

The iPad guarantee: information literacy, the library and a reinvigorated undergraduate science program

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Abstract

The year 2011 saw a seismic shift at the University of Adelaide, with the rollout of nearly 700 iPads to commencing first year Faculty of Sciences students. The iPads were symbolic of a broader move by the faculty to reinvigorate undergraduate teaching and learning. This paper will look at the implications for the library of a faculty making significant changes. It will examine the impact of the changes, namely the move to eTextbooks, and the practical and pedagogical challenges of embedding information literacy in SCIENCE 1100, a new flagship first-year science course with a student-iPad coverage of 100%.

Introduction

“We'll never stop sharing our memories. Or getting lost in a good book. We'll always cook dinner and cheer for our favorite team. We'll still go to meetings, make home movies, and learn new things. But how we do all this will never be the same” (Apple 2011, iPad 2 advertisement)

Successfully engaging with new technologies poses great opportunities and great challenges for libraries. In 2011, the University of Adelaide provided iPads to commencing first-year Faculty of Sciences students as part of a longer-term commitment to reinvigorating the science curriculum and mode of content delivery. This reinvention comprised a commitment to making the curriculum more relevant and accessible by designing it around ‘10 Big Questions’ (Barovich 2011). These questions, grounded in the Faculty’s research strengths, and demonstrating social and scientific relevance, were identified following extensive internal staff consultation. The reinvention also heralded a shift towards a more interactive and collaborative learning environment, including the use of mobile technologies, and included a staged approach towards utilising solely open source materials for courses (Barovich 2011).

Within the higher education context, libraries have acted as a support service with multifaceted involvement in teaching, learning and research. Libraries have tended to have a dual focus: firstly, on collection development and associated services, and secondly, an increasingly active role in student information literacy development. The iPad rollout and the innovation it represented posed challenges for the Barr Smith Library in both core service areas. The first challenge was to collection development, with the faculty committing to eTextbooks for 2011 and a move to open source materials in future years (Barovich 2011). The traditional role of the Library in providing access to recommended and required texts for students who cannot afford or choose not to purchase textbooks became complicated by publisher eTextbook sales models and licensing. Ultimately this raised the spectre of whether the Library should, or perhaps more appropriately *could*, continue to have a role to play.

The second challenge came in the form of Library involvement in *SCIENCE 1100: Principles & Practice of Science 1*. In a departure from standard first-year science subjects, SCIENCE 1100 did not focus on traditional science content and subject matter, but rather on the principles, roles and rationale of science and the process of scientific communication (particularly academic writing). The emphasis of SCIENCE 1100 on scientific communication had strong crossover with areas of information literacy, providing an ideal opening for Library involvement. This took the form of assisting with curriculum and assessment development, and content delivery. Debuting at the same time as the iPad rollout, and limited to Faculty of Sciences enrolled students, SCIENCE 1100 had the advantage of a 100% student-iPad coverage. With the iPad providing a personalised yet standardised platform, SCIENCE 1100 could be designed with mobile computing as a key pedagogical consideration, and one that could be used to greatly facilitate a student-centred, active learning approach.

This paper will look at the impact on the Library of a faculty making significant changes to its approach to undergraduate teaching and learning. It will examine the impact of the changes, namely the move to eTextbooks and the opportunities and

challenges of embedding and delivering information literacy in a technologically enhanced classroom. It will also look at the mechanisms that led to Library involvement in the development and delivery of SCIENCE 1100, and the practical and pedagogical design principles used throughout the course to maximise teaching and learning benefits.

Background

The new approach to teaching being taken at the University of Adelaide has seen science placed more firmly within its everyday context, with the aim of making science more accessible and immediately relevant. A two-year period has seen the University's research strengths in the sciences being used more overtly to inform teaching, commencing in first year science. The most visible manifestation of the change is the redevelopment of the science curriculum around the '10 Big Questions' or issues facing society, such as climate change and food security (Barovich 2011), which correspond to areas of research excellence at the University. Alongside the change in content was a change in pedagogical style, with the iPads marking a significant step towards the faculty's goal of creating a more student-centred, collaborative, interactive and technologically rich learning environment (Barovich 2011).

In September 2010, the University of Adelaide announced that all commencing first year Faculty of Science students would receive an iPad in one of the first large-scale educational rollouts. In making the announcement, Executive Dean of the Faculty of Sciences, Professor Bob Hill, stated that the iPad "will revolutionise the way science is taught at the University of Adelaide. We will be the first university in Australia to teach in this innovative way" (University of Adelaide 2010). The rollout was a trial for 2011, and the iPad itself was selected for the trial following evaluation of a number of devices. The iPad rollout was designed as an opportunity for academics to evaluate how new technologies could enhance teaching and learning. It was also aimed at increasing enrolments in the Faculty of Sciences, both as part of a marketing strategy and, more significantly, as a catalytic tool for the new approach to teaching undergraduate science at the University of Adelaide.

iPads were given on a permanent basis to all commencing first year Sciences students in 2011 who enrolled in a minimum of two semester 1 courses within the Sciences program, and remained so until after the census date (University of Adelaide 2011b). The iPads were both WiFi and 3G enabled, and therefore able to connect to the wireless network on campus, while also providing the students with the opportunity to set up their own 3G internet access. Most first-year science subjects include a mix of commencing and continuing students, as well as students taking science subjects but enrolled in non-science degrees. Within the 'big 4' first-year disciplinary courses (Biology, Chemistry, Geology and Physics) the majority of, but not all, students were given an iPad as part of the initiative. While iPads were considered a useful tool by the faculty for all first-year science subjects, academics were unable to fully embed the iPad within the course. The exception was a new subject, SCIENCE 1100: *Principles & Practice of Science*, which was limited to Bachelor of Science students, and had a student-iPad coverage of 100%.

Information literacy

“The most important challenge for mobile learning is whether we can embrace the technology as a genuinely new form of engagement with students”

John Ittelson, California State University (Grush 2009 in Lippincott 2010, p. 212)

Information literacy has many faces, from the technological to the philosophical, and has been the subject of much debate and interpretation (e.g. see Pinto, Gómez Díaz & Córdón 2010; Špiranec & Zorica 2010). Definitions range from the relatively mechanistic and practical: "a set of abilities requiring individuals to recognise when information is needed and have the ability to locate, evaluate and use effectively the needed information" (American Library Association, in Luo 2010, p. 32) to the cultural and societal where information literacy becomes the means through which we acquire the necessary knowledge to "understand, improve and benefit from living in our society" (Pinto, Gómez Díaz & Córdón 2010, p.5). Within the Australian context, an influential and widely used definition and set of standards are contained within the 2004 *Australian and New Zealand Information Literacy Framework: principles, standards and practice* (ANZIL framework). Under the ANZIL framework, an information literate person is one who (2004, p.11):

1. recognises the need for information and determines the nature and extent of the information needed;
2. finds needed information effectively and efficiently;
3. critically evaluates information and the information seeking process;
4. manages information collected or generated;
5. applies prior and new information to construct new concepts or create new understandings; and,
6. uses information with understanding and acknowledges cultural, ethical, economic, legal, and social issues surrounding the use of information.

Despite the difficulty in defining information literacy, librarianship as a profession has “long worked to promote the knowledge and skills necessary to be effective consumers of information” (Saunders 2009, p. 99) and has played an instrumental role in the development and promotion of information literacy (Ross & Sennyey 2008). Recognition of the need for information literacy development is not uniform and the ‘information literacy’ label itself can be problematic, being dismissed by both students and academics alike as ‘library research skills’ or inferred within a broader ‘generic skills’, ‘graduate attribute’ or ‘research skills’ label (Saunders 2009). Despite this, in 2010, library staff from across the Australian university sector conducted over 27,000 group information literacy /library skills sessions that reached over half a million students and staff (CAUL 2010).

SCIENCE 1100

“If there is one resounding message about undergraduate perceptions about technology, it is this: Technology could be used much more strategically to engage students in academic life.” (Dahlstrom et al. 2011, p.4)

In a departure from traditional discipline-based subjects, the major focus of SCIENCE 1100 was to engage students in a conversation about science (what it is,

how it operates and what makes it unique). In a clear crossover with information literacy, a minimum of one hour per week would be devoted to introducing and developing scientific literacy skills, particularly those related to finding, reading and interpreting scientific literature. The course was developed following a 2007 University review of the Bachelor of Science that recommended that the degree include a “flagship inter-disciplinary, first year course” (University of Adelaide 2007, p.7). A secondary driver was an internal research project investigating the extent to which Graduate Attributes, such as “to value the close relationship between scientific research and the development of new knowledge” and “the ability to communicate scientific information effectively, both orally and in writing” (University of Adelaide Faculty of Sciences 2011) were being explicitly addressed or developed in the four major first-year disciplinary courses.

Key findings of the project included evidence across the disciplines that many of the ‘soft skills’ that formed the basis of the graduate attributes were being assumed and not actively taught, particularly academic writing. Of greater concern was the finding that students (particularly international students) did not think that their ‘soft skills’ had developed much over their first year of study. In seeking to redress the gap, the University of Adelaide was not alone, with the higher education sector “placing increasing value on its role in the development and embedding of generic skills into the learning experiences of students” (Dean, Cowley & Yung 2009, p.1). While the literature consensus tends to be that generic skills, and information literacy, are best “integrated and embedded into a curriculum, and not incorporated using a ‘bolt-on’ or checklist approach” (Bowden et al., 2000 in Dean, Cowley & Yung 2009, p.2), Faculty opinion was divided as to whether emphasising the development of more generic, soft skills was important enough to take time away from discipline-specific knowledge. Secondly, if it was important enough, whether it required a specific course explicitly designed around the development of those skills.

Contact time for SCIENCE 1100 comprised one hour per week devoted to career & personal development learning (in collaboration with the University’s Career’s Service), four hours to group and open discussion of what science is and how it works (including consideration of key elements of scientific practice and utilisation of the developing scientific literacy skills) and the remaining hour to introducing and developing scientific literacy skills. The iPad rollout announcement was made after planning for the subject was underway, causing a significant rethink in terms of how the curriculum, and presentation of the curriculum, could be modified to take advantage of the device. The use of the device within the course also necessitated significant input and assistance from the University’s information technology department. SCIENCE 1100 was scheduled into two separate lecture theatres, and both were upgraded to have closed Wi-Fi networks, so that all students would be able to simultaneously access the wireless network with good bandwidth performance. The recommended text was an eTextbook that students could purchase and download onto their iPad. Students could also access their eTextbook online (by logging into the relevant site) or download it onto a laptop. In addition, the subject incorporated *MyWritingLab*, a commercial online learning program designed to progressively develop students’ writing and comprehension skills.

SCIENCE 1100 provided both a challenge and an opportunity for the Library in terms of information literacy. It challenged the Library to take part in building a pedagogically sound, collaborative, active-learning experience for the students, and

one that could make the most of an iPad enabled classroom. The Library was involved in assisting with the development of, and provision of content for, several of the weekly tasks (including analysis of the structure of a journal article, and recognition of the difference between scholarly and non-scholarly communication) and was directly responsible for creating and running a two-hour session on information search strategies. The Library also provided feedback and advice on information literacy issues relating to the major student assessment tasks (a literature review and essay). Each task was built with a collaborative, active learning approach in line with the subject coordinator and Faculty's approach to learning, and also in congruence with the library literature itself. There is widespread recognition of the need to move away from a traditional lecture/demonstration approach, with "abundant literature on the need for librarians conducting information literacy instruction to emphasize active learning techniques" (Bell, 2007, p.99) to provide better educational outcomes, such as improved retention and understanding. Each task was designed around the desired learning outcomes, with consideration given to the interactive and collaborative opportunities provided by the iPad, including live information searching, feedback and discussion through microblogging and real time wiki authoring.

The major benefit of the iPad rollout was the provision of a personal yet standardized mobile device that could legitimately be considered a required educational tool for participation in SCIENCE 1100. According to the 2011 ECAR National Study of Undergraduate Students and Information Technology survey, "students have a clear preference for smart, mobile devices (nearly nine in 10 students own laptops, more than half own smartphones, and one in 10 owns an iPad or other tablet)" (Dahlstrom et al. 2011, p.4) and the majority of students believe that technology, when used effectively by academic staff, enhances their learning experience and outcomes. This raises an interesting challenge for education, as while "mobile devices can offer more opportunities for students to be actively engaged in their learning and to fully participate in the social nature of learning" (Lippincott 2010, p.211), the diversity in device capability and ownership creates a considerable barrier to deeply embedding technology into a course. With all students in SCIENCE 1100 having an iPad, significant interactive/collaborative activities based around the use of online tools and resources (wikis, blogs, discussion boards & journals) could form an integral part of the in-class work.

Library involvement

As an example of Library involvement, a suite of tasks were constructed where students examined the similarities and differences between the reporting of a scientific idea in a newspaper article, a popular science article and a scholarly article. Students then contributed to a real time group wiki located within the learning management system.

However, the intersection of Library, mobile technology and pedagogy is best seen in the two-hour information skills workshop where the use of the iPad and an active learning approach saw a change to standard course dynamics with students "doing the work of discovery while using the resources. The balance of the session shifts from librarian to student" (Kenney 2008, p.389). For the workshop, discovery was both metaphorical and literal. The information skills session comprised several demonstrations but largely centred on students working as individuals and as part of

small groups to create and explore their own “search evolution”. This involved the students using the iPad to engage with the capabilities of two search tools: Summon (the Library’s resource discovery layer) and Web of Science. The students started with a basic search strategy then, using the techniques introduced throughout the session (e.g. Boolean operators, truncation) developed more sophisticated queries. Students were encouraged to reflect on the differences in search results and, more importantly, the implications of the differences in search results, and used the iPad to add their findings to a real time group wiki located within the learning management system.

While a hands-on and reflective approach to developing information search skills is not revolutionary, the use of the iPad did facilitate several subtle, but important differences. Firstly, the students were engaging with materials ‘on their own turf’: within the standard class environment (rather than a computer barn, or within library training rooms). They were also participating and seeing the process and results on their own mobile devices, reinforcing the notion that information seeking skills are not just a ‘library issue’ or removed from everyday study, but are an integral element of university study. Secondly, the use of the mobile device created a flexible learning environment in which tasks could be interchangeably undertaken as individuals and as part of a group, and the online was seamlessly woven into an in-class learning experience. Students could readily engage with each other and with the online content, creating a scenario where “sessions are lively, students are engaged, and faculty are pleased with the results” (Kenney 2008, p. 387).

Implications for the Library

“Managing diverse technologies and weaving them all into a coordinated pedagogy is a challenging business requiring diverse expertise... there are opportunities to inspire student participation and interactivity with existing technology, but the technology by itself isn’t sufficient and doesn’t guarantee successful learning outcomes.” (Dahlstrom et al. 2011, p.25)

Involvement in SCIENCE 1100 highlighted two main issues for libraries and librarians involved with information literacy development. In order to participate in the development of a curriculum, and to advocate for the Library’s understanding and experience of information literacy issues, an up-to-date understanding of pedagogy was required, alongside an understanding of how new technologies could facilitate pedagogical outcomes. This can be problematic, as “one area in which academic librarians lag is our understanding of pedagogy and adoption of instructional design theory and practice” (Bell & Shank 2004, p.373)”, while Saunders notes “for librarians to be truly integrated into the curriculum rather than offering one-shot sessions, they must have much more pedagogical and theoretical knowledge” (Saunders 2009 p.107). Working in a collaborative environment involving faculty, librarians, learning designers and student advisors, a shared understanding of pedagogy can act as a bridge to the different conceptualisations of information literacy, and the priority it should be afforded.

At the Barr Smith Library, opportunities for professional development include sponsored staff places in the University of Adelaide’s Graduate Certificate in Online Learning and Graduate Certificate in Education (Higher Education). Such opportunities ensured that staff involved in research and reference services could

develop and maintain knowledge of teaching and learning theory and practice. The development of this understanding by library staff enabled influence beyond a one-shot session. In providing input based on a sound knowledge of current pedagogy, the library was able to integrate into the curriculum its own understanding of and ideas for circumventing the problems frequently seen at the research help or information desk.

A second key influence on the Library's ability to successfully participate was the quick response by senior staff to the Faculty's iPad rollout. While academic libraries have a long tradition of excelling at "grasping the significance and potential of technology as a powerful force" (Bell & Shank 2004, p. 373), they have not necessarily been quick to act on that potential, often earning the reputation of "thinking long and hard, debating all of the fine points, before deciding to implement a new technology or technology-based service, sometimes missing the peak of the trend" (Jacobs, 2010 in Lippincott 2010, p.212). In this instance, the potentially game-changing nature of the iPad rollout was recognised and within weeks, iPads were provided for all senior library staff, the Research Librarian for the Science Faculty, and subsequently to staff within the Research and Reference Services section.

The iPad was viewed as having wider implications for staff assisting students on service desks and for staff involved with information literacy development (both as a tool to conduct sessions, and as a device that should be considered in terms of the content of the session). The provision of iPads allowed staff to develop a thorough working knowledge of the device and its use in accessing and managing information, enabling a more responsive and knowledgeable service. This is particularly important given the complexities of information sources available via an academic library, and that "at the most basic level of pedagogical effectiveness, students want technology to work and for instructors [and librarians] to know how to use it" (Dahlstrom et al. 2011, p.30)

The iPad rollout also highlighted challenges around the increasingly mainstream use of eBooks. The University of Adelaide has over 105,000 eBooks (includes current & subscription eBooks, CAVAL 2010) available from multiple vendors and with a myriad of different purchasing arrangements and access models, not all compatible with the iPad. According to the ECAR survey, a "majority of students (57 percent) also use e-books or e-textbooks for academic or personal purposes" (Dahlstrom et al. 2011, p.14) while the 2011 Horizon report lists eBooks with a time-to-adoption timeframe of one year or less (Johnson et al. 2011). Yet despite solid usage, a "surprising number of students say they are not fully confident that they have the technology skills to meet their needs [39% for e-books or e-textbooks]" (Dahlstrom et al. 2011, p.20), which may provide an opportunity for information literacy instruction.

As part of the overall change program, SCIENCE 1100 and the four major disciplinary subjects moved to eTextbooks for 2011. This process commenced in late 2010 with the course coordinators discovering that for the 'big 4' disciplinary courses, the textbooks currently in use were not available in Australia in e-format. Discussions were held between the Faculty of Sciences and the publishers regarding fast-tracking the availability of the textbooks in online format, with the upshot that all four disciplinary subjects, plus SCIENCE 1100, were able to recommend eTextbook titles for 2011. The Barr Smith Library became involved in the project subsequent to the

initial discussions between the Faculty and publishers. Of the publishers later contacted by the Library, none would enable the Library to provide access to the online version of the textbook. For 2011, this meant that the Library continued to provide print-based access to each of the recommended textbooks.

There are many eBook and eTextbook business/licensing models, and the marketplace is changing as publishers expand access to textbooks and other digital materials, through ventures such as *CourseSmart*. In this instance, the refusal of publishers to allow the Library to provide access to the required eTextbooks poses questions for the continuation of the Library's equity and access role. An internal survey of first year Geology students in mid-Semester 1 2011 found a generally positive response to the course eTextbook, and it is estimated that textbook penetration increased following the introduction of the online version. However, despite the lower cost of the online version, textbook affordability remained a key concern, and issues around access and application ('app') functionality emerged (University of Adelaide 2011a).

As eTextbooks become more sophisticated, and move away from merely an online replication of the print text to incorporating interactivity and multimedia elements, such as is seen in apps like Inkling, the gap between the print and online widens. As Lippincott questions: will the library's emphasis on the "provision of fee-less access to information... survive in the wake of personal ownership and management of information? The mobile revolution offers both challenges and opportunities for academic libraries." (2010, p.212). With the Faculty's stated goal of moving away from textbooks to open source content, the goalposts continue to shift. However, the ongoing challenge for the Library is to be a central part of the discussions. In terms of a move to eTextbooks, Library involvement can help ensure academics are aware of the potential implications of moving to eTextbooks and the varying publisher business models, and that they take advantage of the Library's existing relationships with many of the publishers. Being part of the discussion also provides an opportunity to highlight the range of eBooks and eTextbooks that are already available via the Library, and the mechanisms through which they can be embedded within learning management systems. Despite publicity regarding the acquisition of new eBook packages and the availability of eBooks in general, discussions with Faculty staff consistently reveal limited awareness of existing eBook access, and the Library's role in the provision of that content.

Response to the iPad rollout and SCIENCE 1100

Initially a trial for 2011, the iPad rollout is to be extended to 2012; however, at present there are no plans to make the rollout permanent. Faculty of Sciences enrolments did increase for 2011 although it is unlikely that the iPad itself had a significant impact, with anecdotal evidence suggesting many of the enrolled students were unaware that they would receive an iPad. SCIENCE 1100 will return for 2012. Faculty concerns regarding time being diverted away from disciplinary content have, to a large extent, been allayed by recognition of the scientific writing and communication skill set that the students developed. Formal evaluation of the impact of SCIENCE 1100 is currently in progress, however at least one Faculty of Sciences semester two course-coordinator found that students who had taken SCIENCE 1100 exhibited significantly improved information literacy skills in comparison to other students in that course, as well as in comparison to previous years.

Student response to the subject was largely positive. Results of the official Course SELT (Student Experience of Learning and Teaching) survey indicated that students perceived that their thinking skills and ability to work independently had improved (broad agreement of 67% and 66% respectively). Students also indicated that they participated in interactive/collaborative classroom tasks with their iPads (82% broad agreement). Student response to the Teacher SELT survey strongly indicated a classroom environment where there was enthusiasm for encouraging student learning (99% broad agreement) and where student participation was encouraged (98% broad agreement). In addition, the reflective writing tasks set as part of the course assessment demonstrated a deep level of engagement with the nature of science, and of scientific communication. The writing tasks revealed that many students, echoing faculty concerns, were not convinced at the outset of the need to understand and develop skills in scientific communication, particularly at the expense of discipline specific knowledge, and the real benefits only became apparent over time and with reflection.

Conclusion

“As devices with compelling new features emerge and wireless connectivity is almost ubiquitously available, we may be on the verge of a revolutionary phase of mobile device impact on higher education and libraries.” (Lippincott 2010, p.205)

As university libraries continue to reposition themselves in the mobile digital era so too do the educational and technological environments in which they operate. For the University of Adelaide Library, major changes within the Faculty of Sciences offered the Library an opportunity to embed information literacy within SCIENCE 1100, an active learning, technologically-enhanced classroom. With the iPad rollout providing a standardised mobile environment, the library was able to design and facilitate an interactive and collaborative approach to information literacy development, and one based around utilising the online information environment. Given the portability and functionality of the device, students could work independently and as part of a group, and interact with the online library almost simultaneously. They could also do so within their standard class environment and using their own personal device, reinforcing the notion that information skills are a core part of academic development.

Successfully capitalising on emerging opportunities requires that libraries recognise and quickly respond to a changing environment. The opportunity to be part of a new subject from its inception was due in no small part to steps taken by the Library to ensure staff had the theoretical knowledge and practical skills required. Theoretical knowledge, in the form of a current understanding of pedagogy and online learning theories, was provided via select staff development opportunities while practical skills were developed following the rapid rollout of iPads to key library personnel. However, alongside the opportunities provided by technological development are the risks. For 2011, the Library was not able to provide online access to the eTextbooks recommended to students enrolled in the core first year science subjects. Access platforms and models continue to evolve, and while the print copy remains largely equivalent to the online version the disadvantage is not significant. However, this does raise a red flag for the continuation of the Library's equity and access role in an eTextbook environment. Importantly, it highlights the necessity for libraries and

librarians to be involved in the shift towards eTextbooks in order to ensure that such issues form part of faculty considerations.

Information literacy can be a hard sell to students, and the iPad proved to be a significant advantage with its ability to facilitate interactive and collaborative learning. Rather than transforming information literacy, it enhanced an active learning program that was situated within a solid pedagogical framework. However, this is just the beginning, with the iPad and the potential of ubiquitous access to information potent forces in an information landscape that continues to rapidly evolve.

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