing, interchanging and authoring. They distinguished four clusters of interactive media users labeling them; 'Traditionalists', 'Gamers', 'Networkers' and 'Producers'. An important outcome from this research was the complex relationship between behavioural dimensions. The factors grouped activities, but they did not relate in a straightforward way to clusters of users.

Despite these attempts to provide a more coherent and diverse description of students there is a need for methodological innovation. The distributed nature of mobile and networked technologies is a barrier to traditional forms of observation and new and innovative approaches to collecting in vivo data are required. As Staksrud et al (2009) noted much of the early research work took the form of large and medium scale surveys. Recently there has been a development of a range of methods to research in contexts not appropriate for survey research. Judd and Kennedy (2011) used logs from computers in a large open-access computer laboratory to study a group of undergraduate medical students and their computer-based task switching and multitasking behavior. Hargittai et al (2010) mixed interviews with stratified samples of students and observation of students' searching behavior. Jones and Healing (2010a) made use of a cultural probe in which students were issued with small video cameras and notebooks and responded to set questions when they received SMS text messages on their mobile phone. These methodological approaches take our understanding beyond the surface covered by surveys. However there is still a need for further innovation to gain a fuller picture of the shape of the student in the emerging technological conditions.

The implications for Higher Education are that the gap between students and their teachers is neither fixed nor is the gulf so large that it cannot be bridged. Universities should be confident that the provision of what might seem to be basic services (for example Learning Management Systems) often fulfills most if not all of their students' needs. The evidence shows that students appreciate and make use of basic elements of such infrastructures for learning that are often criticised for being out of date and unimaginative uses of new technology. Advice to government and policy makers derived from generational arguments should not be used to promote radical changes in university structures designed to accommodate a net generation of digital natives. The evidence indicates that young students do

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not express consistent or generationally organised demands and political choices should be made explicit and not disguised by arguments about generational change.

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