

Assumed Digital Literacy Knowledge by Australian Universities: are students informed?

Jo Coldwell-Neilson
Deakin University
School of Information Technology
Geelong, VIC
+61 3 5227 1417
jo.neilson@deakin.edu.au

ABSTRACT

As disruptive technologies make an impact in the workplace, employers are demanding a broader range of skills that go beyond the capabilities that graduates have developed through their higher education studies. Further, digital literacy is increasingly being recognised as an essential skill, on a par with literacy and numeracy, to support job readiness. As a result there is increasing pressure on universities to ensure their courses prepare graduates appropriately, but is digital literacy amongst these skills? The first step to address this question is to gain an understanding of what universities' expectations are of a student's assumed digital literacy knowledge, the foundation from which graduate digital capabilities are built. The aim of this study is to investigate what information Australian universities provide to prospective students to inform them of the expectations of assumed digital literacy knowledge when entering a course. Based on a sample of 13 Australian universities it seems that minimal information is being provided to new students. This study demonstrates that there is no shared understanding of what digital literacy entails, which poses challenges for students who are expected to have an ill-defined and in some instances, unknown set of digital skills. It also challenges relationships between staff and students, as expectations and understanding of digital skills are not aligned.

CCS Concepts

• **Social and professional topics~Computing literacy** • *Social and professional topics~Employment issues*

Keywords

Digital literacy, assumed knowledge, higher education

1. INTRODUCTION

Technological advances are changing the nature of employment and informing the skill sets which will support employment in fields and industries that are currently unknown [6], [8] [10]. Amongst the array of skills that graduates will require for the jobs of the future are improved digital literacy skills. It is estimated that more than half of Australian workers will need to be able to use,

configure or build digital systems in the next few years [10]. As a result, digital literacy is becoming a basic requirement for most jobs, alongside numeracy and literacy [13], yet there is growing recognition that the skills and capabilities that employers will and are demanding, go beyond the current preparation of many graduates from higher education [3].

From the perspective of all stakeholders 'it is the responsibility of universities to best equip students to maximize their potential, to enable them to find suitable work and excel in the workplace' [14, page 29]. However, a recent report in the Financial Review [17] suggests that young Australians feel that their university education does not prepare them adequately for work in the digital economy. Industry is also raising concerns about the need to better anticipate and address digital literacy and digital skills requirements [15]. These concerns have resulted in an increasing pressure on universities to ensure their courses prepare graduates for future roles in a twenty-first century workforce that is embedded in the growing digital economy.

Universities increasingly claim digital skills and knowledge as priorities or core outcomes for higher education awards including generalist, specialist and professional degrees. However without a clear understanding of what digital literacy entails it is very difficult to scaffold student learning to adequately meet the demands of employers. The first step to addressing this situation is to better understand the expectations that universities have of incoming students assumed digital literacy knowledge.

The work being reported here is contributing to a broader project that aims to build a shared understanding of digital literacy, and develop a digital literacy benchmark for students entering and graduating from Australian higher education institutions. The project will attempt to bridge the gap between school skills (as defined by [4]) and workplace skills (as demanded by employers). This understanding will provide grounding and insight for all disciplines to interpret digital literacy graduate learning outcomes in their context, and thus improve graduate employability.

This paper focusses on exploring the publically available information that universities provide to prospective students regarding the *use* of technology; in other words investigating statements regarding digital literacy capability and expectations of assumed digital literacy knowledge. There is an expectation that the knowledge and skills that students bring into their studies is sufficient to support engagement with the digital learning environments offered by the institutions, and that this assumed digital literacy knowledge will lay the foundations for the development of graduate level digital literacy skills which satisfies employer expectations.

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2. BACKGROUND

Since its initial formulation by Paul Gilster [12], a significant body of research has been undertaken investigating digital literacy and how the term can and should be applied. Despite this research we still do not have a firm understanding of what the concept entails and what it means in the twenty-first century context. Recent work has focused on reimagining and redefining digital literacy (such as [16], [18], and [22] for example), but there is still little clarity about the concept.

Within higher education there is a generally implicit expectation that incoming students have an adequate level of digital literacy to support their learning. They are expected to have achieved some digital competencies through their secondary schooling and, particularly for mature age students, developed digital skills through their work and life experiences. There is also an assumption that because digital natives (those born or brought up during the digital technology age, nominally from 1980) use technology extensively, they are digitally literate. This is not the case [20]. There is a growing awareness that technology use does not equate to technology understanding, nor does it necessarily contribute to the development of transferable digital literacy skills [5]. The 2014 National Assessment Program (NAP) ICT literacy report reinforces the fact that our young digital natives *do* lack digital literacy skills [1]. The NAP-ICT test assesses ‘student ICT knowledge, understanding and skills, as well as students’ ability to use ICT creatively, critically and responsibly’ [2] at school Years 6 and 10. The report shows a significant decline in the mean performance of students in the 2014 test compared to previous assessments [1]. Whether the NAP-ICT literacy test is indicative of digital literacy is debatable, but it is comparable to similar international literacy measures [19]. Further, there is no evidence to suggest that the lack of digital skills is limited to school children.

‘Australia’s future workforce?’ published by the Committee for Economic Development of Australia [6] presents a very strong case for an increased focus on digital literacy skills. The contributors critically reviewed the requirements of today’s workforce and predicted future requirements, resulting in recommendations for policy, employment and education sectors. The report suggests that ‘there are significant shortages in digital skills, which will become a new basic skillset in the way reading and writing are today’ [6, page 12]. It also introduces the idea that ‘digital competency will be a basic competency for all workers’ [6, page 15] and key emerging technologies such as cloud services, the Internet of Things, Big Data, artificial intelligence and robots, and immersive communications are likely to reshape business activities. The report does not provide any indication of what competencies digital literacy entails but does suggest that new technologies will require a range of different competencies that need to be included in what is currently termed digital literacy. ‘So ubiquitous will ICT be in the future that it will be added to reading, writing and arithmetic as basic competencies expected of all Australians ... The workers of the future need to have deep computer literacy’ [6, page 26]. The report further suggests that ‘digital literacy needs to be included as a core component of school education ... [and] ... must continue into tertiary education and be a core component of ongoing workplace skills development’ [6, page 162].

It is estimated that over half of Australian workers will need to be able to use, configure or build digital systems in the next 2-3 years [10]. A helpful framework for classifying the digital skills required in our workforce recently emerged as part of the UK Digital Skills Taskforce. The UK Forum on Computing Education classified four

bands of digital skills and estimated the proportion of the workforce expected to be in each category in the near future [6, page 163]:

- Digital muggle: no digital skills required (7% of workforce)
- Digital citizen: the ability to use digital technology purposefully and confidently to communicate, find information and purchase goods/services (37% of workforce)
- Digital worker: the ability to evaluate, configure and use complex digital systems. Elementary programming skills such as scripting are often required for these tasks (46% of workforce)
- Digital maker: skills sufficient to build digital technology (10% of workforce)

The report suggests that ‘[c]hanging demands from firms, consumers, students and communities means that apprenticeships, vocational qualifications and degrees need to deliver more general and also specific digital capabilities’ [6, page 163], and that ‘technology-enabled [higher education] requires a mindset change for which universities must focus more strongly on what their students want and what employers are looking for in graduates’ [11].

It is not unreasonable to anticipate that many higher education graduates would fall into the Digital Worker category. This places significant demands on curricula and teachers to prepare students to become Digital Workers regardless of discipline. Let us consider the expectations of a Digital Worker in an example of digital literacy expectations of graduates outlined by one higher education institution which is included in this study. Uni08’s graduate learning outcome for digital literacy defines digital literacy as ‘using technologies to find, use and disseminate information’ [21]. Of course this is a minimum standard and has to be contextualised within the discipline, but it doesn’t relate to any of the characteristics of the non-‘muggle’ categories suggested above. Now is the time to reflect on and review what students need to achieve by graduation and how their studies are preparing them for employment in the digital age.

The Australian Government’s National Innovation and Science Agenda [3] strongly supports improvement of digital literacy skills amongst others, which is reflected in the substantial investment in programs to boost digital literacy and STEM amongst young Australians. In parallel, the Government has recently adopted the Higher Education Standards Framework (<http://www.teqsa.gov.au/regulatory-approach/higher-education-standards-framework>) which requires explicit definition of course learning outcomes as well as effective scaffolding and support for student learning. This builds on recent movement to outcomes-focused curricula as described by the Office of Learning and Teaching’s Learning and Teaching Academic Standards program. Together these initiatives emphasise the value of a shared understanding of digital literacy and accompanying standards. Australian universities are in a position to adopt resources that advance this agenda, yet there is little or no indication of what *defines* that shared understanding and what exactly it entails.

Moving from statements of intent to improve the digital literacy skills of graduates to better meet employer expectations will require universities to support the development of this capability. Although universities provide prospective students with information regarding minimum requirements for *access* to computer technology, there are limited statements regarding ability to *use* the technology. Since digital literacy is strongly related to using technologies it is useful to understand what skills and knowledge

our institutions expect students to have on their first day. This provides the foundation to scaffold learning that will meet employer expectations.

3. METHODOLOGY

Thirteen Australian universities were selected to participate in this study. These were selected based on the following criteria (as categorised by the Australian Education Network www.australianuniversities.com.au):

- At least one university from each state or territory;
- At least one university representing the Australian Group of Eight (GO8);
- At least one university representing the Australian Technology Network (ATN);
- At least one university representing the Australian Innovative Research Universities group;
- At least one university representing the Australian Regional Universities Network;
- At least one non-aligned university; and
- At least one multi-campus university.

In this paper the universities are coded Uni01, Uni02 ... Uni13. The universities' public websites were explored from the perspective of a prospective or new student trying to identify what expectations the university had of them regarding digital skills or what information the university provided on digital skills development.

Initially each university's home page was explored, looking for any statements relating to digital literacy or digital learning. The term 'digital literacy' was entered into the website search bar and links appearing as a result of the search were followed. In some cases the search for 'digital literacy' returned alternative terms to search. These included 'digital learning', 'information literacy', 'digital strategy' and 'digital capability' which were used to further explore the public websites. Further manual searching was undertaken by following links to potentially relevant pages, including information about courses, information for new students and graduate capabilities. Many of the universities had a 'why study here' (or something equivalent) which was used as a starting point for the search.

4. FINDINGS

Entering 'digital literacy' into the search function on the universities' websites resulted in: five institutions returning links to scholarly articles with digital literacy listed in the keywords or included in the title; six returning links to unit guides or university handbooks or similar; one institution (Uni01) returning a link to a strategy document entitled 'Information and Digital Literacy at Uni01'; and one (Uni08) returning links to digital literacy tutorials run by the library.

An individualised approach was then adopted, searching for terms suggested by the outcomes of the initial digital literacy search and following links to specific pages. The outcomes of this process are now described.

4.1 Uni01

The starting point for searching Uni01's website was the Information and Digital Literacy Strategy Document identified in the initial search. This document describes its purpose as being 'to demonstrate how the library will lead the development of our students to become information literate and digital literate graduates'. The document describes digital literacy skills as including communication, collaboration and teamwork, and social awareness in the digital environment, and to find, use, create and disseminate information. According to the strategy document, the

university will adopt the Research Skills Development (RSD) Framework, which had been developed at the University of Adelaide (<http://www.adelaide.edu.au/rsd/>), to guide information and digital literacy initiatives. Using the six facets of research (each facet containing five levels) the strategy will 'lead students from being able to find and use information with clear guidance to becoming autonomous researchers'. Despite this strong statement from the library, no information was found that would inform students from where their digital literacy journey should start.

4.2 Uni02

A search of Uni02's webpages did not elicit any information about digital literacy or approaches to digital learning. A search for digital strategies returned a document entitled 'Information Technology Strategy 2015-2017' which outlines the university's approach to providing IT support and solutions to enhance the learning experience. This document further suggests that the role of the university is to provide the technology infrastructure which is required by students to learn effectively since they are 'digital natives', but did not indicate what skill-set digital natives were expected to bring to their studies.

4.3 Uni03

Like Uni02, Uni03 does not appear to have a specified learning outcome related to digital literacy. Mentions of digital literacy were identified in unit guides as a learning outcome but generally these were units that have a 'digital' focus. However, learning in a digital environment and using technology to enhance learning does appear in a number of documents. Apart from this, there is no specific guidance for students within the university's public website. There are a number of references in the IT and Staff sections which refer to digital technologies but the specific pages are on the university's intranet and not available to prospective students.

4.4 Uni04

The information available on Uni04's website relating to digital literacy capabilities appears to be focused on equipping teachers with the skills and knowledge to build their digital literacy. Connections are made to how the online learning environment will enhance the student experience but no connections are made to any specific digital literacy learning, rather comparisons are made to traditional teacher-centric learning practices.

However, Uni04 does provide prospective students with some specific digital skills advice relating to technological readiness and required computer skills. The web page containing the advice invites prospective students to 'check your readiness for online study from a technology viewpoint' specifying that they need to be able to check and adjust computer settings, download and install new software, respond effectively to screen messages, access a computer system with administrator rights, and use online information sources to complete these tasks. Students are further advised that 'these capabilities are important not because you are going to use them all the time, but because they could be necessary anytime, including your first week of online study'. As for computer skills these include keyboarding skills, basic word-processing, understanding and being able to use a web browser, managing digital files and folders, managing email effectively and more.

4.5 Uni05

A strategic document, 'Real World Learning 2020 Vision' was located on Uni05's website. The vision indicates that amongst other characteristics, Uni05 graduates will 'employ digital literacies and use technology strategically to leverage information and to collaborate.' The accompanying blueprint document mentions

several times the need for Uni05 to adapt to technology and build capacity in this space. A document titled 'Digital Roadmap 2015' was also available but this pointed to a broken link. However, searching for information literacy proved more fruitful, locating an information literacy framework and syllabus. On delving into the framework itself, a definition of information literacy was located which made no reference to digital aspects or usage of technology.

4.6 Uni06

Uni06 appears to focus on 'digital learning' rather than digital literacy. A search on this term resulted in a link to the Uni06 'Digital Learning Strategy 2015-2020'. This strategic document recognises that digital learning needs to be incorporated into learning and teaching, to ensure graduate employability and should be used as a performance indicator of the outcomes of the university itself. The strategy document articulates a number of priorities related to digital learning and digital literacy including supporting students to become productive professionals in the digital age, developing academics as leaders in the digital learning experience, and promoting life-long learning which explores the institution's commitment to developing digital literacy in staff and students. There was no guidance found relating to assumed digital literacy knowledge.

4.7 Uni07

Uni07 has limited statements around implementation and use of technology enhanced learning and teaching. What statements are available are focused on the teaching aspect, suggesting that curriculum renewal will apply technology and blended learning approaches to develop curricula that enhance students' learning experience. The overall goal is to provide a foundation for efficient and effective student-centred teaching that is supported by technology. There does not appear to be any clear statement or commitment to ensuring students are equipped for the digital landscape.

4.8 Uni08

Having located digital literacy tutorials on Uni08's library pages, further exploration of the website led to the discovery of a page titled 'what do I graduate with?' where digital literacy is acknowledged as a graduate learning outcome. Following links from the 'About Uni08' page led to the student handbook page containing the Graduate Learning Outcomes together with definitions. The digital literacy graduate learning outcome states that it is 'using technologies to find, use and disseminate information'. Uni08 has a strong definition of digital literacy articulated through strategy documents and curriculum frameworks. It clearly identifies how digital literacy can be taught and incorporated into the design of units to reflect expectations of students.

Uni08 also provides students with a statement regarding the minimum requirements needed to use the online learning system effectively, indicating that 'to ensure you can make the most of your learning experience ... you must comply with our computing, connectivity and capability requirements'.

Computing requirements include suggestions for suitable hardware and software; a desktop or laptop computer purchased in the past two years, using Windows 7 or later, run a modern browser, Java, programs to create documents, spreadsheets and presentations, connect to Uni08's wireless network and enable the use of a web camera and headset. Students are advised that courses increasingly require reliable broadband internet connectivity which is available wirelessly on campus. However, for access from elsewhere students are advised that their internet connection should provide

sufficient speed to download required study materials and to engage in online learning activities associated with their course.

As far as digital capabilities are concerned students are expected to be able to: use technologies to find, use and disseminate information and access text, image and audio files on the web; communicate using email and attachments; create basic documents, spreadsheets and presentations, manage and backup files using common file formats, use a common operating system to install and uninstall software as well as manage software settings.

4.9 Uni09

Uni09's website revealed a 'Digital Learning Strategy' which outlines how the university aims to produce an online learning environment, and how they will support staff and students to engage with digital learning environments. The focus of the strategy appears to be on providing technological and environmental infrastructure to staff and students; there is no mention of digital literacy or digital capabilities.

4.10 Uni10

Uni10 has very limited information available on their public website. Reference was found to teaching and learning policies, reports and to digital learning but these are only accessible to Uni10 staff. No further information regarding digital literacy or learning was found.

4.11 Uni11

Like Uni10, information relating to the university's digital technology aspirations were not available to the public. However, a core graduate attribute relating to information literacy was located via the library. This is listed under generic skills and states:

'Information technology competence introductory level: use general software and the University's learning management system to advance personal learning; Intermediate level: use discipline-specific software independently to explore/interpret information; Graduate level: apply appropriate discipline specific software to provide solutions to questions.'

4.12 Uni12

As with some of the other institutions, it was difficult to source anything other than general statements about digital capabilities across Uni12's website. Webpages dedicated to 'Why choose Uni12' highlight the flexible spaces that provide a variety of learning experiences for students and of the availability of 'cutting edge technologies'. The library pages provide information about using technology, digitisation and online resources. However this information does not mention how students' digital literacy skills will be enhanced or how this could contribute to a broader digital strategy.

4.13 Uni13

Located within the teaching and learning support pages, Uni13's 'Strategic Teaching and Learning Plan' provides some information about technology and learning environments, highlighting that it will be a global leader in delivering high quality and innovative teaching and learning supported by digital and online education. Uni13 does specify what graduate attributes are being targeted but none relates to digital literacy or information literacy.

Similarly to Uni08, Uni13 requires students to have access to an internet enabled computer to facilitate their learning. It also provides recommendations for minimum specifications which again, are similar to those for Uni08. However, unlike Uni08, Uni13 requires the use of a CD-ROM or DVD drive which is often not included as standard in modern laptops or smaller mobile

devices. Specific software is recommended, much of which is freely available or is licensed for Uni13 students.

There is comprehensive information about browsers available to students, with a recommendation that at least two browsers should be installed. Those browsers that are incompatible with Uni13's learning management system are highlighted. Uni13 also provides a browser check to ensure that all relevant settings will allow full access to electronic resources. There is also a suggested bandwidth check application (external to Uni13) together with an indication of what speeds would be required to facilitate a variety of learning and other online activities.

Unlike Uni08, there is no guidance provided to students regarding what digital literacy capabilities they need to enable them to engage with the online resources and learning activities.

5. DISCUSSION

It was surprisingly difficult to locate information about digital literacy, digital learning and digital capabilities from the university websites. When information relevant to digital literacy was located it was often within teaching and learning web pages, the library or strategic documents rather than those dedicated to providing prospective students with information relating to their future studies.

From a teaching and learning perspective some common themes were identified among the universities in this study. Most of the universities recognise a need to embrace technology and incorporate it into students' learning experiences. There is also a strong push to incorporate appropriate technologies into the teaching and learning environments and develop digital spaces to support student learning. Related to the integration of technologies into teaching is the provision of support for staff to utilise the infrastructure and integrate digital technologies into the curriculum. Blended learning models are being put forward as appropriate to support accessibility of learning, particularly for rural and remote students. These initiatives to integrate technology into the learning and teaching environment will support the development of graduate skills to meet twenty-first century requirements, if their digital capabilities are also supported and enhanced in parallel.

It is no longer sufficient to assume that technology use will translate to transferable digital capabilities. The majority of universities made broad, sweeping statements about moving to the future and equipping students with the necessary skills to make them employable after graduation, Uni02 being the only exception. However, very few specify key attributes or outcomes and even fewer identified digital literacy as a learning outcome to be developed and assessed.

There is little consistency as to where information about digital learning or digital strategies are located on the university websites. The pages found are located in policy or strategic direction documents, or, in staff sections hidden from public view on password protected university intranets. Information was also found via the library webpages which seem to have a more open and student-centered approach to information dissemination. The publicly accessible student or study sections of the websites did not mention digital literacy or building skills in a digital environment.

If one were to navigate the university websites from a future student perspective, overall, it would be unclear what level of commitment each university has made to allow for an interactive, digitally supported and inclusive learning environment.

Four universities, Uni01, Uni05, Uni06 and Uni08, were good examples of universities that have digital learning strategies that

have been implemented or are in the process of being implemented. Surprisingly, Uni08 was the only university which specified digital literacy as a graduate learning outcome.

Just three universities provided prospective students with information regarding the technologies they were expected to have access to or what they were expected to be able to do on commencing study at the institution. Based on the information that was found, the digital capability benchmark should include statements about access to computer technology (including connectivity to the internet), as well as the digital capabilities required in order to make best use of the technologies and digitally-enhanced learning activities. Uni08 would be the benchmark for such a statement as it includes computing, connectivity and capability in the statement of requirements. Uni13 included excellent statements regarding computing and connectivity requirements, even providing a link to an application that could check the connectivity interactively. However, Uni13 did not provide any guidance as to expected digital capabilities.

An interesting rationale for providing digital environments for students was presented by Uni02, which indicated that this was necessary since their students are digital natives. Although a seemingly logical rationale, it does overlook the fact that research suggests digital natives are not digitally literate [20] and employers are demanding increasingly sophisticated digital literacy skills from graduates [6], [13].

6. CONCLUSIONS AND FURTHER WORK

The process of searching each website for the term 'digital literacy' and finding very little, indicates digital literacy is still an ill-defined and misunderstood term, particularly in regards to university graduates and their digital capabilities. All of the universities included in this study did refer to ideas of twenty-first century learning and demonstrated an understanding of the need to integrate learning into a digital space. However, little information was available for students regarding assumed digital literacy knowledge, further highlighting the lack of clarity for both staff and students in this area.

Across the board, there is a growing recognition that technology use does not necessarily equate to technology understanding and may not contribute to transferable digital literacy skills [5]. The 2014 NAP-ICT literacy report reinforces this [1]. Graduates need to develop sound digital literacy skills and transferable skills which transcend disciplinary boundaries, allowing them to thrive and lead in a digitally enhanced work environment [9], [3]. The question of how universities can adequately prepare students for jobs of the future, when there is no common understanding of what skills are required to perform in these jobs, must be asked.

This study demonstrates that there is no shared understanding in higher education of what digital capabilities students are expected to possess when commencing university study. This is analogous to having no statements or requirements relating to English language competency for entry into an Australian university. It is clear that all universities are integrating, or have integrated digital technologies into teaching and learning portfolios, and yet there is no accompanying statement that identifies the digital capabilities students require to take advantage of these digitally enhanced learning opportunities. This poses significant challenges for both staff and students. Students commence their studies expecting to be guided and supported, particularly through the early stages of their university learning experience. It poses challenges for staff who expect students to be digitally capable, able to adequately use email, prepare assignments and use the learning management system to access online resources, participate in online learning

activities and submit assessments online successfully. This mismatch in expectations leads to misunderstandings and disgruntled stakeholders [7], which can be overcome if a common understanding of digital literacy is identified.

The limitations of this study are acknowledged. The selection of included universities was somewhat arbitrary within the rationale provided in the methodology section. Time did not permit including all universities. The web pages investigated were limited to those that are publically available. More extensive information may be present within universities' intranet but was not accessible.

The work reported here marks the first stage of a multi-stage project that aims to address the questions raised in this investigation. The goal of the next stage is to develop a working definition of digital literacy, tested as an initial reference point with higher education and industry stakeholders. This definition will inform the development of a foundational digital capability standard or benchmark that once agreed upon, will assist students in judging whether they are ready to engage with digitally enhanced learning environments. Finally, the benchmark will form the basis from which institutions can scaffold graduate learning outcomes and enhance graduate digital capability to meet employer expectations. In the longer term it is anticipated that the outcomes of the project will inform the development of university policy and curricula to ensure that graduates are adequately prepared for a digitally enhanced, dynamic workplace.

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