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A multidimensional approach to understanding and addressing digital literacy in higher education

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Despite an increased focus on traditional literacies such as reading and writing, digital literacy remains a concern due to the inconsistency with which the current generation of students are able to use digital technologies for academic and future professional purposes. One of the challenges of digital literacy is its multidimensional nature. There have been many attempts to define these dimensions but most have focused on a narrow range. The focus of this paper is to synthesise the existing research into a multidimensional taxonomy that may provide a framework for ensuring the development of digital literacy skills in higher education. The taxonomy defines the media and skills inherent in digital literacy at multiple cognitive and epistemological levels, while accommodating the contexts that mediate their use.

Keywords: Digital Literacy, Learning Outcomes, Educational Taxonomies

The need for digital literacy

In 1987, in preparation of the International Year of Literacy, UNESCO argued “literacy training is not simply teaching people to read and write, but teaching them to understand so that they can live their conscious life to the full” (UNESCO, 1987, p. 2). This need for skills that engage with information and communication and their centrality to human wellbeing are as true in 2014 as they were then. In Australia, the focus on literacy has intensified rather than abated, particularly in recent years. The implementation of the National Assessment Program – Literacy and Numeracy (NAPLAN) is one example where literacy issues have received significant exposure and subsequent intervention in the Australian primary and secondary school sectors (Australian Curriculum Assessment and Reporting Authority, 2013). In higher education, TEQSA’s adoption of various literacies – such as English Language Proficiency and numeracy – into its Terms of Reference have led to an increased attention to literacy graduate attributes for degree students. While such actions provide an effective response to common criticisms about the lack of reading and writing within schools (Leung, 2006), it could be argued that they have failed to see the totality of literacy and reflect the changes and paradigm shifts in literacy by remaining entrenched in historical definitions of reading and writing. We no longer just read books, and the advent of social media has changed the nature of written communication. Rheingold (2012) expands on the notion of ‘literacies’ to integrate concepts such as critical information consumption, managed media attention or ‘infotention’, ethical collaborative research, networked coproduction of knowledge, and digital citizenship. These are not traditional literacies - rather ‘new social skills’ for a digital informationscape. The extent to which students are able to demonstrate these is highly debatable.

Generalisations about current students as ‘millennials’ and ‘digital natives’ (Prensky, 2006) have created assumptions that such students are digitally literate (Strauss & Howe, 2006), and
it does seem that students born in or after 1982 are habituated to technologies and expect them to be integrated into their learning (Brown, 2000; Frand, 2000; Oblinger, 2003). However, studies (Kennedy, Judd, Churchward, Gray, & Krause, 2008; Ladbrook & Probert, 2011) have shown that many students, including millennials, have a tendency to most value those technologies that have an immediate benefit to their lifestyles rather than as learning and productivity tools. Also, there appears to be a lack of formal support for integration of digital literacy into high schools so there are no accepted threshold standards for school leavers for their ability to engage effectively in the use of digital technologies (Ladbrook & Probert, 2011). A further point of concern is that while there has been a great deal of attention on millennial students they are only one group in a diverse cohort. Nearly 30% of students in Australia are international, 10% are low SES students, and the number who are entering via enabling courses increased by 7.1% between 2011 and 2012 (Australian Government Department of Industry, 2013). This diversity warns against making any prejudgements about students’ existing capacity, or lack thereof, to fully utilize digital technologies for learning. No doubt all of these students use technology in their lives but that is not the same as having a formalized understanding of them and an ability to apply them in a manner that is connected to institutional and public-sphere knowledge-building and argumentation. This ‘premium literacy’ (Gee, 2012) is a much rarer commodity and a set of skills that is vital to future success.

Snyder (2008) has warned of ideological wars around literacy and the conflicts inherent in the old and new ways of teaching reading and writing, and proposes digital literacy as a means to bridge these. This can happen, not by treating it as an add-on component to literacy, but by bringing a focus on exacting discipline, drawing attention to cognitive processes, and engaging in production skills relevant to contemporary media and technologies (Gibson, 2008). As such, it broadens the concept of literacy, rather than sitting at odds with it (Chase & Laufenberg, 2011), and provides a means to engage with tools of interpreting and producing information in a way that allows learners to continue to evolve as the technological landscape changes.

While there are many interpretations and facets to digital literacy, there is strong consensus that it is essential for future success (Chase & Laufenberg, 2011). A 2009 OECD report found that digital literacy was key to academic achievement because literate learners are able to judge the credibility of information, integrate multiple forms of information, obtain more frequent and better feedback, and engage in the most up-to-date research and thinking (OECD, 2009, cited in Carneiro & Gordon, 2013). Despite this importance, studies have found that many students lack even basic skills such as Internet searching, despite a heavy reliance on these skills (Marupova & Vega Garcia, 2007).

An integrative model for promoting digital literacy

Digital literacy is a natural product of the changing nature of literacy, as people’s information and communication behaviours have changed with the evolution of technologies. The definition of digital literacy encompasses much more complex learning processes involving a combination of technical procedural, cognitive, and socio-emotional skills (Eshet-Alkali, 2004) sharing the core competencies and strategies of information literacy: the ability to identify, assess, retrieve, evaluate, adapt, organise and communicate information within an iterative context of review and reflection (The Society of College National and University Libraries, 1999).
What digital literacy provides is a context for these skills and, as such, can be summarised as a fluency of knowledge acquisition and utilisation using digital technology. Sharing Gibson’s (2008) view of digital literacy in terms of cognitive processes and production skills, Eshet-Alkalai and Chajut (2009) provided a concrete conceptual model of digital literacy that focuses on six literacy skills: photovisual, reproduction, branching, information, socioemotional and real-time skills. These delineate a range of non-traditional literacies such as being able to interpret images, construct knowledge through non-linear navigation, communicate effectively and manage large volumes of information simultaneously such as in computer games.

Bawden (2008) provides an alternative view of digital literacy outcomes in terms of four dimensions that suggest levels of complexity rather than discrete domains:

- **Underpinnings**: foundational literacy; basic ICT skills
- **Background knowledge**: the nature of information – forms, sources/origins, understanding of the ‘publication chains’, authorship, provenance
- **Central competencies**: finding/searching, navigating, synthesising, critically analysing, creating and communicating
- **Perspectives**: independent learning, ethical use of information (respect for privacy), and ethical behaviour in digital communication.

Robinson (2008) argues for a cultural interpretation that emphasizes the relationship between three core components of literacy, identity and authority. It is a hierarchical model that articulates from the ability to encode and decode media through the development of a sense of a digital ‘self’ to the authority inherent in being an effective curator and synthesizer of the digital information space. When examining Bawden’s (2008) focus on underpinnings and knowledge leading to the development of skills and values it becomes evident that the skills described by Eshet-Alkalai and Chajut do not just cross knowledge domains but cognitive levels, from the use of tools and strategies to the ability to critically evaluate their application and develop innovative solutions using digital technologies.

It is not surprising, therefore, that there have been attempts to develop an approach to defining these levels using Bloom’s taxonomy (Bloom, 1956). This influential framework, articulating from lower order outcomes such as knowledge, comprehension and application to the higher order thinking involved in analysis, synthesis and evaluation, has gone through revisions that broaden it out to the psychomotor (Harrow, 1972) and affective (Krathwohl, Bloom, & Masia, 1964) domains, as well as to expand the cognitive domain across factual, conceptual, procedural and metacognitive knowledge types (Krathwohl, 2002). Churches (2012) has reshaped Bloom’s levels of thinking into a digital taxonomy that articulates his levels in terms of specific activities using digital technologies.

However, just as Bloom’s original taxonomy is prone to being reduced to a verb list for writing learning outcomes, much of the focus on the digital taxonomy has been in classifying digital activities in terms of the extent to which they address a level, so that bookmarking is remembering, tweeting is understanding, editing is applying and so on (Churches, 2012). The utility of this approach is hampered by this reductiveness as well as the inherent bias towards individual psychology, such that the model is ultimately flawed. Complex activity such as social networking is defined in terms of remembering and most of the other social aspects of digital technologies, such as chatting, networking and commenting, sitting off to the side of the model as part of the ‘communication spectrum’. Other attempts have gone so far as to
classify the taxonomic levels in terms of specific websites and software (Schrock, 2011). Neither of these approaches captures the multiplicity of digital literacy and the issue is further compounded by the contextually embedded nature of how digital skills are applied.

When Kennedy et al. (2008) observed a pattern of digital technology use in first year students that was sporadic, isolated to certain technologies and applications and inconsistent between individuals, a part of that may have been a result of the contexts in which digital technologies had previously been used. Many self-described digital ‘illiterates’ are quite adept at using technologies that enhance their lives. The widespread uptake of Facebook is not purely because it is easy to use, rather because it affords people a communication medium that is highly relevant to their needs.

Belshaw (2012) acknowledges the contextual complexity of digital literacy by proposing eight key characteristics: cultural, cognitive, constructive, communicative, confident, creative, critical and civic. In many ways, these all denote the uses to which digital literacy skills are applied, providing a platform for users to achieve their goals within a given context. So, the cultural element could be an ability to adapt to the cultural norms of a study forum rather than a role-playing game. Likewise, cognitive literacy is the ability to conceptualise an experience in digital terms rather than relying on analogue metaphors, constructive literacy affords the user the ability to repurpose digital content and combine it in new forms such as mashups, visual composites and so on.

This paper attempts to unpack these epistemological assumptions and develop a more coherent taxonomy for digital literacy that can be used as the basis for developing applied strategies to support its development. The model accommodates the paradigms outlined above, embracing the complexity of the concept while ensuring a discrete and manageable set of criteria to classify it and provide a basis for learning interventions. Five dimensions are proposed: skills, levels, media, schema and contexts. Within each of these are characteristics that qualify each dimension so that consideration can be given to how digital literacy can be best addressed. (Figure 1).

**Digital literacy skills**

The skills dimension allows us to accommodate the cognitive, psychomotor and affective orientations of the taxonomies based on Bloom’s research while embracing social skills, which, while not exclusive of the affective domain, affords a focus on the connections that exist between people rather than purely the impacts of social interaction on the self.

**Digital literacy levels**

The levels are described here in a way that embraces Bloom’s levels in terms of a hierarchy of complexity. However, rather than having discreet levels for each individual skill using the levels of receiving, organising, responding, applying, characterising and generating enables them to be applied to all skill domains while still embracing the hierarchy of knowing through to creating in the cognitive domain, physical reflexes through to non-discursive communication in the psychomotor domain and so on.
Media for digital literacy

The third dimension focuses on the digital media learners engage with. Ultimately these may be similar to analogue media (language, images) but also embrace newer forms such as time-based media, including animation. Networks allows the view of media in the form of non-linear narratives and via navigation. The interactivity afforded by this promotes a sense of agency in terms of choice, with information being developed through aggregation and constructed through interactive decision-making rather than as a traditional text.

Digital literacy schema

Schema embraces the broader knowledge types proposed by Krathwohl (2002), articulating from factual through procedural to conceptual, through to metacognitive knowledge, which allows digital literacy skills to transfer across domains. Connectivist knowledge is also included here to encapsulate the knowledge that can sit between people rather than within them such. An example of this is the collaborative knowledge inherent in a wiki, where no individual may be able to claim complete understanding of the content that is developed.

Contexts for digital literacy

The contexts of digital literacy define their applications in terms of how appropriately they are applied to a given purpose. These obviously vary depending on the cultural milieu. Similarly, the use of digital technologies as creative or communicative tools or to critically engage in media provide a clear contextual basis for the skills required. Confidence can be interpreted as
the ability to make digital technologies work for you, rather than experiencing the helplessness and frustration that is typical when coming to terms with a new piece of software or a complex user interface. The notion of civic digital literacy can be seen as integrating ethical use of digital media while specifically accommodating the arguments made by Rheingold (2012) and Robinson (2008), who point to the need for stewardship or gatekeepers, respectively, of the democratized but potentially chaotic digital information space.

**Applying the taxonomy**

The value of the taxonomy proposed in Figure 1 is apparent when one attempts to classify the multiple literacies that can constitute digital literacy. A coherent and integrative model such as this can allow teachers to explore the range of literacies covered across a whole course and map them through the multiple levels and contexts, as students develop foundational technology skills through to the broader application of digital media as they transition into professional life. In applying these dimensions, one could classify using a keyboard, for example, as primarily a reflexive psychomotor skill involved in the application of language at a factual level to construct text. That is a far different activity to building an online community where social skills are applied to the development of connections between people that are generated through networks of information for purposes such as mutual support (civic) or to create of a new product (creative/constructive). Thus, the elements in each of the five dimensions in the taxonomy can be used as a means to engage students in digital literacy through the breadth of subordinate skills and potentially articulate a range of threshold outcomes for a course. Once these have been identified then the necessary evidence of their achievement can be defined through assessments and activities that students undertake.

While the taxonomy proposed in this paper has immediate value in prompting educators to consider how learners develop and apply digital literacy as part of their studies, it must be noted that the five dimensions do not yet constitute a validated framework. Digital literacy has been described as both “complex and fascinating” (Bhatt, 2012, p. 290) and an inherently ‘squishy’ concept (Chase & Laufenberg, 2011). They are not complete, nor are the elements within them mutually exclusive. Nevertheless, with a firm basis in existing literature, they provide a starting point for a conversation about digital literacy that can be explored through further research to develop a widely accepted framework that can then be articulated into learning strategies. The diversity of the two examples above suggest that any approach to facilitating digital literacy is likely to be as complex and multidimensional as digital literacy itself, embracing the educational philosophies and epistemologies most relevant to the skills, levels, and schema to be developed in terms of the media learners engage in and their context for use. Digital literacy in one course may not mean the same thing in another.

It should be acknowledged that digital literacy is not just an issue for students. While the complexity of the concept does not make it purely a generational phenomenon, it is likely that teachers unpracticed in the range of digital literacy dimensions are likely to struggle with some applications of it. In their exploration of the inter-generational digital divide between student and faculty, Salajan, Schönwetter, and Cleghorn (2010) found that while there was no direct dichotomy between faculty and students, differences within these groups as well as some attitudinal differences between them suggest that the issue is still a prevalent one across all sectors of academia. Any subsequent research into enhancing students’ digital literacy, therefore, will also need to address the need for professional development for teachers to ensure they are fluent in digital technologies themselves and that they are properly equipped to facilitate students’ development in this area.
Conclusion

Robinson (2008) describes the digital age in terms of the ‘other climate crisis’ where technology and demography are reshaping the fundamental structures of industry and education. While digital technologies are now ubiquitous, the ability to use them with the confidence to apply them with a high level of complexity across a full range of contexts is far less evident. As technologies continue to evolve at a rapid rate and the industries which graduates enter evolve equally rapidly, the need to produce graduates that are immediately digitally ready but also able to adapt to the technological challenges of the future is a pressing one.

The taxonomy proposed in this paper attempts to synthesise a model for digital literacy that embraces the diversity of the concept and allows teachers to address how students’ skills can be developed to match the complex requirements of the 21st Century. Further work is required to validate and contextualize it across a range of disciplines relevant to tertiary education. This can be achieved initially through expert review by key educators throughout the tertiary sector. Given the importance of digital literacy, such collaborative refinement of the model may lead to identifying threshold learning outcomes that embrace the multiple dimensions that can then be applied to higher education curricula. Not all of the characteristics proposed here may be relevant to all courses, but one thing is abundantly clear: in order to be productive in their chosen careers, university graduates will need not just to show competence in computer applications but to demonstrate critical and creative mastery of digital information and tools. Universities have a responsibility, therefore, to equip students for this need, producing graduates that are confident and ethical participants in an increasingly intricate and potentially disorienting digital society.

References


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