

**Digital literacy in higher education: The rhetoric and the reality**  
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**Abstract**

This chapter examines empirical data to address the rhetoric of the digital native as a competent and digitally literate learner. The chapter also questions the reality of the notion that a digital delivery platform is easy to navigate and facilitates positive learning experiences. Data from surveys of students studying both on-campus and via distance education (or online) at the University of Southern Queensland (USQ), a regional Australian university, provides useful insights into the literacies of digital natives and will help to debunk the myth about digital learning being quick and easy. The findings indicate that most distance education students identified concerns about how technology supported their learning and were frustrated by information and communication technology (ICT) issues. For example, while those classified as digital natives did display high levels of digital literacy, this result was not confined to a particular age group. Interestingly, the students in this sample who could be classified as “digital natives” (under 30 years of age) did not prefer the distance or online mode of study; they preferred to study on-campus (60%). In contrast, the “digital immigrants” (those over 30 years of age) preferred the distance/online mode of study (57%). Both groups showed a high degree of experience with, and confidence in, their ability to engage with the various digital technologies. Evidence presented in this chapter will help universities to put in place appropriate and timely interventions to enable students to develop and apply digital literacies to support their learning. Specifically, guidelines for educators on how best to embed digital literacies into an online pedagogy, and recommendations for establishing effective learning management systems to support online education, are provided.

**Introduction**

Two interrelated myths arise from Australian higher education’s responses to an increased emphasis on technological delivery. One myth stems from the view that tertiary education students are digital natives who have universal and uniform digital experiences. This myth presumes that the technological experiences of these students are homogeneous and linked to a sophisticated knowledge and understanding of information and communication technologies (ICTs). The second myth emanates from the idea that the internet is a panacea for the issues of increasing costs of higher education and increasing demand by students for authentic and interactive learning opportunities. The assumption here is that technology underpinning online learning is quick, easy to use, can be accessed by everyone, and is appropriate for all learning activities.

Such myths risk overlooking a complex mix of technology-based skills, knowledge and preferences among student populations and need scrutiny. Firstly, what is the reality about students’ digital learning abilities and, secondly, is a cost-effective, digitally delivered learning platform able to transfer knowledge and facilitate effective learning? This chapter explores the assumptions underlying these two myths. The research literature will initially be reviewed followed by a review of students’ perspectives, measured via online surveys conducted at the University of Southern Queensland (USQ), a regional Australian university. The survey was part of an innovation called DART (Diagnostic and Reflective Tool), an enabling tool devised to assist students to identify and build their individual digital learning capabilities. The survey data provides useful insights into the pervasiveness of digital literacies possessed by commencing tertiary students.

**Myth 1: The digital native**

The term “digital literacy” was originally used to refer to a minimal set of technical skills that enabled users of technology to operate effectively and to perform basic tasks (Buckingham, 2010). This functional definition specifies the basic skills required to perform particular operations. However, it fails to recognise that digital literacy now means more than just the technical skills involved in using a computer. It also means knowing how to do online searches or send emails. Computers and other mobile devices have evolved past being simply machines that provide quick information retrieval. These devices provide opportunities for self-expression, play, and communication and act as a medium through which personal relationships may be experienced. Smart phones, for example, are now marketed as lifestyle companions, not communication devices. Thus, a person’s ability to learn effectively in a digital world needs to consider a wider range of skills and literacies than just technical proficiency (Buckingham, 2010; Pegrum, 2011). Digital literacy also comprises effective problem solving skills, critical thinking and communication skills, creativity and self-regulation along with an understanding of culturally and contextually-based practice in the use of, and engagement with, digital technologies (Bawden, 2001; Beetham, McGill, & Littlejohn, 2009; Buckingham, 2010; Lankshear & Knobel, 2008). Indeed, most educators now agree it is useful to conceptualise digital literacy as a series of characteristics rather than as a discrete and static checklist of skills. Further, these characteristics are likely to change over time as new skills and literacies emerge in response to changes and evolution in technology (Hockley, 2012; Pegrum, 2011).

The characteristics of students are an important consideration. Prensky (2001) proposed that digital natives are those born in the millennial generation (i.e., after 1980), have grown up with digital technology and have been immersed in a digital world. Prensky (2001) argued that digital natives learn differently from those born in earlier generations (i.e., “digital immigrants”). According to Prensky, digital natives typically come from media-rich households; they readily use the internet to access information and multi-task using ICTs to carry out a range of activities. In an education context, digital natives have been found to be active, experiential learners, who engage readily with a wide variety of information as long as it is provided quickly and preferably in graphical form (Burdick & Wills, 2011; Ng, 2012). For this group, using and understanding technology is likened to being a “first language” and digital immigrants can never catch up because life experiences before the technology continue to influence their capacity to develop the required digital skills (Prensky, 2001). If one accepts Prensky’s (2001) central thesis, we can assume that digital natives should be able to transfer these digital literacies developed over their lifetime effortlessly into learning. Similarly, digital natives are expected to effectively use learning technologies to improve educational outcomes. However, this does not appear to be the case with many educationalists in both the secondary and tertiary sectors claiming that digital natives are unable to effectively or intuitively use technology for learning in either school or university curriculums (Ng, 2012). Thus, in an education context, the myth that digital natives should know and be able to use educational technologies almost intuitively and certainly more effectively than their older counterparts is not supported by empirical and anecdotal evidence. Two questions then arise. Firstly, is there a problem with the digital native classification? Secondly, is the context in which one learns these digital skills an important aspect influencing how one uses educational technologies?

Many have debated Prensky’s (2001) central premise that being born in a particular time period reliably predicts digital literacy (Burdick & Wills, 2011; Helsper & Eynon, 2010). Such critics argue that digital natives can better be classified by what one can do with technology rather than when one is born. These researchers suggest that breadth of use, experience, gender and educational levels are more important predictors of internet and technology savvy than a birth date (Burdick & Wills, 2011; Helsper & Eynon, 2010). Researchers have also noted that even though digital natives have grown up immersed

in technology, using this technology for learning requires different skills and strategies than just using the technology for socialising or for routine tasks (Aziz, 2010; Margaryan, Littlejohn, & Vojt, 2011; Ng, 2012). Indeed, many digital natives are inexperienced in using technology for learning and do not seek out and explore the use of educational technologies as part of their everyday lifestyles. These are skills that need to be taught and need to be linked to an outcome, such as studying for a degree (Aziz, 2010; Margaryan et al., 2011; Ng, 2012). Finally, there is no empirical evidence to show that just because digital natives have grown up in a technological world their brain structures differ from digital immigrants (Brown & Czerniewicz, 2010).

Although learners can be classified in terms of their cultural and generational characteristics, one cannot assume that the younger generation, simply because they have been submerged within the digital learning context since birth, have had a uniform digital upbringing and possess a high level of understanding. We need to move away from the idea of digital natives and other assumptions about students' capacity for digital learning, to examine how technological knowledge and/or experience may be transferred to learning. This involves recognising where assumptions have been made about students' digital literacies, including stereotypes about mature-age learners, "Gen Y-ers", first in family to study at university, and rural and/or remote students. It should not be presumed that school leavers have had broadly universal experiences or have a sophisticated knowledge and understanding of ICTs. Nor can it be presumed that that mature students or those from rural and remote locations have low levels of digital experience and skills. Such generalisations risk overlooking a more complex mix of technology-based skills, knowledge, and preferences among the student population (Kennedy, Judd, Churchward, Gray, & Krause, 2008).

An important alternative focus involves determining how levels of experience with technology can be understood, developed, and translated to better support digital learning. Indeed, Kirkwood and Price (2005) argued that "few students have high levels of competence across a wide range of applications" and that "familiarity with the use of email does not imply expertise in rigorous online debate and discussion" (p. 271). Similarly, Lorenzo, Oblinger, and Dziubam (2006) noted "today's students are not just the traditional-age Net generation, nor have they all had the benefit of state-of-the-art, ubiquitous technology...higher education [institutions] comprises a highly diverse and growing student body with a wide variety of information literacy capabilities" (p. 4). It is uncertain whether the Net generation knows how to employ technology-based tools strategically to optimise learning experiences in higher education (Kennedy et al., 2008). It cannot be assumed that incoming students' age or remote location implies anything in particular about their ability to adapt to digital learning environments. It is indeed possible for mature age learners, people from earlier generations, to acquire and develop the digital skills that those born since 1980 are assumed to have acquired organically. These points reinforce the need to focus on supporting students in transferring whatever previous experience they may have with ICTs and digital environments to optimise learning outcomes at university.

### **Digital natives in higher education: The rhetoric**

Digital natives are assumed to learn differently from past generations of students (Prensky, 2001). For example, Prensky (2001) argued that digital natives are already fluent in the use of digital technologies, regardless of context, and subsequently do not require digital literacy support. Digital natives or the Net generation, are young people said to have been immersed in technology all their lives, imbuing them with sophisticated technical skills and learning preferences. Immersion in this technology-rich culture is said to have influenced the skills and interests of digital natives in ways significant for higher education (Aziz, 2010; Margaryan et al., 2011). Bennett, Maton, and Kervin (2008) suggested that digital natives

have a different way of thinking and processing information, reflecting their high standards of technical skills after being exposed to technology for their whole life. Prensky (2001) added that digital natives require a different way of communicating, reflecting their desire to move faster and in a more random fashion. This view is supported by evidence from learning based on computer games, which require their users to deal with multiple sources of information simultaneously within a constantly changing context (Apperley & Walsh, 2012). While this ability to multitask appears to be more comfortable for young people, the effectiveness of multitasking in a learning environment has been questioned as it may result in cognitive overload and loss of concentration (Helsper & Eynon, 2010). Additionally, while there is a wealth of information available online, it is uncertain whether digital natives have the skills or tools to critically assess the quality of the information they access, an essential skill in higher education (Helsper & Eynon, 2010). Commencing students' ability to use the internet varies according to their ability to locate, evaluate, and use online information with many possessing low self-reported perceptions of skills in this area. A finding further supported by Eynon and Malmberg (2012), who reported that the quality of information seeking performed by digital natives was often shallow and without scholarly merit.

There are assumed differences between digital natives— those with technology integrated into their everyday lives, and digital immigrants— those who have had to learn technology more progressively. Prensky (2001) argued that because digital natives know no different way of communicating, current education systems need to accommodate varied styles of thinking and working. More specifically, because digital natives are “active experiential learners, proficient in multitasking and dependent on communications technologies for accessing information and for interacting with others” (Bennett et al., 2008, p. 775), educators need to apply technology in sophisticated ways to support their learning.

Although not seen as a homogenous group, commencing tertiary students coming directly from high school are thought to prefer a different way of studying and to process and use information differently than generations before them. However, these learning preferences might not necessarily align with current teaching practices (Helsper & Eynon, 2010). Today's students are typically no longer happy with the traditional methods of face-to-face teaching and are seeking a move towards a predominantly electronically based curriculum due to their different ways of learning and their demand for more flexibility during study (Burdick & Willis, 2011).

### **The reality of digital natives in higher education**

It is problematic to generalise about the skills of digital natives using an age definition. Evidence indicates that while many young people are skilled in using technology, a significant proportion do not have access to digital technologies or skills to be considered “expert” (Eynon & Malmberg, 2012). Further, by focusing on the group who are adept at new technologies, those with less skills can be neglected and become isolated in both socioeconomic and cultural areas (Bennett et al., 2008). A further complication in assuming that first year students are homogeneous groups (Prensky, 2001), is that little attention is given to the needs of mature-age or other marginalised groups within these cohorts. Indeed, the Australian context and experience contradicts this assumption of homogeneity, with first year students being represented by diverse demographic and socioeconomic characteristics (Andrews & Tynan, 2012; Conole, 2008; Fitzgerald & Steele, 2008; Kennedy et al., 2009; Wood & Dodd, 2010).

Students can use ICTs for both personal and learning purposes. Digital natives might own a personal computer and/or mobile device, however, many report lower skill proficiencies in relation to learning

technologies than might be expected (Kvavik, Caruso, & Morgan, 2004, as cited in Bennett et al., 2008). Factors such as socioeconomic status, background, and gender can also influence the use and understanding of technologies creating a divide within the group of digital natives themselves. For example, Dahlstrom, de Boor, Grunwald, Vockley, and Oblinger (2011) asked commencing students to reflect on their own technology skills and almost one third believed they didn't have the skills needed for effective study. A large number of students in the Dahlstrom et al. (2011) study indicated a desire to possess more specialised software skills. Thus, while some scholars believe those born within a certain period have developed technology skills naturally throughout their lives, many digital natives do not feel confident in using technology to support their learning.

There remains a lack of clarity in the use of terms digital natives, Net generation and of generational boundaries (Jones & Czerniewicz, 2010). An Australian study of first year university students showed that while they were considered "tech-savvy", these skills were limited to use of technologies such as computers, mobile phones, and email (Kennedy et al., 2008). The skill sets of digital natives are uncertain as is the knowledge of what digital natives expect from their studies. Kennedy et al. (2008) questioned the rhetoric of the need to overhaul teaching methods to accommodate the needs of the digital native generation. They argued that educators need to consider the learning needs of a wide variety of generational students before time and money are expended on changing systems or how educators teach. Opportunities to actively engage both digital natives and digital immigrants in learning should be paramount in any pedagogy.

Thus, the digital native discourse does not provide an especially accurate nor objective account of young people and technology. The argument is reductive and implies that young people do not require support to operate effectively in digital learning environments. The true picture is much more complex. Aside from potential inequalities in access and engagement, many young people's actual use of digital technologies appears rather more limited in scope than the digital native rhetoric might suggest. Some recent studies indicate that children and young people do not necessarily expect or even want to use technology in institutional settings such as schools or libraries in the same manner as they do at home (Lohnes & Kinzer, 2007). Indeed, young people appear to be more discerning in their desire to use (or not use) digital technologies in all aspects of their lives (Selwyn, 2009).

### **Myth 2: Digital delivery as a panacea**

Students have a need to feel connected with other students, with their lecturers, and with their university. They might use social media such as Facebook to communicate with fellow students regarding their studies, but rarely use this technology to interact with their lecturers (Echo360, 2012). Social interaction has been strongly related to online learning enjoyment, effectiveness of learning online, and the likelihood of taking another online class (Muilenberg & Berge, 2005). Online learning offers greater flexibility than face-to-face study, however, course structure and educator support will always be vital to ensuring quality and facilitating positive learning experiences for students. Depending on the design of the course, lack of face-to-face interaction and often limited synchronous exchanges can demand extra time and energy to establish an online learning community.

Online learning environments can also make more demands on students than traditional contexts in terms of expected study behaviours to achieve academic success. Students quickly learn how much they rely on teacher explanations of content and activities in face-to-face classrooms (Howland & Moore, 2002). While the nature of the online environment has necessitated this shift away from reliance on lecturers, it cannot be left to students alone to meet this demand.

Students currently prefer a blended learning platform and evidence indicates it can be more effective than strictly face-to-face or online instruction alone (Akyol, Garrison, & Ozden, 2009; Wold, 2013). Blended learning combines the benefits of collaborating with other students with the advantage of studying when, where, and how individuals want. Approximately 84% of surveyed American and Australian higher education students believed this preferred method of learning helped them to understand better (Echo360, 2012; Uzan & Senturk, 2010; Wold, 2013;). Blended learning environments are believed to give students more control over their academic experience; blended learning enables students greater flexibility to learn at their own pace and to better manage course demands with other life commitments (Echo360, 2012).

The task of bridging the transition from traditional to individualised, facilitated learning is fraught with difficulties. While face-to-face pedagogy can inform online pedagogy, it cannot automatically be transferred to the online learning environment. Online pedagogy should also be considered to create a successful and meaningful course experience (Gill, 2003; Li & Akins, 2004). Success in meeting the needs of online learners requires new teaching methods and strategies that support knowledge creation and problem solving skills (Quinton, 2010). Any attempt to accommodate the skills and preferences of digital natives will inevitably compel education designers to consider strategies that are in line with students' expectations and demands. Such strategies might include providing dynamically generated teaching materials that are relative to the current context; search and support tools that enable interactivity among learners; and online assessments that provide immediate feedback tailored to students' individual performance and learning needs. All students can potentially benefit from this enhanced interactivity and personalised learning journey.

Research indicates that online learning is a medium not superior to traditional class rooms (Means, Toyama, Murphy, Bakia, & Jones, 2009). Online classrooms typically differ from face-to-face contexts in terms of time spent in discussion, curriculum, and pedagogy, and a combination of these elements influences students' opportunities for collaboration and learning outcomes. Quality interactions among learners, content, and lecturers can help "create a sense of social, cognitive and teaching presence, thereby allowing students to participate in an engaging and cognitively enriching community of inquiry" (Rourke, Anderson, Garrison, & Archer, 2001, p. 3). Quality online learning is not assured, and requires attention to these factors to ensure maximum positive impact.

The potential of a digitally delivered higher education is not being realised. Andrews and Tynan (2012) argued that the promised improvements to communication and interaction are yet to be achieved. There is a minimal uptake of technologies by lecturers and a general lack of understanding by educators of the potential of digital education technologies in supporting pedagogy (Apperley & Walsh, 2012; Margaryan et al., 2011). A common theme is that the lecture materials themselves are not changed; they are merely delivered electronically, with little incorporation of ICTs to promote interactivity. However, the online delivery of course content often demands a different approach. The course should be redesigned to incorporate opportunities for students to actively engage with others through their learning (Burdick & Willis, 2011).

Students' expectations can also influence online learning experiences (Howland & Moore, 2002). While it is often presumed that online learning will be easier to fit around existing lifestyle commitments, online learning has very high attrition rates, with both academic and personal circumstances contributing to students dropping out of online courses (Martinez, 2003). The reality is that online learners need to be highly motivated and self-disciplined with great persistence and commitment to

experience success. Both confidence and experience with technology can influence students' online learning outcomes (Muilenberg & Berge, 2005).

Learning in an online environment involves much more than mastery of particular technologies. Student confidence increases the more familiar one becomes with online learning contexts (Muilenberg & Berge, 2005). As experience with technology increases, students perceive it to be easier to use and more useful; in turn, they are more likely to persist (Stoel & Lee, 2003). Students who report positive attitudes about their online learning experiences tend to be constructivist learners, recognising the need to be more independent and self-directed in their learning (Howland & Moore, 2002). Other students can feel overwhelmed by the online learning experience and the need to rely on themselves. Such students typically express a need for more structure, guidance, and feedback from the lecturer. They also desire packaged material to step them through the learning requirements (Howland & Moore, 2002) and are generally unable to self-direct their learning. They typically interpret this need for self-responsibility in learning as "abandonment and feeling isolated" (Howland & Moore, 2002, p. 187). Therefore, while being competent and confident with technology is a clear advantage, learning in the online environment involves much more than being ICT savvy.

### **Method**

This study was designed to examine the experience, attributes, and digital learning needs of first year cohorts. The focus was to determine the level of students' digital literacies. The research design comprised both quantitative and qualitative components.

Firstly, the research employed an online survey to measure students' perceptions of their digital literacies. A pilot study comprising an online survey of students in Semester 3, 2011 attracted responses from experienced online learners ( $N= 532$ ). They were asked to describe various aspects of their digital learning experiences, including how often and how easily they accessed various university support systems. The self-report survey was developed to enable tertiary students to identify and build their individual digital learning capabilities. The framework mapped all relevant dimensions of digital literacy, reflecting the argument that technical experience and learning experience are different issues.

A larger-scale study followed in Semester 1, 2012 ( $N = 652$ ), using the same online survey and focus groups. The aim of these focus groups was to ascertain students' skills in managing online learning and to receive feedback on an online resource (DART) developed to support students' digital literacies.

### **Instrument**

In the survey, students were required to self-report their level of confidence in using various technologies (1 = *not at all confident*; 3 = *very confident*). They were also asked to rate their level of confidence in accessing various supports at the university, and in performing various tasks on the university learning management system (i.e., USQ Studydesk). The quantitative survey data were collated and analysed.

### **Survey results**

The demographic characteristics of students in the current sample are summarised in Table 1. The digital learning experiences of Digital Natives ( $N = 407$ ) and Digital Immigrants ( $N = 240$ ) are summarised in Table 2.

**Table 1**  
**Demographics of Digital Natives and Digital Immigrants in the Current Sample**

	<b>Digital Natives</b> (students 15 – 30 years)* <i>N</i> = 407	<b>Digital Immigrants</b> (students 31 years and over)* <i>N</i> = 240
Gender		
Male	72 (17.5%)	60 (25%)
Female	340 (83.5%)	182 (75%)
Mode of study		
On-campus	243 (59.7%)	103 (42.9%)
Distance/online	164 (40.3%)	137 (57.1%)
Study type*		
Full time	329 (80.2%)	123 (51%)
Part time	81 (19.8%)	118 (49%)
Level of study		
Undergraduate	385 (94.4%)	204 (84%)
Postgraduate	23 (2.6%)	39 (16%)
Is this your first year studying at USQ?		
Yes	262 (63.9%)	121 (50.4%)
No	148 (36.1%)	119 (49.6%)
School leaver in the last 12 months		
Yes	116 (28.5%)	2 (0.5%)
No	293 (71.5%)	237 (99.5%)
Highest level of education		
Yr 10 or lower	12 (2.9%)	24 (10%)
Yr 11 or Yr 12	253 (61.3%)	43 (17.7%)
TAFE (or similar)	85 (20.6%)	84 (34.5%)
University	49 (11.9%)	78 (32%)
Other (e.g., trade)	14 (3.4%)	14 (5.5%)
As well as studying I am currently in employment.		
Yes	287 (70.3%)	150 (62.5%)
No	121 (29.7%)	90 (37.5%)
In an average week how many hours do you spend studying? ( <i>M</i> = 26 hrs)		
0 – 5 hours per week	17 (4%)	9 (3.5%)
6 – 10 hours per week	47 (11.5%)	28 (11.5%)
11 – 20 hours per week	125 (30.5%)	70 (28.7%)
21 – 30 hours per week	120 (30.3%)	56 (23%)
31 – 40 hours per week	64 (15.5%)	52 (21.5%)
41 – 50 hours per week	26 (6.5%)	20 (8.5%)
> 50 hours per week	13 (3.5%)	9 (3.7%)

Note. \*full time study is represented by students studying 3 - 4 courses per semester, part time study is anything less than that and generally averages to 2 courses per semester.



**Table 2**  
**Digital Experiences of Digital Natives and Digital Immigrants**

	Digital Natives (students 15 – 30 years)* N= 407	Digital Immigrants (students 31 years and over)* N = 240
Length of time using the internet		
Rarely and less than 1 year		4(1.5%)
1 – 2 years		5 (2.0%)
3 – 5 years		12 (5.0%)
6 – 8 years		33 (13.5%)
9 years or more		171 (71%)
Frequency accessing the internet		
Multiple times per day	304 (74.5%)	179 (74.5%)
Once a day	31 (7.5%)	25 (10.5%)
Multiple times per week	72 (17.5%)	35 (14.5%)
Once per week	1 (0.5%)	2 (0.5%)
My frequency of accessing the internet to support my studies is:		
Multiple times per day	304 (74.5%)	179 (74.5%)
Once per day	31 (7.6%)	25 (10.5%)
Multiple times per week	72 (17.5%)	35 (14.5%)
Once per week	1 (0.2%)	2 (0.5%)
How often do you access support for learning in the online environment?		
Multiple times per day	34 (8.8%)	15 (6.5%)
Once per day	12 (3.1%)	9 (3.9%)
Multiple times per week	55 (14.2%)	27 (11.7%)
Once per week	61 (15.8%)	47 (20.4%)
Monthly or less	118 (30.6%)	76 (33%)
Rarely or never	106 (27.5%)	56 (26.3%)
Most common way of accessing the internet:	246	166
Own private desktop	62	55
Work computer	109	35
Shared computer at home	63	23
Shared public computer	187	75
Computer on the University campus	288	146
Mobile device		
How usually access the internet?		
Dial up connection	11	1
ADSL or ADSL2	104	108
Broadband	126	71
Wireless	295	135
Satellite	10	8

Don't Know	23	5
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\* Some results do not tally to 100% due to missing data (not all questions were mandatory).

Respondents were asked to rate their level of confidence in using, and experience with, a range of technologies both generally and specifically related to their study experience at USQ. This data is presented in Table 3. Some differences were evident in how Digital Natives and Digital Immigrants rated themselves, both in terms of experience and confidence in using specific technologies. For example, the Digital Natives were more confident than Digital Immigrants in using instant messaging and social networking tools. However, although Digital Natives were more experienced and confident than Digital Immigrants, they were only “somewhat confident” in their abilities. Generally, the two groups showed comparable levels of experience and confidence. Respondents were also asked to rate how experienced they were and how confident they were in using a range of technologies on the University’s learning management system (i.e., USQ Studydesk). As the data was non-normal, a Mann-Whitney U test for differences between the means of the two groups was conducted with the confidence interval set at 99% ( $p < .01$ ).

**Table 3**  
**Digital Natives and Digital Immigrants Experience with and Confidence in using specific technologies**

Technology	Digital Native mean score experience*	Digital Native mean score confidence*	Digital Immigrant mean score experience*	Digital Immigrant mean score confidence*
Sending and receiving emails	4.54	2.94	4.53	2.92
Using word processing	4.50	2.88 <sup>1</sup>	4.31	2.73 <sup>1</sup>
Using presentation software (i.e., PowerPoint)	3.97	2.61 <sup>1</sup>	3.51	2.30 <sup>1</sup>
Using spreadsheet tools	3.40	2.20	3.20	2.06
Using database tools	2.65	1.77	2.54	1.69
Searching and navigating the internet	4.67	2.90 <sup>1</sup>	4.48	2.86 <sup>1</sup>
Searching online databases	3.74	2.36	3.80	2.43
Using Instant messaging tools	3.89	2.71 <sup>1</sup>	3.02	2.29 <sup>1</sup>
Using social networking tools	4.33	2.84 <sup>1</sup>	3.55	2.52 <sup>1</sup>
Using Skype or similar technologies	3.08	2.34 <sup>1</sup>	2.86	2.20 <sup>1</sup>
Accessing a course home page	4.52	2.87	4.40	2.83
Editing the USQ Studydesk profile	3.36	2.36	3.28	2.33
Accessing course materials on Studydesk	4.49	2.81	4.44	2.77
Downloading lecture recordings	4.42	2.76	4.35	2.70
Participating in discussion forums	3.85	2.57	3.97	2.61
Using WIMBA classroom	2.25	1.73	2.48	1.83
Accessing assessment/assignment material	4.31	2.70	4.31	2.72
Submitting assignments	4.12	2.63	4.16	2.66

<sup>1</sup> significant difference at ( $p < .01$ )

Accessing assessment results online	4.08	2.61	4.00	2.61
Accessing marked assignments online	3.95	2.59	3.94	2.60

\* Experience rating score was: 1 = never used, 2 = rarely used, 3 = occasionally used, 4 = often used and 5 = expert user. Confidence Score rating was 1 = not at all confident, 2 – somewhat confident, 3 – very confident.

Results of this study, coupled with the outcomes of the earlier pilot study, support the notion that despite the commonly reported assumption, levels of experience with technology and confidence in demonstrating a range of digital literacies does not appear to be solely age reliant. Our data found small differences in the digital skills and levels of confidence in relation to age but the time spent online, both studying and for other purposes, was consistent across age groups. These findings suggest that this group of students regardless of when they were born (those over 30 generally assumed to have low levels of experience with technology and digital learning tools), are equally literate and confident.

While the myth of age being a factor in digital literacy was not supported by our current findings, some interesting gender differences in experience and confidence with technology were observed. Once again the mean scores were still in the somewhat to very confident range, but our data did show women to be more confident and experienced in using social networking technologies ( $F = 17.9$ ,  $df = 1$ ,  $p < .01$ ) and men to be more confident and experienced in using spreadsheets ( $F=9.489$ ,  $df = 1$ ,  $p < .01$ ), data bases, and voice and video conferencing (Skype). Whilst this finding was not related to the age of students and thus the myth of digital natives evidencing higher levels of digital literacy, it does support the notion that learning literacies are complex and multi-dimensional and that educators need to consider a range of indicators (i.e., age, gender and experience) when developing curriculum and learning support systems.

All students surveyed indicated confidence in using centrally provided support systems available to them at the University, but very few students indicated that they used these types of support, instead relying more on information from other students and academic staff directly. These findings are summarised in Table 4.

An interesting finding was that the majority of the Digital Natives in our sample opted for on-campus study rather than studying in a digital format. Both surveys found that the majority of USQ students were mature age learners (i.e., not school leavers) and most were also employed while studying. The majority of students reported reliable internet speed and connections (93%) and most have been using the internet for more than 5 years. Both groups of students reported that they rarely accessed support offered by the University, and that they tended more to rely on support from family, friends and other students. Academic matters were the main reason students sought assistance, including the need to understand assessment requirements, course content and key concepts. ICT issues were also rated highly in terms of support requirements.

**Table 4**  
**Accessing Support**

	Digital Natives	Digital Immigrants	First Year students	Not First year students
How often on average would you access support for your studies?				
Multiple times per day	34 (9%)	15 (6.5%)	33 (9%)	18 (7%)
Once per day	12 (3%)	9 (4%)	15 (4%)	6 (2.5%)
Multiple times per week	55 (14%)	27 (11.5%)	56 (15.5%)	25 (10%)
Once per week	61 (16%)	47 (20.5%)	59 (19%)	36 (14%)
Monthly or less	118 (27.5%)	76 (33%)	98 (27%)	96 (38%)
never	106 (27.5%)	56 (24.5%)	91 (25.5%)	72 (28.5%)
What do you most often access support for?				
Course related issues	99 (36%)	59 (35%)	94 (35%)	65 (37%)
ICT problems	55 (20%)	36 (21%)	57 (21%)	35 (20%)
Administrative issues such as enrolment problems	43 (15.5%)	26 (15.5%)	35 (13%)	33 (19%)
Student support – learning center, stress and disability support	41 (15%)	28 (16.5%)	48 (18%)	20 (11.5%)
Study desk navigation and general efficacy issues	38 (14%)	21 (12.5%)	37 (13.5%)	22 (13%)
Who else do you contact other than the university for support?				
Friends and family	107 (50.5%)	66 (61%)	120 (54%)	54 (53.5%)
Work Colleagues	13 (6%)	6 (6%)	9 (4%)	11 (11%)
Other students enrolled in my course	40 (19%)	33 (30.5%)	50 (22.5%)	23 (23%)
Parents	52 (24.5%)	3 (3%)	43 (19.5%)	13 (12.5%)

#### **Discussion: Implications for digitally delivered higher education**

Many higher education institutions have viewed online learning as the answer to meeting the learning demands of digital natives (Bennett et al., 2008). Whether educators support this view or not, the fact remains that digital technologies are now widely used across higher education settings (Dahlstrom et al., 2011). Dahlstrom et al. (2011) advocated that there are considerable advantages in using technology to support learning, including:

1. Technology gives students easy access to resources and helps them dispense with administrative tasks and keep track of academic progress.
2. Technology makes students more productive.
3. Technology helps students feel connected.
4. Technology can make learning a more immersive, engaging, and relevant experience (p. 4).

Educational resources provided in a digital form underpinned by a digital pedagogy provide students with positive learning experiences, enabling them to study when and where it is convenient to them (Andrews & Tynan, 2012). This flexibility minimises the need to attend scheduled face-to-face lectures and tutorials. Advantages of digital content over more traditional print includes flexibility to change,

ease of keeping materials up to date, and simplicity in searching the content (Nelson, 2006). Given the preference of students to streamline their studying, this digital format enables them to study whenever and wherever they want, more effectively. However, Nelson (2006) outlined two forms of digital content:

1. Digitised content; developed for traditional print, and following a linear organisation. Content may be scanned or digitised by optical character recognition.
2. Born digital content; originated, developed and produced within a digitally rich context. Content enables various features and capabilities of digital media for nonlinear organisation and interactivity.

Previous research has sought to demonstrate that online learning contexts perform as well as traditional contexts in terms of student achievement and learning outcomes. The principle of “no significant difference” was argued to support the validity and value of online learning and its equivalence with traditional methods (Simonson, Schlosser, & Orellana, 2011; Swan, 2003). The general argument was that “as long as the quality of instruction delivered over distance was as good as the quality of traditional education, there would be no significant differences in learning between them” (Swan, 2003, p. 3). Simonson et al. (2011) asserted that many conditions for quality online learning design are shared with traditional contexts. These include:

1. The degree of active versus passive learning techniques;
2. The amount of flexibility and variety in how the course is presented and undertaken;
3. The nature, frequency, and quality of feedback;
4. The clarity and explicitness of goals or expectations, and
5. How much contact and guidance is provided by instructors.

However, such a simplistic argument creates the potential for ignoring the many complexities of quality online learning. This includes the need to consider the relative importance of different elements of online course design, such as the characteristics, skills, and practices of both students and lecturers. Factors such as the degree of structure and transparency, and the communication potential of courses, have much more significance for online learning than traditional classrooms (Swan, 2003). Lecturers and students are separated by time and space, and the need for clarity of meaning becomes essential in online learning. Online learners therefore appreciate consistent, transparent, and simple course structures that support their overall student learning journey (Swan, 2003).

In arguing for the value of online learning, it is also important to consider the learning outcomes that may not be so readily available in traditional face-to-face classrooms. Swan (2003) argued that particular knowledge and skills, including divergent thinking, are better supported via online learning. For example, students who explored complex topics from multiple perspectives through hypermedia programs scored higher on measures of complex understanding than students presented with similar material through a traditional (linear) format (Swan, 2003). Interactive online learning environments enable students to more readily integrate multiple perspectives by interacting with other students’ points of view in asynchronous course discussions. Such online communications enable the exchange of meaningful ideas that promote critical thinking and underpin reflective learning skills (Echo360, 2012).

#### **Guidelines for educators in establishing effective learning management systems**

Online learning environments typically focus on maintaining social connections with students via asynchronous discussion forums. Many learning management systems are based on students merely receiving information to be learned. However, the focus of online learning should be to provide a fully

interactive and integrated learning process, taking full advantage of online flexibility and not merely presenting existing material online (Wold, 2013). Collaboration and social interaction are two very important contributors to effective online learning where students are required to craft, interact with and modify their thoughts based on other student's feedback and ideas (Uzun & Senturk, 2010).

Understanding the skill levels of students is a major contributor to the success of online learning. The mobility requirements of today's student means that content needs to be accessible via a variety of devices for study at any time and place by the student (Sheehan, 2012). Without this, students will potentially become disengaged and a barrier between the lecturer and student may be created. Similarly, ensuring that academic staff are provided with appropriate staff development opportunities and incentives to support online learning are imperative to addressing the gap between rhetoric and practice (Andrews & Tynan, 2012). It is envisaged that ongoing professional development in this area will enable educators to gain confidence in using technologies that students find more engaging and relevant (Dahlstrom et al., 2011). Dahlstrom et al. (2011) also recommended that educators identify and make better use of technologies that are valued by students, integrating them into key learning experiences in transformative ways (such as participatory and collaborative interactions). This involves determining students' technology needs and preferences and creating an action plan to better integrate technology into their courses. Importantly, students should be able to access this institutional and academic information from their varied mobile devices and platforms. This will help to meet expectations for anytime, everywhere, wireless access on students' preferred learning devices. Moving towards a blended learning environment will also enable institutions to better meet students' preferred learning styles and differentiated needs (Dahlstrom et al., 2011). To this end, the institution should establish or refine social media policies to support the application of social media in online learning experiences (Dahlstrom et al., 2011).

Rarely do online learning classrooms promote pedagogical diversity or provide students with the tools to accommodate their individual learning needs (Quinton, 2010). According to Quinton (2010), online learning environments should be based around three core principles: collaboration, self-organisation, and ecological systems. The online learning environment should provide opportunities for social interactions and knowledge transfer in virtual learning communities (Quinton, 2010). For example, online learning communities should:

1. "Encourage and support students to negotiate learning pathways through a multiplicity of contexts and domains by applying ecological and connectionist design strategies to dynamically assemble clusters of teaching content and information (also useful for evaluation purposes).
2. Devise and apply intelligent feedback and cognitive support systems that interactively empower learner cognition and respond immediately to learner input through the dynamic assembly of content that is relevant to the specific learning needs of the individual.
3. Incorporate "on-demand" tools for facilitating and managing collaborative encounters whenever the need arises" (p. 344).

Thus, a complex array of factors and conditions underpin optimal online learning. Whether high quality interactions within a "community of inquiry" (Rourke et al., 2001) are achieved or not, students' perceptions of, experiences with, attitudes to, and behaviours within, online learning contexts also influence overall learning experiences. Swan (2003) found that three general factors— clarity of design, interaction with instructors, and active discussion among course participants— influenced students' satisfaction and perceived learning. It is evident that a clear and consistent course structure, an instructor who interacts frequently and constructively with students, and a valued and dynamic

discussion, underpin positive learning experiences (Swan, 2003). The authors posit that it is the interplay of these key factors that jointly supports the development of online communities of inquiry. This notion is supported by the work of Rodriguez and Ooms (2005) who found that confidence with technology was related to satisfaction with the online course experience, which in turn was related to perceived quality. Additionally, motivation to learn more about technology was also related to students' satisfaction of online learning experiences. Thus students' perceptions of quality online environments related to their levels of prior experience and confidence in using digital tools in online environments. These perceptions and behaviours are mediated by external factors such as course design, pedagogical, and institutional factors. Efforts to ensure quality online learning experiences need to address both these intrinsic and external factors.

### **Future directions**

Opportunities to undertake study "anytime, anywhere" have enabled increased access to higher education. However, higher education institutions must develop rigorous systems to support online learning, enabling learning to be contextualised for individual participants. Concomitantly, as the technology continues to evolve, and as lecturers begin to understand the potential of e-learning, it is likely that we will see the emergence of new and more effective approaches to online learning and teaching in the future. There is growing evidence that online learning is a useful tool for higher education if applied with skill. It is the development of skill, for both staff and students that must become a focus, rather than simply supporting information technology innovation.

Technology requirements of higher education have been categorised into three groups. First, technologies to be adopted within the next year or less will include cloud computing, learning analytics, mobile apps and tablet computing. Such technologies enable one to be flexible to change and to process or access larger resources more easily. Second, in the next 2 to 3 years, education should become more student-focussed, enabling individual learners to develop a digital identity while participating in a more personalised educational experience that is tailored to their specific needs. The expectation is that educators will apply more game based learning and open source content and practices to enhance engagement and improve potential learning outcomes. Finally, although technology continues to evolve at a rapid pace, in the next 4 to 5 years, higher education will need to focus on issues such as digital preservation, open online courseware, and telepresence. Institutions need to forward plan and educators need to begin preparing for these emerging technologies now, to enable them to adapt their curricula and teaching approaches in time to meet the needs of future students.

Improvements in the online learning journey are unlikely without some fundamental changes at the institutional level to better support staff. A new paradigm may be required, in which diverse skills of staff and students are recognised and used as a resource, in more flexible organisational structures. Emerging technologies raise the skill requirements of academics, and successful applications of online learning are dependent on additional skills provided in tandem by other support professionals including instructional designers and media producers, among others.

### **Conclusion**

The current data helped to debunk the myth that age determines experience and confidence in using digital learning technologies. Digital Immigrants did not show the assumed low levels of experience with digital learning tools; their experience and confidence was comparable to that of Digital Natives. Further, the current data highlighted the complexities of quality online learning. This includes

recognising the importance of online course design to the student learning experience. Online learning environments should enable the exchange of meaningful ideas to promote critical thinking and reflective learning experiences. This will help to create a sense of community among the online learners. However, quality online learning is not assured, and requires attention to internal factors such as prior experience and confidence in using digital learning tools, and external factors such as course design, pedagogy, and institutional support, to ensure maximum positive impact.



## References

- Apperley, T., & Walsh, C. (2012). What digital games and literacy have in common: a heuristic for understanding pupil's gaming literacy, *Literacy*, 46(3), 115-122.
- Andrews, T., & Tynan, B. (2012). Distance learners: Connected, mobile and resourceful individuals. *Australasian Journal of Educational Technology*, 28(4), 565-579.
- Akyol, Z., Garrison, D. R., & Ozden, M. Y. (2009). Online and blended communities of inquiry: Exploring the developmental and perceptual differences. *International Review of Research in Open and Distance Learning*, 10(6), 65-83.
- Aziz, H. (2010). The 5 keys to educational technology: Transforming education through technology. Retrieved 10 October, 2013 from: <http://thejournal.com/articles/2010/09/16/the-5-keys-to-educational-technology.aspx>
- Bawden, D. (2001). Information and Digital Literacies: A Review of Concepts. *Journal of Documentation*, 57(2), 218-259.
- Beetham, H., McGill, L., & Littlejohn, A. (2009). Thriving in the 21st century: Learning Literacies for the Digital Age (LLiDA project). London: JISC.
- Bennett, S., Maton, K., & Kervin, L. (2008). The 'digital natives' debate: A critical review of the evidence. *British Journal of Educational Technology*, 39(5), 775-786. doi:10.1111/j.1467-8535.2007.00793.x
- Buckingham, D. (2010). Defining Digital Literacy. *Medienbuilung in neuen Kulturraumen VS Verlag fur Sozialwissenschaften*, 59 – 71.
- Burdick, A., & Willis, H. (2011, November). Digital learning, digital scholarship and design thinking: Opportunities for integration. *Design Studies*, 32(6), 546-556.
- Conole, G. (2008). Listening to the learner voice: The ever changing landscape of technology use for language students. *ReCALL*, 20(2), 124-140. Retrieved from: <http://dx.doi.org/10.1017/S0958344008000220>
- Dahlstrom, E., de Boor, T., Grunwald, P., Vockley, M., & Oblinger, W. A. (2011). *The ECAR National Study of Undergraduate Students and Information Technology*. Boulder, CO: EDUCAUSE Centre for Applied Research.
- Echo360. (2012). *Blended Learning Technology: Connecting with the Online-All-the-Time Student*. Echo360. Retrieved from: [http://echo360.com/sites/all/themes/echo360/files/Connecting\\_to\\_the\\_Online\\_All\\_the\\_Time\\_Student.pdf](http://echo360.com/sites/all/themes/echo360/files/Connecting_to_the_Online_All_the_Time_Student.pdf)
- Eynon, R., & Malmberg, L. -E. (2012). Understanding the online information-seeking behaviours of young people: the role of networks of support. *Journal of Computer Assisted Learning*, 28, 514-529. Retrieved December 7, 2012, from [www.usq.edu.au](http://www.usq.edu.au)
- Fitzgerald, R., & Steele, J. (2008). *Digital learning communities: Investigating the application of social software to support networked learning*. Australian Learning and Teaching Council. Retrieved from: [http://www.olt.gov.au/system/files/resources/grants\\_cg\\_report\\_dlc\\_uc\\_feb09.pdf](http://www.olt.gov.au/system/files/resources/grants_cg_report_dlc_uc_feb09.pdf)
- Gill, S. (2003). Myths and reality of e-learning. *Educational Technology*, January-February, 20-24.
- Helsper, E. J., & Eynon, R. (2010, June). Digital natives: where is the evidence? *British Educational Research Journal*, 36(3), 503-520. Retrieved December 7, 2012, from: <http://www.esource.com.au>
- Hockley, N. (2012). Technology for the Language Teacher: Digital Literacies. *ELT Journal*, Vol 66, Iss 1. pp. 108-112.
- Howland, J. L., & Moore, J. L. (2002). Student Perceptions as Distance Learners in Internet-Based Courses. *Distance Education*, 23(2), 183 - 195. Johnson, L., Adams, S., & Cummins, M. (2012).

- Technology Outlook for Australian Tertiary Education 2012-2017: An NMC Horizon Report Regional Analysis*. Austin, Texas: The New Media Consortium.
- Jones, C., & Czerniewicz, L. (2010). Describing or debunking? The net generation and digital natives. *Journal of Computer Assisted Learning*, 26, 317-320. doi:10.1111/j.1365-2729.2010.00379.x
- Kennedy, G. E., Judd, T. S., Churchward, A., Gray, K., & Krause, K.-L. (2008). First year students' experiences with technology: Are they really digital natives? *Australasian Journal of Educational Technology*, 24(1), 108-122.
- Kennedy, G., Dalgarno, B., Bennett, S., Gray, K., Judd, T., Waycott, J., Chang, R., Bishop, A., Maton K. & Krause, K-L. (2009). *Educating the net generation: Implications for learning and teaching in Australian universities: Final report*. ALTC. Retrieved from: <http://www.netgen.unimelb.edu.au/outcomes/toolkit.html>
- Kirkwood, A., & Price, L. (2005). Learners and learning in the 21st century: What do we know about students' attitudes and experiences of ICT that will help us design courses? *Studies in Higher Education* 30(3), 257-274.
- Lankshear, C., & Knobel, M. (Eds.). (2008). *Digital literacies: Concepts, policies and practices*. New York: Peter Lang Publishing.
- Li, Q., & Akins, M. (2004). Sixteen myths about online teaching and learning in higher education: Don't believe everything you hear. *TechTrends*, 49(4), 51-60.
- Lohnes, S., & Kinzer, C. (2007). Questioning assumptions about students' expectations for technology in college classrooms. *Innovate*, 3(5). Retrieved from: [http://www.innovateonline.info/pdf/vol3\\_issue5/questioning\\_assumptions\\_about\\_students'\\_expectations\\_for\\_technology\\_in\\_college\\_classrooms.pdf](http://www.innovateonline.info/pdf/vol3_issue5/questioning_assumptions_about_students'_expectations_for_technology_in_college_classrooms.pdf)
- Lorenzo, G., Oblinger, D., & Dziuban, C. (2006). How choice, co-creation, and culture are changing what it means to be net savvy. *EDUCAUSE Quarterly*, 30(1). Retrieved from: <http://www.educause.edu/ir/library/pdf/ELI3008.pdf>
- Margaryan, A, Littlejohn, A., & Vojt, G. (2011). Are digital natives a myth or a reality? University students' use of digital technologies, *Computers and Education*, 56 (2), 429-440.
- Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies*. Washington DC: U.S. Department of Education Office of Planning, Evaluation, and Policy Development Policy and Program Studies Service.
- Muilenburg, L. Y., & Berge, Z. L. (2005). Student Barriers to Online Learning: A factor analytic study. *Distance Education*, 26(1), 29-48.
- Nelson, M. R. (2006). *Digital content delivery trends in higher education*. Boulder, Colorado: Educause.
- Ng, W. (2012). Can we teach digital natives digital literacy? *Computers and Education*, 59(3), 1065-1078.
- Pegrum, M. (2011). Modified, multiplied and (re) mixed: Social media and digital literacies, in M Thomas (Ed.), *Digital Education: Opportunities for Social Collaboration*. New York, NT: Palgrave, MacMillan.
- Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon*, 9(5), 1-6.
- Quinton, S. R. (2010). Principles of Effective Learning Environment Design. In M. Ebner & M. Schiefner (Eds.), *Looking toward the future of technology-enhanced education: ubiquitous learning and the digital native* (pp. 327-352). Hershey, PA, USA: Information Science Reference.
- Rodriguez, M. C., & Ooms, A. (2005). *Perceptions of online learning quality given comfort with technology, motivation to learn technology skills, satisfaction, & online learning experience* Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Canada.

- Rourke, L., Anderson, T., Garrison, D. R., & Archer, W. (2001). Assessing social presence in asynchronous text-based computer conferencing. *Journal of Distance Education, 14*(2).
- Selwyn, N. (2009). The digital native - myth and reality. *Aslib Proceedings, 61*(4), 364-379.
- Sheehan, T. (2012). *Developing a digital learning strategy*. Ashridge?: Ashridge Business School. Retrieved December 7, 2012, from [www.ashridge.org.uk](http://www.ashridge.org.uk)
- Simonson, M., Schlosser, C., & Orellana, A. (2011). Distance education research: A review of the literature. *Journal of Computing in Higher Education, 23*(2), 124-142.
- Stoel, L., & Lee, K. H. (2003). Modeling the effect of experience on student acceptance of Web-based courseware. *Internet Research, 13*(5), 364.
- Swan, K. (2003). Learning effectiveness online: what the research tells us. In J. Bourne & J. C. Moore (Eds.), *Elements of Quality Online Education, Practice and Direction* (pp. 13-45). Needham, MA: Sloan Center for Online Education.
- Uzun, A., & Senturk, A. (2010). Blending makes the difference: Comparison of blended and traditional instruction on student's performance and attitudes in computer literacy. *Contemporary Educational Technology, 6*(1), 81-94.
- Wold, K., (2013). Collaborative Inquiry: Expert analysis of blended learning in higher education. *International Journal on E-Learning, 12*(2), 221–238.
- Wood, D. & Dodd, A. (2010). Preparing students and community organisations for effective use of ICT through a service learning initiative. In *Curriculum, technology & transformation for an unknown future. Proceedings ascilite Sydney 2010*. Retrieved from: <http://ascilite.org.au/conferences/sydney10/procs/Wood-full.pdf>