Sustainable Decision Making for Emerging Educational Technologies in Libraries

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Abstract

Purpose – To discuss approaches to sustainable decision making for integrating emerging educational technologies in library instruction while supporting evidence based practice.

Design/methodology/approach – The article highlights recent trends in emerging educational technologies and evidence based practice, and details a model for supporting evidence informed decision-making. This viewpoint article draws on an analysis of recent literature, as well as experience from professional practice.

Findings – Authors discuss the need for sustainable decision making that addresses a perceived lack of evidence surrounding emerging technologies, a dilemma that many library educators and practitioner-researchers will have faced in their own library instruction. To support evidence informed selection and integration of emerging educational technologies, a two-pronged model is presented, beginning with an articulation of pedagogical aims, alignment of technological affordances to these aims, and support of this alignment via hard evidence available in the research literature as well as soft evidence found in the environmental scan.

Originality/value – The article provides an outline and synthesis of key issues of relevance to library practitioners working within a challenging and ever-changing landscape of technologies available for learning and instruction. The proposed approach aims to create a sustainable model for addressing problems of evidence and will benefit academic librarians considering emerging

educational technologies in their own pedagogy, as well as those who support the pedagogy of others.

Introduction

With the expanding range of emerging educational technologies that could be introduced to library-supported instruction, making evidence-based decisions for selecting such tools for instructional purposes is a critical yet challenging task. Librarians involved with instruction, whether through their own teaching or when supporting the pedagogy of others, must make evidence-informed decisions about using particular emerging educational technologies. However, such decisions are often complicated by a problem of evidence—due to their newness, there is often a perceived lack of available "up-to-the-minute" research about the pedagogical impact of such new technologies. Engaging with themes of sustainability in changing academic environments, and discussing the balance between planning and innovation, the goal of this article is to identify the problem of evidence and propose an evidence-based decision-making model for selecting and integrating emerging educational technologies in practice. Based upon a literature review and lessons learned from practice, the authors propose a strategy that supports evidence based practice when deciding whether or not to use emerging educational technologies in library instruction.

Emerging Technologies and Trends

Defining Emerging Technologies

A significant amount of research examines the implementation of well-established technologies for library instruction. However, little research addresses the decision-making process around selecting emerging educational technologies in libraries. Indeed, the very concept of "emerging technologies" can be difficult to define. Although information technology and education issues

are frequently the focus for library professionals, ideas of emerging technologies more broadly include transformative and revolutionary developments projected to have impacts in areas as diverse as biotechnology, nanotechnology, and stem cell research (Einsiedel, 2009). As technologies still under development and therefore not yet mainstream, emerging technologies are innovations addressing a user need. Einsiedel (2009) argues that emerging technologies are viewed as inherently bringing strategic value, often in aspirational ways, and as such are future-looking.

Emerging Educational Technologies

To focus our discussion on issues of importance for library instruction, the authors use the definition articulated by Veletsianos (2010), who characterizes emerging educational technologies as the "tools, concepts, innovations, and advancements utilized in diverse educational settings…evolving organisms that experience hype cycles…not yet fully understood, and not yet fully researched" (pp. 3-4). Such technologies are also often projected to have revolutionary or transformative impacts for education. A popular source outlining trends in education is the New Media Consortium's annual *Horizon Report*, which presents key emerging technologies that will impact higher education on a five-year scale. For example, the 2014 report identifies tablet computing, games and gamification, and wearable technologies as just a few of the emerging technology trends impacting teaching and learning (Johnson et al., 2014a). Educators, practitioners, and researchers must be willing to consider whether our own libraries and institutions can and should support these trending technologies. Indeed, this is an important consideration for anyone using educational technologies.

Trends affecting emerging technologies are often discussed in the context of libraries specifically, including those issues outlined in the *NMC Horizon Report: 2014 Library Edition*. The most recent edition discusses several trends and related challenges, such as increased mobile content delivery, electronic publishing, and open resources, identifying notable technological developments forecasted to be important evolutions for libraries over the coming five years (Johnson et al., 2014b). Within academic library settings, the importance of emerging technologies can also be witnessed in discussions regarding the creation of new librarian roles to meet these needs, such as a dedicated emerging technologies librarian. Through her study of this new library position, Radniecki (2013) outlines both the benefits and challenges of emerging technologies in libraries:

> Libraries can leverage these emerging technologies in providing new resources and services that meet their patrons' point-of-need location, device preferences, and information seeking behaviors. New technologies can also make libraries more efficient in utilizing financial, staffing, and space resources. These new technologies also create additional demands upon busy library staffs. (p. 2)

Whether one's job title is emerging technology librarian, user experience librarian, or instructional design librarian, those supporting educational technologies in libraries know first-hand that these tools present unique opportunities as well as challenges. How librarians make decisions that can enable opportunities or mitigate challenges remains an issue needing further exploration.

Trends and Hype Cycles

The rise of massively open online courses (MOOCs) is another trend identified in the *Horizon Report*, with widespread discussion of this trend occurring in academia and the popular media. MOOCs represent an excellent example of an emerging educational technology exemplifying the hype cycles surrounding these tools. MOOCs have been presented as everything from revolutionary and game changing (Leckart, 2012), and "tool[s] for democratizing higher education" (Lewin, 2012), to a phenomenon that is over-hyped and problematic (Schuman, 2013). Maguire's (2014) recent commentary examines in detail how MOOCs exemplify hype cycles (specifically, Gartner's hype cycle model), asking those within higher education to consider the numerous factors that drive hype, such as pressure from government, consultants, leaders, or the media.

Whether MOOCs represent a revolutionary, disruptive technology that alters the very core of academia is a key debate occurring across higher education (Kolowich, 2013). Specific to academic libraries, Wu (2013) endorses MOOCs as change agents, especially with regard to open access and other open educational resources, before adopting a measured voice when noting it is likely that the library role regarding MOOCs will be one of support, wherein libraries "collaborat[e] with stakeholders on all levels" (p. 585). Barnes (2014) recognizes that MOOCs represent multiple opportunities for promoting online library content, online library instruction, and embedded librarianship, but again these reflect existing support roles that are hardly revolutionary. What is missing from these discussions is a fulsome analysis of the pedagogical impact MOOCs have for library instruction specifically and for academic libraries in general. For example, how might MOOCs present opportunities or challenges for the library and its

instructional philosophies, aims, and outcomes? To get beyond the hype, we must find, evaluate, and present clear evidence that supports libraries in their decisions to adopt, or disregard, such emerging educational technologies. This example represents just one of many emerging educational technology conundrums at the core of our call to examine decision-making processes and problems of evidence for library instruction.

Convergence

Another key trend connected to emerging technologies is the idea of convergence, the notion that many of the technologies we use will not only emerge and evolve, but also synergize in unifying ways (Kaldis, 2010). In this way, convergence occurs by building upon and integrating the qualities of previously separate technologies. Google Apps, a popular suite of web-based technologies familiar to many educators and librarians, offers an example of convergence. The Google suite combines email service with previously discrete enhancements and features, such as calendars and talk (combining voice over IP and chat), further enriched through features such as online storage and cloud software. Through Google Drive, users have multiple options for electronic storage, document creation, collaboration and sharing, and dissemination, while Google Sites provides simple, streamlined personal website or e-portfolio. All of these become accessible through a single platform. There is a convergence of features, functions, and characteristics unified in one place.

Other examples of convergence can be witnessed in the increasing prominence of a single access point bringing together separate third-party technologies. Within academic libraries, an example of a convergent emerging educational technology can be seen in the evolution and integration of

so-called “next-generation” discovery tools. Previously discrete library catalogues have been merged with databases and search indices to form discovery layers, and in many cases these are now treated as the primary search interface for library content. Yet in what is perhaps an acknowledgement of the emerging status of discovery layers, many libraries continue to maintain access to those discrete interfaces alongside their discovery layer, so that users still have the option to search via the original stand-alone technology as well as via the convergent one.

Examining the Problem of Evidence

Library Practitioners and EBP

Decision-making processes go hand in hand with evidence based practice (EBP), especially in academic settings. Naturally, there are different approaches to EBP within different professional and disciplinary contexts. Yet EBP is itself a broad reaching, interdisciplinary, and interprofessional concept spanning many professions and disciplines (Smith & Hayman, in press). EBP is quickly gaining mainstream acceptance in librarianship in particular. However, similar to professionalized fields such as education, many within library and information science (LIS) experience tensions between being a researcher and a practitioner (Booth, 2003), and there is a pressing need to bridge this research-practice gap.

Recent discussions of EBP in LIS have taken a variety of forms, and the value and impact EBP has for practitioners involved in decision making is widely recognized. As a case in point, while researching required skills for librarians working frequently in digital environments, Partridge, Lee, and Munro (2010) found “[g]athering evidence to demonstrate feasibility, and undertaking

continual evaluation and assessment of resources and services being introduced…" (p. 327) to be a vital skill for librarians. Such studies underscore the ability to integrate research and practice as essential for all academic librarians, regardless of specialty. Affirming this point, Eldredge's (2014) review establishes the value of EBP as a "social movement among library and information practitioners… [that] serves multiple purposes, among them principally providing a process for informed decision making" (p. 63). Further reinforcing the relationship between evidence and decision making, Koufogiannakis (2014) identifies five factors that enable or inhibit the use of EBP processes among academic librarians, arguing that such factors "have a direct influence on whether evidence will be incorporated into decision making within professional practice" (p. 2). For practitioners struggling to balance planning and innovation when dealing with emerging educational technologies, connecting EBP with decision making is both an important and timely activity.

Decision makers often find themselves qualifying what counts as evidence. Within LIS, formal evidence typically includes comprehensive research using some kind of qualitative, quantitative, or mixed-methods approach (Centre for Evidence Based Library & Information Practice, 2014). Numerous thinkers discuss whether certain types of research should be more heavily considered, and those seeking additional background on this debate should consult Eldredge's (2004) treatment of the evidence base. Participants in Koufogiannakis' (2012) study of Canadian academic librarians identified their use of two primary types of evidence, *hard* versus *soft*, for decision making in their own professional settings. Hard evidence is characterized here by rigour and is scientific in nature, deemed as 'formal' research evidence by most academics. Hard evidence that can inform decision making typically includes published literature, statistics, the

results of local research and evaluation, other documentation (such as policies and procedures), and established factual information. Alternatively, soft evidence is typically seen as less rigorous and tends to "focus on experience and accumulated knowledge, opinion, instinct, and what other libraries or librarians do" (Koufogiannakis, 2012, p. 11). Soft evidence sources include input from colleagues, tacit knowledge, user feedback, and anecdotal evidence. Hard and soft evidence categories provide a useful frame for problems of evidence regarding emerging educational technologies, a point which we further illustrate in our decision-making model, below.

The best available evidence should inform evidence-based decisions. Practitioners and researchers tend to prioritize hard evidence, dismissing practice-focused soft evidence in the process. Illustrating this issue, Koufogiannakis (2012) found that both hard and soft evidence are used and valued by academic librarians involved in evidence-based decision making, though only sources falling into the hard evidence category "were truly thought of as evidence" (p. 17). In this sense, formal, rigorous evidence may be viewed as the best evidence when it comes to decision making in practice. However, with regards to emerging technologies, this type of evidence may be limited or unavailable. Where hard evidence is not readily available, how can practitioners employ evidence informed decision making in practice? This is the problem of evidence in regards to emerging educational technologies in library instruction to which we now turn.

The Problem of Evidence

Reports forecasting emerging technology trends are often accompanied by popular media sources discussing trending features and functions. However, due to their emerging status, at

times very little hard evidence exists regarding the use of a particular emerging tool in practice. Emerging educational technologies are seen as so new that there is a common assumption for there to be few, if any, up-to-date research investigations on their implementation in the classroom. Early sources rarely report hard evidence measuring impacts on teaching and learning processes, noting that there was not yet time for this research to be completed. This is the root of the problem of evidence for emerging technologies. If there is a lack of formal evidence around the use, value, and impact of the technology in question, is it even possible to make evidence-based decisions about whether, and how, to adopt said technology into one's own pedagogy?

Practitioner-researchers often face this question when teaching or when consulting with faculty: *Should I adopt an emerging technology right away, despite the lack of hard evidence? Or, should I wait until formal research evidence has properly measured this technology's impact*? Many of us have witnessed "innovators" and "early adopters" (see Sahin, 2006) quickly embracing a new technology, some of whom express dismay that they are not making evidence informed decisions about the most impactful ways to integrate the selected technology within their teaching. Conversely, many have witnessed practitioners who choose to delay the adoption of an emerging technology express concern that they may be missing a key opportunity, or that their practice will become out-dated. Far too often the problem is posed as an either/or dichotomy—either be an innovator who risks ignoring EBP, or become out-dated awaiting evidence to inform practice. In approaching the dilemma with this binary either/or mindset, there is no easy path forward.

The authors argue that when presented in this way, the problem takes the form of a false dichotomy. Instead, such questions can be rephrased in ways that ask: *What evidence can I find about whether a particular technology can be used to meet my instructional goals?* Rephrasing the problem in this manner serves two purposes. First, it eliminates the false dichotomy and instead forces us to face the problem of evidence as an information seeking activity with discoverable, though not necessarily definitive, results. Second, it encourages practical and sustainable decision-making processes that (re)focus on the reasons and rationale for employing the emerging educational technology under consideration, while instilling and promoting critical analysis useful for facing future emerging technologies and trends.

Evidence Informed Decision Making for Technologies in Library Instruction

Given the issues outlined above, how can librarians make informed decisions about whether to integrate particular emerging educational technologies in their instruction? While there are a many possible approaches to this dilemma, the authors offer here one decision-making model that can help to address such issues within library instruction contexts via a two-pronged approach: firstly, by identifying instructional aims and technological affordances; and secondly, by employing an information-seeking environmental scan. Within this decision-making model, identifying aims and affordances is the primary phase, which then informs the direction of the environmental scan in the second phase. However, these phases are not necessarily linear in nature. Instead, each phase should reflect the other, so that the decision-making process becomes an iterative assessment of aims, affordances, and information gathering that happens in parallel, rather than via a linear sequence of steps.

Emerging Technologies in Library Instruction: A Decision-Making Model

Articulating Instructional Goals and Learning Outcomes

The importance of articulating the educational aims and outcomes of library instruction in ways that guide our practice, enabling thoughtful selection of emerging educational technologies to meet pedagogical purposes, is a point well worth reflecting upon for the first component of the proposed decision-making model. In a recent longitudinal study of Canadian academic libraries, Julien, Tan, and Merillat (2013) conclude that a key challenge for library instruction remains the alignment of instructional practices with current approaches, particularly the "absence of articulated instructional objectives and formal evaluation and assessment measures" (p. 100), which they warn undermines confidence in information literacy instruction outcomes. Articulating clear instructional objectives that inform educational practices and guide decisions on whether to employ emerging educational technologies for pedagogical ends is a straightforward process that librarians can undertake to build confidence in their overall information literacy instruction.

When articulating and aligning to pedagogical goals and aims through instructional objectives and learning outcomes, academic librarians have several resources to which they can turn. The Association of College & Research Libraries (ACRL) provides a synopsis of overarching aims and philosophies of undergraduate information literacy programs in their metaset of elements, as noted in the recently updated *Characteristics of Programs of Information Literacy that Illustrate Best Practices: A Guideline* (2012). More specifically, ACRL's *Information Literacy Competency Standards for Higher Education* (2014), as well as their list of *Objectives for*

Information Literacy Instruction (2001), provide frameworks for faculty and librarians to use in instruction and assessing student learning. Of course, many other resources exist, including those within local institutional contexts (e.g., centers for teaching and learning) and in the form of strategic or academic plans.

Aligning Pedagogical Aims with Technological Affordances

Continuing with the first part of the decision-making process, once instructional objectives are identified, one can assess whether there is a complimentary connection between the affordances of the technology in question and the desired learning outcomes. An affordance is the characteristic that allows one to carry out possible actions via an object or within an environment. Willcockson and Phelps (2010) define an affordance as "the way a technology or software can be used and what it allows the user to do or not to do" (para. 9), and provide several helpful recommendations for solidifying the connection between technological affordances and learning outcomes, connecting emerging technologies to educational practice. One recommendation is to conduct affordance-learning goal matching, such as designing student blogging assignments for reflective learning via journaling, or selecting a wiki so students can collaborate on content creation (Willcockson & Phelps, 2010, para. 10).

To further mitigate the problem of evidence concerning emerging educational technologies, the authors recommend conducting an evidence search for implementations of comparable pedagogical aims achieved with similar technologies and affordances, especially searching existing research connecting pedagogical goals with technological affordances in comparable instructional situations. The very definitions of emergence and convergence underscore how

these technologies evolve to reflect and integrate well-known and established affordances. Identifying the overarching instructional aims at play, along with the potential (inter)actions afforded by a particular educational technology, can inform an evidence search that incorporates hard evidence from peer-reviewed publications and empirical observation of established functions.

Regardless of the particular technological trend or hype cycle encountered, there is a wealth of hard evidence that can be integrated into practice. Rigorous research on educational technology and instructional design can be leveraged after identifying how the technological affordances align with pedagogical aims. Practitioners seeking to build an evidence base can search for recent implementation of similar affordances or features of comparable educational technologies, thereby employing established scholarship in fields such as instructional design, and avoiding a focus on the one specific new technology in isolation. For example, an educator interested in using a student response system (electronic polling) via a 'bring your own device' (BYOD) approach can consult the wide array of existing research on similar features and outcomes from educational use of proprietary devices, such as i>Clickers, or polling software used within learning management systems. Rather than lamenting the lack of evidence for a particular "new" emerging educational technology, by incorporating hard evidence that addresses aims and affordances, we can foster a sustainable approach for making informed, evidence-based decisions with the ultimate goal of improving practice.

Employing an Information-Seeking Environmental Scan

Informing the second part of the decision-making model, environmental scanning is an activity

familiar to library and information professionals, and many organizations conduct environmental scanning in strategic, future-looking planning processes (Chrusciel, 2011; Grummon, 2012). Environmental scanning involves acquiring, evaluating, and utilizing information from a variety of sources, which can then be adapted and applied within individual or organizational contexts. This information behavior is common across various kinds of LIS work, and can be particularly useful when considering adopting an emerging educational technology. The most common starting place for an environmental scan is public Internet websites, initiated by a simple keyword search via a search engine. Websites, blog postings, news and media stories, and other grey literature and reports serve as possible sources of soft evidence on a particular emerging technology. It is important to remember that such scanning requires critical evaluation and significant weeding, especially since these informal sources typically lack peer review or the indexing and abstracting information of formal evidence sources.

In this information gathering process, the scanner seeks sources that can be applied to their context and situation. This is quite distinct from the search for affordances because the types of resources discovered will largely include informal evidence. Ideally, the evidence discovered during the scan will discuss the specific emerging educational technology being considered, or failing that, a convergent technology with congruent aims and affordances. The scan must therefore be a critical, iterative process. Zhang, Majid, and Foo (2010) make a noteworthy conclusion that environmental scanning requires strong information literacy skills, including evaluation of the sources for their relevance to the information need that initiated the scan. In this way, librarians are extremely well-positioned to model and teach others about environmental scanning practices that incorporate excellence in information literacy and foster evidence based

practice.

A topic often overlooked in discussions of environmental scanning is the inclusion of communities of inquiry (Garrison, Anderson, & Archer, 2010), communities of practice (Wenger, 1998), and professional (or personal) networks within the set of sources being scanned. These informal sources serve as ideal locations for expanding environmental scans, revealing new sources directly, or else providing links to professionals who might serve as a resource. Outreach activities will also be a familiar to LIS professionals, and especially to academic librarians, who are often called upon to cold-call faculty, students, and other user groups as a regular part of their work. Placing a call to a respected colleague, sending an email to a community listserv, or posting to a trusted social media site can be particularly fruitful. Instead of simply trolling through a sea of information, this portion of the environmental scan allows the scanner to submit a call for information and suggestions, facilitating responses from the community and forging new connections in the process.

The point of the environmental scan in this decision-making model is not to reduce the reliance on traditional, formal evidence in favor of a generating a soft evidence base. For those looking for a more detailed example of this model in practice, see the iPads in the library case study detailed by the authors elsewhere (Smith & Hayman, in press). Rather than replacing valued forms of research, soft evidence can supplement other, more traditional hard evidence sources when looking for the *best available* evidence. And while environmental scanning is not a panacea solving all problems of evidence given that some evidence will remain undiscovered or inaccessible despite the best efforts of the scanner, when combined with a traditional search for

formal sources, this addition of up-to-date soft evidence from trusted communities of practice helps to build a more comprehensive, robust evidence base that creates a balanced approach to the decision-making process.

Conclusion

Making evidence-informed decisions for emerging educational technologies in library instruction can be a daunting task for practitioners and researchers alike. This issue is further complicated by a perceived lack of available evidence on a particular emerging educational technology in question. To foster a sustainable approach to decision making that supports the need for evidence based practice, practitioners must shift from a false dichotomy mindset that positions so-called trendsetting innovators against practitioners cautiously awaiting evidence. To support an evidence informed selection and integration of emerging educational technologies, the authors offer a two-pronged model that begins with 1) articulating pedagogical aims, aligning technological affordances to these aims, and 2) supporting this alignment with hard evidence in extant literature and soft evidence in the environmental scan.

Decision making around emerging educational technologies should include a range of sources, acknowledging roles for both hard and soft evidence, particularly when faced with a lack of published research around a recent technological development. Incorporating soft evidence gathered via an environmental scan and using this in tandem with hard evidence that discusses technologies that have similar aims and affordances is a tried and tested method that the authors have used successfully in their own pedagogical and professional practice, and one they strongly recommend to others practitioners looking to use evidence based practice in their instructional

settings.

Though the discussion above deals specifically with the problem of evidence surrounding emerging educational technologies, the suggested approach can be used in a variety of settings when considering educational technologies of all sorts, new or old. Ultimately, what becomes most important is the *meaningful* integration of technology into one's instructional practice. There is significant pressure on librarians and their libraries to be seen as innovators and technology-forward, and it is easy to fall prey to the pressure of hype cycles and assumptions that practitioners should hurry up and meet a perceived demand from the current generation of so-called "digital natives" who are supposed technophiles (Smith, 2012). However, constantly racing to select, implement, and support every trend and technological shift is simply unsustainable, as is the practice of adopting technology for technology's sake, appearing to be innovative.

Practitioners weighing the adoption of a technology should first consider whether there is in fact a need to be filled, and critically examine whether this adoption aligns with identifiable pedagogical goals. Since our libraries and institutions are continually called upon to stay abreast of technological change of all kinds, practitioners need to be information-savvy innovators who also view trends with a critical eye. By being ever conscious of hype cycles and seeking the very best application of current evidence in practice, practitioners can foster sustainable decision making for years to come.

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