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Virtual Libraries Supporting Student Learning

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School libraries can exist in two spaces, a physical space or a virtual space. The author argues that students need a virtual library as well as a physical library because of the different learning opportunities that can be supported by virtual libraries. If a virtual library is carefully planned and designed, it can provide a rich learning environment. Although some authors may distinguish between various terms used to describe virtual libraries: digital libraries, electronic libraries, e-libraries, *and the broader term* virtual library, *in this article, the term* virtual library *is used to describe any managed collection of information sources in an electronic format. Therefore, virtual libraries could include digital collections of pictures, maps, Web sites, or library records.*

Introduction

Virtual libraries are organized collections of digital information. They are constructed collections organized for a particular community of users, and they are designed to support the information needs of that community (Saracevic, 2000). Virtual libraries can offer resources from many sources and in many formats, including audio and video. The items in these virtual collections do not have to reside on one server, but they share a common interface to assist the user in accessing the collection. The emphasis in virtual libraries is on organization and access, not on physical collections (Baldwin & Mitchell, 1996).

School libraries can exist in two different spaces, a physical space and a virtual space. Each space enables different learning activities and serves different purposes for learning (Bruce & Leander, 1997). Many libraries exist only in one space, whereas others maintain a hybrid space, both a physical and virtual space, in recognition of the distinct information uses and learning activities that can occur in each environment. All libraries, whether virtual or physical, create an environment for learning (Abram, 1999).

This article explores the advantages of virtual libraries for student learning, the types of learning that can be supported in virtual library environments, the importance of design to enable different types of learning, and the concerns posed by virtual libraries.

Learning in Physical and Virtual Libraries

Marchionini and Maurer (1995b) saw libraries as serving three roles in learning:

- They are places to share expensive information resources;

- They preserve artifacts and ideas; and
- They serve social and intellectual roles of bringing people and ideas together.

Both virtual and physical libraries can fulfill these roles.

Libraries, both physical and virtual, support various types of learning:

- Formal learning, the systematic learning that is guided by instruction;
- Informal learning, which is opportunistic, self-paced, and self-directed; and
- Professional learning, the lifelong learning in which library workers engage in order to improve their work-related knowledge (Marchionini & Maurer, 1995b).

The primary purpose of school libraries is to support, facilitate, and enhance the formal learning of the institutions that created them. The resources in these libraries, whether physical or digital, have been selected to support the curriculum that is taught in the schools. These information sources are utilized by students, teachers, and teacher-librarians in resource-based learning activities.

> Resource-based learning activity involves students, teachers, and teacher-librarians in the effective use of a wide range of print, non-print and human resources. Resource-based learning fosters the development of individual students by accommodating their varied interests, learning styles, needs and ability levels. (*Foundation for the Atlantic Canada English Language Arts Curriculum*, n.d.)

Much student learning, however, is not formal learning; it is informal and opportunistic (Marchionini & Maurer, 1995b). This self-paced and self-directed learning is an ongoing process of acquiring and utilizing information and creating meaning for an individual learner's interests (Fischer & Scharff, 1998).

Advantages of Virtual Libraries for Student Learning

Virtual libraries offer opportunities for learning that are not possible in their physical counterparts. Whereas physical libraries operate with designated hours, virtual libraries are available any time and anywhere there is an Internet connection. "A paradigm shift takes place from libraries as collectors of items to libraries as facilitators of access to all kinds of information, provided by anybody, located anywhere in the world, accessible at any time" (Grothkopf, 2000, Libraries on and off the Web section, para. 2).

Virtual libraries, especially those with customized collections, facilitate just-in-time learning. Riel (1998) described just-in-time learning as learning needed for a particular task or purpose. Just-in-time learning can be independent of time and place (Riel, 1998; Weinberger, 1997). Schools with virtual libraries can make resources available just in time for specific assignments.

Virtual libraries provide immediate access to a range of resources not available in physical collections. Virtual libraries often contain more up-to-

date information than physical collections. Their sources can be searched more efficiently than those in physical libraries, and the information they contain can be updated more frequently. Well-designed virtual library collections are organized and managed to increase the productivity and efficiency of the user (Saracevic, 2000; Schamber, 1990). Roes (2001) believed that virtual libraries complement other virtual learning environments such as those provided in distance education and courses offered online.

Virtual libraries can empower the user and promote informal learning. Marchionini and Maurer (1995a) saw advancing informal learning as the most important change created by virtual libraries. Virtual libraries, which are customized for the learning needs of particular users—either schools, classes, or individuals—enable just-for-me learning. Just-for-me learning can be tailored to individual learning styles, preferences, and other characteristics of the learner or community of learners. Teacher librarians who have selected online resources for specific classes, teachers, or student groups are facilitating just-for-me learning.

Neuman (1997) recognized that any library must have a range of resources to meet the information needs of different users, and she saw the variety of formats and methods of navigation that can be used in virtual libraries as one of their greatest strengths. Resources in a virtual library can be organized so that sources for a particular group of users are easily identified. Virtual libraries can be customized for particular schools, grades, and subjects. This variety of formats in presentation and navigation is quite different from that of a physical library.

Marchionini and Maurer (1995a) pointed out that virtual libraries tailored for specific communities of interest could create global communities of learners.

Virtual libraries have the ability to transform practices and values for those who work in schools and libraries because of the processes that are enabled through these virtual resources (Bruce & Leander, 1997). Bruce and Leander, however, were concerned that the people who work in libraries might transfer values embedded in physical libraries to virtual libraries, thus preventing this transformation from occurring. Marchionini and Maurer (1995a) also saw the possibility of changed practices in virtual libraries, and believed that virtual libraries offered the potential for users to become authors and publishers as well as readers in this online environment, blurring the line between reader and author. This opportunity rarely presents itself in physical libraries. McKenzie (2000b) also saw the potential of virtual school libraries for changing learning practices and called on media specialists in schools to build a different type of library collection in virtual libraries: a new vertical file of student-created art, photography, oral histories, local histories, and local survey data that would be housed on the school server and that would be used to support the local curriculum and compensate for the inadequacies and inefficiencies of commercial clip art

and the lack of local resources on the Internet. He recognized that these locally produced materials change the nature of library collections and could influence the type of learning they support.

Virtual libraries break down the physical barriers between users and information sources (Marchinoini, 1995b). Not all students are at ease using physical libraries, and certain students face barriers in physical library use. Some students encounter more obstacles in accessing library materials than others. Visually impaired students face a number of access issues in physical libraries not faced by other students. There are limited materials available in a format they can read, and text on many computer screens is too small to be legible for some visually impaired students. Kavanagh (1999) noted that, "Even in developed countries, services to blind patrons do not meet library service benchmarks set for the general population" (p. 296). Through the use of audio and video, virtual libraries can also make resources available to users who are visually impaired, and virtual libraries can make these resources available in their homes. Technology exists to make virtual libraries more accessible for the visually impaired: refreshable Braille displays, screen readers with a synthesized voice output, and large buttons on keyboards (Kautzman, 1998). An adaptive technology that enlarges text size on computer screens can make some visually impaired students independent learners in virtual libraries. Chute, Sayers, and Gardner (2000) believe that virtual libraries of the future may integrate voice, video, and text for users involved in distance education in remote locations.

Designing Virtual Libraries to Support Student Learning

> Digital libraries are not just storehouses of information; they should be aids in question-asking, information-gathering, information-organizing, information-analyzing, and question-answering processes of users. (Borgman et al., 2000, p. 232)

Virtual libraries are constructed environments, and the way they are constructed influences how they will be used, to what extent they will be used, and the type of learning that can take place in that environment (Jasinski, 1998; Saracevic, 2000). Virtual libraries are usually constructed following the individual learning model. This model allows access to material and enables just-in-time and just-enough learning (Jasinski, 1998; Riel, 1998). The term *just-enough learning* comes from the business world where customized training provides just enough information or learning in order to complete a particular task. Just-in-time learning is a common term in e-learning. Just-in-time learning offers just enough information to solve a current problem without the distraction of additional information. This type of learning is made possible through the presentation of carefully selected resources to support the curriculum.

Neuman cited numerous studies to demonstrate how virtual libraries are a venue for higher-level thinking skills and higher-level learning such as

problem-solving, decision-making, critical thinking, or creative thinking. Higher-level thinking skills, as described by Marzano (1992, in Lockett & Kuehl, 2001), included comparing and contrasting, classifying, induction, deduction, abstracting, analyzing perspectives, decision-making, problem-solving, error analysis, investigation, experimental inquiry, systems analysis, invention, and constructing support.

According to Neuman (1997), two different types of learning are contained in the phrase *learning and the digital library.*

> Learning related to accessing, evaluating, and using the information resources available in this environment and learning related to mastering and building upon ideas embodied within these resources ... Information studies provide insights primarily about learning with these media formats ... "Information literacy," an area that incorporates concepts from both areas, provides a useful overarching framework for considering the digital library as a learning environment. (p. 1)

Many students who are accustomed to using the Internet as a source of information expect schools to make quality online resources available to them in order for them to complete school assignments (Levin & Arafeh, 2002). Levin and Arafeh noted, "Even students with strong skills say that finding the right information can be frustrating and time-consuming." The Internet-savvy students who participated in a study reported in *Digital Disconnect* by Levin and Arafeh found search engine results frustrating. These students stated that search engines retrieved too much, that the information that was retrieved was often biased or incomplete, and that many sites they located were filled with commercial advertising. Although these students did not use the term *virtual library,* they were really asking for the learning resources that a virtual library would provide.

The selection of resources for virtual libraries can help students address the concept of *enough,* an important idea in an environment of information abundance. Kulthau (1999) described the importance of determining when enough information was found when searching for information. Although it is important for information-seekers to continue the information search process until they are successful in locating information, they also need to know when they have enough information to begin presenting it. Customized virtual libraries, with preselected resources on various topics, can help learners not to become overwhelmed by the large number of resources available on a topic.

Much of the learning that occurs in physical school libraries is collaborative, not individual, involving students interacting with resources and each other, as well as the teacher and teacher librarian. Virtual libraries can be constructed to facilitate collaboration among learners either synchronously (real-time), or asynchronously. They can also incorporate instruction, tutorials, and reference service or assistance by e-mail or in real time. However, school libraries have not reached their potential in these extended

online services. A listing of a real-time reference service offered by two or more libraries by Sloan (2002) showed no school libraries.

Knowing the purpose of the virtual library, the users who access it, and what they do with the information from this space makes it easier to understand the type of learning that is supported in this virtual space and whether the learning in that space is successful. Borgman et al. (2000) saw the difficulty in evaluating the success of virtual libraries for learning because of their "richness, complexity, and variety of uses and users" (Evaluating Digital Libraries section). They explained that one way of determining the success of these virtual libraries in improving student learning was to observe whether these libraries helped achieve pedagogical objectives in teaching and learning. Borgman et al. were able to determine that the users of the Alexandria Digital Earth Prototype Library met the four skill sets required for answering geographic questions, while users of this library experienced user satisfaction, efficiency of learning, and a reduction in short-term memory load.

The European SchoolNet Virtual Library did not fare so well in its evaluation. The experts who evaluated this library described it as average, "due to its lack of interactivity, pedagogical objectives, general structure, and language barrier" (Piguet & Peraya, 2000, Redefining the Virtual Library section, para. 1). Piguet and Peraya saw the existing virtual library as an extended reference source and did not view it as particularly innovative in either its conception or delivery. They recommended a new approach to the design of virtual libraries, calling for a virtual library that would consist of two sites: one that would contain all the reference material and act as a resource area for teachers and students, and the second that would be a virtual workplace where students and staff could share ideas. This model would create a truly virtual learning environment as well as a virtual selection of resources.

Concerns About Virtual Libraries

Virtual libraries require connectivity. If there is no Internet connection, the virtual library is inaccessible. Although Internet use is becoming more widespread, many people still do not have Internet access (CyberAtlas staff, 2002). The term *digital divide* describes the gap between those people with access to the Internet and information technology tools and those without ("Digital Divide Basics," 2002). This digital divide exists not only between countries, but within countries. *Rethinking the Information Highway: Rethinking the Dual Digital Divide*, the report of the digital divide in Canada as of the year 2000, described the factors that determined home Internet access: income, educational attainment, type of job a person held, and the region of the country in which a citizen resided. Reddick, Boucher, and Groseilliers (2001) pointed out that home Internet access in Canada was concentrated among professional, management, and administrative workers. *Falling Through the Net*, the report from the American National Telecommunications and Infor-

mation Administration (NTIA, 2000) showed that even though substantial gains in Internet access had been made with lower-income citizens and that the disparity in Internet usage between men and women had largely disappeared in the United States, home Internet access still differed by region of the country, race, education level, and a person's age.

Connectivity, however, is not the only concern with the use of virtual libraries. Even if students have access to virtual libraries, they may not possess the skills to access and utilize the information effectively. Hargattai (2002) noted considerable difference in people's online skills in locating particular information and used the term *second-level digital divide* to describe the group of people who had access to the Internet, but lacked the skills to utilize the online information efficiently.

Virtual libraries still require skilled professionals to organize, maintain, and help students reap the benefits of this virtual learning environment. "The power of Internet resources remains latent to those without the skills to use them" (Ryder & Wilson, 1996, Timeliness of Holdings section, para. 3). Although some virtual libraries are lists of Web sites and require little Internet searching ability, others demand knowledge of Boolean logic and advanced searching skills to realize the potential of the database. Fitzgerald (2001), in her study of high school students' use of Galileo, the state of Georgia's virtual library, observed that students had trouble making effective choices when faced with multiple databases, that they had difficulty with effective searching, and were often unable to determine whether articles they located were relevant to their needs. Ryder and Wilson recognized that virtual spaces require scaffolding and coaching. "Who are the librarians in this virtual library? Who will provide the scaffolding and coaching for the unskilled researcher? ... Who will classify the knowledge and information? The tasks don't go away in the virtual environment" (Timeliness of Holdings section, para. 4). The teacher librarian is needed more than ever in this virtual library to guide students in their selection, evaluation, and use of the many electronic options. The need for instruction in the use in this electronic environment has been demonstrated in a number of studies (Bilal, 2000; Fidel et al., 1999; Large & Beheshti, 2000; *Learning Support Needs*, 2000; Gunn & Hepburn, in press). McKenzie (2000a) saw new roles for the teacher librarian or library media specialist in the new wired library: librarian as coach, librarian as navigator and pilot, and librarian as Infoteck. This new librarian will "select the best resources so that no one needs to waste time wandering around" (McKenzie, 2000a).

Other issues of a more technical nature affect the learning potential of resources available in virtual libraries. Storage of digital information is relatively new, and the many long-term storage issues have not been settled: the permanency, or lack thereof, of digital information; archiving digital information to make it accessible in the future; and the long-term maintenance costs of information in digital form (Greenstein, 2000).

Virtual libraries have increased the number of resources available to library users, but often many of these resources would not be materials that the library would ordinarily add to their collections. This is particularly true with online periodical databases available on a subscription basis. When libraries purchase online databases, collections are no longer tailored to a particular community of learners. Fister (2001) described the "oddball mix" of periodicals that come with a periodical database subscription such as EBSCOHost or Infotrac: "news magazines, junk business newswires, the contents of the sort of magazines you can buy at your local grocery store, and an assortment of scholarly journals" (para. 11), and explained the difficulty students face in selecting quality material from such a mix. The need for instruction in use and evaluation of resources does not disappear in a virtual environment.

Conclusion

Virtual is "a place, not a format" (Abram, 1999, Trend 6 section), and many people spend a lot of time in this virtual place (CyberAtlas staff, 2002). Teenagers in particular prefer the Internet as an information source to traditional print sources (Lenhart, Rainie, & Lewis, 2001; *Young Canadians*, 2001). The mere presence of virtual libraries, however, does not cause learning to occur. It is how these libraries are utilized by students and teachers that will enable learning.

Virtual libraries present a new paradigm for learning in school libraries. They have the ability to transform the relationship between learners and resources, facilitating both formal and informal learning. With careful design and the support of skilled information professionals, virtual libraries can provide powerful environmenst for student learning.

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