Technology and the Concept of Information Literacy for Pre-Service Teachers
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Through an examination of a variety of information literacy documents and an analysis of supporting materials, this article argues that the impact of technology on the conceptualization of information literacy is two-fold: technology serves as a catalyst for developing a rationale for the importance of the concept and as a mechanism for focusing attention on specific issues within the broader concept of information literacy. Understanding the relationship between technology and information literacy is particularly important in light of recent findings from the Pew Internet and American Life Project (2002) that "many schools and teachers have not yet recognized–much less responded to–the new ways students communicate and access information over the Internet" (iii), resulting in a "digital disconnect" (v) between students and teachers with respect to Internet-based information seeking. The discussion is thus contextualized within the field of education, but the majority of the ideas raised here apply to information literacy for any discipline or profession. The article ends with a discussion of additional considerations related to information literacy and digital technologies within the field of education.

THE CONCEPTUALIZATION OF INFORMATION LITERACY

Writing about the impact of technology on information literacy and library instruction has many challenges, not the least of which is determining what is meant by "information literacy." Perhaps the most often quoted definition of information literacy was articulated in the Final Report of the American Library Association Presidential Committee on Information Literacy (1989):

> To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information... Ultimately, information literate people are those who have learned how to learn. They know how to learn because they know how knowledge is organized, how to find information, and how to use information in such a way that others can learn from them.

This narrative definition is echoed in most writing on information literacy since 1989 and is the foundation of the Information Literacy Competency Standards for Higher Education (2000). Indeed, the influence of this definition is particularly obvious in the structure of the Standards, which delineates one standard for each of the four general characteristics (identify needs, locate, evaluate, and use) plus a fifth to address the issues of legality, ethics, and social environment that attend to the exercise of information literacy. As such, though some might take issue with this definition from the Final Report, it stands as the touchstone document for the library profession and, in some ways, functions as a benchmark against which other definitions of information literacy are judged.

IMPACT OF TECHNOLOGY ON INFORMATION LITERACY

Thinking about the relationship between information literacy and technology, it is interesting to note that the very first paragraph of the Final Report points to technology as a source of the challenges faced in the information age:

No other change in American society has offered greater challenges than the emergence of the Information Age. Information is expanding at an unprecedented rate, and enormously rapid strides are being made in the technology for storing, organizing, and accessing the ever growing tidal wave of information.

Of course, the years since this publication have seen the ever-increasing development of technology, an explosion of information resources, and the resulting disintermediation of access to information brought about through and because of technological advances.

In reflecting on the Final Report, the 1987 Model Statement of Objectives for Academic Bibliographic Instruction, and the development of information literacy as a concept, one can cautiously conclude that the developments in technology have served as a catalyst for crystallizing the concept of information literacy and the importance of information literacy for learning and civic life. Likewise, as evidenced by the Pew (2002) study, advances in technology and access to information have led to changes in the professional skills required of K-12 educators. Prior to the infusion of technology into libraries, primarily through the automation of the card catalog, publications about information literacy were very limited in number. This is no longer the case today as publications about information literacy abound. In 2000, the influence of technology on the concept of information literacy was significant enough to warrant a section in the introduction to the Information Literacy Competency Standards for Higher Education which serves to distinguish information literacy from information technology or computer

Beyond these general observations, in order to examine the full impact of technology on the concept of information literacy, it is useful to consider the specifics of the Information Literacy Competency Standards for Higher Education and the contemporary discussion of 21st century literacies.

TECHNOLOGY AND STANDARDS

As mentioned above, the introduction to the Information Literacy Competency Standards for Higher Education distinguishes between information literacy, computer literacy, and fluency with information technology. In doing so, the Standards draw on the National Research Council (1999) report, Being Fluent with Information Technology. The complex interplay between information literacy and information technology literacy is revealed in the identification of information literacy as "a distinct and broader area of competence" which "initiates, sustains, and extends lifelong learning through abilities which may use technologies but are ultimately independent of them" though the text also recognizes that "information literate individuals necessarily develop some technology skills." The linkage between information literacy and information technology literacy is even more apparent in the consideration of specific performance indicators and learning outcomes. The following selections exemplify this point:

> 1.1.1 Confers with instructors and participates in class discussions, peer workgroups, and electronic discussions to identify a research topic, or other information need.
> 2.2.5 Implements the search strategy in various information retrieval systems using different user interfaces and search engines, with different command languages, protocols, and search parameters.
> 2.3 The information literate student retrieves information online or in person using a variety of methods.
> 5.1. The information literate student understands many of the ethical, legal and socio-economic issues surrounding information and information technology.

Clearly, the technological tools through which information is accessed, retrieved, and manipulated are not easily separated from the information itself. Indeed, such separation would likely not be desirable since the result would not accurately represent the real-world tasks and circumstances that learners must learn to negotiate.

Moreover, in addition to the outcomes related specifically to information technology literacy, a second point is relevant to this discussion of information literacy and technology. Technology is not only part of the content of information literacy. Technology has also caused librarians, and faculty, to focus their attention on certain outcomes which do not relate to technology per se. This re-focusing is necessitated by technological changes in information access and manipulation. The most obvious example of this is the focus that is now regularly placed on evaluating information sources. Another general example is the increasing challenge of plagiarism from online resources and the need to emphasize ethical and legal use of information resources. It is important, however, not to confuse the shift in emphasis within the range of issues encompassed by information literacy with a shift away from information literacy to technological literacy per se.

21ST CENTURY LITERACIES

The final issue worth exploring with respect to technology and the conceptualization of information literacy is the notion of 21st century literacies. Nancy Kranich (2000) discussed this concept in an American Libraries column during her year as President of the American Library Association. In her column, "Building Partnerships for 21st-Century Literacy," Kranich presents an expanded notion of literacy for the 21st century, stating that:

> In the 21st century literacy takes on a new and expanded meaning. Information literacy means being information smart. It means knowing when a book may be more helpful than a computer. It means knowing how to make critical judgments about information: its completeness, accuracy, viewpoint. Information literacy is a critical life skill in today's information jungle.

In this representation, 21st century literacy is equivalent to information literacy.

Other authors, however, have expanded the scope of the discussion to a broader conception of contemporary literacy, which incorporates information literacy but includes other elements as well. For example, the White Paper (2002) from the 21st Century Literacy Summit identifies four literacies as key components of 21st century literacy:

- technology literacy
- information literacy
- media creativity
- social competence and responsibility.

The White Paper argues that the education, workplace, and public sectors are all stakeholders that are challenged to address 21st century literacy at individual, organizational, and societal levels. The models highlighted in the White Paper, the great variety of efforts underway to address the digital divide, documented, for example, at <http://www. digitaldividenetwork.org>, and the general awareness of issues related to the vast amount of information in today's society are all part of the larger context in which academic librarians pursue information literacy programming. Lipu (2003) provides another example of professional discussion of this issue in her identification of "tertiary literacies" for Australian higher education.

INFORMATION LITERACY IN THE FIELD OF EDUCATION

Before concluding this discussion of the impact of technology on information literacy as a concept, it is worth spending a little time on the "Information Retrieval and Evaluation Skills for Education Students" (1992). This statement of skills is based on the Model Statement of Objectives for Academic Bibliographic Instruction (1987) and its development was also motivated, in part, by changing technologies. In particular, Goal 1, Objective C states that: "The learner realizes the effects of evolving information technologies on the generation, communication, and access of information." The integration of technology into the skills expected for education students is even more apparent when one considers the specific examples of how the skills statement might be utilized for different instructional situations.

The discussions of these situations mention particular technologies, primarily CD-ROM, though print resources are still very much present in the discussions.

The "Information Retrieval and Evaluation Skills for Education Students" document from the Education and Behavioral Sciences Section of the Association of College and Research Libraries is currently undergoing revision in light of the Information Literacy Competency Standards for Higher Education. In the revision, there will be "particular focus on the information competencies themselves and the role of the librarian in collaborating and facilitating student achievement of these competencies will be stressed."1 Given that the revision is not complete, it is difficult to predict how technology will be integrated into the revised document; however, it seems fairly safe to suggest that the integration will likely parallel the approach taken in the Information Literacy Competency Standards for Higher Education.

The other document of note for considering information literacy in the field of education is the Professional Standards for the Accreditation of Schools, Colleges, and Departments of Education (2002). These accreditation standards are promulgated by the National Council for Accreditation of Teacher Education (NCATE), which is "the accrediting body for colleges and universities that prepare teachers and other professional personnel for work in elementary and secondary schools" (1). The American Library Association is a member organization of NCATE as are the Association for Educational Communications and Technology and the International Society for Technology in Education.

Because of the importance of NCATE accreditation for teacher education programs, the language of the accrediting standards is influential in affecting the initiatives pursued by education programs. Standard One identifies candidate knowledge, skills, and dispositions "necessary to help all students learn" (Professional Standards, 2002, 14) and includes a target outcome that teacher candidates "present the content to students in challenging, clear, and compelling ways and integrate technology appropriately" (15). Though information literacy is arguably implicit in the target outcomes, it is not until the supporting explanation for the standard that the concept appears explicitly:

> They are able to appropriately and effectively integrate technology and information literacy in instruction to support student learning. (19)

Though librarians would probably argue that the complementary concept of information literacy would have been better included in the target outcome language per se, the inclusion of the phrase "information literacy" in the accreditation document will likely prove useful to librarians in arguing the importance of information literacy for education students. The low-profile mention may not be notable enough to leverage as much influence as librarians would wish and so continued advocacy within the education profession is no doubt needed to bring the concept of information literacy into the foreground of the accrediting standards document.

Of course, none of this discussion is intended to diminish the importance of technology literacy for teachers as delineated in the ISTE National Educational Technology Standards (NETS) and Performance Indicators for Teachers by the International Society for Technology in Education (2000). Rather, because information literacy and technology literacy are easily confused, efforts here are intended to clarify their distinct yet complementary competencies in light of the complexities of pursuing information literacy and technology literacy competencies for pre-service teachers. Just as technology has influenced information literacy, so too do changes in information affect the conceptualization of technology literacy and its importance for teachers.

EDUCATION STUDENTS AS FUTURE INFORMATION LITERACY INSTRUCTORS
Finally, because much of the focus within the field of education is, rightly so, on pre-service teachers, some attention must also be paid to the information literacy standards utilized in primary and secondary school settings to which the students may find themselves accountable during student and post-baccalaureate teaching experiences. Byerly and Brodie (1999) provide an excellent summary of the many

information literacy models which have been developed and implemented in primary and secondary settings throughout various parts of the United States. Though the limitations of this article do not permit a thorough consideration of the various models, a few general comments are in order.

As future teachers, pre-service education students need to be prepared to develop instruction to help their students attain information literacy learning outcomes. The challenge in preparing pre-service teachers for this role is similar to the challenge of preparing pre-service teachers with respect to other outcomes they must address in their teaching–pre-service teachers are often learning both the content to be taught as well as methods to teach it while they are in college. As Carr (1998) so clearly stated, "Teachers cannot prepare their students to be information literate unless they themselves understand how to find and use information." Thus, because pre-service teachers must be information literate as college students, but also need to be taught how to incorporate information literacy in lesson plans and curriculum development, librarians providing instruction to pre-service teachers will find that they must not only provide instruction in information literacy skills, but must also model pedagogical approaches and practices which students can then utilize in their own teaching plans.

The circumstances for the education librarian are made more complex because of the current lack of articulation between the K-12 and higher education information literacy standards. Cahoy (2002) provides a detailed comparative analysis of the Information Literacy Competency Standards for Higher Education and the K-12 Information Literacy Standards for Student Learning, pointing out that "when compared, each set of standards communicates a slightly different vision of what information literacy is and how it can be achieved by every student" (13). As such, though the two sets of standards overlap in many areas, the librarian who designs instruction for pre-service teachers based on the higher education standards may find it difficult to also provide a model of information literacy as envisioned in the K-12 standards.

Future developments may ameliorate these difficulties as a joint AASL/ACRL Information Literacy Task Force is currently charged with "pursuing writing a joint publication . . . enumerating a seamless K-20 process that reflects the Information Literacy Standards previously published by each division."2 This future document should assist education librarians in developing instruction that both develops pre-service teachers' information literacy skills and models appropriate methods for teaching information literacy.

RELATED ISSUES

In addition to the issues related to the impact of technology on the conceptualization of information literacy as discussed above, there are many other issues related to information literacy programming for education students which deserve mention even though they cannot be addressed in full.

As is true of much of the literature within education librarianship, this article focused primarily on the information literacy needs of undergraduate students who are or who intend to become pre-service teachers. Other undergraduate and graduate programs are also likely to be found among the programs offered by a department or college of education including school counseling, student life and development, school administration, and possibly even library science, media services, and/or educational technology. For pre-service teachers, librarians might also consider whether students are prepared for the transition from the relatively information resource-rich academic library environment to the arguably significantly different school practitioner environment and, if they are not, how to best address this issue.

Also implied in the discussion of the NCATE standards, though not explicitly discussed, is the reality that education faculty members, supervising teachers, and support staff, as well as librarians, are jointly responsible for helping education students develop information literacy. The challenges and opportunities of collaboration are many but, again, can only be hinted at here with a recommendation to pursue this topic in The Collaborative Imperative, edited by Raspa and Ward (2000).

Related to collaboration are issues of instruction program management and administration. Education librarians are challenged to create instruction programs that are institutionalized–rather than dependent on the efforts of individual people only, systematic–rather than happenstance, and sustainable–rather than a series of pilot projects which cannot scale to reach all intended students. Theoretical

frameworks relating to technological change and innovation can also be used to more carefully understand the management of instruction programs in libraries (Woodard and Hinchliffe, 2002) in addition to information literacy per se as this article addressed.

As stated, it is not possible to fully address these topics within this chapter, but they are mentioned to provide at least a cursory overview of the instructional and organizational context in which education librarians pursue information literacy instruction.

CONCLUSION

The concepts of information literacy and information literacy instruction are, as demonstrated by this discussion, complex and multi-faceted. This article focused on the conceptualization of information literacy– both generally and within the field of education, with particular attention to the complexity of the issues for pre-service teachers. With respect to conceptualizing information literacy, the impact of technology appears two-fold: as a catalyst for developing a rationale for the importance of the concept and as a mechanism for focusing attention on specific issues within the broader concept of information literacy. For librarians serving education students, the challenge of designing instruction programs is further complicated by the fact that pre-service teachers are future teachers of information literacy. Hopefully the issues discussed herein provide an overview of the impact of technology on information literacy and instruction and a useful vantage point from which to consider future developments in this arena.

NOTES
1.   From http://www.lib.msu.edu/corby/ebss/02midwinter.htm#insted.
2.   http://www.ala.org/assl/committees.html.

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