

Embedding Digital Literacies in Curricula: Australian and Malaysian Experiences

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Abstract The ubiquity of Web 2.0 technologies means students require a base level of digital literacies in order to succeed in twenty-first century (C21st) learning environments. However, in the era of widening university participation, it is problematic to assume that students will enter higher education with the digital literacies required to support their academic endeavours. This paper describes the theoretical and pedagogical impetus behind two distinct approaches to enhancing digital readiness among undergraduate students in Australian and Malaysian universities. A comprehensive literature review and adoption of the Joint Information Systems Committee (Jisc) six capabilities of digital literacies model as the underlying theoretical framework guided the development of two distinct projects: one based at an Australian university and the other at a Malaysian university. The Australian approach focused on the development of a suite of online modules utilising an adaptive e-Learning platform (AeLP). The Malaysian approach focused

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on facilitating digital readiness among education students through student-created learning objects that simultaneously served as interactive pedagogical products and cognitive tools for facilitating learning. The cases presented demonstrate two distinct approaches to developing curriculum to support students' digital literacies that respond to two different contextual situations. Subsequent investigations into the student experience will inform future decisions regarding the use of AeLPs and cognitive tools in tertiary institutions, in addition to providing valuable information on the design of curriculum to support digital literacies instruction in the Australasian university context.

Keywords Digital literacies • Curriculum design • Higher education • Adaptive e-Learning • Cognitive tools

Introduction

The ubiquity of Web 2.0 technologies means students require a base level of digital literacies in order to succeed in twenty-first century (C21st) learning environments. However, in the era of widening participation, it is problematic to assume that students will enter higher education with the digital literacies required to support their academic endeavours (Kennedy et al. 2009). Even students with high ICT skills “do not necessarily expect to use these technologies to support some activities, including learning” (Kennedy et al. 2009, p. 4). Consequently, it is necessary to develop pedagogical approaches to integrating digital literacies into curricula (Richardson 2013). This paper describes the theoretical and pedagogical impetus behind two distinct approaches to enhancing digital readiness among undergraduate students in Australian and Malaysian universities. In the Australian context, the approach consisted of an online digital literacies curriculum, authored using proprietary adaptive e-Learning software, and orientated towards digital literacies instruction among a multidisciplinary cohort of sub-degree students. In the Malaysian context, the project focused on student-created digital learning objects. Learning objects were designed by student teachers as cognitive tools to support learning and integrated into an education subject. Together, these approaches demonstrate methods for developing digital pedagogies to enable success in technology-rich university learning environments.

Research Problem

Both Malaysia and Australia are rapidly expanding access to higher education. In this context of widening participation, the ability to engage with learning technologies will be key to success at university. The importance of institutional support for students in the effective use of learning technologies is acknowledged in

benchmarks set by the New Media Consortium (Johnson et al. 2015). However, diverse student cohorts result in variable levels of digital literacies in the classroom. Students require support to develop their usage of technology in academic contexts, and the provision of curriculum relevant methods for supporting digital readiness is one of the key challenges associated with teaching and learning in technology-rich environments. Consequently, this project seeks to answer the research question: How can targeted curriculum support the development of digital literacies for academic success in the higher education sector?

Objectives

The objective of this paper is to describe how a review of the literature has informed the design of two distinct approaches to embedding digital literacies instruction into university curricula: one approach is based at an Australian university and the other at a Malaysian university. These distinctive approaches demonstrate how digital literacies instruction can be tailored to suit specific cohorts and disciplinary requirements. Together, the cases illuminate the role interactive technologies can play in developing digital literacies and the manner in which research informed curriculum design can enhance students' digital readiness.

Methodology

A literature review exploring definitions of digital literacies and research into digital readiness in Australian, Malaysian, and international contexts was completed. The literature review was complemented by a review of pedagogical approaches to e-Learning design, exploring the intersections of authentic learning and the use of Web 2.0 technologies as cognitive tools. The findings of these reviews provided the theoretical, conceptual, and pedagogical impetus for individual campus teams in Australia and Malaysia to design their respective curriculum interventions.

Two different approaches, modelling distinct methods for digital literacies instruction, have subsequently been developed. The first approach consists of a suite of online modules, developed using an adaptive e-Learning platform (AeLP), that are currently being trialled at an Australian regional university within a bridging course designed to aid student's transition into tertiary study. This open access course attracts a diverse array of multidisciplinary students and serves as a "stepping stone" to Bachelor qualifications. The second approach is focused on facilitating digital readiness among preservice teachers, at a public university in Malaysia, through student-created learning objects that simultaneously serve as interactive pedagogical products and cognitive tools for facilitating learning. Together, these respective approaches show how digital pedagogies can enable the integration of digital literacies instruction into curricula.

Discussion

Throughout the design process, the *Educating the Net Generation* report and toolkit (Kennedy et al. 2009) was central to our understanding of digital literacies in the Australian context. Kennedy et al. (2009) administered an “experiences with technology” questionnaire, followed by qualitative data collection, to further explore student experiences with technology. Key findings from the questionnaire indicate that:

- there is little empirical support for the rhetoric that university students are digital natives and university staff are digital immigrants;
- there is great diversity in student experiences with and preferences for the use of technology in higher education;
- the data paints a complex picture of the technological experiences first-year university students bring to higher education.

(Kennedy et al. 2009, p. 3)

These findings are confirmed in research conducted among Malaysian university students that similarly questions the classification of students as “digital natives” and highlights the complexity of students’ relationship with technologies (Shariman et al. 2012). Shariman et al. (2012) also identified some distinct themes with regard to Malaysian students’ engagement with digital resources that do not appear as prominently in the Australian literature, namely English language difficulties, which prevent students from reading and critically responding to online content, and a preference for immediacy that may lead to superficial engagement with online instructional materials. They also found that Malaysian students particularly preferred multimodal content that contained both audio and video information (Shariman et al. 2012).

In an international context, the US-based organisation, EDUCAUSE, also provided significant insight into the digital literacies of students. In 2015, their annual Study of Students and IT surveyed the digital practices of 50,274 students, at 161 institutions, in 11 different countries (Dahlstrom et al. 2015). Some key findings of the 2015 student survey were as follows:

- students’ academic use of technology is widespread, but not deep;
- although omnipresent in students’ lives, leveraging technology as an engagement tool is still evolving;
- students have a complex relationship with technology—they recognise its value but still need guidance in order to use it in meaningful ways.

(Dahlstrom et al. 2015)

These findings confirm and expand on the outcomes of Australasian studies with regard to the lack of empirical support for the assumption that students are necessarily “digital natives”. However, international findings regarding the omnipresence of technologies should be viewed with caution. Shariman et al. (2012) and Kennedy et al. (2009) both highlight the manner in which socio-economic status

(SES) can impact access to digital technologies. Shariman et al. (2012) found that low SES Malaysian students primarily accessed the Internet through university networks. These findings are mirrored among regional Australian students. In a university readiness assessment, 40% of the cohort participating in the curriculum intervention described below reported having no Internet access at home. Access to digital technologies is fundamental to the development of digital literacies, and while universities can act as access hubs, the literature indicates that guidance is necessary if students are to use digital technologies effectively for study.

Students require a base level of digital literacies in order to succeed in higher education; however, a definition of what actually constitutes digital literacies continues to develop. For example, Belshaw (2014) suggested that there are eight elements of digital literacies: cultural, cognitive, constructive, communicative, confident, creative, critical, and civic. In earlier work, Lankshear and Knobel (2003) identified three dimensions: operational, cultural, and critical. Operational literacies included competence with tools and procedures, while the cultural dimension was concerned with a person's ability to understand text in its cultural context. Finally, the critical dimension was described as an awareness that literacies are socially constructed. As investigations into the nature of digital literacies have advanced, the UK's Joint Information Systems Committee (Jisc) have been instrumental in

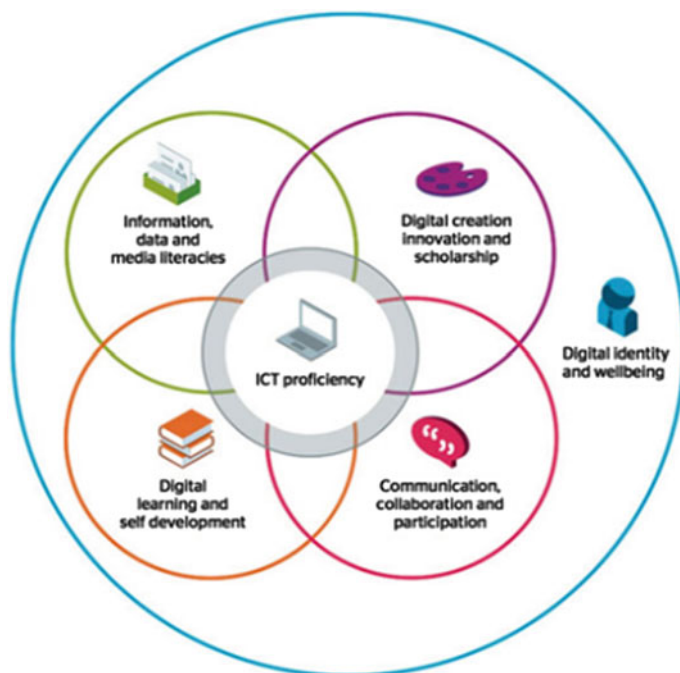


Fig. 1 Jisc's six capabilities model of digital literacies. Reprinted from "Building digital capability", by Jisc (2015a, b). <https://www.jisc.ac.uk/rd/projects/building-digital-capability>

bringing together these differing definitions and creating a conceptual framework (Jisc 2015a, b) that describes the digital literacies necessary for student success. The Jisc (2015a, b) six capabilities of digital literacies model (Fig. 1) acknowledge that digital literacies are multifaceted—incorporating multiple aspects of literacies and multiple literacies. The model identifies the variety of digital literacies that higher education students need to master—including ICT literacies; information, data, and media literacies; digital learning and self-development; digital creation, innovation, and scholarship; and identity and well-being. The comprehensive, yet flexible nature of this model resulted in its selection as an underlying theoretical framework for the development of the adaptive e-Lessons and student-created learning objects described below.

Adaptive e-Lessons

The e-Lessons, utilised in the Australian context, use an adaptive e-Learning platform (AeLP) to contribute a reusable technical solution to the challenges associated with digital literacies instruction among diverse cohorts in non-computer science-based disciplines. In doing so, the lessons build on findings from the 2007 to 2012 Adaptive Mechanics project, which demonstrated the capacity of adaptive tutorials (ATs) to advance the attainment of learning outcomes and comprehension of threshold concepts in first-year engineering subjects (Gangadhara Prusty et al. 2013). The Adaptive Mechanics project identified a positive correlation between the use of adaptive tutorials, student outcomes and course satisfaction, as well as showing reductions in failure rates and significant improvements among under-prepared students (Gangadhara Prusty et al. 2013). The adaptive digital literacies lessons build on these successes.

In accordance with identified requirements of incoming students, the lessons are orientated around information data and media literacies. The lessons follow the narrative of a simulated group project, during which students direct virtual group members (henceforth referred to as non-player characters, or NPCs) through a series of research and data analysis activities culminating in the creation of a faux research poster. Throughout the lessons, two supporting characters in the form of a librarian and a lecturer guide the student user through lesson activities in addition to providing feedback and remediation where necessary. In accordance with the lesson narrative, each of the NPCs embodies specific strengths and common misconceptions. The student completing the simulation subsequently has to negotiate with their NPCs to solve a series of challenges orientated around information, data, and media literacies. There are three levels of adaptivity built into the platform used for the e-Lessons: adaptive feedback, adaptive learning pathways, and adaptive content authoring. The adaptive feedback allows for the provision of targeted help and enables the platform to address specific misconceptions in response to student input. Adaptive learning pathways provide varying sequences of content that facilitate fast movement through the lessons where information is known, or

remediation where necessary. Finally, adaptive content authoring and analytics enable instructors to track lesson outcomes, assess their efficacy, and adjust content and learning pathways accordingly. In combination, these various levels of adaptivity facilitate a holistic learning experience where active learning, explicit instruction, and evaluation combine to facilitate success among diverse learners.

Student-Created Learning Objects

In the Malaysian context, preservice teachers were required to participate in a learning task that asked them to create digital learning objects for use in teaching secondary school chemistry classes. The integration of this project into an existing education curriculum provided student teachers with the opportunity to enhance their IT, digital media, and design skills, while concurrently building their ability to select appropriate media for use in teaching chemistry (P21 2007). The task began with explicit instruction on the IT skills required to develop the digital objects. Students then translated their understanding of a chosen chemistry content area into a digital presentation to be used as a cognitive tool for learners in secondary schools.

Cognitive tools are computer-based tools that can be used to provide students with C21st skills, such as problem-solving, and help them become lifelong learners (Bransford et al. 2000; Jonassen 1996). A key aspect of the task asked the pre-service teachers to design the digital learning objects in a way that could be easily understood by secondary school students. This design process required wide reading, which in turn enabled students to consolidate their own understanding of chemistry content and visualise abstract nanoscopic concepts through animation and simulation. Students utilised Microsoft PowerPoint, Adobe Flash, or iSpring to design learning objects that contained interactive elements. The design of this task exemplified the use of technology as a cognitive tool that can support student teachers to develop their abilities to comprehend and present information in a meaningful way (Jonassen and Reeves 1996). In addition, the students learned the design and IT skills associated with producing a cognitive tool for learning, thus contributing to the development of their own digital literacies. When mapped against the Jisc (2015a, b) six capabilities model, student teachers are developing digital learning and self-development, digital creation, innovation, scholarship, and ICT proficiency. Furthermore, the project integrates a self-assessment and reflection component that facilitates improvement of the digital object they have produced. C21st educators need to be able to design and create digital learning objects that can serve as cognitive tools to promote meaningful and active learning. This project enables preservice teachers to engage in this creative design process, thus providing an authentic learning experience where task design and the context in which learning occurs reflect processes of knowledge application in the “real world”.

Contributions

The two case studies presented in this paper demonstrate how literature on digital literacies can inform the embedding of digital literacies instruction into university curricula. Both projects respond to the requirement that universities provide explicit digital literacies instruction in order to facilitate student success in technology-rich learning environments. In the Australian case, an AeLP was used to combine processes of explicit instruction, active learning, and personalised feedback into a suite of stand-alone lessons that can supplement existing subject content. In the Malaysian instance, processes of digital learning and self-development were implicitly integrated into an existing curriculum through an IT-orientated project that utilised digital technologies as cognitive tools to enhance student learning. Together, these cases illuminate the role interactive technology can play in developing digital literacies and the manner in which digital literacies instruction can be tailored towards institutional, cohort, and disciplinary contexts. Giving students the opportunity to work creatively with digital learning objects (either as content users or creators) can provide structured support that is adaptable to individual learning levels.

Conclusions

Digital literacies are increasingly being recognised as a key attributes that students must develop in order to succeed in tertiary education and employment. Research suggests that digital literacies instruction is necessary and that the rhetoric of “digital natives” is not helpful when it comes to supporting students. Learners need support for developing transferable digital literacies that can be used in academic and professional environments. In order to support this, Jisc (2015a, b) has provided a model that can be readily adopted and deployed in curriculum development. The cases presented in this paper demonstrate two distinct approaches to developing curriculum to support students’ digital literacies that respond to two different contextual situations: in the first case, through the use of an AeLP to provide explicit online instruction; in the second case, through the project-based learning using digital technologies as cognitive tools. Subsequent investigations into the student experience will inform future decisions regarding the use of AeLPs and cognitive tools in tertiary institutions, in addition to providing valuable information on the design of curriculum to support digital literacies instruction in the Australasian university context.

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