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Information Literacy in the 21st Century

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OVERVIEW

Information literacy is a key capability for the 21st century. The distinction between information and knowledge is central to understanding the meaning of information literacy. Information literacy goes beyond that of information retrieval and evaluation. An information-literate person actively uses information to further personal learning and growth with respect to all facets of life. The importance of planning information searches and prioritizing potential sources of information is stressed, as is the need for active engagement with information to seek understanding. It is at this point that the bridge between information literacy and learning occurs; the transformation of information into knowledge that is demonstrated in the production of a unique product (be it an essay, report, media object, etc.). Technology can facilitate learners' development of information literacy skills but also bring new challenges. The model of a community digital library may be a valuable one in this regard. One challenging but exciting new area is how e-books may contribute to curriculum design in the 21st century. Another emerging area that will impact on information literacy is the nature of online communities and whether Web 2.0 will bring new levels of information literacy to learners of all ages in the 21st century.

BACKGROUND: THE NATURE OF LEARNING

Normally, the goal of searching for information is to learn more about the topic under investigation. It is worthwhile spending a little time looking at the meaning of learning. Learning is a complex process. How do people learn the important ideas they need to know? Do they assimilate information which they then reproduce? This might be possible for certain facts, but even then, if the facts are all unrelated, it is hard to remember them. Learning is much easier if connections can be made between ideas and facts. How can these connections be made? Is it by rules, as in a system of information processing, much like the way a computer can be programmed? This might be possible for learning fixed processes which are always the same, for example, a laboratory procedure such as setting up an electrical circuit from a diagram, or routine clinical procedures such as taking a patient's blood pressure. But sets of rules are not enough when learners need to solve a problem they have not seen before, or when they want to design something quite new (a bridge, a poem, or a plan for doing new research). Something else is needed then. In these cases, learning appears to be a complex process where knowledge is constructed from a variety of sources. What people learn depends on what they already know, how they engage with new ideas, and the processes of discussion and interaction with those they talk to about these ideas. Learning is thus a personal adventure leading to knowledge construction. The outcomes of one learning process often have deep implications for how future learning might occur.

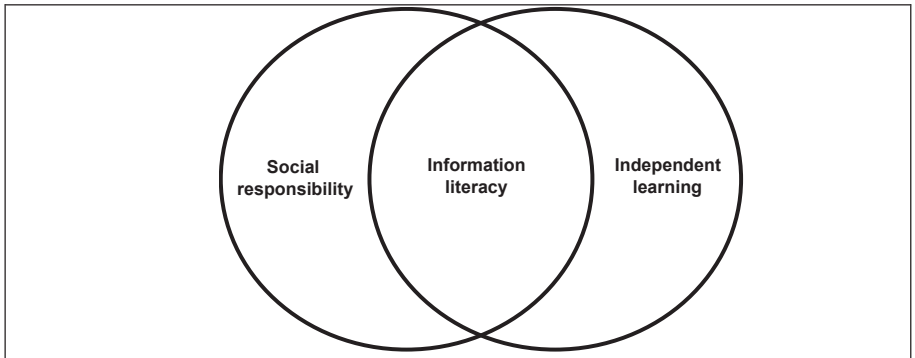
The outcomes of any education process, especially if we take a lifelong view of learning, are usefully described by broad capabilities, such as the list of clusters of abilities noted by Nightingale, Te Wiata, Toohey, Ryan, Hughes, and Magin (1996): thinking critically and making judgments; solving problems and developing plans; performing procedures and demonstrating techniques; managing and developing oneself; accessing and managing information; demonstrating knowledge and understanding; designing, creating, performing; and communicating. It is with broad view of learning that I now turn to a consideration of information literacy.

SPECIFIC FOCUS ON INFORMATION LITERACY

Meaning of Information Literacy

Information literacy is integral to the development of many of the capabilities listed above. A useful working definition of information literacy might be as follows:

Figure 1. Nine information literacy standards (after ALA & AECT, 1998)



Information Literacy
Standard 1: The person accesses information efficiently and effectively.
Standard 2: The person evaluates information critically and competently.
Standard 3: The person uses information accurately and creatively.

Independent Learning
Standard 4: The person pursues information related.
Standard 5: The person appreciates literature and other creative expressions of information.
Standard 6: The person strives for excellence in information seeking and knowledge generation.

Social Responsibility: contributing positively to the learning community and to society
Standard 7: The person recognizes the importance of information to a democratic society.

"Information literacy involves accessing, evaluating, managing and communicating information."

Information literacy is not synonymous with learning and, in order to understand this, the difference between information and knowledge needs to be explored. This difference is often not clearly defined, and indeed there is often a strong overlap in normal conversation. The analogy of the difference between the bricks and mortar and the house can be useful. Information is the bricks, and learning skills and processes constitute the mortar. Combining "bricks" of information together using appropriate strategies (mortar) can result in a new house of knowledge. Knowledge is constructed from information. Thus, an information-literate person is someone who can find and select the right information for any given task. In this sense, information literacy is a prerequisite for learning.

With this basic definition in mind, let us take a more detailed look at information literacy standards and skills. The American Library Association and Association for Educational Communications and Technology (ALA & AECT, 1998) produced a list of nine information literacy standards. By standards is meant goals or benchmarks. There are three areas with three standards in each area. The three areas are information literacy, independent learning, and social responsibility. The fact that information literacy itself is a subset of the information literacy areas is an illustration of the challenges that occur when one tries to define the boundaries of information literacy. What is helpful about this framework is the sense of moving from a more neutral skills orientation to a value-laden position of social connectedness. The nine standards are shown in Figure 1 with the centrality of the information literacy area highlighted.

One other useful term is "critical literacy." This essentially encapsulates all nine of the standards described above. Van Duzer and Florez (1999) describe critical literacy as encompassing "a range of critical and analytical attitudes and skills used in the process of understanding and interpreting texts, both spoken and written." The term is often used with adult language learners but its applicability is much wider. It is useful to be reminded that aural (and oral) skills are also needed in developing high levels of information literacy. In our multilingual societies this reminder is especially important.

Acquiring Information Literacy Skills

Just what does a learner need to do in order to carry out a successful information search? What skills does the learner need? Eisenberg's (2001) Big6™ Skills (Table 1) are a useful set. They indicate clearly the complexity of information searching but also highlight that information searching is best approached in a methodical and meticulous manner. A lot more than random Google searches is involved!

The Role of Technology

Can technology facilitate the development of information literacy skills? The answer is "yes" and "no." Online environments facilitate access to and retrieval of information. They can also facilitate people's communication with other knowledge seekers and this can be useful in evaluating the usefulness of any resource.

The two aspects of the wealth of information and the possibility of an online community which can explore and work with that information to construct knowledge have lead to the rosy promises for the future of e-learning that has been predicted for some time (e.g., Siemens, 2003). However, if we analyze more carefully just how well technology currently enables access to information we can see there are several challenges. These are outlined in Table 2.

Honing in on Community Digital Libraries

Several of the functions listed under "implications" in Table 2 are currently performed by university (and other) libraries, digital repositories, and professional subject organizations. The potential of a combination of all three together could be a way forward. Examples of organizations that have these characteristics can be

Table 1. Big6™ Skills (Eisenberg, 2001)

Stage	Details of the process
1.Task definition	1.1 Define the information problem. 1.2 Identify information needed.
2. Information seeking strategies	2.1 Determine all possible sources. 2.2 Select the best sources.
3. Location and access	3.1 Locate sources (intellectually and physically). 3.2 Find information within sources.
4. Use of information	4.1 Engage (e.g., read, hear, view, touch). 4.2 Extract relevant information.
5. Synthesis	5.1 Organize from multiple sources. 5.2 Present the information.
6. Evaluation	6.1 Judge the product (effectiveness). 6.2 Judge the information process (efficiency).

Note. The Big6™ is copyright © (1987) Michael B. Eisenberg and Robert E. Berkowitz. www.big6.com

Table 2. Implications of the challenges of using technology to access information (after McNaught, 2006, p. 39)

Positive contribution	Challenges	Implications: Need for:
More information available to more people	Chaotic and fragmented nature of the Web	Guidelines to facilitate searching
Cross-referencing through hyperlinks	Poor navigation; being "lost in the Web"	Good navigation models
Large number of perspectives because there are multiple publishers	Difficult to find evidence of the authority of much material	Models of how to display information with adequate authentication
Finding appropriate information in a given area	Often only low level information is found, or information is out-of-date	Dedicated subject repositories with staff who keep them up-to-date

found in a relatively recent move towards the creation of "community digital libraries." Digital libraries have existed for some time, with the focus being on how to best gather relevant and accessible digital collections. Cole (2002) describes the three primary constructs of digitization projects as digital collections, digital objects, and metadata. His checklists of principles for these constructs are recommended for those embarking or refining a digital library.

However, the "people" aspect also needs attention. As Wright, Marlino, and Sumner (2002) comment, "A community digital library is distinct through having a community of potential users define and guide the development of the library." They were writing about a community digital library dealing with the broad subject domain of earth system education. The Digital Library for Earth System Education (DLESE, http://www.dlese.org/) has this description which clearly shows the three elements of material, activities, and people, showing a clear focus on "user-centered design" (Lynch, 2002):

The Digital Library for Earth System Education (DLESE) is a distributed community effort involving educators, students, and scientists working together to improve the quality, quantity, and efficiency of teaching and learning about the Earth system at all levels. DLESE supports Earth system science education by providing:

- *Access to high-quality collections of educational resources;*
- *Access to Earth data sets and imagery, including the tools and interfaces that enable their effective use in educational settings;*
- *Support services to help educators and learners effectively create, use, and share educational resources; and*
- *Communication networks to facilitate interactions and collaborations across all dimensions of Earth system education. (http://www.dlese.org/about)*

DLESE is a partnership between the National Science Foundation (NSF), the DLESE community that is open to all interested in earth system education, the Steering Committee, and the DLESE Program Center, a group of core staff. The concept of the library took shape in 1998, and is now governed by an elected Steering Committee that is broadly representative of the diverse interests in Earth system science education. Its future growth and development is guided by the DLESE Strategic Plan, which outlines the broad functionalities of the library to be developed over the next five years (2002-2006). Its goals cover six core functions: 1) collection-building; 2) community-building; 3) library services to support creation, discovery, assessment, and use of resources, as well as community networks; 4) accessibility and use; 5) catering for a diversity of user needs; and 6) research and evaluation on many aspects of community digital libraries.

It is this final core function that was the reason this example has been chosen for this article; there has been extensive evaluation research on the model. A search of the Association for Computing Machinery (ACM) digital library (http://portal.acm.org/dl.cfm) on "dlese" yields 200 papers. Two examples of particular relevance to the educational potential of DLESE are papers by Marlino and Sumner (2001) and Sumner and Marlino (2004). These papers (and others) show a clear endeavor towards ensuring that the needs of the earth system education community are a strong driving force towards the development of policy for the library.

FUTURE TRENDS

E-Books

There are many who assert that mobile learning (m-learning) will be the area of most significant advances in education. What implications does this have for information literacy? Flexible modes of learning have the potential to increase students' engagement in learning through giving them more control over the nature of the learning content and activities, and over the time and place they study. Electronic format (e-format) books (e-books) are a recent technology with the potential to support flexible learning strategies by possibly improving access to information. E-books are downloadable and are portable if they are stored in light portable devices such as pocket personal computers (PPCs) or smartphones. The technology has also made possible a growth in the number of publications and a shorter publishing time. The use of electronic format books (e-books) is likely to grow as more books are either only made available in an e-format, or are available earlier in e-format than in the traditional paper-based format (p-books).

Information on collections of e-books is readily accessible on the Web. For example, there are 137 entries on a list of available e-book libraries (http://drscavanaugh.org/ebooks/ libraries/ebook_libraries_list.htm). Collections of academic e-books are now also growing. One of the largest such collections is NetLibrary (http://www.NetLibrary.com), which, at present, houses more than 100,000 titles. The rising costs of p-books and the potential to link multimedia resources to e-books will have major impacts on the strategies used by university libraries in their support of scholarly communication (Ching, Poon, & McNaught, 2006).

E-books have many potential benefits. Briefly, these are: 1) access to more readings; 2) remote access which can save travel time; 3) searchable readings; 4) potential links to allied multimedia resources; 5) portable resources (a PPC can hold many books); and 6) optimizing reading time (e.g., during travel). However, the use of e-books involves several factors associated with 1) using new forms of technology and 2) adapting existing practices for reading and studying. Many innovations involving technology fail because these factors are not addressed. More needs to be learned about the usability and, especially, the acceptability of e-books. Effective strategies and support can then be formulated based on the identified challenges and opportunities.

Concerning acceptability, there is some empirical evidence which indicates that, once students can connect to the technology, they enjoy it (Simon, 2002) and even read faster (Wilson, 2003). On the other hand, there are negative reports of the difficulty of reading long text on the computer screen. "Most studies comparing paper and computer screen readability show that screens are less readable than paper" (Mills & Weldon, 1987, p. 329). Wilson (2003) also reports complaints about the ineffective navigational controls on e-book readers, as being "awkward, difficult or time-consuming to use" (p. 14) and "reading from the small screen was 'painful'" (p. 11). These uncertainties about usability and acceptability of e-books strongly mandate in-depth investigations.

The "Wikipedia" Phenomenon and Web 2.0

Earlier I advocated the model of community digital libraries for the purposes of providing access to high quality information and relevant learning support for the development of information literacy skills in the domain of interest. Community digital libraries such as DLESE are quite structured entities. Can a model with more freedom offer the same information literacy support? "Wikipedia" (http://www.wikipedia.org/) is undoubtedly an amazing phenomenon with over 100,000 articles in a multitude of languages. There is a degree of self-regulation and some well-known claims to quality, for example, the recent often-cited study in Nature (Giles, 2005) claiming that Wikipedia articles are about as accurate as those in the Encyclopaedia Brittanica. However, not all teachers are convinced and there are now some academic "bans" on students quoting from Wikipedia in university assignments (Jaschik, 2007). Wikipedia is just one instantiation of Web 2.0 which is an emerging form of Web design that focuses on structures "such as social networking sites, wikis, communication tools, and folksonomies that emphasize online collaboration and sharing among users" (Wikipedia; http://en.wikipedia.org/wiki/Web_2). It is likely that the next few years will see increasing interest in questions about whether, and if so how, online communities can provide accurate and timely information to people, together with the support they may need in evaluating and utlitizing that information. There will be exciting times ahead.

CONCLUSION

In this article, I have indicated that good information literacy skills are a prerequisite to being an effective learner in the 21st century. Information literacy is much more than a simple ability to carry out searches in catalogues, online or off-line. A capacity to interrogate and evaluate information is required, and also an ability to contextualize the information in its social and cultural settings. All this implies a personal approach to the construction of knowledge. Technology can facilitate these processes, both through providing access to information and also through communication support to learners as they make sense of information and use it in knowledge-building. Community digital libraries offer a useful model in this regard. The growth of e-books and the nature of Web 2.0 technologies are certain to alter the opportunities and challenges for the growth of an information-literate society in the 21st century.

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KEY TERMS

Community Digital Libraries: A community digital library is a resource collection, often in a defined discipline area, that is developed and managed in a structured fashion by the community itself. The Digital Library for Earth System Education (DLESE) is a well-documented example of a successful community digital library.

Critical Literacy: The use of the word "critical" emphasizes two aspects of a holistic definition of information literacy. The word "critical" has connotations of evaluating information carefully, of making a critique of it. Another meaning of the word "critical" relates to its use in discussion of societal power; in this sense an information-literate person is one who realized the social, cultural, and political implications of information. Information is not value-free.

E-books: E-books are books available in electronic format, most often downloadable from the Internet. E-books should be distinguished from shorter online articles. The process of accessing and effectively reading significant parts of a book onscreen needs careful investigation in order to see if the electronic format can support the development of information literacy skills.

Information Literacy: Information literacy involves accessing, evaluating, managing, and communicating information.

Learning: Learning is a personal construction of knowledge. In order to learn a particular concept or skill, the learner needs to consider how new information relates to the existing understandings that the learner has. The process of sifting through available information in order to select the most appropriate information to use in knowledge construction requires the skills of information literacy. Good information literacy skills are a prerequisite for effective learning.

Web 2.0: As Web 2.0 is still an emerging set of technologies and standards, it is premature to give a definitive definition. The phrase was coined by Tim O'Reilly in 2004 (e.g., see http://oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html) and refers to interactive and communicative Internet-based services where online collaboration is emphasized.

Wikipedia: An example of a loosely structured online resource collection where the information resources can be contributed by any person and the process of validating the information occurs voluntarily by members who consider themselves part of that community. The growth of Wikipedia entries has been rapid and there are now over 100,000 articles in many languages.