# *The Digital School Library*

## *Emerging Electronic Learning Communities K-12*

**Edited by Daniel W. Fuller**

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# *Introduction*

The emergence of digital libraries increases the value of libraries by providing the learner with the digital components of convenience and ease of use, two characteristics learners value. While the school library has traditionally been available only throughout the school day, suddenly students and teachers are able to access resources from anywhere in the school and from home. In addition, this new information system can be a portal to access digital library collections throughout the world. The digital school library creates an information system that is learner-centered rather than just a limited facility in the school. The learner has the opportunity to define their library and use that library at their convenience, particularly as wireless technology becomes ubiquitous.

The following chapters explore the emergence of the digital library in the K-12 educational environment and provide an indication of the direction these libraries have in the future. David Loertscher discusses the concept of a virtual information space, the information-rich environment designed for the student to use and control within the context of their experience in the process of learning. Kathleen Smoot brings school librarians into the mix. She examines the added value of school librarians when they act as the Webmaster and create the portal for students to enter the information media stream and information-rich environment.

Dispersion is the aptly titled chapter for Jesse Holden. It is an exploration of the relationship of the K-12 digital library and the curriculum as the information media stream is decentralized. It is a complex interaction where the learner has information options presented either as a formal part of the curriculum or informally in the larger information media stream. Likewise, Sandy Tao examines the pricing schemes and options vendors provide. Here the change in the landscape is obvious. Instead of buying resources, the library is "renting" access to the content. The cost of these quality resources to create an information-rich environment is significant.

Creating the learning community means looking at the services provided by the library differently. David Villiancio-Wolter introduces e-lockers (def) as part of the K-12 digital library. Digital media allows the K-12 digital library to deliver new services such as streaming video. Monique Turner's chapter discusses the future of multimedia in this environment. Deb Karpuk provides insight into the access to these digital materials and how it impacts the learner.

A model for a community of learners is the topic of the chapter by Karlton Chapman, Joe Marrone, and Dan Fuller. The model finds a basis in the experience of the Quaker Valley School District and stresses the importance of networks (def) to bind the community together. The final chapter by Fuller gives an overview of the state government's efforts to support the K-12 digital library.

As a whole, the reader should gain new insight into a world that is only now beginning to take shape. Surely new issues and abilities to create and use digital information systems will emerge in the next decade, however many of the issues will remain the same. As readers grapple with the issues presented here, it is the editor's hope that new questions and opportunities will emerge. Wouldn't it be fun to read these essays a decade hence to see what progress has been made and what ideas have been superceded or discarded?

CHAPTER 1

# *Building Knowledge-Rich Environments for Youth: A World-wide Challenge for Schools and School Librarians*

**David V. Loertscher**

*This chapter outlines the development of a digital school library intranet as an information-rich and technology-rich environment designed to provide a nurturing and safe environment for both students and teachers throughout the school and extending this environment into the home. Emphasis is given to the creation of individualized views of the intranet by both students and teachers, complete with academic, career/professional, and personal information spaces. Built upon this environment, the author proposes strategies designed to stimulate the rise of a knowledge-rich environment or learning community using concepts of collaboration, information literacy, user control, and the phenomenon of small world networks.*

Knowledge-rich environments, the amalgamation of information-rich spaces with technology and active learners, are emerging very rapidly in the early 21st century. They have the potential to nurture every learner in a world fraught with division and widening disparity.

For the past ten years, this author has been mulling over the major shift in technology, the Internet, and the role of the school library. Trends in these three fronts have been both exciting and troubling.

In this paper, the author will outline an emerging view for the creation of a digital school library intranet which will, in turn, be the foundation of a knowledge-rich environment.

## Information Environments: A Background

The information environment for millions of children around the globe consists of a family and social structure interpreting the environment surrounding it. Such cultures are generally under-appreciated in the modern world because the shrinking global community is uncertain how to coexist with the strengths those cultures bring.

The Hmong people, for example, had a very difficult time trying to adapt to the American society after the Vietnam War. In Denver, Colorado, where I lived at that time, Hmong men, transferred from a rich mountain experience and suddenly shifted to a modern, highly competitive and capitalist society, were dying for no apparent reason, other than cultural shock. Of all the difficulties experienced, the change in cultural information systems to academic information environments was just as shocking as the change in food, terrain, and value systems. One could not succeed in American life using previous knowledge systems because a family's survival depended on quite a different set of rules. The traditional information systems were not robust enough to adapt when the immediate need was to provide a living for one's family using almost none of the previously known skills.

Millions of other children in the world, in addition to their cultural knowledge-based systems, have the minds of their teachers. They may have no books, computers, or even paper and pencils, but in addition to their family and environmental knowledge system, they have the experience of teachers with knowledge systems beyond their local culture. In American newspapers, many stories of the reopening of schools for Afghani and Iraqi children have been circulated in a celebration of children and teachers who want to grow and develop and be able to seize opportunity.

Still other millions of children may draw not only upon their culture and their teacher, but have the advantage of a textbook as an added information system. Textbooks have been wonderful inventions because they combine the expertise of many subject specialists coalesced through the eyes of a textbook author into a very versatile data storage mechanism. These information packages are very convenient and available for use both in and out of school depending on the circumstances and affluence of the school.

Added to this culture-teacher-textbook environment may be a library – ranging around the world from simple to complex, varying both in size and contents from exclusively print to multimedia materials. Costs of these information environments for materials, information, and the various technologies to make them viable include a human component known as the librarian. At first, the role of the librarian was to create a knowledge system though known storage and retrieval principles developed by inventive library professionals – Ranganathan of India and Dewey of the United States, to name two examples.

In the later part of the 20th century, the school library community has been working on a broader picture of the library or information system as it interfaces with students and teachers. Not content to continue only with storage and retrieval roles, school librar-

ians have stepped into a collaborative partnership role for teachers in the creation of exciting learning experiences. They excel at using whatever resources and technologies are available to make a positive impact on teaching and learning. This interface and collaborative role change has been a difficult transition, not just for the librarian, who had to adapt to a role shift, but also for students and teachers who also had to shift focus. Users could now expect a dynamic learning environment, not just storage and retrieval.

In selected locations around the world, a few teachers and students are experiencing this collaborative information environment. In these educational communities, the information is plentiful, the staff of the library large, and the collaborative environment rich. But this model ebbs and grows based on the affluence of the community, the vision of educational leaders, and the competence of the librarian.

Numerous research studies show that the strong collaborative model of school libraries stimulates "achievement" or learner outcomes. Among the promising characteristics showing impact, size of collection, size of professional and support staff, and amount of collaboration are key factors (Lance and Loertscher, 2004). These factors or variables seem to work in concert particularly when comparing high achieving schools to low achieving schools.

Efforts to spread this collaborative school library model have received mixed results, even in the United States from which the research emanates. Collaborative model information systems are expensive, require leadership, vision, support, and expertise – ingredients that may not be in abundant supply in an individual local jurisdiction. The results seem to be a patchwork quilt of success, not only in the United States, but also in Canada, the United Kingdom, Sweden, Australia, and New Zealand – countries with which the author is familiar. The building of collaborative information systems in schools has not paralleled electrification, the spread of communications technology, or global business systems because the impact has not been valued highly enough to be considered essential. Where it is regarded, the investment has not been sufficient to come even close to its theoretical potential.

Enter the Internet. Everything changes, or at least, needs to be re-examined.

The purpose of this paper is to rethink the information environment of children, young adults, and teachers as high-tech becomes ubiquitous throughout the world. The information system which I will describe is very close to be operational in a few locations in North America and, with some capital for development and refinement, could serve as a model easily implemented almost anywhere.

## The Expanding Knowledge Base

In the eighteenth century, Dennis Diderot felt that the universe contained a finite amount of knowledge and that almost all of what could be known was known. Thus, he created an Encyclopèdie, feeling that all knowledge could be captured and summarized in a single set of volumes. Melville Dewy also felt in the late 19th century that his classification system would go through only a few editions before it could classify the sum total of all knowledge.

Looking back from today's vantage point, we have seen an explosion of knowledge, and while encyclopedias are still a valuable asset, they summarize only the barest of essentials. To be sure, Stephen Hawking postulates: "Will we succeed in our quest for a complete unified theory that will govern the universe and everything that it contains? . . . We may have already identified the Theory of Everything (ToE) as M-theory." (Hawking, 2001, p. 175) Hawking wrote his popular book: A Brief History of Time in 1988 and noted in the introduction of his latest work how much more is known in 2001 than in 1988. He and other scholars see much left to learn before a Diderot or M-theory sense of euphoria overtakes us.

A group of well-meaning educational and governmental leaders in the United State have been trying to solve the ever-expanding curriculum with a system known as standards-based education. Instead of allowing a rapidly expanding content model, they have opted to define a central core of knowledge that every young person should know and be able to apply. Standardized testing across the grade levels has been created to measure how well this core has been internalized. The spectacular progress expected, dictated, and pressured to happen, has not yet occurred according to the NAEP reports regularly issued by the U.S. Government. (NAEP, 2000) If we look across educational practice for the past 50 years, the current model is likely to be superceded in a fairly short period of time since the pressure of expanding knowledge renders even core knowledge obsolete rather quickly.

The rapidly expanding knowledge base plays havoc with libraries as well as educators, because the high cost of keeping pace is beyond many normal budgets, at least at the funding levels of the past and particularly during times of economic decline. It seems that every time the Hubble telescope is pointed in a new direction, entire library shelves are rendered hopelessly out-of-date. The quandary for every librarian has been weeding criteria: What percent of inaccuracy should I allow before the harm done by this book surpasses its benefit?

## In the Age of the Internet

The Internet as an information environment for children and young adults has created a fascinating competitor to libraries of all types. Search engines such as Google are so easy and immediate that many young people, faced with a research assignment, just "google" their way through the Internet rather than struggle through the hoops of a more traditional library environment.

To be sure, the Internet is:

- Overwhelmingly large.
- Mostly irrelevant and largely unreliable.
- Full of advertising, pornography, and other entities designed to lure young people into becoming paying customers or in other unwholesome activities.
- Getting outdated as many sites age without funding or time for volunteers to update them.
- Becoming less and less "free" as corporate entities try to recover costs or make a profit.
- In some danger of collapsing as its size overwhelms capacity.

Yet in spite of these drawbacks, youth are attracted in such large percentages that library collections, even though superior in content, are ignored. Users gravitate to information systems and technology that suit their needs, whether or not those systems are superior. Handheld devises may rule in the marketplace, not because of screen size or quality of graphics, but because portability overwhelms the negative factors.

Librarians need to realize that to stay relevant, they must embrace the information needs of children and young people on their own terms, not those of well-meaning adults. Many school libraries are rarely accessible at the times when information needs are critical. They are down the hall, filled with classes already, closed in the evenings, and often their most valuable information resources, the reference collections, are chained to their shelves. Google, on the other hand, is always there as long as the connection is working. And in the age of wireless, it is ubiquitous as well as available 24 hours a day, seven days a week.

What sort of school library information system would young people be attracted to? What system would be so valuable and so convenient that students and their teachers would want to start there first before venturing forth into the information smog of the Internet?

## The Library as the Digital Hub of the School

In the United States, many school administrators understand that when they give a speech about the library, they should refer to their library as "the hub of the school." In the age of digital information systems, that phrase can be truer than ever before. I would propose that every school library in the world that is able, construct a portal/web page that constitutes the central hub of information essential to every student and teacher. This portal would be the home page of every student and teacher's computing device as it is turned on. The school library would be every student and teacher's essential information system. To these users, "It all begins at the school library," since it is the gateway to the world. It is the place to start: A safe and nurturing information environment.

In the next few sections of this paper, three views of the total digital school library intranet are provided:

- The academic environment
- Career and professional space
- Personal space

The academic environment will receive the most attention. At the conclusion of this exploration, observations will be given concerning the transformation of these spaces into a knowledge-rich environment.

## The Academic Environment

### A Safe, Nurturing Environment

The first essential element of an information environment that would truly nurture every student and teacher is a closed system with a firewall of protection from the outside world, an intranet rather than an Internet. For hundreds of years, libraries have built collections of materials, information, and technology targeted at a particular group of users. It never contained everything, but it did contain the highest quality materials targeted at users in a specific community. It was as large as the librarian could influence the community to afford.

School librarians have not sought to build libraries containing all that is known. Such collections would not be desirable in any elementary or secondary school. Even in the digital age, librarians would build a smaller (a relative term) system, yet it would be "enough," to challenge every learner.

The digital information system would also be a safe environment from a number of elements that have become so common on the Internet: advertising, pornography, hackers, and push elements from persons or groups trying to gain access to youth for a variety of nefarious reasons. Just as we might protect our homes or school grounds from harmful elements in the community, the digital information system would also guard against destructive forces. Such a protective environment has nothing to do with the issue of intellectual freedom or with filtering as it is known currently. And this protection extends not just within the library walls, but into the classrooms of the school and into the homes of students and teachers who are accessing this school library intranet.

The intranet envisioned here is no different than many created for professionals in corporate and research environments around the world. Many organizations have intranets protected from the outside world. Within these systems, email and instant messaging can take place, but only within the internal environment. Students might have additional email and instant messaging as a part of independent accounts from home. Figure one shows this protected information environment or the walls of the digital school library.

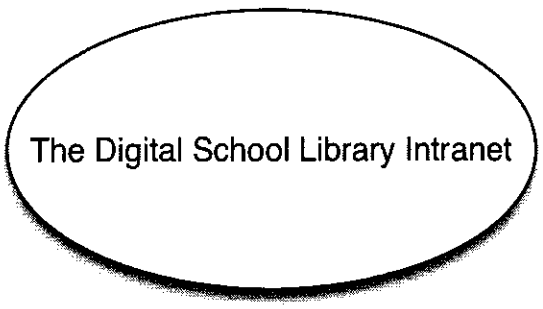


Fig. 1

## Customization for Every User

Librarians are accustomed to building "one-size-fits-all" information systems. They build catalogs using search mechanisms and search terminology that all users, adult or child, sophisticated or novice, must use to find materials successfully. A number of libraries targeted at children have subscribed to automation programs that are aimed at children utilizing kid-friendly interfaces and easier search terminology. However, even with these kids catalogs, the interface is still one-size-fits-all at the child level.

A much more optimal interface would allow each user to create and build their own view of the information space within the school library intranet. A child at a certain grade level might wish to view information targeted at their grade level, assignments from only their teachers, e-textbooks for their classes, plus access to information suited to personal interests. This interface could expand or contract within the intranet at the discretion of the user under the guidance of the librarian and the teacher.

Close to the beginning of the school year, students would enter the main school library intranet and, after some exploration of that environment, would design their own home page within that space, gaining access codes/authority at that time which could then be used on whatever electronic device they were using, either at home or within the school.

For example, students would identify teachers, courses, needed tools, areas of interest, topics for which they want to be notified regularly, languages spoken, cultural and religious preferences, level of ability; and they would set up email/instant messaging accounts inside the protected information space. At any time during the year, students, perhaps in consultation with teachers and librarians, could reset their parameters, or they might just choose to see the entire intranet.

The same features could be constructed by teachers who would want to be in contact with only their own students, their classes, their e-textbooks, and resources for their classes. If they were collaborating with teachers outside their own discipline, other spaces could be opened up temporarily as needed. Following a common pattern already known in the larger library world, these personalized information spaces might be termed "My School Library" as shown in figure two.

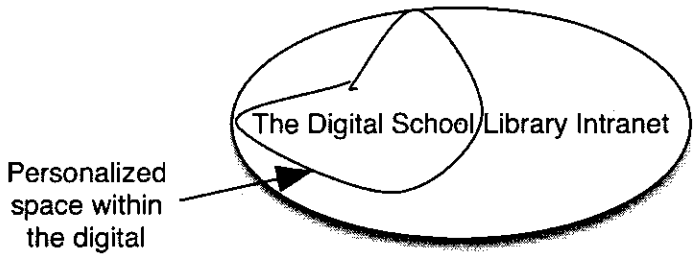


Fig. 2

## Building the Digital Contents of the Academic Information Space

### An Information-Rich Environment

Building a digital information-rich environment for teachers and students draws upon long-known principles of selection: a solid match with the curriculum, appropriate difficulty level, authority, and high quality, among others. Publishers and jobbers are still learning how to support the needs of young learners in the digital world and provide affordable resources.

Digital resources for school library collections might contain three levels within the intranet. These are the core collection, the curriculum collection, and the elastic collection.

**The core collection.** Similar to the reference collection of traditional libraries, the core collection contains materials meeting the longstanding Bradford distribution principal that 20% of the collection can usually account for 80% of the inquiries. Thus, encyclopedias, dictionaries, atlases, core databases, and captured web sites spanning common curricular topics would be selected. In the United States, school districts and even states have licensed many of these core works not only for the schools, but for every citizen within their state. By doing so, these core works cost much less per capita and, carefully selected, can provide a rich starter collection available equitably across whole populations. Individual school librarians might create such a core collection, take advantage of core works created by larger entities for use by school students, or add to core collections as needed until the Bradford phenomenon appears to be operational. Figure three shows this concept.

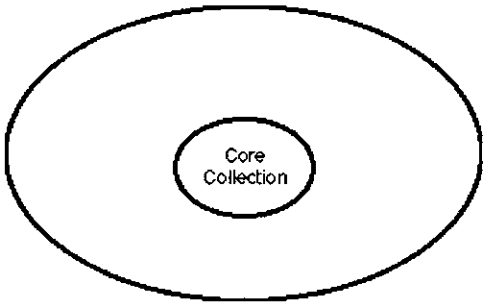


***Fig. 3: The Core Collection***

**The curriculum collection.** Using well-known collection development principles, a school librarian would then add resources to the core collection designed to serve a particular curriculum. These might include e-textbooks, collections to support reading initiatives, science and social studies materials, original sources, graphical sources, and curricular information in a variety of languages and difficulty levels. From major projects such as Access Pennsylvania done in the United States a number of years ago when school library catalogs were joined to form a single online catalog, we learned an important principle about school librarians. They choose collections matching their curriculums that are as different as they are alike across schools.

Some may presume that a school district might build a digital collection that would serve the needs of every elementary school. Not so. With professionals as "chief information officers" at the building level, digital collections would be as diverse and unique as required by the needs of a particular school's curriculum, and student population as shown in figure four.

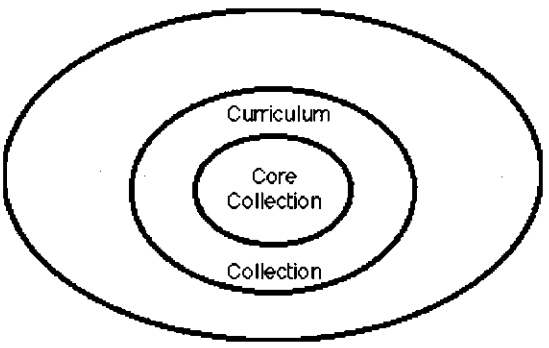


***Fig. 4: The Curriculum Collection***

**The elastic collection.** Information vendors often pitch their information databases to schools and libraries based on a subscription lasting for an entire school year. The idea of the elastic collection would be to open, on the basis of need but on a short term basis, certain information channels to serve short-term information needs. For example, an advanced high school chemistry class might need access to Chemistry Abstracts but could never afford to subscribe to such a sophisticated data repository for a year. The librarian might contract with the company to open that database for three hours at an appropriate time when the students and teachers were doing high-level research. Access would then be ended. For some companies, the librarian might buy a "phone card" in advance that would allow access to a variety of specialized databases based on the minutes used or queries made.

Such access to specialized resources would be termed "elastic" since the school library collection would vary in size from day to day depending on the requirements of teachers and the needs of students at any given moment (see figure five). This concept follows the well-known principle that in the digital age there is a great deal of difference between what a library "owns" as opposed to what it "provides access to."

The elastic concept would work in the world of fiction as easily as in the advanced database arena. For example: As Harry Potter books are released, the school librarian might lease 300 digital copies for two weeks, dropping to ten copies thereafter. Or, one could imagine that as holidays are observed or popular topics become fads, the digital collection would swell or contract as required by the users. Students and teachers might indeed control the size of the collection at any given moment as they clicked on the Harry Potter book collection. Instead of contracting for a certain number of copies, the users would govern the number of copies required as they clicked their way through the system. A teacher having all students read the same novel would "order" the number of e-copies needed for a short period of time.

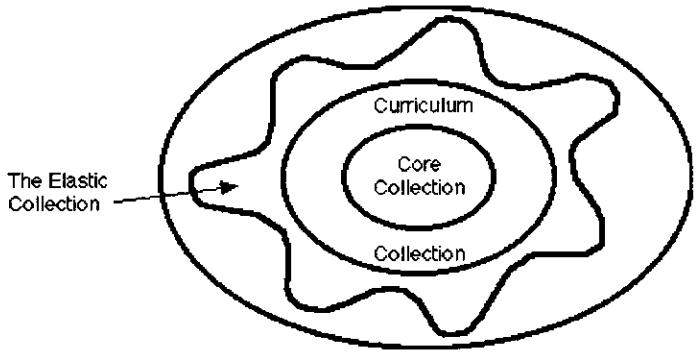


***Fig. 5: The Elastic Collection***

## The Internet and the Intranet

No matter how large the school library intranet is, students and teachers can benefit greatly from access to the Internet. In the view posited here, access to the Internet would be a feature that each student would have to "turn on" as their own customized web page was created. However, rather than lodge the responsibility of Internet access onto the shoulders of the school librarian or teacher, the parent would have full control.

A parent or caregiver, depending on the technology available, might authorize various levels of access to the Internet:

**Level One Internet Access.** Level one access of "white-listed sites" (those URL's that could be accessed from the intranet but not further) would consist of selected web sites using normal library selection criteria for authority, usefulness, and appropriateness. At least one commercial vendor already has 180,000 carefully selected websites that would be useful to children and young adults. This core collection can be "leased" by the school librarian and it is updated/maintained daily by the commercial vendor. Such a collection might be a part of the core collection described earlier. Or, the librarian might lease selected chunks of the whole collection offered either for the intranet or for level one access. The school librarian (chief information officer) would add other desirable websites of a curricular nature as a part of the curriculum collection above. And as part of changing curricular needs, the chief information officer could open access to specialized web sites for a few hours as part of a specialized study (controversial sites, very sophisticated sites, or other sites where temporary rather than regular access would be desirable). In addition, fee sites would be a part of the elastic Internet collection as described earlier. Parents would sign up for this level of access and would be assured that selection criteria would have been applied to all of the sites within this collection. If there were sites that parents would rather not have their children access, these sites could be eliminated for the level one access collection that could be seen by an individual student. In the Harry Potter example above, some parents might not wish to have these titles accessible to their children and that would be their choice.

**Level two Internet access.** Level two might be subdivided into a number of various levels depending on the growth and sophistication of the technology available. One might think of turning on "blocks" of Internet sites, all of which would be screened or selected by a librarian or teacher, areas of the full Internet, but not the entire Internet; larger than level one, not everything. Parents would need to understand the choices this level of access would provide to their children or teens and would have the power to open or close this access at will.

**Level three Internet access.** Parents might feel that their child or teenager is responsible enough and information literate enough to tackle the entire Internet as a part of their school experience. In this case, the parent could turn on full access or at least full "filtered" access as deemed relevant to their own child's needs. Again the parent would have to understand fully the responsibilities connected to the online switch and could control access, opening and closing it as appropriate.

## The Picture of the Whole

Figure six illustrates the central components of the school library digital collection as a safe, smaller (a relative term), and high quality information system. It emanates from the school library into every learning space in the school and into the homes or locations where learners are served. It would spread out to home schoolers, those who for any reason could not physically come to school, and include distant sites or "sister schools" as partnering occurs locally, national, or internationally. Yet it is behind a fire wall.

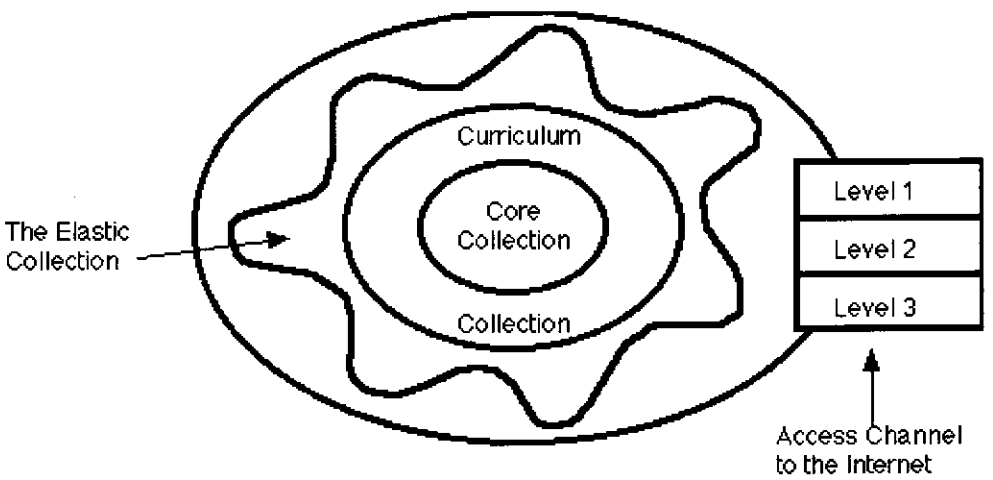


*Fig. 6: The Digital School Library and the Internet*

## Personalized Features of the Academic Space

Within the intranet, every student and teacher should be provided with various other information technologies designed to maximize a learner's opportunities and potential. The current state of technology allows a description of three features, but others are likely to develop. Those described here include tools, push technology, and pull technology.

**Tools.** Young people and their teachers will need the tools to operate within digital space that will boost their potential to learn and provide both sophistication and efficiency in support of the learning process. Current tools that come immediately to mind include:

- An office suite (word processor, database, spreadsheet including mentoring software such as spelling checks, grammar checks, wizards, or other guidance software such as stimulation toward critical or creative thinking).
- Graphics packages (drawing, graphic art software, concept mapping programs, among others)
- Web construction editors.
- Presentation software (tools such as PowerPoint or Photoshop).
- Communication tools (allowing voice and visual contact with other learners or experts and allowing students and teachers to transmit projects, messages, graphics, or conduct planning).
- Translation packages (both language translation and cross-platform translation or conversion).
- Assistive technology (for blind, disabled or other physical challenges).
- Communication tools (certainly within the educational environment and beyond as parents and protective technologies allow).
- Course/classroom software (programs such as "Web CT" or "Blackboard" where courses are conducted).
- Remote sensing devices (allowing collection of data, experimentation, or experiencing whether onsite or from afar).
- Tutorials for using any of the system tools or their upgrades.
- Management tools for teachers such as grade books and attendance software.

Whether these tools will be resident on the school library server, on the client's device, or a combination of both will depend on the sophistication of technology, bandwidth, and a host of other technological issues known now or in the future. Many institutions already license software packages for entire work groups, an entire student body, or

small groups with specialized needs. Thus the pattern for this work environment is already in place and will become more and more flexible as schools exhibit the need to equip each individual with the tools required to flourish. These work tools will need to be updated on a regular basis as innovation and technology advance. Software operation will need to be seamless across the computing devices in the school, personal technologies and home-based or mobile technologies.

**Push technology.** Both learners and teachers can expect software on the intranet that will allow them to become aware of things that will benefit them. Current push technologies might include:

- Automatic notification software – including calendaring, notification of assignments; alerting messages about new software available; messages alerting the user to new articles on topics of personal interest or research; opportunities available for scholarships, learning opportunities; student activities and service projects; and a whole host of other messages to grow and develop as a responsible member of the learning community. For teachers, this technology would provide notices of new professional articles or research reports of interest, alerts concerning policy changes, or opportunities for professional development, to list a few.

- Messages/news from administrators, librarians, teachers, parents. For both students and teachers, messages of upcoming events, announcements, reminders, and opportunities are designed to help the individual plan and work successfully within the educational environment.

**Pull technology.** Pull technologies include the various search engines and meta-search engines to allow the user to locate desired information within the information system. Over the past two decades, search engines have become better and better, and there is reason to believe they will become smarter and more adaptable to a particular individual's needs. Progress is being made toward a single rather than multiple search engines that will search a wide variety of information databases and sites rather than using multiple engines with a plethora of icons cluttering the computer desktop. A single meta-search engine might allow us to search first within the intranet and as the parent allows, then outside that environment in the world of the Internet. At the present, the emphasis on building search engines is on precision, that is, to provide a selected few sources that meet a need exactly. Dr. David Barr, however, reminds us that learners who are becoming mini-experts in a topic or teachers who want to build comprehensive knowledge, require recall as well (where every relevant document is retrieved) (Barr, 2002, p. 21-26).

## Career and Professional Space

Both within the intranet world of the digital school library and outside its walls in an independent space, each student and teacher might construct a second space devoted to career interests that eventually expand into a professional or vocational information space. This nurturing information environment would support hopes and dreams, plans, and the building of expertise. As a career, a profession or trade is embraced, the information space evolves to support and extend.

For example, a youth headed toward medicine would be able to explore educational opportunities, find help in preparing for college, expect support while in college, and build a career information-rich environment as a physician. For a teacher, this space would provide the informational foundation or "professional library" that would help that teacher stay current, participate in professional development, and grow in other ways to increase their personal expertise. In a number of countries, the adult years are not focused on a single job but seem to be changing at varying intervals. The information space would be at the command of its user. One thinks of an information cone spiraling outward as the child grows and develops toward adult life. As an adult, the same space nurtures a specific career or helps that adult grow or change to a new career. To reiterate, this space contains:

- Expert topics you are pursuing.
- Career exploration at any stage of life.
- Educational opportunities throughout life.
- Professional or trade group support.

## The Personal Information Space

Outside the digital school library intranet, every student and teacher would construct their own personal information space. This would be in addition to the academic and career space outlined above.

### Building a Personal Space

Young people already connected to the Internet quickly build their own personal information space whether or not they change the look or feel of their home page. As their experience grows, they know exactly how and where to click to get to pieces and parts of their personal space. Customization is already well-known such as My Yahoo. Jakob Nielsen reported recently a number of problems connected with person-

alizing websites and building for the child (Nielsen, 2002). Customization of interfaces is being developed at the University of Maryland and will no doubt develop rapidly as school librarians, in league with students, develop ideas for viable interfaces. Young people already know what they want in their personal space:

**Games.** Number one. Numero Uno. From simple to elaborate, the youthful crowd know what they want, what devices are needed, and how much they cost.

**Communication.** Young people want to communicate with friends, family, and the school community, in that order. Telephones, e-mail, chats and instant messaging currently are center stage in this arena, and this will grow as telephones and personal data devices merge into a single device. Teachers, librarians, and student work groups already benefiting from instant and ubiquitous communication technology have not always learned how to channel this communications technology well or how to focus an individual's attention. Perhaps a set of function switches could be developed to turn on or off selected information spaces at given times.

**Family space.** As digital information expands, so do opportunities to communicate and function in ways to enhance family ties and nurturing, particularly in mobile, extended, and divided families common in some cultures.

**Private space.** Many young people have special needs including mental health, physical health, spiritual health and other personal needs that a more private space would satisfy, free from prying eyes and outside forces designed to attract or pull in unwanted ways.

## Advantages of the Digital School Library Intranet

Numerous advantages drive the construction of a digital school library, at least one that is ubiquitous, reliable, and available twenty four hours a day, seven days a week, and 365 days a year. The following may not be a complete list:

- The digital school library becomes the **primary information system** – the true hub of the school. Finally, on every digital device, computer screen, or instructional space at school or at home, the school library has an essential place as "the place where I begin."

- Digital libraries are available for students who are being **home schooled** yet who need access to the same information-rich environment that government supporters have provided for those attending public schools.

- If a student for some reason moves to a distant location for a season, the digital school library is **available anywhere and anytime**. It might also provide **distance educational opportunities** for young people with special academic needs not available at the local school.

- By utilizing the personalized space that every user can create, the digital school library can provide many more **cultural and religious** materials that can be accessed or ignored under user control.

- The digital library provides for **individual differences** in ways print libraries could not do very well. Using the personalized space construction tools, the library can serve:

    - Age ranges
    - Ability levels
    - Personal preferences
    - Languages
    - Sophistication levels

- **Equity** issues are served very well by the digital school library and are particularly effective with funding agencies seeing that access to all can become a reality.

- **Access** to information in the digital world will not depend on access to a single physical location with the traditional organizational restrictions to when, where, and at what time information resources can be used. This concept is discussed further in the section of this article dealing with issues.

- Digital school libraries can be **"device enabled."** The information will be compatible with a wide range of devices whether they be computers, hand-held devices, or other technical devices now being developed.

- The technology is now available to provide an information system for young people including **individualized customization**. The "my space" concept is already growing rapidly in many sectors of business and industry.

- Analysis of the digital possibilities allow us to think in terms of a **"smaller," but high quality** information environment. Here, searches come up with both reasonable and/or rich results as queries are made.

- The digital school library intranet vs. Internet concept **transfers responsibility** of information access to the full Internet to parents/care givers where it belongs.

- **Safe information environments** are created away from and protected from the rush-hour traffic on the Internet highway. Predators of all types are locked out.

- Digital school libraries still embrace the principles of **intellectual freedom** since all materials within the library are carefully selected under the guidance of selection policies as has been the case for a century. The tug-of-war of ideas is still alive and well.

- Librarians will continue to build a **selected collection** utilizing their time-honored expertise. They recognize the needed core materials, materials that will support specific curricular agendas, and they will know which resources belong in the elastic collection for specialized uses.

## Issues Related to the Digital School Library

Numerous issues surround the creation of a digital school library. Some have already arisen. Others await more experience, and the development of software and hardware.

### Access

The major issue of the digital school library is really identical to the print school library: access. Who can gain access, when, for what periods of time, through what devices, at what speed, and from what locations? It will not take a great deal of effort or networking to surpass the access to the print library that is currently visited frequently by a few, occasionally by many, and never by more users than we care to admit. In the United States, access to computers has risen very rapidly in the past ten years. In nations where wireless technologies are ubiquitous, hand-held devices are becoming extremely common so that access issues are decreasing in importance.

## The Concept of Enough

How much information and technology is "enough?" Two factors have limited the size of information space in the print world: what the community could afford, and the limits placed upon the user by the librarian. All over the world, national, regional, and local governments claim poverty and generally under fund information systems for young people. When included in full organizational budgets, expenditures for school libraries have often been low and are given low priority. That is because in any school, salaries, buildings, and maintenance often approach 90% of any funds available so that all services fight over the small percentage left. Of that 10% or so, an adequately funded library will require the largest chunk next to the textbook budget. No wonder the crows surround the body.

In their own way, librarians have also severely restricted access to library materials claiming that some users must be denied access because they are irresponsible. Most librarians restrict access to print reference and periodical collections because of the need to have those materials available during open hours. Still others restrict circulation to one or two items in a given period. Such restrictions have the organization's interest at heart rather than the needs of the users.

Even though library standards in various countries have advocated the idea that "bigger collections are better," in-house restrictions have severely tested this concept. This author knows no research testing on "how much is too much."

In the digital world, we already know from experience rather than from research that access to the full Internet produces instant information overload and data smog. So, how much is "enough?" In the proposed high quality, yet safe school library intranet, that concept may be tested not by professionals, but as a deduction based on user control over their own information space. As users create their own portals within our portals, we will be able to study the information spaces they create for themselves to learn what to regularly stock in the digital collection, what to provide from the elastic collection, and the response of parents to various size channel settings to the Internet. And, users should be able to communicate with us about the boundaries, barriers, and problems encountered in the library space. If we find that they are seeking nurturing elsewhere, we will want to re-adjust our boundaries until we find an optimal and liberating size rather than a confining space.

We will also find those of our users who don't care anything about "a rich information space." They see no relevance in becoming educated or in growing and developing in

any intellectual way because they don't see a payback. This may be true about their academic information space, but their personal space containing recreational materials may be huge. For example, Apple Computer makes the iPod – a 5 gigabyte cigarette-sized solid drive on which 2,000 songs may be recorded. Early users filled that space up with MP3 recordings in a few days and clamored for more. A 20 gigabyte version is now available. At what point between 2,000 and 8,000 songs will the system become too much for its owner? Or, will the appetite be satisfied at 100,000 songs? A study of behavior in the popular culture may give us clues about "enough" in academic information space. One wonders how many science fiction or fantasy e-books a young person might want to store on their personal digital device. And, if that is possible, how many e-books, articles, dig site updates, and other information about dinosaurs would they want to "own?" Already we know how comforting ownership feels.

## The Redesign of Workspace

Much needs to be done in the design of workspace for children and young people. In the tools section discussed above, we envision surrounding each student with the tools needed to be an efficient learner. Numerous companies have developed kid-friendly versions of tools originally designed for adults. Missing at the moment, however, is a workspace designed for a child where both process and content learning can be developed and delivered to teachers.

One thinks of the need for students to question, find, consume, create, present, and reflect using a tool that would be a record of learning. For example, if the teacher sees only the research paper with the bibliography, the teacher can often not track the sources used by the student, particularly when those are URL's that are often unavailable shortly after they are cited.

Imagine a workspace where both the process and the product can be examined. For example, the central part of the screen is the product – the research paper. It might be a multimedia product, but for simplicity's sake, let us assume that it is a report or research paper. Surrounding the product space on the screen is the process space that can be consulted with simple clicks by the reader of the paper. Clicks might include the process log, concept maps, full-text resources used in the paper's construction, captured web sites, notes from sources used, logs of research queries, rubrics, and any other useful record of the path matching the product being evaluated.

More comprehensive and easy-to-use software designed by and for youth would lessen greatly the "cut and clip" methodology used so widely. Teachers would be able to assess not only what had been learned, but how content had been developed.

### Breaking the Googling Habit

There may be no way to break the googling habit for students who have searching patterns well established, but the good thing about schools is the turnover each year. We can groom our digital library and start with a new crop. First, the digital library must be designed cleverly to attract and nurture a potential student. Then we press our advantage. We might use the strategy of the German corporation Daimler-Chrysler that took a bold step forward in the design of the PT Cruiser automobile. Their automobile is probably no more reliable or superior mechanically from any other, but the unique design caught instant attention and demand spiraled. In the library world we can do better. We can have both a unique design and a much-superior information space. It should not be terribly difficult to grab the attention of our users. Perhaps they can help. Someone has said that the currency of the 21st century is attention.

### Working with the Commercial World: Fair Use vs. Copyright

Librarians have always been concerned about creating a balance between copyright issues and fair use in the educational world. Given the current confusion within the music world, educational publishers have been reticent to open electronic channels lest intellectual property and publishing revenues be ravished by wholesale copying.

By creating an intranet as the school library, the long-standing protection of intellectual property remains intact. School libraries have always purchased the periodicals, books, and multimedia for their collections or obtained licenses for such things as television programs having time limits on their storage longevity. A printed book is purchased once and made available to many many users over time as long as that book is retained in the collection. We expect the same to be true in the digital school library. Let us not forget. Some companies are providing e-books with a certain number of chairs. An e-book with one chair limits the use of that book to one user at a time but includes unlimited uses.

What is different is the idea of ownership vs. "access to." Subscribing to a periodical in pre-digital days meant that the information would be available to users of the library as long as the librarian cared to archive the periodical run and that usage was unlimited to the patrons of the library. Such agreements in the licensing world are critical, especially

if a temporary dip in budgets were to occur, the library would still have previous runs of periodical data rather than none at all. For example, if I purchased access to 500 copies of an e-text, that access right should continue for as long as I would care to archive it, or I could keep such e-texts continuously updated through a system of licensing.
In the digital world, publishers and librarians will have to learn how to work with each other to negotiate ownership vs. access rights. The notion that all access by a student to the information pool on a metered system might be very attractive to the publishing world but unacceptable to the library and education world who would be held hostage by those who controlled access to content. On the other hand, by creating an intranet, publishers could license materials to a small group of users without the fear of losing control across schools.

Several methods for purchase, licensing, "try before you buy," or free access are already being tested in the digital market. Librarians will continue to vote for the systems they prefer with the money they spend. School librarians will continue to champion the copyright laws but will also insist on the fair-use needs of their students.

## Will Books Survive?

The user will decide. They have already decided in the world of periodicals, preferring online, full-text, and downloadable in a few seconds to searching magazine rooms when and if they could get to the library. The same will be true for books. When e-books become widely available on ubiquitous personal devices, our users will vote with their usage patterns. We need not make the decision for them. Users already killed 16mm films even though that was a superior format to video tape. Now video tape is under attack. Filmstrips are dead. So are single concept 8mm film loops. No one is crying.

## Budgets and the Concept of the *Information Utility*

Digital libraries cost more. True, the cost per information unit per person may be less, but the digital library easily surpasses the size of the largest school library. Costs including the reliable networks to maintain them are higher than their paper counterparts. That's the way it is. Face it librarians, administrators, boards, and taxpayers!

We seem to be emerging into an information utility concept. There are costs associated with school busses, heat, lights, and now information. Don't pay the gasoline bill – cancel school. Don't pay the information utility bill, cancel school. Interestingly enough, my calculations show that the cost per child for e-texts and all digital library materials would actually be less per month than the cable or satellite television access bill in the

home. At U.S. current rates, most families are spending somewhere between $35-50 per month for television – a handsome sum if used to build a digital school library.

### Commercial Competition

Publishers of all types have competed for library budgets in the past. They will in the future. The librarian creating the digital library will vote with their money for the highest quality information at the most reasonable prices. No differences here. If some commercial providers try to capture a monopoly, upstart digital publishers will arise to challenge them as long as the free market system is in place.

### Staffing

Some of the components of the digital school library can be funded and shaped at district, regional, state, and federal levels or their counterparts in various countries of the world. We have some temptation to build one system and serve it out to everyone. While theoretically this could be done, there are a number of important reasons why this will be insufficient. After an extensive review of the research literature on information literacy, Loertscher and Woolls concluded that in the world as we know it, the human interface is a vital component of the information system. (Loertscher and Woolls, 2002, p. 21)

Unless computer systems and delivery mechanisms become extremely intelligent, just linking young people in and turning it on will be insufficient. If and when that scenario happens, we will learn what is best. Meanwhile, this generation needs full-time professional, technical, and paraprofessional assistance to transform the tools and technologies now known into learning.

## The Rise of the Knowledge-Rich Environment and A Final Prediction

We have spent a fair amount of space considering the components of the information infrastructure, concentrating for the most part on its content and its structure.

Such an information-rich and technology-rich environment could still not constitute a knowledge-rich environment if it remains just a tool with potential or a system bypassed by the users for whom it was created.

A knowledge-rich environment suggests the idea of transformation; a space in which data, information, tools, and technology are changed into an active and dynamic

learning laboratory where knowledge is born, nurtured, captured, and shared as it operates dynamically.

How might such a dynamic learning environment be stimulated? We might already have discovered the key elements in the work of Lance and others who have studied the connection between school libraries and achievement. (Lance and Loertscher, 2004)

## Collaborative Planning and the Digital School Library

Collaborative planning, the integration of library and learning experience through teacher, and librarian collaborative planning has long been touted as a key element in library transformation. Urged on by many theorists in the field, many school librarians have experimented over the last 20 years with this outward reach concept. To be sure, they have been in the minority for a number of reasons, mostly because of the roadblocks of fixed scheduling of the library in the elementary school. It is evident in the experience of the author after many conversations in almost every state of the United States and in other countries, that, at all levels, the librarians who have discovered the power of collaboration build quite a different world of learning and knowledge construction than their storage and retrieval professional counterparts. Hints of this effectiveness are becoming clearer in the Lance research and in a number of other studies that have included collaboration as a variable.

## The Role of Information Literacy

Likewise, school library theorists such as Eisenburg, Stripling, Kuhlthau and others have urged the school library community to insert in the mix of learning activities the introduction of information literacy instruction. Traditionally, this teaching was done as a course taught in "library class" over the school year or in a separate mini-course. Theorists, however have encouraged a different pattern where that instruction is integrated into learning experiences driven by whatever information task needed to master content learning at any given time. By inserting process learning / inquiry / information literacy into the learning activity, librarians discover that learners use information literacy skills to introduce efficiency into the mastery of content. For those young learners who experience the "aha," they become "power learners," defined as a person who is in command of their own learning. Librarians who become diagnosticians using tools such and those created by Koechlin and Zwaan (Koechlin and Zwaan, 2001) discover that they do not have to teach every child the same skills at the same dosage level to stimulate a quite different learning environment.

## The Responsibilities of the User

School library theorists of late have realized that providing the tools and the nurturing are not enough to see learners transform themselves from mere students into power learners. Mel Levine, a respected learning expert in the United States and one of many new thinkers and brain researchers, calls our attention to the responsibilities of the learner to participate activity in a high-quality teaching and information-rich environment. Levine uses a "concentration cockpit" technique with learners who are experiencing trouble in school. He sees learners imagining themselves as pilots of an aircraft with instrumentation in front of their eyes giving themselves feedback about their behavior, learning, and success in the learning community.

These learner pilots monitor three major systems to take off, fly, and land successfully (Levine, 2002, p. 279)

- Process controls (intake)
    - Mind activity control
    - Want and excitement control
    - Concentration depth control
    - Concentration time control
    - Important intake control

- Mental energy controls
    - Alertness control
    - Consistency control
    - Mental effort control
    - Sleep control

- Production controls (output)
    - Preview control
    - Speed control
    - Past experience control
    - Possible choices control
    - Monitoring control

Michael J. Gelb is a popular author who has devoted careful analysis to the concept of genius and how many of the traits of super thinking can be learned and imitated. In his book: Discover Your Genius: How to Think Like History's Ten Most Revolutionary Minds, he notes the mental controls we can all develop in our "becoming." A study of his book is highly recommended, but note the characteristics that children of all ages can build under teacher and librarian nurturing (Gelb, 2002, p. vii-viii):

- Act like Plato: Deepen your love of wisdom.
- Act like Brunelleschi: Expand your perspective.
- Act like Columbus: Strengthen your optimism, vision, and courage.
- Act like Copernicus: Revolutionize your worldview.
- Act like Elizabeth I: Wield your power with balance and effectiveness.
- Act like Shakespeare: Cultivate your emotional intelligence
- Act like Jefferson: Celebrate your freedom in the pursuit of happiness.
- Act like Darwin: Develop your power of observation and opening your mind.
- Act like Gandhi: Harmonize your spirit, mind, and body.
- Act like Einstein: Understand your imagination and combinatory play.

By studying carefully the ideas of Levine, Gelb, and others, librarians can understand how the learner can be taught to and adjust to an information-rich environment. They can and must transform themselves into power learners.

## Small World Networks

Mark Buchanan in a recent book entitled Nexus: Small World and the Groundbreaking Science of Networks introduces us to the ideas of what happens when an effective librarian uses powerful information-rich networks, collaborating with the teacher, teaching integrated information literacy, and encouraging learner controls. To appreciate the phenomenon, the reader is encouraged to study Buchanan's synthesis from social, neural, information, financial, and even disease perspectives. Librarians who are constructing information-rich networks layered with collaborative planning, information literacy skills and learner controls may be constructing an environment pictured in figure eight and by adding to this network a few random connections such as cross-disciplinary collaboration as pictured in figure nine actually build and experience a small world network phenomenon, "learning community," or "knowledge-rich environment." It is a phenomenon worthy not only of analysis, but also for research. Such an investigation of excellence, that is, the study of library programs in schools where the knowledge-rich environment has arisen, might give very rich clues to others who are trying to build such systems.

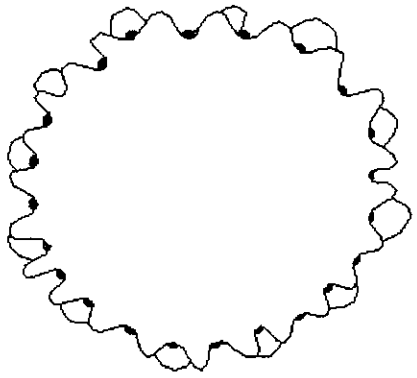

*Fig. 8: Common Networks*

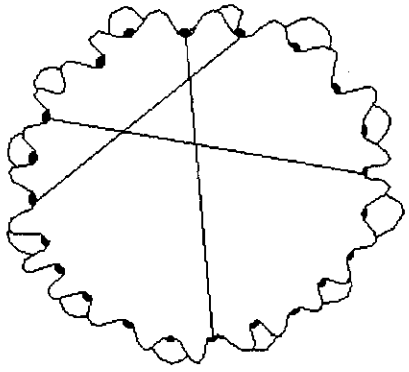

*Fig. 9: Small World Networks*

## A Final Prediction

The technology will soon be available to create dynamic and three-dimensional virtual spaces within school library information-rich and technology-rich environments. In these environments, there can be numerous views of the information work space of the digital school library. Think of a spiral staircase where the central support column is the digital school library with individualized views for the librarian, teacher, student, administrator, and parent. Think of this work space as a dynamic record of the collaboratively built learning experiences between librarians and teachers. A space where the foundational information web supports and nurtures the learner as pictured in figure ten. The understanding of small world networks stimulated by information systems, collaborative planning, information literacy, and learner controls may prove to be the elusive mixture we have been seeking for some time. It is a notion worth pursuing to build a knowledge-rich environment for youth.

*Fig. 10: The Digital Library Media Center as the Center Pole of the School*

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CHAPTER 2

# *The Human Touch in the Technological Environment: A Survey of Librarians as School Library Webmasters*

**Kathleen A. Smoot**

*A 2003 survey of school library web sites and library media teacher webmasters is discussed. Based on the work of Clyde (1996, 1999), the survey finds similar conclusions about the purposes of school library web sites and adds three more. Key findings from the results of a survey identified the central use of the website was to provide access to the local online catalog and to online databases. It further revealed the need for planning in the evolution and development of effective school library web sites.*

Behind every school library website is the mind that has created it. Many librarians recognize the need to create a digital school library, though maintaining it is an added task, often without recognition of the increased workload. Librarians understand that digital libraries require the human touch to be useful to learners. Computer technology hardware is pervasive, and learners demand more information delivery to desktops. On the other hand, District and State Level administrators want high technology schools but struggle to find the balancing factor of high touch, the human touch. They consider replacing the physical space with a digital library, but libraries still provide value as community centers. In school libraries, communities of learners gather and feel the influence of a reading center and a research center. In the age of the Internet, librarians create web spaces for users' information needs, a library without walls. Here the school library serves as a bridge over the Digital Divide. Using the library website as a calling card in today's digital world, Librarians offer a variety of electronic and traditional resources for learners. Building a library web site is a logical role for librarians who focus on the organization of information and documents for easy access.

There are two conclusions drawn from school library web sites on the Internet. First, there is tremendous diversity in sites, in site design techniques used, and in the variety of offerings they provided their users. Second, only a small percentage of school libraries have a web presence.

The reason for the lack of library web sites are beyond the scope of this investigation. The focus is on those librarians who have created digital libraries, and their impressions of the results. The author analyzed school library web sites and surveyed a sample of librarians who also act as web masters. The result is their analysis of school library web site issues and the impact on students.

## School Library Web Site Research

Anne Clyde did extensive research on school library web sites and conducted international longitudinal studies in 1996 and 1999. In 1996, she examined 50 sites, selected from Peter Milbury's Network of School Librarian Web Pages and Linda Bertland's School Libraries on the Web. Her research methodology used content analysis techniques to compare sites and to quantify the frequency of certain content features. She found a great deal of variety in the sites, specifically in the content and intended purpose of the sites. Part of the variation is the result of different needs at different school sites. However, many sites lacked a clear purpose, and some sites were just simple lists of randomly selected items on the web (Clyde, 2000). Her research identified the following purposes:

- "To provide access to Internet resources for students;
- To provide access to Internet resources for teachers;
- To provide information for parents;
- To create a 'library without walls';
- To create public relations, face, i.e., an 'electronic brochure' describing the school library;
- To provide access for the school community to online information sources and services, including commercial databases and other library catalogs;
- To provide access to the school library catalog (and possibly other online resources) from outside the school or library;
- To support the school curriculum;
- To 'showcase' the work of students in the school."
  (Clyde, 2000)

This author found three additional purposes in her review of school library web sites.

- To promote the love of reading in the library's reading programs;
- To provide access to Internet resources to other librarians;
- To instruct students in the research process, including bibliographic citation.

Clyde reexamined the same 50 sites in 1999. Of those 50 sites, thirteen had disappeared altogether. Out of the 37 remaining, 29 sites had made improvements in their content, while seven stayed the same and one had declined in quality (Clyde, 2000).

## The Internet Debate

The central argument in the debate about the Internet is anyone can find anything they need using search engines. Therefore, the extreme view is there is no need a school library, just access to technology and the Internet. David Loertscher has another view: "There are lots of reasons to compete with the full Internet for attention in the lives of young people: four billion sites—most of which are junk; advertising at the top of Google searches; lack of quality information; the aging of many Internet sites; the overwhelming surge of information when a search is done" (Loertscher, 2002b). The free Internet, accessed with a generic search engine, allows for sites with negative educational impact to appear authoritative. For example, a "Paper mill" site sells essays online to students. A Google search for the California standard for high school history "Causes and effects of World War II" produces a search result of more than 200 sites. There are sites with lesson plans and course outlines and sites selling research papers on the topic. The proximity to trusted educational sites gives these sites the same appearance and authority as those produced by a trained professional.

A librarian functioning as Webmaster provides a better Internet experience for their learners by focusing library web sites on student needs. Loertscher's model of a knowledge rich environment accessed through the school library media portal proposes a teaching tool that pushes library services (i.e. accessible quality information and instruction) out over the computer networks to the students wherever they may be (Loertscher, 2002b). As the portal concept implies, there is an increased ability of the patrons to interact with the information space, as well as the information sources for their needs. There is evidence of the early stages of the concept on some school library sites. For example, when students submit a book review to the library website, they become part of a reader's advisory for students. Loertscher (2002b) takes this one step further. He proposes taking control of the school's intranet and creating a Digital School Library Intranet, making the library the virtual "hub of the school." This creates a safe online environment with information resources selected by professionals. Further developments lead to the interactive and collaborative features of personalized information spaces and knowledge management (Loertscher, 2002b).

## Analysis of School Library Web Sites

Using Clyde's criteria as a guide, the author reviewed 166 sites from February to April 2003. The sites reviewed were drawn from the list of IASL web award winners and Peter Milbury's Network of School Librarian Web Pages.

The author found a tremendous variety in levels of site design and content is tremendous. At one end of the continuum, the library web site content was a set of pathfinders for research projects to an electronic brochure, including a picture and basic information: library hours of operation, staff and the library collection. As the brochure format becomes more complex, sites provide the mission statement, library policies, and behavior expectations. On one site, the Acceptable Use Policy functioned as a gateway into the site. The users agree to the policy by saying "I accept" each time they enter the site.

The analysis found two main features in the sites and a variety of other commonalities. One main feature is to link the library catalog to the website. Two, provide access to subscription databases such as magazine indexes, online encyclopedias, e-books, or other fee-based online reference tools. The sites also served to market the services of the library, including advertising books, offering book reviews, or suggesting reading programs. Many include the last updated information, a counter, and contact information. To a lesser degree, sites provided research tips for students, such as using a research process, citing sources, and evaluating information and web sites. Other content included web quests and tutorials on common programs that students use. The appearance of a rudimentary form of online reference using email to ask a reference question was an encouraging example of stretching the boundaries of the school library website.

In terms of site design and navigation, sites in a simple tabular form are quite easy to use. These sites have a clear consistent look. A dark color of text works best on a light or white background. Learners find it difficult to scroll through long blocks of unbroken text. Ultimately, a web site used as an effective teaching and communication tool appeals to users.

## Survey of Librarian Webmasters

Following the review and analysis of school library websites, the author developed a survey for librarian webmasters using an open-ended questionnaire. The goal of the survey was to examine the following areas: content, measurement of student use, user satisfaction, and information literacy. The focus of the questionnaire of six open-ended questions, sent via email to selected individuals, was to discover the application of school library web pages to engage student interest and learning. The webmasters selected had their contact information posted on their library's web site, including an email address. The survey was sent to 132 librarians maintaining web sites and 60 responded. These responses came from librarians throughout the United States, one from Australia, and one from the United Kingdom. The surveys went out to elementary, middle and high school librarian webmasters. The questions in the survey are in Appendix B.

## Analysis of Survey Responses

The survey questions were open ended and the survey recipients responded with unique answers to each of the open-ended questions. In these answers, patterns emerged and they are categorized in Tables 1 through 6. If the respondents answered in more than one way, their response appears in two categories.

### Content

When asked what content was most beneficial on their websites, the respondents had a variety of items offered on their web sites. Some examples of items that many had in common are subscription databases, project pathfinders or lists of hotlinks, readers' advisory, web quests, citation guides, and research guides. Responses are in Table 1.

**Table 1.**

| Response Category | Number of Responses |
|---|---|
| Project Pathfinders | 16 |
| All Components of the Site | 13 |
| Both Pathfinders and Databases | 12 |
| Database Subscriptions | 9 |
| Databases + One Item (not pathfinders) | 7 |
| Reading Programs | 2 |
| Library Catalog | 1 |

When grouped together, 46% of the responses indicated that pathfinders were the most important category and an equal amount said the Database subscriptions were important. The pathfinder group felt that if the pathfinders were customized by adding project focused pathfinders, hotlinks to support teacher's projects, or links to specific school subjects, they made the page stronger. Project pathfinders go beyond simple lists of hotlinks, giving an overview of the topic, and delineating possible sources, including books, periodicals, subject-specific search engines, and web sites. Alice Yucht (2002) created a useful guide on project pathfinders, and Joyce Valenza's (2003) site includes pathfinder templates with a clear explanation of their purpose and form. Her examples of student pathfinders demonstrate the format (Valenza, 2003).

The other major response was to create links to subscription databases. They emerged as three groups. In the first, twelve people indicated they had both pathfinders and

lists of links and subscription databases. In the second, nine said the databases only. In the third, seven people reported the databases and one other item. Examples are the database and search engines, the database and the OPAC, or the database and source citing information. Two librarians mentioned reading programs, both using Accelerated Reader. They indicated students and parents valued the availability of the AR lists on the web site.

Twenty-two percent of the respondents refused to choose a specific component. A common response by the teacher librarian webmasters was that everything on their site benefited students. A representative response was: "I like our electronic book review, the hyperlink to the Dewey decimal stuff, the library calendar, the book reviews, the current research projects websites, and the citing sources information, the database hyperlinks... Actually I think almost all of it is really beneficial."

**Measurement of Use**

The responses to the question about measuring the use of the school library website by students provided a wide variety of answers. Perhaps the most telling is the fact that only 22 percent of the respondents reported having empirical evidence on use. The vast majority relied on informal sources for evidence of use.

**Table 2.**

| Type of Evidence | Number of Responses |
|---|---|
| Observation | 18 |
| Numerical Data | 13 |
| Anecdotal | 10 |
| Emails | 7 |
| Several Types of Evidence | 4 |
| Other | 4 |
| No Evidence | 4 |

The eighteen who reported observation utilized an assortment of techniques. They included observing students using the site in the library for assignments. One person responded that she prints business cards with the library's logo, street address and URL, and that she is "ALWAYS" having to print more because students want a copy for their home and wallet. Another librarian reported similarly that students want cards with the access codes. Another group said students must access the library's site

in order to be able to complete assignments. A final group said they look at students' reference lists to see if they have cited sources from the web page.

The librarians reported interesting anecdotal evidence. Students report to them that the database access passwords are posted to the refrigerator at home. Graduates report they are still using the high school's library web site for their college research assignments. One indication of use was the number of complaints from students and teachers when the web site was down. Additionally, librarians get verbal feedback about their sites. Seven get feedback from emails, including email from students requesting the database passwords. Another had a guest book on the site for comments.

There were three methods of obtaining numerical data. The most popular was a hit counter. Next was a network log from the school's servers hosting the website. One respondent indicated the use of counts from the database vendors for the number of times the databases were accessed from particular accounts. The other category was for answers that indicated not evidence, but actions taken to promote the web site's use. Four stated that there was no evidence.

**User Satisfaction**

Next, the webmasters were asked what they felt the students appreciated the most about their websites. Thirty percent of the librarians thought that users most appreciated the organization of the site. An additional twenty percent of librarians provided unique responses to the question.

**Table 3.**

| Response Types | Number of Responses |
|---|---|
| Organization | 18 |
| Other | 12 |
| Pre-selected Web Site Links | 9 |
| Database Subscriptions | 7 |
| Schedules or Calendars | 4 |
| Pre-selected Links and Databases | 3 |
| Don't Know | 7 |

One unexpected result was that so many responded on some aspect of organization of the web site. These are some examples of their responses:

- "I believe users appreciate having a clean, well-organized gateway, or starting point, that easily and quickly takes them to online resources that they most frequently use."
- "It's simply organized; the most important stuff is on the opening page."
- "It's like the mom and pop candy shop. They know where things are. I feel I have created signage for the Web. Kids know where to find the licorice. Kids who have graduated and return to visit tell me they still use it even though they have access to huge college collections."
- "'One Stop Shopping' for information (books, web sites, databases)."

The unique responses are in the "other" category. There are two examples of responses:

- "Right at the moment it is being used all over the country for getting a batch of links to invisible or deep web sites all in one place;"
- "I've been told by many teachers that they love the homework helpers. Obviously, some classes use them more than others, but they are used a lot. Unfortunately, I was unaware of how many people take kids into the various computer labs in the building and teach them how to use the library web pages. That means that I'm not always sure how many people know how to use the library's website."

A grouping about organization related to the website was the schedules and calendars; four responses in this category suggested the School Library Website has a role in creating local information for the school. A sample response was: "The information about schedule changes is important, especially to students who spend part of their school day elsewhere, e.g., the community college."

Although organization was the single largest grouping, many were concerned with content. Nineteen respondents mentioned their links pages they created for students and teachers, the databases or both. Four did not know, but indicated they wanted to conduct a survey to find the answer.

## Future Changes

There was a dissonance between the answers to question 4 and the previous question. In the previous question, the respondents indicated students valued organization in the school library website. The librarian webmaster indicated that content was the aspect of the school library websites to change.

**Table 4.**

| Response Types | Number of Responses |
|---|---|
| Add Content—Information Literacy | 11 |
| Improve Navigation | 6 |
| Continuously Updated | 5 |
| Sharper Image, Appeal | 5 |
| Add Content—Improve Web Collections | 5 |
| Difficult to Keep Updated | 5 |
| Add New Technologies | 4 |
| More Interactive | 3 |
| Major Redesign | 3 |
| Don't Know | 3 |
| Add Fun Stuff | 2 |
| Other | 8 |

A major concern for library webmasters was not identifying pure content, but content related to the research process. Because of the relationship of these answers, they are under the general heading of information literacy. Two examples are presented below:

- "I hope to create a fairly streamlined guide to help students doing research, including how to evaluate and document their sources. It will steer them towards the online databases to which we subscribe, though how to do that effectively still eludes me."
- "We are planning to add a whole research paper guide; there are so many problems with citations and plagiarism."

Many participants in this survey wanted to add content by improving web collections. The following response was typical: "I would include fewer links and annotate more. I plan to include more pathfinders and create new web quests."
The webmasters had further indication of concern with information literacy were the number of pathfinders and web quests to assist students in their evaluation of sources. One response was: "I would like to add short descriptions of each site as an enticement and infomation piece so that users have a better idea of the content and purpose of each link. I haven't had time and, of course, this would be a space/organization consideration for the opening page."

Some believed they kept up with the needs of users by continuously updating the site. Others want to do so, but felt that they did not have time. The time commitment required to create and maintain a website, delete dead links, and improve the content was not measured. However, the respondents had concerns about this, as evidenced by their remarks. Other changes the library webmasters wanted to make were time consuming, such as improving navigation and adding new technologies. Two respondents wanted to rebuild their sites.

Several of the groupings referred to the technology of web design, including speed and approach. Several wanted to improve navigation on their site, some examples of their responses are:

- "This summer I am hoping to work on the overall layout, clean up the appearance. Update links."
- "I need to make access to the databases quicker. Right now the way my students get to Grolier is 'too long'—according to them..."
- "I am trying to reduce the number of clicks to get to where you want to be, but it's hard. Students are so savvy now; they dislike long loading times. At school we have fast connections, but use at home is a different matter."

Responses categorized as sharper image appeal said:

- "New site coming soon, designed by a student in a web design class...new design is really important!"
- "Snazzier, more upbeat appearance."
- "I'd like it to look 'slicker,' with roll-overs, etc., that the kids seem to appreciate but time is at a premium."

The following shows some responses in the category of adding new technologies:

- "Add software or a service that will allow users to perform one search for the multiple databases. The software is nascent and does not perform well at this time." (One other gave a similar response.)
- "I would like students to be able to access a personal account that keeps track of everything...what books they have checked out, circulation statistics, messages from teaching staff. (Check out Follett's Destiny program)... I would also like them to be able to submit assignments, and receive and keep track of grades all through the school's website."

Some wishing to make the web site more interactive, said:

- "I would like to provide some interactive opportunities so that student's could take a survey, or post a book review, etc.
- "I would like to add forms and questionnaires, but I am waiting on the school district for the FrontPage extensions."

Finally, regarding a major redesign:

- "I'd like to remake it with an electronic gateway similar to UCLA's and other academic libraries. I'm working on it right now. I'd like to use Dreamweaver to design a drop-menu system that will walk you through steps for writing a paper in US History, for example, giving you Eagle Eyes resources, the correct database to use first, online catalog searches, etc. I'd also like to change the design"

The responses under "other" represented a combination of all the responses.

**Information Literacy**

Three categories emerged with a focus on library skills and information literacy.

**Table 5.**

| Response Types | Number of Responses |
|---|---|
| Teaches Searching and Research Skills | 17 |
| Pre-selected Quality Resources | 16 |
| Teachers Teach Information Literacy | 9 |
| Demonstrates Variety of Sources Available | 7 |
| Database Access | 2 |
| Evaluation of Sources | 2 |
| Tool for Collaboration | 2 |
| Other | 3 |

Again, the participants' open-ended responses were categorized but they were more complex. However, seventeen answers fit under "teach searching and research skills." Examples are:

- "We have included resources on searching techniques, research techniques, copyright, plagiarism, citations, etc. We emphasize the Information Literacy Standards during class presentations."
- "I use the site to teach my students how to evaluate a quality website and also how to search on the Internet."
- "I do have information on 'Tips for Searching the Internet' (with links to Kathy Schrock's site) that I use with students. I find it's useful to introduce information literacy, but students must practice it themselves.
- "I use our web site to teach the concepts of information literacy every day. Take a look at the Internet Survivor Tutorials (Craver, n.d.) and you'll understand what I'm talking about."

The pre-selected quality resources grouping of the respondents mentioned pathfinders again. Others focused on sites selected to fit the curriculum, teachers' projects, fiction links and book reviews.

Some participants wanted to clearly distinguish the fact that it is a teacher who teaches information literacy, and the site was just a tool. These described the web site in some way or another as a resource. Here is an example of one response:

"Part of it is organized according to the steps of the research process. But, I really don't think it helps teach information literacy, just makes it fairly easy for students to

find information for their needs. I think the skills to become an information literate person need to be taught to students, as they are not intuitive."

Respondents emphasized that the web site demonstrates a variety of sources available, as indicated in these responses:

- "In all honesty, the site was designed for student and teacher convenience; however, when students use the site I believe they develop an awareness of the variety of sources available.
- "At the moment, it should at least make them aware that there are different information sources—books, magazines, Internet. Again I hope the assignment guide will enhance this."
- "It helps show them quality sites and it is also good to have a 'one stop shop' for them to go to when doing research."

Two indicated database access as the main component for teaching information literacy, and two others said the information on evaluation of sources was most helpful. The other grouping had unique responses, such as portability; the web site was available in every classroom where the librarian taught.

**Searching Behavior**

Access to the Internet creates a great deal of speculation among the larger library community. One topic is the change in search behavior seen as negative in the library community.

**Table 6.**

| Response Types | Number of Responses |
|---|---|
| Use Search Engines Exclusively | 17 |
| Failure to Evaluate Sources | 11 |
| Student Behavior Managed | 8 |
| Plagiarism | 6 |
| All of the Above | 15 |
| Other | 4 |

A majority of the respondents said the students' number one negative behavior was to use search engines exclusively. These are a couple of their responses:

- "Tendency to ignore links / pathfinders we've created – and like you mention jump to Google (funny because just a few years ago it was Yahoo everyone jumped to). Students like to ignore print resources. I would also say that students don't use online databases as much as we'd like them to..."
- "Many times they do ignore print materials when it's much faster and easier to find something using print. They often believe the first web site they find is the best when it frequently is not the best resource."

Some had a long list of items for negative student behavior. They are part of "all of the above." The following is one response that summarizes the others well:

"1) An over-reliance on electronic information resources, when sometimes better print resources are available in the local collection,
2) A failure to differentiate between reliable and trustworthy providers of on line information and providers that are not as credible,
3) A failure to adequately document what online sources were consulted and used in their assignments,
4) An overall disturbing trend toward "superficiality" of fact-based research, meaning that students will load up their reports with superficial facts and provide little or no meaningful opinion or commentary to tie those facts together. It is data gathering without assimilation, reflection, or evaluation."

Eleven respondents expressed that students showed a failure to evaluate sources as their main problem. The previous example represents their thoughts.

Some responses included the negative behaviors reduced or eliminated when student behavior was managed. Nine librarians chose to emphasize this phenomenon. Six identified plagiarism as the main problem and four unique responses are listed in the other category. Two of these said the problem for students is the lack of knowledge about conducting a search and search engines. One said only half of their students had access to the resources in the home, and teachers were not using the computer lab enough. The last said the lack of teacher requirements was the problem.

## Conclusion

Creating and maintaining viable school library web sites is a challenging task in the volatile environment of technological change. As many of the respondents stated, the time required to create, maintain, and upgrade a school library website is a constraint,

especially when considering the overall job responsibilities of school librarians. Yet within the very fabric of these responsibilities, a web site becomes an indispensable tool. If the premise stated in Information Power: Building Partnerships for Learning, "Information literacy—the ability to find and use information—is the keystone of lifelong learning" (ALA, 1998) is valid, then the librarian has responsibility to use the tool.

In today's educational environment, a student mostly uses information found online, as Technology integration into curriculum becomes a cornerstone in educational practice. However, the learner achieves the greatest success when finding information if they use authoritative information fitting the inquiry regardless of the format of presentation, be it a print book, a periodical, an interview, a video, an online periodical, or a web site. The ability to evaluate information sources is another key component in information literacy and is essential to this process. The skills are important for lifelong learning, regardless of the change in future formats of information delivery.

No matter what the name, the school library website, portal, digital school library, or cyber library the role is to serve as a gateway for students' learning needs and support the school's curriculum. The other two main user groups of the digital school library are the teachers and parents. The advancement of information retrieval technologies has created a population that expects to find information instantaneously. Even now, search engine technologies and the increase in digital information sources continues to improve. The challenge for librarians and libraries is to maintain an edge in information delivery to students and teachers over the use of the Internet. The school library website is the best starting point for their information needs. Librarian's role is an important ingredient for the creation of successful digital school libraries. That role is the very human element of communication. Librarians query the users for their needs in a virtual library. This survey is a good starting point for planning a new website or redesigning an existing one. It reveals unimagined possibilities for the site. Furthermore, when the librarian communicates the value of information services and teaches users to discriminate between types of information sources, they add value to the process. Users "don't know what they don't know." Librarians are professionals who anticipate users' needs and respond to them. They are the human interface to the digital world of information.

Inherent to the success of the portal is marketing the websites. This includes brochures, business cards, and hidden passwords for websites. Ken Vesey provided an idea to battle the negative tendency to rely on search engines at http://www.lovett.org/libraryweb/myopic.htm (Vesey, 2002). Many librarians collaborate with classroom teachers and provide curriculum aids such as link pages or project pathfinders. Additionally, reading programs benefit through advertisement on the web site. Sharing a good book

with others using an online form is a successful method to promote the library and the website. For those starting out on the journey to build a digital school library, the following site has many helpful links to great ideas: http://www.sldirectory.com/libsf/resf/wpages.html (Bertland, 2003).

So what does the future hold for the school library web sites? Content continues to be the main concern for the library web master, followed by good design principles for facilitating the easiest access. Emerging technologies continue to shape librarians' response to user service. Safety in online environments is still a concern and outcomes in student learning, as evidenced through standardized tests. Possible future interests among users are file storage systems, personalized information spaces, and online collaboration. However, the key ingredient is the human element of communication in creating online services that fulfill students', teachers' and parents' need to know. Librarians who recognize and enact this element fulfill the mission of the digital school library.

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## Appendix A

Selection criteria for the IASL School Library Web Page of the Month/Year Awards:

- evidence of school library and/or school librarian involvement in page/site development;
- relevance of the page/site to the goals and objectives of the school library;
- visual appeal, including layout, choice of images, type face and style;
- organization of information on the page/site;
- quality of the writing and use of language (and proof-reading);
- ease of use of the page/site, and navigational features;
- educational, information, entertainment, or public relations value of the page/site;
- appropriateness for the needs of users;
- currency, evidence of update policy, and the provision of current information and/or links;
- technical quality (note that this is interpreted as the appropriate use of technology, not necessarily leading-edge technology);
- value of the page/site as a model for other school libraries and/or school librarians.

Source: IASL, http://www.iasl-slo.org/web_criteria.html

## Appendix B: Survey Questions

1. What content on your web site do you consider most beneficial to student learning?

2. Do you have any evidence that your website is being used? By whom? (any student characteristics?)

3. What do your users appreciate the most about the library web site?

4. As you learn more about student behavior in the digital world, what changes would you like to make on your web site?

5. How do you think the library web site helps in teaching information literacy?

6. What negative behaviors do you see happening to students when they try to do research? (Reasons could be that they don't use the library web site because they use Google exclusively, or they ignore print sources, or they don't have access to it from home or from the classroom, etc.)

## Appendix C: Acknowledgements

A special thanks goes to all the participants of this survey. You gave me a splendid panorama of the world of digital school libraries outside of my small pond.

Sue Crocombe, The Glennie School, Qld, Australia http://www.glennie.qld.edu.au/irc/index.htm (IASL Award)

Hugh Eveleigh, Westminster School, London, UK http://www.westminster.org.uk/library (IASL Award)

Marie Lundstrom, A. J. Dimond High School, Anchorage, AK (Site redesign in progress) [check on this]

Vaneesa Thompson, East Lawrence High School, Trinity, AL http://lawrenceal.org/users/hzhslib/

Sarah Roberson, Fayetteville High School, Fayetteville, AR http://fayar.net/east/library/

Kerrlita Westrick, Palm Valley Elementary School, Litchfield, AZ http://www.lesd.k12.az.us/PV/specials/media/index.html

Sharon Ewers, Arcadia High School, Phoenix, AZ http://www.susd.org/schools/high/arcadia/library.htm (SLJ Award)

Susan Garvin, Cloves C. Campbell Elementary School, Phoenix, AZ http://www.rsd.k12.az.us/%7ecampbell/librarymediacenter/website2001.htm

Steve Grant, La Jolla High School, La Jolla, CA http://ljhs.sandi.net/departments/library/

Tony Doyle, Livingston High School, Livingston, CA http://www.lhs.muhsd.k12.ca.us/library/index.htm

Thomas Kaun, Redwood High School, Larkspur, CA http://rhsweb.org/library/ (IASL Award)

Dean Capralis, Oceanside High School, Oceanside, CA http://www.ohs.oside.k12.ca.us/ohslibrary/index.html

Claudia Jozel, Mt. Carmel High School, San Diego, CA http://powayusd.sdcoe.k12.ca.us/pusdmchs/Library/LIBHOME.htm

Lissa Crider, Lick-Wilmerding High School, San Francisco, CA http://www.lwhs.org/lwhslibrary/

John Elmblad, Park Lane Elementary School, Aurora, CO http://www.aps.k12.co.us/parklane/

Joanne Carl, Cannon City Middle School, Cannon City, CO http://www.ccmsfalcons mediacenter.homestead.com/

Shannon McNeice, Ellington Middle School, Ellington, CT www.biblio.org/ellington middle

Janet Roche, Simsbury High School, Simsbury, CT http://www.simsbury.k12.ct.us/teachers/JRoche/library/index.htm

Rita Hennessey, Bedford Middle School, Westport, CT http://bms.westport.k12.ct.us/lmc

Kathleen Craver, National Cathedral School, Washington, DC http://ncs.cathedral.org/uslibrary/Library/amainpage/upperlowerlib.htm (IASL Award)

Michael Izzo, Christiana High School, DE http://www.k12.de.us/christiana/library/

Deborah Monck, Port Charlotte High School, Port Charlotte, FL http://www.ccps.k12.fl.us/Schools/PCHS/MediaCenter_site/media.htm

Dian Adjamah, Miami Palmetto Senior High School, Miami, FL http://www.dade.k12.fl.us/palmetto/Media/index.html

Ken Vesey, The Lovett School, Atlanta, GA http://www.lovett.org/libraryweb/library.htm (IASL Award)

Anna Watkins, The Paideia School, Atlanta, GA http://www.paideiaschool.org/library/default.htm (IASL Award)

Patricia Moore, North Polk Jr. Sr. High School, Alleman, IA http://hs.n-polk.k12.ia.us/Departments/Media/MediaCenter.html

Pati Daisy, Southern Cal Community School, Lake City, IA http://www.southern-cal.k12.ia.us/library/library_homepage.htm

Cathy Claybaugh, North Junior High School, Boise, ID http://www.sd01.k12.id.us/schools/north/library.htm

Adrienne Stark, Riverglen Junior High School, Boise, ID http://www.sd01.k12.id.us/schools/riverglen/Library/library.htm

Norma Odiaga, Jerome Middle School, Jerome ID http://www.magiclink.com/web/odiaga/JEROME.HTM

Elizabeth Lorz, Bartlett High School, Bartlett, IL http://www.u46.k12.il.us/bhs/library/

Kathryn Weisman, Willowbrook School, Glenview, IL http://willowbrook.district30.k12.il.us/wblibrary/index.htm

Janie Schomberg, Leal Elementary School, Urbana, IL http://www.cmi.k12.il.us/Urbana/leal/Library/lib.html

Theresa Collins, Goshen High School, Goshen, IN http://www.goshenhs.org/media/index.html

Mary Beth Castonguay, Travilah Elementary School, Rockville, MD http://www.mcps.k12.md.us/schools/travilahes/

Linda French, Springbrook High School, Silver Spring, MD http://www.mcps.k12.md.us/schools/springbrookhs/media.html

Frances Aley, Boothbay Region High School, Boothbay, ME http://home.gwi.net/brhs/

Londa Brown, Caribou High School, Caribou, ME, http://www.caribouschools.org/secondary/chs/Old Library 3-12-03/index.html

Jane Perry, Winslow Junior High School, Winslow, ME http://www.winslow-jhs.u52.k12.me.us/jperry/main.htm

Ruth Clair Thompson, Hattiesburg High School, Hattiesburg, MS http://www.hpsd.k12.ms.us/blair/library/

John York, Flathead High School, Kalispell, MT http://www.sd5.k12.mt.us/fhs/lmcf/index.htm

Jay Gibson, Elkin High School, Elkin, NC http://www.elkincityschools.com/ehs/media.htm

Linda Naugle, C. M. Eppes Middle School, Greenville, NC http://schools.eastnet.ecu.edu/pitt/eppes/mediacenter.htm

Verna LaBounty, Kindred Public School, Kindred, ND http://www.kindred.k12.nd.us/CyLib/homeA.html

Peggy Beck, Cherry Hill High School East, Cherry Hill, NJ http://www.chlive.org/home/eastlibrary/

Nancy Schneible, Catskill Senior High School, Catskill, NY http://instruct.neric.org/chslmc/

Will Haines, Athena Middle School, Rochester, NY http://www.greece.k12.ny.us/ath/library/ (IASL Award)

Joyce Kasman Valenza, Springfield Township High School, Erdenheim, PA http://mciu.org/~spjvweb/ (IASL Award)

Cheryl Tunno, Meadville Middle/High School, Meadville, PA http://www.tnte.com/mmc/Index.html

Mary Boyaj, Lincoln Middle and High School, Lincoln, RI http://www.lhslibrary.org/

Boris Bauer, Berea High School, Greenville, SC http://www.greenville.k12.sc.us/bereah/media.htm

Valerie Byrd, Dutch Fork Elementary School, Irmo, SC http://www.lex5.k12.sc.us/dfes/media_home.html

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Linda McCune, Clinton High School, Clinton, TN http://www.acs.ac/schools/clintonh/main.htm

Karen Lyons, Happy Valley High School, Elizabethton, TN http://c3qtz11.remote.schoolcenter.com/education/staff/stafflist.php?sectiondetailid=96&category-=49&cattitle=LIBRARY

Don Hamerly, McNeil High School, Austin, TX http://www.roundrockisd.org/mcneil/library/

Barbara Jansen, St. Andrews Episcopal School, Austin, TX http://www.standrews.austin.tx.us/library/ (IASL Award)

Noe Torres, McAllen High School, McAllen, TX http://mws.mcallen.isd.tenet.edu/mchi/library/index.shtml

Sharon Harmon, Mesquite High School, Mesquite, TX http://www.mesquiteisd.org/mhs/library/ (SLJ Award)

Liz Johnson, The Woodlands High School, The Woodlands, TX http://info.conroe.isd.tenet.edu/senior/mccullough/TWHS-McClibrary/ (IASL Award)

Lois Stanton, Manchester High School Library, Midlothian, VA http://chesterfield.k12.va.us/Schools/Manchester_HS/Library/

Charlotte Burkholder, Loudoun Valley High School, Purcellville, VA http://www.loudoun.k12.va.us/schools/lvhs/Library/LVHS%20Library%20Homepage.htm

Carl Dellutri, Mt. Erie Elementary School, Anacortes, WA http://mte.asd103.org/library/library.htm (IASL Award)

Karen Mensinger, Belfair Elementary School, Belfair, WA http://www.worldfront.com/kabob/

Arnie Dittbrenner, Kewaskum High School Library, Kewaskum, WI http://teacherweb.com/WI/kewaskumhighschool/kewaskumhighschoollibrary/t.stm

Renee Hoxie, Jefferson Middle School, Madison, WI http://www.madison.k12.wi.us/jefferson/lmc/

Ellen Pryor, West High School, Madison, WI http://www.madison.k12.wi.us/west/lmc/index.htm

CHAPTER 3

# *Dispersions: Digital School Libraries, Integrated Curriculum, and the Decentralization of Learning Information*

**Jesse Holden**

*The distribution of digital resources in K-12 schools has two models. The first is the jobber/vendor approach. It is similar to current print distribution models to a central school library. The second is a decentralized self-contained classroom model. The models are compared and a compromise approach is proposed.*

Uncertainty surrounds the emerging concept of "digital libraries." In the literature, there is no consensus for what constitutes a "library," per se, in the digital world. Vendors of educational software products add little clarification to the discussion. In fact, traditional libraries face challenges maintaining their semantic identity as they struggle to integrate new technologies and services at an unprecedented rate. At the same time, digital school libraries integrated into a vendor's curriculum product are diversifying into a niche market.

There are two clearly established trends. The first trend fitting the description as "library" is the customizable database access services. The best example of this trend is familiar library vendors such as EBSCO, Gale, and Bigchalk (ProQuest) providing traditional "agent" services. They pre-select and aggregate materials from a diverse variety of publishers and then act as intermediaries by licensing the use of these materials on behalf of the content providers. The significant differences between the familiar function of an agent for print content and the digital content function is ownership. While the purchaser owns a physical copy of traditional materials purchased through an agent, the ownership of the digital materials never transfers to the library. Essentially, they are on loan to the licensee and are renewed annually.

The second trend for the distribution of materials to the digital school library is as part of an integrated curriculum product. The best example is the product offering

of the software giants Microsoft and Apple. Like the jobber model, digital content is licensed to the school or educational unit. The key difference is the digital content is integrated digital curriculum at the classroom level as opposed to an integrated library system at the institution level.

## Access and Licensing

### Agent Model

Vendors using the Agent Model created a complex licensing model for school libraries based on the pricing model for academic libraries. Enrollment is the basis for pricing combined with the number of desired simultaneous users. The result is a variety of price points for the school library. While a school library cannot change their enrollment, they can control the number of simultaneous users.

In general, the model operates in the following manner. The vendor provides access to the databases by Internet Protocol (IP) range or the numeric domain assigned by the Internet Service Provider (ISP) to the school. The IP functions as an "address" for the computer. All the computers in a school become one long "street" of sequential IP addresses. The license agreement with the vendor allows only a certain number of users to have access at one time, referred to in the license as "simultaneous users," within the given IP range. A variation is to allow access to the network via a proxy server, a computer that assigns a temporary IP number in the acceptable domain range from an off-campus location. In practice, as a user accesses the database, they are considered part of a "simultaneous user" count recognized by the vendor by IP authentication. Once you reach the limit of simultaneous users, access to the next user is denied. The same case is true if you attempt to access the database from a computer outside the IP range covered in the license. Access for that user is blocked. In either case, the vendor controls the licenses and the number of users.

The K-12 plans of EBSCO are based on a customizable selection of about 80 content databases. The materials in each of the databases are prepackaged with a selection of online content. The complexity of pricing comes from the number of databases and the number of users. The general rule is the greater the number of databases and users, the higher the price. Additionally, EBSCO offers discounts for consortia and school districts. It is handled on a case-by-case basis.

The Gale Group created a simpler, and therefore far less flexible K-12 database model. Like EBSCO, Gale based their efforts on the academic library service Info-

Trac® model. Gale provides three levels of service: InfoTrac Kids Edition (elementary school), InfoTrac Jr. Edition (middle school), and InfoTrac School Edition (high school). Pricing for these services are based on the maximum number of simultaneous users within the allowed IP range. In 2003, pricing for InfoTrac Kids began at less than $500 annually for single user access. By comparison, InfoTrac Jr. was slightly less than $1000 annually for single user access and InfoTrac School slightly more than $2000 for a single user. By increasing the number of users to a maximum of 10 simultaneous users, an annual renewal for InfoTrac School, exceeds $16,000 annually. Currently, Gale also offers consortia pricing, with a discount that averaging around 15% on standard prices. Again it is contingent on factors such as the number and size of schools, as well as the anticipated number of simultaneous users.

Bigchalk (ProQuest) uses a different licensing and access model for schools. It is a fluid combination of products for students and professional staff (Figure 1).

| **Library Resources: General Reference** | **Library Resources: Special Collections** | **Teacher & Curriculum Resources** |
|---|---|---|
| Bigchalk Library | Bigchalk Multimedia | Bigchalk Integrated Classroom |
| Bigchalk Library Elementary | ProQuest Historical Newspapers | ProQuest Professional Education |
| ProQuest Platinum | ProQuest AP Science | |
| eLibrary | ProQuest Career & Technical Education | |
| ELibrary Elementary | Children's Literature Comprehensive Database | |
| | ProQuest Learning: Literature | |
| | Digital National Security Archive | |

(ProQuest, 2003)

The options include several types of reference packages, specialized collections, and an integrated curriculum package. While the number of database packages is less than EBSCO, Bigchalk Library alone includes access to "more than 1,500 full-text magazines, newspapers, transcripts, and reference books" and includes audio, video, web links and images (Bigchalk 2003, p. 2).

Bigchalk offers the most complete licensing models while maintaining the modular approach of its competitors. Like the other vendors, Bigchalk customizes pricing models for each school, district, or consortium. Rather than the simultaneous user access model explained earlier, Bigchalk provides a site license based on the total number of students without restrictions on number of simultaneous users or authorized IP ranges. The price for the Bigchalk Library ranges from approximately $600 for elementary schools to approximately $4700 annually for high schools (ProQuest). Additional products range from $3350 for eLibrary to the Historic New York Times, approximately $2500 per year.

In summary, the subscription prices of all the periodical subscriptions are inexpensive when compared to the cost of acquiring all of these materials in traditional print or microform formats. The difference is, schools that subscribe to the database services do not own the material; access requires both an annual subscription on behalf of the school and continued maintenance of the database by the vendor. With the exception of reference works, the databases are reviews, abstracts, select articles, periodicals and newspapers.

## The Integrated Digital Curriculum

Microsoft is an undisputed leader in software development. Apple's purchasing programs for schools made them the most familiar brand in American classrooms. By stretching the concept of decentralized "library," Microsoft and Apple created broad implications for the centralized school library world. Interestingly, both companies moved in a similar direction: decentralizing the "library" as a conceptual entity and localizing information integration at the classroom level. Neither company specializes in providing content. Through mergers and acquisitions, both moved into creating integrated curriculum. Microsoft markets under their brand name for education products, Microsoft's Encarta Class Server. It provides:

> [a] new curriculum management platform for grades K through 12 [that] combines high-quality educational content from leading publishers with access any time, anyplace for teachers, students and parents. Unlike any other platform[s] available, Encarta Class Server allows teachers to manage online five major teaching areas: curriculum standards, lesson plans, content, assignment and assessment. From PCs or Web-enabled devices wherever Internet or intranet access is available, students can view assignments, complete schoolwork online and review past assignments, including graded work (at the teacher's discretion), from a password-protected site. Parents can also be given their own password to see their children's assignments, work in progress, results and graded papers.
> (Microsoft, Encarta section 2001)

This closely resembles what is commonly perceived as a "portal." Ideally the portal includes access to the local library catalog and online resources. The design of the product focuses on the needs of a teacher at a class level and handles specific resources relating to a given curricular topic. Rather than delivering the breadth of content of a library, it is akin to a multimedia textbook: "Microsoft has worked with high-quality publishers and content providers to ensure that teachers have access to primary content that can correlate with states' and schools' curriculum standards, as most textbooks provide" (Microsoft, 2001 Key Industry section, 1).

Likewise, Apple created a solution that distributes rather than consolidates curriculum-content management software. Their product that most resembles a "digital library" is the Curriculum Mobile Lab. It is similar to the Encarta Class Server offered by Microsoft. According to Apple:

> The components in each Curriculum Mobile Lab have been carefully chosen to provide a superior teaching and learning experience. They include research-based software programs that adhere to curriculum standards, assessment tools to track student performance, and professional development for teachers to ensure that the technology is used effectively in the classroom. Research studies show that the routine use of technology can help raise student achievement by engaging and motivating students.
> (Apple Computer, 2003 Technology Integrated section)

As in the Microsoft example, the integration of customizable hardware and software moves the "library" from a centralized focus on the campus into a localized information node within the classroom.

Comparing the pricing of the two vendors is difficult because Apple provides hardware with their solutions. Pricing for the Curriculum To Go Mobile Wireless Lab, equipped with ten student laptops and no insurance coverage, begins at approximately $12,000 and runs up to $26,000 for a lab with 20 student computers and Apple's AppleCare Protection Plan (Apple Computer 2003, iBook Wireless). The latter, with set-up service and Kensington MicroSaver Lock, cost over $27,500 (Apple Computer). Curriculum software packages to run on the mobile lab are an additional cost as are software for lessons (Apple Computer, Step 2, 2003a-b). Of course, multiple units are required to implement the technology in an entire school. While the Apple Curriculum to go conforms most to the ideals of a digital library – mobile, customizable, individual – it is economically out of range for most schools.

## Future Directions

While current school library models from vendors appear to be moving in disparate directions, it seems likely that digital libraries in K-12 are moving in the direction academic libraries went decades ago. For example, the academic law libraries are seen as structurally equivalent in an academic context as an elementary or middle school segment of the K-12 demographic. Here information products such as LexisNexis or Westlaw serve as a good example as the converging point for school libraries. Lexis began in 1973 on its own proprietary system (LexisNexis, Company Information," 2003) and West Publishing Company launched its competing service in 1975 (West Publishing, West History, 2003). These two rival services eventually offered vast and varied databases to provide access to up-to-the-minute laws, newspaper and law review articles, abstracts from scholarly works, and connections to virtual bookstores for their important publications. These systems originated on their own proprietary software on custom computer systems and they adapted themselves to the Web. Because of their Web-base, librarians at the reference desk, professors in the office or classroom, and students at home use them. The focus for the Westlaw and Lexis products is the law community and this company offers a tremendous amount of flexibility for scholars and students in that field. It is possible that the digital libraries in Schools, now caught between the complicated pricing and licensing models of the content vendors and the distributed classroom-based models of the software/hardware vendors will emerge in a similar kind of arrangement. As digital multimedia content delivery increases in popularity and content licensing increases in price, the media center finds itself challenged by classroom access to reference, video, and periodical materials.

LexisNexis adapted its popular academic database to high schools in their Scholastic Edition. LexisNexis, like other database services, is modular to "allow flexible subscription options and competitive pricing based on enrollment" (LexisNexis, LexisNexis Scholastic, 2003). The Scholastic Edition can allow for access to news, legal research, statistics, African American studies, Women's studies, and presidential studies (LexisNexis Scholastic). The costs for the Scholastic Edition are based on school size and begin at $2000.

In combination with comprehensive, customizable database solutions for the "collection" aspect of digital libraries, new technologies provide the integration of a portal, a meeting, and classroom space. By dispersing the library "space," these latter technologies complement the database and curriculum technologies that have localized the library in the classroom. Perhaps the best example of this technology in the commercial market is Blackboard. This system provides "a Web-based server software platform that offers... course management, an open architecture for customization and interoperability, and a

scalable design that allows for integration with student information systems" ("Products and Services," Overview section, 2003). In many respects Blackboard represents the closest realization to the "virtual classroom." It provides an environment shaped to fit a given situation. Besides acting as an online forum where ideas can be exchanged, documents can be linked in a logical and meaningful way. Like software and database services that bring the library into the classroom, Blackboard allows both the classroom and the library to move into cyberspace.

Synthesizing these two trends, the localized full-text database access and dispersed library space, are those companies in the best place to accomplish this: the integrated library system (ILS) vendors. Sirsi Corporation "will resell the ebrarian for Libraries database as part of its Unicorn Library Management System and iBistro Electronic Library products" ("Sirsi bundles," 2002). This provides user access to about 10,000 digital books from over 130 publishers through a library's catalog ("Sirsi bundles"). Innovative Interfaces introduced a new product in November of 2002. This K-12 system, Via, includes homeroom-based notices, multimedia management, and "an information portal that offers a meta-searching capability against the sources to which a library subscribes." (Innovative Interfaces, 2003).

## Conclusion

It is likely that as technologies develop, the concept of school library will be impacted if not radically transformed. With this change already underway, teachers, librarians, and administrators have to develop new notions of "ownership," "access," and even "library," while adjusting to new demands on their budget. While vendors provide customized access to both content and space, funding continuous access undermines the budget for traditional media. At the same time, the library no longer has ownership of the material. The benefits of customizable databases accessed anywhere need to be weighed against the volatility of the market and of the vendors who need to make constant software upgrades to stay competitive.

The other factor weighing heavily on the development of these digital technologies is school budgets. As many of these new products, such as Blackboard or the Curriculum Mobile Lab, are geared specifically for classroom use, their costs must be absorbed by class-sized budgets and multiplied by the number of classrooms for the entire school. In some instances, where teachers' classroom budgets are dropping below $5 per student annually, even single-user access to some databases is unrealistic (Shaw, 2003). Conversely, the cost of a single user is readily absorbed by the school (i.e., media center), it is unlikely that access for one person at a time is sufficient for a whole school.

In the end, the dispersion hinges on the ability of technology to deliver content more efficiently and more cost effectively than the models of the past. It also depends on the acceptance of new models of content ownership by school decision makers.

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## Appendix A

### Selected List of Vendors

Bigchalk (http://www.bigchalk.com/cgi-bin/WebObjects/WOPortal.woa/wa/BCPageDA/gen~PIC~picmain)
Blackboard (http://www.blackboard.com)
EBSCO (www.epnet.com)
Gale Group (http://www.gale.com/schools/k12info/index.htm)
LexisNexis (www.lexisnexis.com) (www.lexisnexis.com/academic/universe)
LexisNexis Scholastic Edition (www.lexisnexis.com/academic/universe/Scholastic)

# *The School Library Portal: Fair Market Value of the Online Database Product*

**Sandy D. Tao**

*The practice of negotiating with vendors for online services and databases is new for librarians. To be effective, the librarian requires negotiation skills and an understanding of pricing models used by vendors. This paper discusses the various pricing models commonly found in the online database marketplace and the factors vendors overcome to establish pricing.*

What is Fair Market Value? According to Merriam-Webster Dictionary, Fair Market Value is a price at which both buyers and sellers compromise to do business. The fair market value of online database product is simply a reasonable agreement between the library and the vendor. Over the years, online database vendors have explored a variety of pricing schemes ranging from pay-as-you-go to fixed price (flat fee) models. Vendors utilize user-based licensing and advertising-based models, with some vendors providing free or trial retrieval over the web (Ojala, 1998). In times of budget constraints, librarians must look for the best value for their budget dollars. They need to understand that online database prices are not set in stone. Librarians need to learn to negotiate with vendors on a price that is fair, easily understood, and also meets the budget needs of the library.

Over time, the pricing for online databases became increasingly complicated. At the same time, the sheer number of online database services grew exponentially. There was a tremendous growth in the online database industry in terms of the number and types of databases, producers, and vendors. Librarians need a thorough understanding of the pricing structure and availability of the online databases in preparation to develop an online database collection for their libraries. Only then are they able to match their selection criteria to cost and arrive at fair market value.

## The Difficulties of Pricing Information

To date, pricing the online database product proves to be a very difficult exercise for vendors. Bates (2002) indicates digital resources are neither strictly a product nor

strictly a service. Vendors compound the problem with complex pricing information. The essential question is: How do we value information as a commodity? Standard economic methods fail to determine the precise value of information. We never know the true and total benefits of using information. Therefore, a cost benefit ratio is always uncertain (Raban, 2003). A market economy allows prices to fluctuate over time. Given the high fixed costs of acquiring content, the risk the vendors accept is high.

Everyone has his or her own perceived idea on the value of digital information. Many people simply feel there is no need to pay for digital information. With the mass of free information on the Internet, many people expect to get free information online. Yet, there are costs involved to provide even information services. Contents have a cost associated with time, intellectual effort, and computing resources (Arnold, 2000). People who use online systems accept upgrades in technology and services without thinking about the actual cost of these improvements. Arnold (2000) argues that what users think of as "free" information is actually far from free. More and more online websites are going from free to fee. Vendors find people "flee" when a "fee" is found on a previously free site changes strategy. These online database vendors must find a way to become profitable and stay in business by persuading people to pay for information that was free in the past.

Furthermore, in the online world, timeliness limits the value of information. Information valuable today is worthless tomorrow. There is no consensus for the pricing of such volatility. Some newswires give away the recent news and charge for their archives. Others place a premium price on breaking news and consider their archives not as valuable (Ojala, 1998). Regardless how unpredictable the information market is, there is always value in reputable information. In today's society, information is a form of currency in itself; information translates into knowledge, which generates profit and money.

In the end, vendors base pricing for online database products on the ability to sustain a viable business and make a profit. A profit is necessary to produce product and services to school libraries. The reliability of the pricing model is essential to maintain the business through good times and rough times.

## Pricing Models

How does one come up with a sensible pricing model on online database product? To begin with, a good pricing model is fair to both sides. If it is too high, the library is out of the market. When it is it too low, it undercuts the vendor. A proper pricing

model ensures the information vendor's financial stability and competitiveness in the market while rewarding the library with quality contents and services.
Arnold (2000) suggests there are six types of fee collection used by online database vendors: subscription fees, per-use fees, license fees, invisible fees, activation fees, and advertiser fees. Subscription fees require customers to pay upfront for access to certain services or content. In the per-use fees scenario, libraries are charged when a learner consumes information. In other words, the customer pays only for what is viewed or downloaded. License fees are commonly associated with commercial database companies to identify a fee paid by an organization or institution to allow learners with unlimited access to a specific database. Activation fees are variations of the license fee (Arnold, 2000).

Information professionals rarely see invisible fees and advertiser fees when dealing with the vendors. The invisible and advertising fees are more subtle and clever. An example of an invisible fee is a click-through link that allows the referring web site to receive a payment on qualified users from another site. Advertising fees provide vendors with income from advertisers in the form of pop-up ads or banner advertisements. However, on such sites, it is difficult to separate the sponsored message from the content. The neutral and impartiality of the information is questionable (Arnold, 2000).

## Online Databases

Tenopir's study (1998) of 100 public and academic librarians focused on pricing options of online databases in their libraries. She discovered most databases fall into three major categories: pay-as-you-go, fixed price (flat fee), and user-based licensing. The survey found that librarians tend to choose a budgeting price model that fits their budget. As a result, user based pricing is popular followed by the flat rate pricing option and then pay-as-you-go.

Pay-as-you-go pricing was originally calculated strictly on connect time, but that approach is nearly obsolete. Currently, it combines with other factors, such as output-based pricing or per search pricing. Dialog has a pricing plan that is based on connect time charges (Tenopir, 1998).

Fixed-rate or flat-fee pricing is similar to traditional print pricing which is familiar to libraries. They pay a single one-time cost or yearly subscription rate for use of digital materials. This is common with CD-ROMs, which, like printed materials, are owned by the library. However, digital products involving multiple users, networking and multiple connections almost always have more cost (Tenopir, 1998).

User-based pricing is the most common option. For libraries that have an identifiable base of users and do not bill their customers, user-based pricing is the most advantageous. Unfortunately, it is also the most complex of all three—thus it usually involves negotiation. This option hinges on the calculation of the total user population, on library size, on potential users, or on simultaneous users. It is understood that everything is negotiable when dealing with vendors for a particular pricing plan (Tenopir, 1998).

## Librarians

In preparation to negotiate with online database vendors, librarians need to evaluate each resource thoroughly and conduct comparisons between different vendors based on specific and consistent criteria. The following are the four major considerations in selecting an online database subscription.

Table 1. Peterson's criteria for selecting an online database subscription. (Peterson, 2003)

1. Product development: search capability, scope of resource, full text availability, and graphical information availability
2. User needs: interface design, training, e-mail capabilities, print capabilities, download capabilities, and home access
3. Technical capabilities: hardware/software requirements, technical support, administrator privileges, and user statistics availability
4. Budget constraints: pricing per user, added services, and collection enhancement

Negotiation with vendors of online database subscriptions is a new skill for librarians. By following a plan and evaluating options, librarians provide the best electronic resources for their budget. Librarians need to negotiate with the vendor for licensing agreements. Many vendors provide access to multiple databases as a package. If the budget limits the purchase of the full service, the librarian must investigate other options the company offers. If split services are not a policy of the vendor, consider a group discount.

The ability to cooperate with other libraries is essential to achieving the best prices in an electronic era. Group buying of online database subscriptions with the consortia agreeing to acquire data and make it accessible to others in the group. Joining a consortium is fiscally responsible and provides the students with low-cost or free resources (Peterson, 2003).

In addition, it is essential for Librarians to understand the needs of the learners. The measurement of database usage and learner preferences and behavior are the key to

maximizing the budget funds. Usage contracts are generally based on a number of variables such as the number of potential users and the number of simultaneous users. The Librarians decide if it is advantageous to have a single year contract or a multi-year contract. Without understanding the pricing, they are not able to negotiate effectively. It requires practice honed by experience to perfect this skill and to be an effective negotiator. One critical conversation is to shop talk with other librarians to pool expertise as the industry evolves. A wise shopper has the essential skills to provide the highest quality of information at the lowest price.

## Additional Considerations

The volatility of online databases has other implications. The choice of a specific online database subscription requires the librarians to acquire the understanding of technical change, hardware, software, and networking environments to provide access to the resource. Besides the initial costs, the vendor has additional costs for maintenance, development of user support services, as well as cataloging, and systems design or modification (Greenstein, 2000). The cost of the hardware and software requirements necessary to run or subscribe to a certain online services impacts the overall budget of the librarian.

When negotiating with the vendors, librarians need to prepare for the common price increases or unexpected changes in pricing policies. Online services reevaluate their prices periodically and change their pricing scheme. These new policies are often costly if the librarians are unprepared.

## Conclusion

The fair market value of online database products is simply a reasonable agreement between the librarians and the vendors. To obtain a fair market value for an online database product, librarians negotiate licensing agreements with the vendor to ensure that vendors continue to provide information that libraries can afford. In most cases, the best contract is achieved through cooperation with other libraries and consortium.

No one pricing option satisfies different needs or situations for every library. However, a thorough understanding of the pricing structure and availability of the online databases allows librarians to effectively negotiate terms to provide the best electronic resources for the library and the budget.

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Barber, David (2000, September) Internet-Accessible Full-Text Electronic Journal & Periodical Collections for Libraries, Library Technology Reports, v36 i5 p1.

Greenstein, Daniel (2000, Fall) Digital Libraries and Their Challenges. Library Trends, v49 i2 p290.

Ojala, Marydee (1998, April-May) To pay or not to pay, that is the question. Data base, v21 n2 p8(1).

Peterson, Janet Walker (2003, February) Stretch your budget: how to select Web-based subscription resources. Computers in Libraries, v23 i2 p20(5).

Raban, Daphne (2003, February) A primer in information economics. Searcher, v11 i2 p54(5).

Tenopir, Carol (1998, September) Online databases: pricing options. Library Journal, v123 n14 p130(2).

## Appendix A

A LIST OF ONLINE DATABASE VENDORS
Compiled by David Barber(Sept 2000)

ACADEMIC JOURNAL AGGREGATORS

Blackwell Electronic Journal Navigator (EJN)
http://navigator.blackwell.com
EJN hosts 1,788 journals. Participating publishers include Blackwells, Oxford University Press, and Taylor & Francis among others. EJN Journals are linked to National Library of Medicine databases, such as MEDLINE, through Blackwell Biomedical Resource Navigator, a joint project with HealthGate.
Swets Subscriptions Services is merging with Blackwell Information Services; see

Blackwell Navigator above. As a result of the merger, SwetsNet's interface will change and will be combined with Blackwell Navigator to create SwetsnetNavigator. After that merger, the combined company, Swets Blackwell Information Services, will have a new URL: www.swetsblackwell.com.

EBSCO
www.ebsco.com
EBSCO Online provides access to more than 3,300 journals from 100+ publishers. Among the publishers are Routledge, Blackwell, and Springer-Verlag. Full text is located at publisher sites. Content is linked to SilverPlatter and Chemical Abstract Service's ChemPort as well as EBSCO's own citation databases, such as EBSCOmed.

InformationQuest (IQ)
www.informationquest.com
A service of RoweCom, InformationQuest (IQ) provides access to more than 2,000 journals from 60+ publishers. Their publishers include STM publishers such as Springer and small societies or publishers, such as White Horse Press. Also offers the License Depot service, www.faxon.com/ld, a database of information about licensing for 4,000+ journals. IQ links to full text at the publisher's site. IQ also includes citations available through document delivery services. It is linked to SilverPlatter's citation databases.

Ingenta
www.ingenta.com
Ingenta provides a central repository of the metadata for 2,500 journals from 30 publishers, including large publishers such as Academic Press and Elsevier Science as well as small publishers like the Association of Applied Biologists. The site links to the full text at publisher sites. Ingenta also hosts a copy of MEDLINE linked to its articles and will soon link its journals to SilverPlatter databases.

OCLC First Search Electronic Content Online
www.oclc.org/oclc/menu/eco.htm
ECO provides access to an archive of the full text for more than 2,300 journals from 51 publishers. OCLC has journals from such publishers as Academic Press, Kluwer, and the American Mathematical Society. ECO is linked to OCLC First Search databases: EconLit; MEDLINE; PsycINFO; PsycFIRST, and Social Sciences Abstracts.

Swets and Zeitlinger SwetsNet
SwetsNet offers access to 3,100 journals from 63 publishers. It includes publishers such as Academic Press, Sage, and the Society for Endocrinology. Articles are both hosted in full-text on their site and linked at publisher sites. SwetsNet is linked with SilverPlatter's citation databases. Swets Subscriptions Services is merging with Blackwell Information Services; see Blackwell Navigator above. As a result of the merger, SwetsNet's interface will change and it will be combined with Blackwell Navigator to create SwetsnetNavigator. After that merger the combined company, Swets Blackwell Information Services, will have a new URL: www.swetsblackwell.com.

## FULL-TEXT PERIODICAL DATABASE VENDOR SITES

EBSCO
www.ebsco.com
In addition to its EBSCO Online journal aggregation service, EBSCO also publishes several full-text periodical database products made available on the Web through its EBSCOhost service. There are many different title groupings available for different types of libraries, such as academic, medical, and public libraries and for specific thematic areas, such as medicine, business, and health. Full-text databases combine online full text with abstracts and indexing for offline titles. One of the larger academic data-bases is Academic Search Elite which includes the full-text for 1,250+ periodicals--some going back to 1990.

HW Wilson
www.hwwilson.com
HW Wilson sells some full text versions of its well-known citation databases. These databases are available for various thematic areas. The backfiles go back as early as 1994. Wilson OmniFile: Full Text Mega is one of the larger databases with 1,300+ titles. Most of the databases combine full text with citations for periodicals not yet in electronic formats.

Infonautics Electric Library (Elibrary)
www.elibrary.com
This online full-text-only periodical database claims it contains "hundreds of popular magazines and scholarly journals." Content is also packaged in the form of two specialized databases: Ethnic Newswatch and Contemporary Women's Database. It states that its academic product provides "over 5 years of ... magazines."

Information Access Company (IAC) InfoTrac
www.galegroup.com
IAC is now part of the Gale Group. Like EBSCO, they publish many different periodical database packages targeted at different types of libraries or for different thematic areas, e.g. business. One of the larger products is Expanded Academic ASAP, containing 1,300 full text titles with the full-text starting at around 1996. Most databases combine full-text periodicals with citations from other periodicals.

ProQuest
www.proquest.com
ProQuest is both the name of a family of full-text periodical databases and will be the new name of the company most recently known as Bell and Howell Information and Learning, and before that for many years it was known as UMI (University Microfilms International). There are databases for academic libraries, ProQuest Academic Edition, and for public libraries, ProQuest News & Magazines. The databases combine citations with full-text. The ProQuest News & Magazine database contains 1400 titles. Thematic databases with full-text are also available, e.g. CINAHL and ABI/Inform. The database backfiles go back to 1992. But, this will be extended by a novel effort by ProQuest to digitize their microfilm of early periodicals.

SIRS
www.sirs.com
A product of the SIRS Mandarin Co., SIRS is four databases: SIRS Researcher, SIRS Discoverer (K-12), and SIRS Renaissance (arts and humanities articles). SIRS Researcher includes the full text of more than 1,500 periodicals from 1989 on.

CHAPTER 5

# *E-Lockers: The Online Personal Storage Space in the Digital School Library*

**David Villancio-Wolter**

*This paper examines the place and purpose of an online personal storage space in schools. It surveys implementations of the concept, and describes the impact of one implementation. It analyzes the problems associated with various implementations, the role of the library media teacher and the value of online personal storage to a community of learners.*

*"Disks are annoying...they always crack in your bag and stuff."*

– High School Boy (Levin, 2002, 14)

In today's emerging world of digital school libraries and networked classroom computers, the "sneaker-net" is thankfully in rapid decline. No longer must students and faculty save work on unreliable floppy disks, sticking those disks into drives on different computers to access files each time they move to a computer lab, the library, or another classroom. The Internet has created a worldwide network of networks, and many people find web-based email to be a solution to file transfer and storage needs.

*"We need to send our schoolwork to ourselves. If you can't do that, then how can you get it to yourself?"*
– High School Girl (Levin, p. 13)

The need for storage and retrieval in a learning environment is integral to the learning process. Schools have developed and refined knowledge systems to include storage and retrieval mechanisms as essential components (Loertscher, p. 2). Textbooks and school libraries are examples of resources used by students to access information customized to support the school curriculum. Additionally, successful students utilize notebooks, journals, index cards, PDAs, and computers to collect information. One proposed component of the digital school library is the online personal storage space, or "e-locker" (Intelenet Commission, 2000), as a place to gather and store information. The availability of an e-locker has the capacity to influence the learning and teaching behaviors of a school's students and faculty.

The Pew Internet and American Life Project commissioned "The Digital Disconnect: The Widening Gap Between Internet-Savvy Students and their Schools." This study aimed "to conduct a qualitative study of the attitudes and behaviors of Internet-using, public middle and high school students drawn from across the country" (Levin, 2002, ii).

One key finding of the Pew study was that "students employ five different metaphors to explain how they use the Internet for school:

- The Internet as virtual textbook and reference library.
- The Internet as virtual tutor and study shortcut.
- The Internet as virtual study group.
- The Internet as virtual guidance counselor.
- The Internet as virtual locker, backpack, and notebook.

(Levin, 2002, iii)

The first four of the five metaphors align with the function of library media teachers through the development of library portals. A library portal, as defined by Michael McCulley, is:

> "an interactive Web site for a library and its users, providing a broad array of resources and services, such as e-mail, forums, search tools, collaboration tools, information resources and content in multiple formats, selected descriptive and organized links to other sites and resources, and electronic library services. The site may also offer customization, personalization, and research tools for the users, to enhance and enrich the portal's value. The site's mission, value, design, and functions are derived from the users and the community it serves" (McCulley 2003).

The fifth metaphor falls outside the scope of virtually all library portals. It is critical to the facilitation of the research process, a paramount role of the library in schools:

**"Metaphor 5: The Internet as virtual locker, backpack, and notebook.** Students think of the Internet as a place to store their important school-related materials and as a way to transport their books and papers from place to place. Online tools allow them to keep track of their class schedule, syllabi, assignments, notes, and papers" (Levin, 2002, iii).

Thus, if schools and school librarians are to meet the challenge set forth at the International Association of School Librarianship's 2002 Conference of building knowledge-rich environments for youth (Loertscher, 2002, 1), they must include an online personal storage space as one component of the digital school library.

Students take a practical approach to using the Internet.

> *"The great thing about the Internet from my point of view is that it saves me having to carry two hundred pounds worth of books, my binders, my work, my whatever paper I'm working on....I have all my stuff... So, wherever I am, if I have a couple of free minutes, I pull it out, get whatever paper I'm working on, go with it, and when I'm done I email it back to myself...I've got a couple of different versions that I can work on anywhere and wherever I am, and be able to finish anything that I'm working on piecemeal. Serious!"*
>
> – High School Boy (Levin, 2002, 13)

> "A major part of school consists of managing information, materials, and paperwork. Students report they used the Internet to not only gather important materials and documents, but also to transport them back and forth..." (Levin, 2002, 13).

While these practical concerns are prosaic, they are an essential part of the nuts and bolts of online learning environments.

## Online Storage

If the school computer network is a primary tool to find information relevant to the learning needs of a student, then it is a logical place to collect and store information. Networked online storage offers advantages over notebooks, journals, index cards, PDAs, keychain drives, and stand-alone computers to collect information. Networked online storage:

- Leverages the increasingly ubiquitous networked computer as the tool for access to many information sources used by students and faculty today, including Web sites, online databases, multimedia presentations, and posted documents developed by teachers and students.
- Allows full-text searching of all publicly-accessible files on a central file server.
- Facilitates collaboration, allowing users to save files to publicly-accessible files on a central file server available to others as either read-only files or as files allowing modifications.
- Provides a partial solution to the problem of dysfunctional computers in some locations of a school. When users save all files to networked online storage shares, their work is available from each individual computer in the Local Area Network. If one computer fails, any of the other computers can be used to access the same files.

- Provides simplified remote backup, given that all files on a networked file server can be automatically backed up nightly by one person who maintains the backup tapes.
- Simplifies virus protection by allowing real-time and nightly scanning of all files in a central location, where virus definitions can be updated nightly to provide the best possible defense against crippling virus infestations on the network.

In addition to accessing the Internet, students and faculty need to be gathering, sorting sifting, synthesizing, creating, collaborating, revising, publishing, sharing, and building a portfolio with the school's investment in networked computers. The e-locker provides the infrastructure for such activities.

## Personal Online Storage

The e-locker is a specialized form of online storage in that the e-locker is accessible from anywhere on the Local Area Network, ideally by logging in from any interface providing Internet access. It is distinct from other online storage in that access is limited to the person or persons assigned to it.

The concept is simple. Each student and teacher has a space on a network file server which is accessible only by logging in with a unique username and password. Access is fast (100 MB/second) on a standard Ethernet network, far faster than a high-speed T-1 Internet connection (1.5 MB/second). Students and teachers can log in from any computer on campus to access their online storage space, including the classrooms, the computer labs, the library workstations, and the LCD-projector-connected presentation workstations in "smart classrooms," the auditorium, and the library.

Potentially, e-lockers also exist as group space for classes, clubs, projects, departments, and committees, allowing groups to collaborate and share their files over the network only with those who share knowledge of a particular group e-locker's unique username and password. The flexibility of access extends outside the campus through the Internet, although many school districts balk at providing the necessary firewall ports to provide for remote access to a Local Area Network.

The e-locker satisfies many of the needs of students and faculty identified by David Loertscher in his challenge to schools and school librarians (Loertscher, 2002, 6 - 16), including:

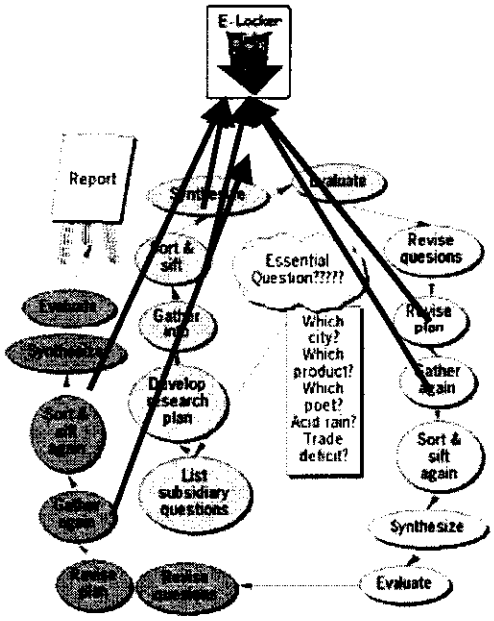
- A safe, nurturing environment
  - The e-locker on a LAN is part of an information environment in a closed system, with a firewall of protection from the outside world.
- Customization for every user
  - The e-locker can contain as many subfolders as the user desires, with any organizational hierarchy the user chooses to develop. A user might, for example, set up a folder for each class she is taking, with subfolders for notes, documents, bibliographies and citations, assignments and projects, reading journals, collected images, useful Web site addresses, and correspondence.
- Career and professional space
  - Students and faculty can collect resources for their career and professional development in their e-lockers. They can store versions of resumes and portfolio documents, and maintain them from year to year.
- Personal space
  - E-lockers can be set up so that only the owners can access them. Individuals can store resources and writings that they wish to maintain for their private use.

The e-locker complements the library portal as the place where information accessed through the library portal is gathered, sorted, sifted, and where projects and products are stored, ready and available for collaboration and publication. As learners consult information sources, they collect URLs and bibliographic citations for a bibliography. This task is an important part of any research process. Ultimately, the student stores their best works in a portfolio section of the e-locker as elements of a portfolio built throughout the student's educational career. Likewise, the teacher documents their own professional career in their personal e-locker.

The e-locker supports the research process at various points in numerous research process models. Figures 1, 2, and 3 visually illustrate where the e-locker is applicable in each of these popular research models. There are five points in McKenzie's Research cycle model where the e-locker fits a student's need. (Fig 1) In Loertscher's Organized Investigator model, there are two points of congruence. (Fig. 2) The Big Six Model of Eisenberg and Berkowitz has two points of convergence. (Fig. 3)

*Figure 1*

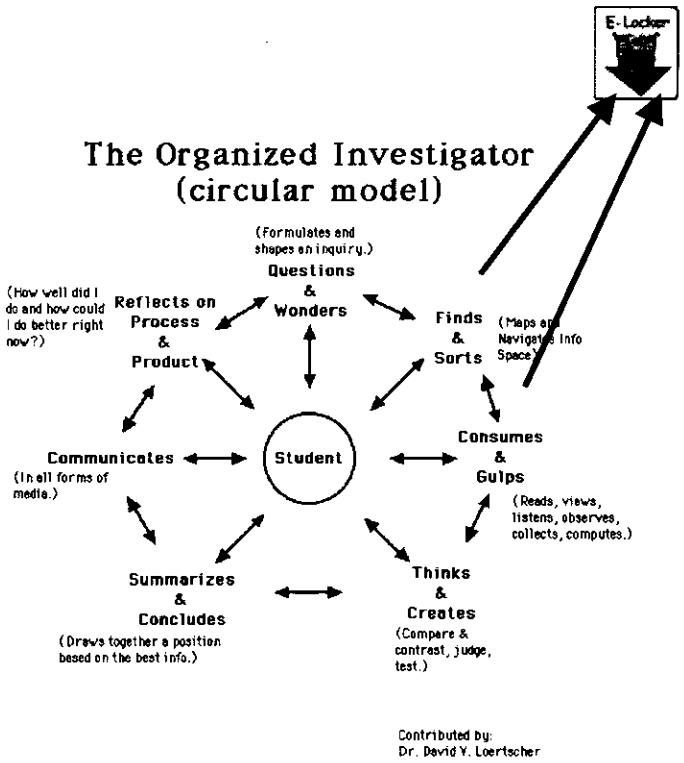
**Research Process Model: The Research Cycle (McKenzie)**
http://questioning.org/rcycle.html




*Where the E-Locker fits into the McKenzie Model.*

*Figure 2*

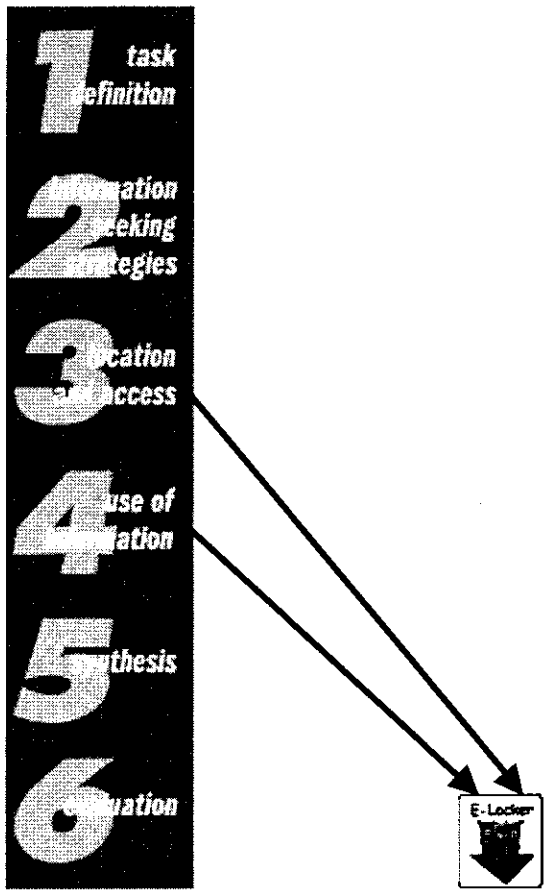
**Research Process Model: The Organized Investigator (Loertscher, Organized)**
http://ctap.fcoe.k12.ca.us/ctap/Info.Lit/Organized.html




***Where the E-Locker fits into the Loertscher Model.***

*Figure 3*

**Research Process Model: Big6 (Eisenberg and Berkowitz)**
http://big6.com/




***Where the E-Locker fits into the Big 6 Model.***

## Implementation Options for E-Lockers

The concept of E-lockers for students and teachers provides a variety of ways for implementation:

- A governmental agency provides remote online personal storage for students and teachers, accessed via the Internet.
- A private, commercial enterprise leases remote online personal storage for anyone, accessed via the Internet.
- A private, commercial enterprise offers free remote online personal storage for anyone, accessed via the Internet. Advertising revenue pays for the service, and limited storage space can be expanded for a fee.
- A school provides on-site online personal storage for students and teachers, accessed via the Local Area Network.

The following provides a brief synopsis of implementation and a high level comparison of cost.

### Governmental Agency Implementation

The Indiana Web Academy is a state education agency program designed to empower the parents, students, and teachers of Indiana to integrate technology and education through a series of programs. The E-Lockers Program provides the teachers and students with a means of storing files and transferring them between school and home. For a fee, students and teachers can access 10 MB of online personal storage via the Internet, with additional space available for additional fees. Each e-locker is password-protected.

| Provider | Annual Cost per Megabyte | Cost per 100 MB E-Locker |
|---|---|---|
| Indiana Web Academy Service (Intelenet) | $0.96 | $96.00 |

### Private, Commercial Fee-Based Implementation

Several private, commercial enterprises lease remote online personal storage for anyone, accessed via the Internet. Well-known and stable examples are Xdrive, MyDocsOnline, and ftpToday. Each offers a pricing structure that includes flexibility for greater storage capacity, larger file sizes, and more functionality for group access to

shared online storage space. These enterprises offer well-designed graphic user interfaces that simulate mapped network drives on the user's computer that are actually remote online storage spaces.

| Provider | Annual Cost per Megabyte | Cost per 100 MB E-Locker |
|---|---|---|
| Xdrive Service (Xdrive) | $0.52 | $52.00 |
| MyDocsOnline Service (My Docs Online) | $0.60 | $60.00 |
| ftpToday Service (Horan) | $0.94 | $94.00 |

### Private, Commercial "Free" Implementation

Yahoo Briefcase is possibly the last well-known service providing free remote online personal storage for anyone. Advertising revenue pays for the service, and the 30 MB storage space can be expanded for a fee. Some companies, such as MyDocsOnline and Xdrive, have stopped offering free remote storage service, and now charge for service. Several others, including Driveway, Freedrive, Idrive, and Myspace, have been bought out or have gone out of business recently. In his survey of online storage services published in December of 2000, academic reference librarian Greg Notess (2000) names dozens of free online storage sites, with fewer than five still in existence today.

All of these services offer flexibility in storing files and transferring them between school and home. On the other hand, transfers are relatively slow because they depend upon the user's Internet connection for every transfer, whether it is across a room, across campus, or around the world. Additionally, most services require monthly, quarterly, or annual fees for services. Finally, the long-term viability of these services is questionable.

### School Site Implementation

A school-provided implementation of the e-locker, or online personal storage space, is relatively easy to set up and manage on an established Local Area Network. Using the "Folder Redirection" capabilities of a network built on the Microsoft Windows 2000 platform, Los Angeles Academy Middle School provides e-lockers to its 3100 students and 200 staff members. The library media teacher manages the network.

Folder Redirection exploits the network manager's ability to set up unique login accounts for each student and staff member. By setting a "group policy" on a set of user accounts, the manager can create a policy that redirects all files placed in a user's "My Documents" folder to a unique, private folder established on a network file server at the time that the user's account is established. Each time a new user's account is established, a new folder is automatically established on the network file server, and that user seamlessly saves all her files to the network file server each time she saves a file in her "My Documents" folder. The "My Documents" folder is actually an e-locker, or an online personal storage space accessible from anywhere on the Local Area Network.

A school-provided Local Area Network implementation of the e-locker, or online personal storage space, offers several advantages over other implementations:

- When a user logs on to various computers on the Local Area Network, such as from the classroom, the library, or the computer labs, their documents are always available.
- Files stored on a network file server are backed up as part of routine system administration. This requires no action on the part of the user.
- Network administration tools can be used to set disk quotas, limiting the amount of space that is taken up by users' files, and increasing quotas for legitimate reasons. Problems resulting from abuse of Napster-like file-sharing can be managed more effectively.
- User files redirected to a network file server are backed up, scanned for viruses, and maintained separate from the user's workstation. When a workstation computer is incapacitated, the user's files are intact and available. If the workstation becomes corrupted, infected, dysfunctional, or stolen, the files are safe and ready for access from any other workstation on the network.
- The network's capacity is virtually unlimited. Hard drive space is relatively inexpensive, and additional hard drive space makes the network highly scalable.

## Maintenance of E-Lockers

Setup of e-lockers on a Windows 2000 network is primarily a clerical task, once the Group Policy settings are in place. Careful planning and testing can limit many problems, and piloting the process prior to announcing its implementation is wise. Setting up generic accounts is useful in a school with a high turnover of students. For example, account usernames could be student record numbers used by the school's student information system and the library's automated circulation program. By setting up individual accounts for all possible record numbers (e.g. 0001 through 9999)

in the school, an account could be granted to a user by simply resetting the password as the user returns their Acceptable Use Policy, signed by his parent. When the student leaves the school, the staff resets the account and all documents are deleted. A clerical person granted the appropriate rights accomplishes these simple procedures from a library circulation workstation.

A Windows 2000 network uses disk quotas. They allow the network managers to set default quotas for unique groups of users with differing storage capacity needs, such as faculty members, computer class students, International Baccalaureate students, multimedia design students, and regular students. Changing quotas for individuals requires just a few mouse clicks per user. However, a realistic quota and a common understanding among users that there are limits to storage space (reinforced by a clear statement in the Acceptable Use Policy signed by students and their parents) are preferable approaches to quota management.

Two years after the implementation of e-lockers at Los Angeles Academy Middle School, students and staff understand the need to limit the size of e-lockers, and they heed messages that automatically appear warning them of their proximity to their assigned limits. In most cases, users delete unused files to make room in their e-lockers for new files.

On occasion, users have requested higher quotas. Staff granted most requests because users were storing legitimate multimedia projects. Staff members who manage labs instruct students to develop large multimedia projects on the local hard drives of the computers and save them as finished projects into the e-lockers. This eliminates the need for huge amounts of data to travel across the network, such as a user editing digital video files.

Hard drive costs have fallen dramatically in recent years. Servers typically have hot-swappable drive bays that can be upgraded in minutes. If a server has five bays for hard drives, and drive capacity is 35 to 140 gigabytes (Hitachi, n.d.), in a school of 3000 users, a 100 MB limit, when reached by each and every user, then the system would require 300 gigabytes. This is easily within the capacity of one server. In reality, some users need a gigabyte to store multimedia projects, while others need only 10 MB for text files. One argument for the quota system is its educational value, in that it may require users to evaluate their work for that which is best or has the most value over a period of time. The emergence of CD- and DVD-writers makes it possible to provide physical storage for students' work as they leave the school's network to move on to another school.

| Provider | Annual Cost per Megabyte | Cost per 100 MB E-Locker |
|---|---|---|
| School Site -- cost is based on IBM Hitachi 140 gigabyte SCSI hard drive, priced at $999.95 (Hitachi). | $0.01 | $1.00 |

* Note that the school site implementation requires the existence of a server already in place for the school network, with expansion bays for more hard drives, as well as the involvement of a capable library media teacher.

The problems of virus protection are easier to manage with e-lockers. If users store files in a common storage disk by default, a real-time virus scan program continuously protects the entire network by the scanning of that one location. Nightly virus updates and full scans can be scheduled to take place automatically at a given time when network usage is minimal or nonexistent.

Likewise, backup is easier to manage with e-lockers. A simple nightly backup process, scheduled to take place automatically at a given time when network usage is minimal or nonexistent, is part of normal network operation. The network manager simply stores each night's backup media (e.g. tape media), and recycles the media on a regular basis. When a hard drive fails, it is replaced and files are restored.
Assuming the school already invested in a network and the support for the network, the implementation of e-lockers is a rich opportunity for library media teacher to demonstrate their role as an information specialist.

## Potential Problems

An off-site implementation of e-lockers, done by a government agency or a commercial enterprise, has the potential to go out of business or become an acquisition of another enterprise. The required user agreement for the Indiana education agency's implementation states that the user is responsible for maintaining backups. Similar statements are included in the user agreements from commercial enterprises. A school site implementation is not subject to the disruptions of the business cycle. However, personnel changes and budgetary reductions threaten technical support and necessary services. It is wise to have more than one staff member develop the skills and experience to manage the e-locker infrastructure.

As network administration for Local Area Networks matures, it is likely to become cheaper and easier to implement e-lockers on a school site LAN. Current problems primarily lie in the lack of stability in staff level members. The result is weak network administration and staff time constrains as they assume additional day-to-day responsibilities on top of many other responsibilities.

From a network administration standpoint, security is simple, robust, and inexpensive. Each time a user accesses their e-locker, they must authenticate by entering a username and password from anywhere on the LAN. The authentication data is encrypted as it travels across the network. The NTFS file system making authentication possible is a required and automatic component of a Windows 2000/XP implementation of e-lockers. It is recognized in the information technology industry as highly secure – there are no major reports of its failure after seven years of use on literally millions of computers around the world.

The potential for security breaches comes almost entirely from social engineering holes

- students may use weak passwords, or worse, give away their passwords. The network administrator can require difficult passwords, such as those requiring numbers and letters, upper and lower case, and long passwords. The consequence of strong passwords is that users are more likely to forget their passwords, requiring more network support for students. Furthermore, such measures do nothing to solve, and probably increase, the likelihood that students write down their passwords where others might see them.

If security is breached, the nightly backups can be used to restore files. However, the possibility of someone's online research document being stolen from an e-locker is probably much less likely than someone forgetting a research paper on the bus.
Several scenarios illustrate other potential problems with the implementation of e-lockers:

- If a staff member's job description doesn't explicitly state that network management is one of her responsibilities, they receive minimal support and reward for their efforts.
- If a new principal fails to realize the value of a network infrastructure, and withdraw the support that keeps it running.
- A new phonics or math program may be implemented at a school site, result ing in the shifting of resources away from integrated technology and information literacy programs.
- As studies have shown (for example, Levin, 2002, 15), school administrators strongly influence the degree to which technology integration programs

succeed or fail in a school. If a school principal leads and collaborates with the school staff in setting up and maintaining e-lockers, then it is likely that problems are solved with relative ease.

## E-Lockers and the Role of Library Media Teachers

E-lockers have the potential to empower students and teachers to leverage our schools' investment in technology for learning and teaching. E-lockers, implemented by library media teachers working with technology staff, fulfills the library media teachers' role as set forth in Information Power, "to actualize collaboration, leadership, and technology in the school library program" (AASL, 1998, 48). The LMT's conceptual understanding of information systems, the vision and creativity to develop information resources, and the management skills basic to library management are at the foundation of e-locker implementation.

Information Power reminds us of our vision "to serve the learning community of students and others in a rapidly changing information world" (AASL, 1998, 47). Narrative accounts from numerous Internet-savvy students led the Levin study to this conclusion, demonstrating that students want and need e-lockers:

> "Some students reported having school-allotted network space in which they could store their files. Most students do not have this level of access via their schools, however, and would like it. Indeed, when they could depend on access, students told us that using the Internet as virtual locker, backpack, and notebook saves them time and makes their lives more convenient" (Levin, 2002, 14).

## The Value of E-Lockers and The Learning Community

The "Information Commons" is a concept being implemented in academic libraries in recent years. It involves the development of an environment empowering the library learner, supported by librarians, to move through the entire research process, from task definition through information retrieval, processing, and presentation (Cowgill et al, 2001, 433). It involves the "functional integration of technology and service delivery" (Beagle, 1999, 83), and necessarily requires an integrated means of personal online storage to meet user needs. The integration of library resources and technology resources in an "Information Commons" can potentially become the "beating heart of the [library]" (Berry, 2002, 40).

Anecdotal evidence at Los Angeles Academy Middle School indicates that teachers modify their teaching behaviors as they experiment with the use of e-lockers. Given the relative ease with which their students collect and sort information, draft and revise writing, and develop presentations across the campus using e-lockers, several teachers became frequent users of the library for quality research projects. Several teachers establish class drop-box folders on the public portion of the network, allowing students to submit copies of drafts from their e-lockers for retrieval later with teacher and even peer comments for further revision. Some teachers develop multimedia presentations on classroom computers then save them in their personal e-lockers. Teachers retrieve the presentations using a lectern computer workstation in the library and present them to a class using a ceiling-mounted LCD projector.

Additional anecdotal evidence indicates that students modify their learning behaviors as they became proficient with e-lockers. Many express that they find it easier to stay focused on long-term projects when they have a place to store their collected information and draft writings. For many students, citations are less cumbersome to collect and maintain when they are given the ability to copy and paste citation information into a list on a file residing in the e-locker. The ability to access and revise student-written drafts from the library as well as from all classrooms visited throughout the day encourages the valuable act of revision.

Library media teacher-led technology integration projects such as the implementation of e-lockers are perhaps typical of the reasons behind Keith Curry Lance's finding: "Test scores increase as library media specialists spend more time managing a computer network through which the library media program reaches beyond its own walls to classrooms, labs, and offices (7th grade)" (Lance, 2000, 4).

## Conclusion

The school library aligns with the Pew Internet and American Life Project except for the fifth metaphor as a virtual locker, backpack and notebook. The concept is a logical extension of the function of the library and aligns with Research Process Models and initiatives for Information Literacy. A district has a number of cost effective methods to implement the e-locker for students. There are potential problems for security and backup plus issues regarding the use of commercial vendors and their stability. It is a function that places the school library at the heart of the learning community and makes them the information commons of the school.

The e-locker is the flip side of the library portal. It is the place where information accessed through the library portal is gathered, sorted, and sifted. It is the place where projects and products are stored, ready and available for collaboration and publication. As learners consult information sources, the URLs and bibliographic citations they collect eventually develop into a bibliography. This is a key part of any research process. Ultimately, the best of their finished works reside in a section of the e-locker as elements of a portfolio built throughout the student's educational career. Professional staff develops a chronicle of their professional career. The e-locker supports the research process and the learning community. It is a worthy project for school libraries and library media teachers.

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CHAPTER 6

# *Streaming Video: The Future of Multimedia in K-12 Education*

**Monique Turner**

*Streaming technologies are redefining the multimedia landscape for K-12 education. The focus of this paper is on streaming video technology applications. The author explores the areas of definition and function, implementation into the K-12 curriculum, and the educational benefits of using multimedia in the classroom. Two streaming media products are explored: AIMS Multi- Media's digitalcurriculum.com (DC) and United Learning's unitedstreaming.com (UL). By examining the use of these two products in the K-12 classroom, the author demonstrates the value and validity of streaming media's effectiveness on the educational achievement of children. It also includes a comparison of the advantages to streaming video technology to standard videotape and DVD.*

Streaming technologies are redefining the multimedia landscape for K-12 education. This technology takes the recognized benefits of video in the educational setting and raises it to another level. It alters traditional distribution networks to provide video to the classroom, giving the learner more options for finding educational experiences. Overcoming the barriers of time and place for the student, the technology realizes its potential with practical applications.

## How it Works

Streaming media works by compressing digital or audio files to distribute them over the Internet. The compression of files decreases their size by arranging them in a different manner than what is found in a typical broadcast or digital video product. Following this compression, the files move across the Internet in smaller packets of information. The video packets sent by the server arrive at the destination computer. This computer decompresses and reassembles the video data into a form understood by the learner's computer.

The video exists on a network-connected computer in a digital format used by Apple's QuickTime, Real Network's Real Player, or Microsoft Windows Media player. Obviously the speed of the network is a factor. Streaming is a true "on-demand" service that allows the user to click on a hyperlink and the learner's computer begins to play the audio or video. To play the video in the manner the producer intended it to play requires bandwidth or, more simply, a fast network.

Streaming media refers to technology allowing a user to watch a video or listen to audio in real time on a computer screen. Typically only video and audio have capabilities of streaming. However, there are new technologies produced by Real Network that allows image files, animations, and texts to stream.

There are two different mechanisms to deliver a media stream. They are Hyper Text Transfer Protocol (HTTP), "pseudo-streaming," and true "real time" streaming, User Datagram Protocol/Internet Protocol (UDP/IP). The basic algorithm for encoding the video is the same in both instances, but the difference lies strictly in the method of transmitting the files over the network. HTTP streaming works over Transmission Control Protocol/Internet Protocol (TCP/IP), whereas real time streaming utilizes Real Time Streaming Protocol (RTSP) to control the delivery of media content. Real time streaming is also interoperable allowing delivery over UDP, TCP, and IP network configurations. Due to the nature of the TCP/IP protocol, HTTP streaming requires the client to "buffer" or save to memory a significant amount of data before the stream begins playing. As TCP/IP is prone to stall temporarily, this buffer may run out, forcing the video to pause as the client's machine attempts to catch up. While this is functional, it precludes the possibility of "live" streams. UDP also allows for broadcast packet transmission. In other words, it allows many clients to view the same packets from a single server simultaneously whereas TCP does not. UDP also requires less server overhead.

While TCP/IP has benefits that make it better suited for serving up documents such as web pages, UDP/IP is the obvious choice for streaming media. Available software to deliver streams comes for any platform. The cost depends on the format. Open source servers, such as Apple's Darwin Streaming Server (QuickTime), are free, whereas a server from Real Network that supports multiple broadband streams typically costs thousands of dollars.

The question of bandwidth is a constant problem for streaming video. What kind of network connection does the client need for video playback? The answer depends on the quality desired to view the stream. A 56k modem is perfectly capable of view-

ing a media stream, but it limits the view to a small window and the video plays in a relatively jerky motion. An internal Local Area Network (LAN) provides for multiple connections of smooth, full-screen video. This allows for users of varying connection speeds, because the server often encodes the video at multiple bit rates that correspond to standard connection speeds. The practical application permits an institution to allow students to access the material from home or any situation with a variety of connection speeds. For example, the United Learning (UL) site uses this technology to provide a sample stream. The ease of use is acceptable and the playback on a cable modem is satisfactory.

## Comparison to Videotape and DVD Technologies

There are many benefits to streaming media compared to utilizing standard videotape or DVD formats. For example, standard videocassettes take up valuable class time because they have to be fast-forwarded or rewound to locate specific segments of a video. Similarly, DVDs must search forward or backwards in order to view a specific segment. The DVD format is better than the videotape format by allowing a learner to utilize the index feature, in effect "jumping" to sections. While the DVD index feature is quicker than videotape, it is does not provide for instantly cutting to a specific segment or clip. On the other hand, streaming media players provide a scroll bar directly underneath the viewing space. The user controls scrolling forward or backward much more quickly than with videotape or DVD. While this is a feature of the player rather than the format itself, it is the underlying streaming technology that makes it a standard feature associated with streaming media players. In addition to locating segments of a video quickly, streaming media companies seem to provide an ample amount of additional content in their products.

Streaming video provides more content per title than obtained by ordering a videotape or DVD. While DVD has more content stored on a single disc than videotape offers, streaming media companies differentiate themselves in the market by providing even more additional content. They tailor the additional content for specific subjects versus the additional content on videotape or DVD. Examples of additional content found in streaming media include post-tests, reinforcement videos, questions, teacher's guides, summaries, key concept videos, and much more.

Another advantage of streaming media is to allow an instructor to create a custom media presentation containing several different videos or clips. For example, the instructor often wants to present opposing sides to key topics in a lesson. Such an undertaking is not feasible considering the time and effort it requires for the teachers

to locate, review, obtain and create a new version of the correct videotape or DVD media. Streaming media provides the opportunity to create and show several clips from different videos consecutively. In the class archives, the clips are available for students to review at a later time. While videotape and DVD also provide additional content, the depth and breadth of the content and services provided by UL and DC allows teachers to create a customized lesson.

The ability to archive content allows students and teachers using streaming media to store and have permanent instant access to the content. Streaming video is always accessible and can be downloaded and stored on hard drives for later use. Students and teachers do not need to wait to check the content out from the library or media center or locate appropriate hardware and viewing space. The biggest advantage of streaming video allows access to the material from home or the classroom. It is important to note that the storage of this content on local hard drives and the length of time permitted vary according to specific licensing agreements.

Recording videos and DVDs requires extra technology. The DVD format often requires built-in encryption to prevent copying. Videotape requires a second videocassette recorder in order to duplicate a copy of the videotape. Streaming media records and saves using the same technology used to view the content. Under specific licensing agreements with streaming media companies, a student or teacher has the ability to download and save copies of the content. This simplifies the process of showing the same content more than once.

An interesting, albeit peripheral, advantage of streaming video is storage. Because streaming media storage is on a remote server, it makes an excellent solution for libraries lacking space for media collections. Downloading also obviates the need for creating catalogs and freeing valuable technical staff time. Streaming media affords collections the opportunity to grow in size while the physical holdings remain the same.

Streaming media is economical. The popular title, "The Geology of the Earth: Of Forces, Rocks, and Time" in videotape format costs approximately $100 per copy while the DVD costs approximately $50 for one disk. The entire digital curriculum package includes over 1400 titles and, including the right to store and copy content, costs less than $1000 for elementary schools, less than $1200 for middle schools, and less than $1400 for high schools. This package of titles costs between $70,000 and $140,000 in videotape or DVD format. Streaming media clearly has a cost advantage.

## Impact on Student Achievement

A study reported the use of streaming media content in the UL product boosted student achievement over 12% (Branigan, 2002). Researchers tested students' knowledge before and after presenting information on one economics unit. The study was performed using a control group and an experimental group. The members of the control group did not receive instruction using streaming media and the members of the experimental group were exposed to streaming media as part of the lesson. "The research showed among the experimental students an increase in performance by 12.6% points compared with the control group" (Branigan, 2002, p. 2). The same article highlights William Collins, a seventh grade teacher at Central Middle School in Charlotte Court House, VA. Collins reported that after using UL his students improved substantially on the Virginia State test. He cited improvement scores from the 44th percentile to the 87th. Collins indicated that UL positively affected his lesson plans and student achievement (Branigan, 2002, p. 1). UL products contributed curriculum content that was already correlated to state and national standards while making the lessons interesting, informative, and exciting.

Another case study using the UL product found substantial learning gains in student performance by use of its content. Comtreka, an independent research company collected and analyzed the data. They conducted a study with randomly assigned experimental and control groups using third grade social science classes at four districts in Virginia. "The major focus of the study was to scientifically answer the question: does the UL product improve learning in the classroom?" United Learning, 2002, ¶ 3) The results were positive. The four districts in the study included Amelia County, Brunswick County, Charlotte County, and Danville City schools, all in southern Virginia. The study used questions based on Virginia's Standards of Learning for the grade and the subject level. This study was conducted over an eighteen-month period from November 2000 to May 2002. The principal investigator stated that his preliminary analyses indicated that the "UL application increased achievement scores substantially." (United Learning, ¶ 4) He further stated that, "the positive impact that UL had on every level of teacher and their classrooms was obvious," (United Learning, 2002) (Figure 1). The students were taught over the two-year period using the streaming media content from UL and were given pre and posttests. The students viewed a minimum of 10 video clips per standard with the post-tests given afterwards.

*Figure 1.*

**Brief overview of three study groups. Note that the higher student achievement gains are in the experimental groups.**

**Third Grade Science**

| Group Type | Group Size | Pre-test | Post-test | Difference |
|---|---|---|---|---|
| Experimental | 291 | 5.0 | 7.1 | 2.1 |
| Control | 374 | 5.3 | 6.2 | 0.9 |

**Third Grade Social Studies**

| Group Type | Group Size | Pre-test | Post-test | Difference |
|---|---|---|---|---|
| Experimental | 319 | 6.1 | 7.1 | 3.7 |
| Control | 323 | 6.6 | 7.8 | 1.2 |

**Eighth Grade Social Studies**

| Group Type | Group Size | Pre-test | Post-test | Difference |
|---|---|---|---|---|
| Experimental | 206 | 10.8 | 17.0 | 6.2 |
| Control | 222 | 10.7 | 10.7 | 0.0 |

***Source: United Learning.com***

The No Child Left Behind Act (NCLB) enacted by the Federal government in 2002 introduced a new level of accountability making states, districts and local schools accountable for the performance of its students. (Recio, 2002) Recio et al discussed the use of e-technologies to simplify compliance with this act. With the passage of this act comes an even greater need for effective assessment of student learning outcomes. Their analysis is that this can be achieved fairly easily with computer logs of student achievement based on test results. New technologies are emerging that allow input from multiple people, places, and applications enabling educators to track state and national test and achievement results. Standard tools are being developed that allow users access to this information, which in the past was not accessible.

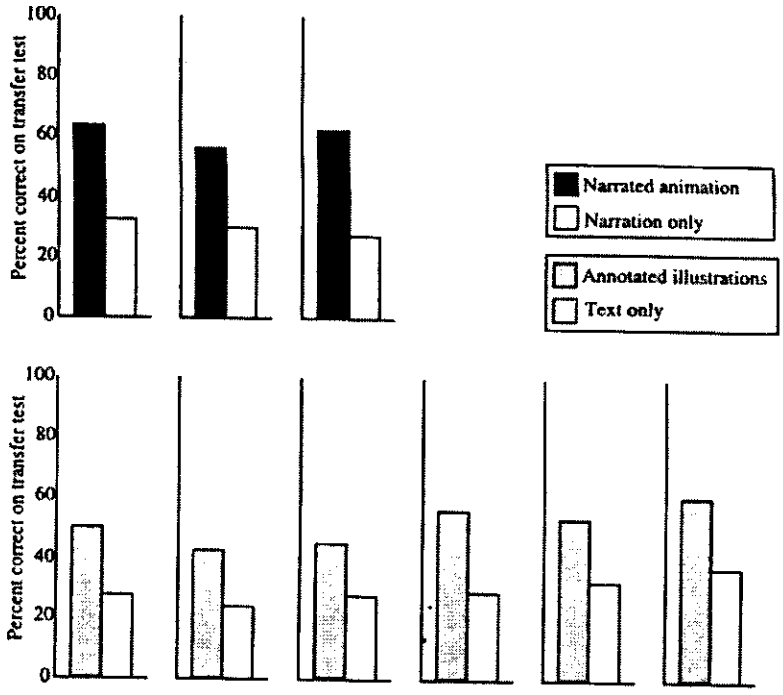
Many of the streaming media companies offer a tracking mechanism to meet the requirements of the NCLB. The main tracking feature in all three companies is usage logs as well as student test results. Another important component is the testing feature, allowing teachers to gain instant feedback on how well the students understand the material. The products lack a feature allowing automated tracking of test results. Such a feature allows teachers to focus time on the key concepts where students experience trouble based on the test results. If the test results are in the tracking system, the tracking system is a useful tool for identifying areas for remediation.

Multimedia presentations have the potential for deeper learning and understanding than presentations solely in one format (Mayer, 2001, p. 46). Gardner's theory of multiple intelligence states that there are seven intelligences and all "seven intelligences are needed to productively function in society." (Brualdi, 1998) The seven intelligences according to Gardner each require a different format to achieve success in that subject (Gardner, 1983). As a result, teachers "should think of all intelligences as equally important. This is in great contrast to traditional education systems, which typically places a strong emphasis on the development and use of verbal and mathematical intelligences. The Theory of Multiple Intelligences implies that educators should recognize and teach to a broader range of talents and skills" (Brualdi, 1998). This concept is applied to classroom instruction by "structuring the presentation of material in a style which engages most or all of the intelligences" (Brualdi, 1998). Streaming media allows for exactly this type of instruction by virtue of its malleability. The teacher uses presentations of clips, videos and narrated animation in a multitude of ways and address many different learning styles. "This kind of presentation not only excites students about learning, but it also allows a teacher to reinforce the same material in a variety of ways. By activating a wide assortment of intelligences, teaching in this manner can facilitate a deeper understanding of the subject material"(Brualdi, 1998).

Figure 2 demonstrates the mean transfer scores from students who received pictures and words and for students who received words only (Mayer, 2001, p. 73). The effect of transfer is important because transfer performance is basically how well students can problem solve from a given set of instructions or lessons. The rate at which transfer occurred in the students who received both pictures and words is noticeably better on transfer tests. Adding pictures to words tended to improve student performance (Mayer, 2001, p. 73).

*Figure 2.*

**Mean transfer scores (Source: Multimedia Learning, 2001)**




Multimedia effect for transfer: better transfer when words and pictures are presented (*dark bars*) rather than words alone (*white bars*).

Pictures and words are a natural part of the learning process. One vendor, BigChalk, is not a producer of streaming media, but offers digital curriculum support materials. "It has been well documented that the integration of visuals in the teaching/learning process increases learning and achievement" (Orlser, 2002, p. 36). BigChalk offers visuals directly connected to a variety of concepts, all of which fit specific grade levels. This direct correlation between content and visuals is the focus of technology like Bigchalk, enabling students to prosper within a rich and creative learning environment while increasing learning and achievement.

## Streaming Media Preparation

A host of companies provide streaming media players. These companies also provide utilities to digitize content, because the method for digitizing content is usually proprietary. Thus you need their player to play their format. Some companies offer the

content for streaming media but do not provide the viewers. The viewer is easily downloaded for free on the Internet. Some of the companies that provide viewers include: Real Networks, Macromedia, Microsoft (via their bundled Media Player), and Apple with their QuickTime protocol.

Streaming media is cutting edge technology for classroom use and there are only a few companies offering streaming media to K-12 education. These companies are laying the groundwork for the technology needed to effectively provide streaming media for the educational market. The following are examples of two companies offering streaming media: AIMS Multimedia through DC and AIMS through UL.

DC offers streaming media content to the K-12 environment. DC focuses on making the program easy to use and effective for students and teachers. Each DC (AIMS) video is encoded at multiple bit rates so that it can play on a home dial up modem or a T-1, cable or fiber connection. Students and educators have the ability to access the content via any Internet connection. According to DC their encoding is higher than the other companies making their videos 84% sharper than the competition. The content for DC comes from AIMS multimedia catalog of 1,100 titles grouped into three grade categories; elementary, middle school, and high school. The content can be searched according to specific grade level. Searching for material by grade level is fast and user friendly. In contrast, UL's web site provides little content.

Streaming from DC adds value to education with its key concept videos and photo libraries. This content reinforces retention and transfer that cannot be accomplished as successfully with lecture alone. In addition to the use of streaming media, the DC license agreement permits the use of still shots of videos in school presentations. DC functionally provides students and teachers with their own personal copy of the video or image they wish to use.

## Conclusion

The 2001 California School Technology Survey conducted by the California Technology Assistance Project under the California Department of Education summarizes the information regarding school infrastructure. (CTAP, 2001) According to the study, 84% of schools have access to the Internet, while 96% of schools are connected to the Internet. These statistics indicate that schools have the capacity to utilize streaming media technology. The financial advantage of using streaming media is that one server provides all the video services for the entire school district.

This is in contrast to schools all buying the same videos and hardware for each location. Larger districts may need to have more than one server.

Streaming media has a clear advantage over DVD and videotape. The benefits in terms of technology, educational advantage, ease of use, and cost are improvements over traditional media. Streaming media's potential in the classroom extends past the scope of this paper. Streaming media has the capability of meeting the needs of different learning styles. Gardner's work on multiple intelligences indicates multimedia education has a place in the modern classroom. While traditional media may meet this need, streaming media's added value and cost savings far outweigh the benefits of DVD and videotape.

Streaming media is another digital technology available to schools to use in the process of learning. The technology is relatively new, but initial studies indicate the huge potential for the technology. In networked schools, the implementation of the technology is easier because of the amount of bandwidth consumed by the technology. It holds the great promise for addressing the need of Gardner's multiple learning modalities.

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## Appendix A

Selected URL

Aims Multimedia through DC - www.digitalcurriculum.com
BigChalk – www.bigchalk.com
United Learning - www.unitedstreaming.com

CHAPTER 7

# *Access to Resources For the School Library Media Center*

**Deb Karpuk**

*An examination of the integrated library systems (ILS) offerings of six vendors, Book Systems, Brodart, COMPanion, Dynix, Follett, and Sagebrush, provides insight into the issues of bibliographic data and description in digital libraries. Adherence to standards such as MARC 21 and AACR II has important impacts on the quality of learning experience for K-12 students. Combined with the use of controlled vocabulary and indexing of standard fields, high quality search engines provide precise and useful results. The school library media specialist needs to have a basic understanding of the issues to successfully utilize the virtual resources in a digital library.*

## Epicenter for Learning

The School Library Media Specialist serves an exciting role as partner with teachers to fulfill the educational mission of the school. In tandem with teachers, the SLM Specialist maps the collection to curricular needs and keeps alert to new resources that enhance resources already available. One component of this access is the library catalog. From the catalog in card format to the online public access catalog (OPAC) of the 1980's and 1990's, the method of reflecting the holdings of one library evolved into the integrated library systems (ILS). The ILS expands the reach of the School Library Media Center (SLMC), enriches the resources available to students and teachers. The SLMC emerges as a virtual center, available from home, through a PDA, or anywhere Internet access is available.

The contemporary ILS extends the range of educational resources available to students and teachers with time savings for the SLMS to maximize the instructional benefit of these materials. Knowledge of the traditional catalog record, the descriptive components, access points, and controlled searching points remains a valuable asset in this highly fluid world of technological evolution. The standards used in the cataloging of library books and media are key to functional local catalogs. Vendors provide expanded catalog options to the school market for catalog records in electronic format employing the Anglo-American Cataloguing Rules 2nd edition for bibliographic description,

use Machine-Readable Cataloging (MARC), and follow consistent practices for applying subject headings based on either the Sears List of Subject Headings or the Library of Congress Subject Headings. These standards promote description, consistency of encoding and subject heading assignment based on an established subject-heading list. The benefit of the consistency is the easy integration of new records into the online catalog already in place. Authority control and consistency in the access points for searching the catalog is core to maximizing the precision of searches in the OPAC.

When moving from the local catalog to the Internet, the rules change for efficiently retrieving needed items. The ILS products discussed below provide exciting added value to the local library collection, allow students and teachers to work from any location with Internet access, and enrich local holdings through one search features that search local catalogs, catalogs of other libraries, databases that the library or district subscribes to, and access to quality educational websites. The ILS puts the SLMC in the forefront of advancing the educational objectives.

## Integrated Library System (ILS)

The evolution of library automation and technological innovations offers libraries options to meet instructional objectives and provide resources for the full range of grade levels served by the SLMC. Specific electronic links unite educational objectives to curriculum materials, teacher outlines and exercises for students, plus alignment with state educational standards. Additionally, websites selected by librarians and educators provide quality and reliable information for student research. Searching options range from the simple search through Boolean search strategies to icons for younger children to click to search their favorite subjects.

Where this discussion is not intended to recommend one system over another the author, as an experienced educator, and former library director, a focus on key features in the ILS is important. The figures that follow outline basic features of selected automation systems. It is important that librarians, teachers, and administrators pool their expertise to determine what features are needed in an ILS. Systems that explicitly reference alignment with state educational standards provide the benefit of curriculum materials keyed to instructional objectives. In addition, following standard practices for cataloging books, media, using MARC for encoding cataloging information, using standard subject heading lists and classification systems, and Z39.50 compliant systems, expands options for resource sharing with other libraries following standards and communication protocols.

*Figure 1.* **Selected Integrated Library System Key Features**

| Vendor | Automation Product | Single-search Product | Platform | Selected/Cataloged Websites |
|---|---|---|---|---|
| Book Systems Inc. | Atriuum; eZ Cat; Web OPAC; Concourse | Search multiple files | Web-based on local server or Windows | Hyperlinks to relevant websites |
| Brodart Automation Division | DartClix 4 Kids; Precision One; Media Minder; LePac NET Gold; Amlib | LePac NET Gold | Windows | DartClix 4 Kids selected websites for K-5 |
| COMPanion Corporation | Alexandria; Easy Entry; Alexandria WEB; NetLink; Net Trekker; SearchALL; Sneak Peak | SearchALL | Windows or Mac | NetLink; Net Trekker |
| Dynix | Horizon Information Portal; Horizon Kid's Information Portal | Both Information Portal products have this feature | Linux (Red Had & SuSE); Windows Server 2003; Thin-client | ----- |
| Follett Corp. K12 Companies | Find-It-All Knowledge Links Collection (One Search, WebPath Express) TITLEWAVE | One Search | Client-server; Thin-client; Browser-based | WebPath Express |
| Sagebrush Corp. | Accent; Athena; Pinpoint; Spectrum Suite; WebMARC | Pinpoint | Windows | WebMARC |

### Book Systems, Inc.

EZ Cat is a client-based product that affords the School Library Media Specialist the opportunity to connect directly to the Library of Congress database using the Z39.50 protocol or to other Z39.50 libraries using the International Standard Book Number (ISBN). EZ Cat allows for local downloads of the MARC record for local editing then importing into the local OPAC. Authority control is accomplished through an authority module that automatically verifies that the subject terms and names match or do not match the list of authorized terms. When a term does not match, an authorized list of suggested terms is provided for mismatches. EZ Cat allows the addition of hyperlinks to relevant websites to the OPAC catalog record. This feature extends the value of the catalog to access both resources owned and additional resources from the World Wide Web. Retrieval in the OPAC is conducted through keyword searching (uncontrolled terms) and through controlled vocabulary terms such as subject headings, author names, and corporate names.

The Atriuum product is designed for libraries not yet automated. Atriuum is not in release by Book Systems, Inc. and the beta test begins shortly. The product is a web-based application on a local file server allowing any school to access resources using their web browser. There are no client-based programs. Atriuum provides the following library functions: Circulation, browsing the OPAC, and identifying materials housed both in the library and within the school district. Atriuum also supports the EZ Cat product and is Z39.50 compliant. It allows for downloading MARC21 records and the generation of shelf-list and inventory reports.

### Brodart Company

Brodart Automation offers DartClix 4 Kids, a subscription service that provides professionally selected and cataloged websites appropriate for grades K-5. The sites are selected by library professionals, are age-appropriate, and searched through the library OPAC. Students select the URL in the MARC record. All of the cataloged websites follow current Anglo-American Cataloguing Rules, 2nd ed., 2002 revision and includes the URL (MARC 856 tag), summary note (MARC 520 tag), audience level note (MARC 521 tag), and multiple subject fields (MARC 6xx tags). Services of the DartClix 4 Kids include monthly maintenance of the sites, adding new sites, and deleting inactive sites.

The Brodart Precision One program is a cataloging resource tool designed for retrospective conversion and for speeding up the ongoing cataloging process. Available via

the Internet or through the computer hard drive, Precision One provides access to over 2 million MARC records, including pre-1968 records and Library of Congress records. Brodart's cataloging team continually updates the database. Brodart will transfer bibliographic information from shelf list cards into MARC, so that the local retrospective conversion of card files to electronic files can be completed.

Media Minder is Brodart's Windows-based media management system software suite that enables the efficiency of booking library media. This program is also MARC compliant to enable staff to find curriculum-enhancing material in one search.

LePac NET Gold expands access to the library OPAC throughout the region, the state, and the world. The program's design is for district-wide and larger union catalog systems by bringing together multiple databases and seamlessly transforms them into one public access catalog. Member libraries have the ability to capture MARC records from the union catalog and download those records into their local catalog. Users perform simple author, title, or subject searches as well as advanced searches using keywords, Boolean operators, and format of the material, publication date, or the location of the item.

### COMPanion Corporation

The Alexandria Library Automation system is an easy system to install, use, and maintain. Features provide for district control and maintenance of resources or individual libraries can tailor the system to fit unique needs. With a 15-year history of K-12 library automation and a reputation for developing intuitive products, Alexandria earned the endorsement of The Big 6, co-founded by Mike Eisenberg, Dean of the Information School, University of Washington and Bob Berkowitz. The task of maintaining an automation system in a school library is a major undertaking and the many integrated features of the Alexandria system simplify the process.

Alexandria is both Windows and Macintosh compatible. A key features includes a Union Catalog/Wide Area Network (WAN) where the searching method is real-time for sharing resources and uses client/server architecture. This distributed union catalog feature gives librarians in a school district management and control over their own collections, with the ability to share resources as well.

Machine-Readable Cataloging (MARC) is available through a drag and drop feature or through a download of MARC records from the Internet. Either way, the authority control feature within Alexandria assures consistency of catalog entries. A Smart-

MARC feature using Z39.50 technology allows for searching multiple Alexandria collections along with other Z39.50 databases. The Easy Entry cataloging template allows for each fill in of cataloging information without having extensive knowledge of MARC, and a MARC editor is available for those familiar with MARC standards.

There are several ways to search the online public access catalog (OPAC):

- Six-level Boolean searching, a standard search screen with multiple levels
- Simple and icon-based searching for younger patrons
- Study program
- Z39.50 searching capabilities

Misspelled search terms result in a "sounds like" search that gives the user optional search to select. Keyword searching and an integrated browse feature can be used to look for similar topics. Search features allow the user to launch URLs to favorite sites or to those websites cataloged into the collection.

Alexandria WEB publishes the school library collection to the web where patrons can access the collection using any web browser on any computer. Younger patrons enjoy the Alexandria Explore feature, an icon-based interface created for children based on their cognitive skills and abilities. They click through a layered system of pictures or letter icons that teach research skills. The system guides the patron into narrowing search results.

COMPanion NetLink is a collection of cataloged websites in MARC format, increasing the collection with thousands of websites identified as quality educational resources. Each NetLink MARC record includes the URL (MARC 856 TAG), a Summary/annotation note (MARC 520 tag), and an intended audience level note (MARC 521 tag). This enriches the MARC record as a tool for educational use as well as containing the Library of Congress Subject Headings for controlled term searching in the OPAC. NetLink updates records monthly adding new records and deleting dead/outdated records. Examples of topical coverage include: history, literature, politics, government, math, science, physics, chemistry, astronomy, biology, photography, art, and music. The Alexandria District Librarian feature provides an option to centralize cataloging and maintenance functions in one location.

For libraries currently using other automation systems, a number of conversion options are available. COMPanion enters the shelf list into a database, adds full MARC/MARC21 records to every item, and then transfers the information into Alexandria. Sneak Peek provides access to title summaries, book reviews from School Library

Journal, Booklist, Library Journal and cover images for juvenile chapter books as well as conference proceedings.

Net Trekker is a feature within Alexandria's Researcher and Web interfaces that contains only academic websites that focus on K-12 curricula. The academic search tool customizes the content of thousands of online resources for elementary (grades K-5) and secondary (grades 6-12). The content aligns with state educational standards and contains learning benchmarks. Online lesson plans are also available.

Alexandria's SearchALL provides access to unlimited numbers and types of information searches with one simultaneous search. Displays are organized in one results window. A possible search example is: Searching other library collections, Google, Yahoo, EBSCO or ProQuest databases, the Library of Congress online catalog, and an online encyclopedia simultaneous.

## Dynix

The Dynix Horizon Information Portal allows users to access the library from anywhere via an internal network, Internet connection or a wireless PDA. The uncluttered displays, sorting and filtering capabilities, and consistent graphical searching interface across databases provides access to bibliographies, tables of contents, book reviews, and cover art. Book lists can be generated using the standard style writing manuals, such as the Chicago Manual of Style.

Searches can be pre-formatted various search limits, stored as HTML links, and can be launched from any of the library web pages. The catalog, electronic resources, and web databases can be searched with a single query. Dynix and WebFeat have partnered to create translators designed to search multiple sources simultaneously and present the results in a single display. The Horizon Information Portal can be adapted to library needs and Horizon Enriched adds visual appeal to the local catalog. In addition, the Horizon Remote Patron Authentication feature provides users seamless access to restricted web resources.

The Horizon Kid's Information Portal appeals to younger users through colorful icon screens and easy-to-understand navigation with access to over 2,800 pre-formulated searches grouped into 500 knowledge categories. In addition, categories of local interest or of importance to curriculum needs can be customized in the Kids Information Portal. Simple searches include keyword, author, title, and/or subject headings.
In Horizon Cataloging, a bibliographic database can be served and cataloging records

created, imported, or exported. A MARC Editor, MARCIN/OUT loading interfaces, Z39.50 client, and best seller/hot picks are key features of the cataloging modules.

### Follett Corporation Companies

Follett Software's Find-It-All Knowledge Links Collection consists of two programs: One Search and WebPath Express. Through One Search, multiple online resources display one search result, providing an efficient, easy-to-use search interface that works with any library system. Included in One Search is multiple Internet databases, over 75 free and fee databases, and the library collection.

WebPath Express links the catalog to over 170,000 educator-approved websites chosen against published selection criteria. Standard subject headings such as Sears List of Subject Headings or the Library of Congress Subject Headings are assigned to the websites, linking them to controlled term searching. 10 content areas, 55 subject areas, and another 60,000 topics organize the websites. The vendor maintains the sites and is up-to-date with current world events, which are easily accessed with keyword and famous people searching. School Tools and Kid-Friendly Help are part of the product. Reporting for the librarian includes an analysis of the most frequently used subject searches and the most actively used subscriptions. WebPath Express supports the Children's Internet Protection Act (CIPA). The Find-It-All Knowledge Links Collection is aligned to state educational standards.

In addition, Follett Software provides a complete suite of products at the building or district level to control circulation and inventory functions, cataloging to update and maintain the MARC database, OPAC, and a union catalog. Platform options include Windows, Macintosh and Web Browsers.

Follett Software and Follett Library Resources cataloging services offers both catalog card sets and for MARC21 and MicroLIF formats for cataloging print and media collections. Both formats contain complete annotations, with either Sears List of Subject Headings or the Library of Congress Subject Headings. Shelf list information includes the reading level, interest level, and, if available, review sources. The MARC 526 tag is used for Accelerated Reader and Reading Counts Cataloging, with the reading program name, reading level, point value, and library holding code for the program. Lexile's are included in MARC 521 field where available. WebPath Express subscribers automatically receive catalog records that include web links.

Follett Library Resources' (FLR) TITLEWAVE service offers online delivery of MARC21 records as soon as the materials ship from the Follett warehouse. All shelf list cards include: ISBN, accession or bar code number, reading level, purchase price, date, Library of Congress control number, funding code, invoice date, and from 1995 onward, review dates where the dates are available.

TITLEWAVE includes lists of books that are tied to specific state and national curriculum standards and provides supplemental lists for textbooks. Search methods include: keywords, author, copyright years, interest levels, reading levels, binding, reading program, Dewey Decimal Classification range, reviews/awards, languages, number or pages, illustrators, and publisher information.

FLR offers a collection development tool to customers, TitleWise. Using the local MARC database, it analyzes the strengths and weaknesses of the collection by comparing it to several standard collection development tools. It reports the results in chart or graph format. It also integrates to TITLEWAVE to identify titles matching the collection's needs.

### Sagebrush Corporation

Accent is a fully centralized library management system designed for K-12 and supports curriculum needs by:

- Providing easy access to the information students need to learn
- Simplifying tasks to maximize library media center efficiency
- Reducing library technology administration time

By simplifying tasks, library media specialists are available to work with students and teachers. Accent features include a web-based catalog for searches in and out of the library media center, graphical search interfaces, cataloging and inventory modules, a circulation module, and other tools to facilitate searching and management functions.

Accent is a WindowsNT application. The database server can be housed at the district site, and is compatible with high-speed wide area networks (WANs). This provides centralized management of district resources for easy update and management. Accent is designed to foster centralized cataloging with a single procedure for handling all materials. This promotes consistency throughout the district and facilitates more reliable catalog searches. Catalog staff can enter or import records in full or brief MARC format. Updates to the catalog are real time.

Z39.50 client capabilities allow students and staff the ability to search other Z39.50 information and MARC bibliographic information. Accent's Z39.50 server capability lets staff from other school library media centers to search the district's catalog. Students can search the entire district, multiple locations within a district, or a single school. Accent's web-based catalog allows students to search the Internet as well as local library materials using a web browser. In addition, the library's web page can be customized to suit each individual library media center. The icon-based search module helps students of all ages navigate the catalog and to access pre-configured searches, as well as providing lists of helpful materials. Multi-lingual interfaces serve student diversity.

Sagebrush Athena is a fully integrated library automation system that combines circulation, online public access catalog searching, cataloging, and inventory functions for Windows2000, WindowsNT, WindowsXP, and Windows95/98. Search results are sorted by relevance and by material type. Full subject searches can be conducted from the Advanced Search or Visual Search screens. Searches include: One term or phrase, full subject heading searches, Boolean searches in Advanced Search, and in Visual Search, icons linked to local networked applications, access to CD-ROM databases, as well as providing access to websites. Reading program searches can also be performed. Z39.50 library collections can be searched with Athena's zMARC fully integrated Z39.50 search interface. The MARC entry screen has built-in safeguards insuring originally cataloged records or downloaded records meet MARC21 standards.

Pinpoint is considered a "library without walls," allowing students to access a web-based interface to search libraries, information databases, online subscriptions, and the World Wide Web in a single search environment. Pinpoint helps students and teachers find information appropriate to their needs by specifying a search priority and grade range. Duplicate records are eliminated in the search results; then results are prioritized based on relevancy with "more like this" links to guide the student through the search process. Electronic content can be clipped with an automatically generated citation then stored in a password-secured location for later use.

Using Sagebrush's WebMARC product, thousands of curriculum-related websites are added into the local library automation system. This product expands the educational resources that the school library media center has to offer for educational support.

The Spectrum Suite consists of user-friendly stations where students can conduct reading program searches, print bibliographies, get access to BenchMARC collection development tools, and access search screens in French or Spanish. Visual Search icons help younger patrons navigate the tools. As a Z39.50 client, Spectrum students can access holdings at other Z39.50 libraries, websites, digital images, and databases. Other Sagebrush programs referenced above have similar capabilities.

Sagebrush offers the Dewey Decimal Classification System and the Sears List of Subject Headings databases with format options for libraries requiring card sets for their catalogs or for the electronic transmission of cataloging information. Spanish language titles are included in the database of over 600,000 K-12 titles. A Library of Congress cataloging option is also provided with all English-language monographs. Also available for use are Cataloging In Publication (CIP) and National Library of Medicine (NLM) resources. The audiovisual materials are handled through an A/V database comprised of LC music and visual materials, Professional Media Services Company cataloging, and original cataloging from Sagebrush.

## Overview of ILS Search Features

Exciting technological innovations provide opportunities to expand the library OPAC and incorporate excellent web resources into an easily searchable product. It is important to recognize that easy searching does not necessarily mean reliable results. Core considerations are:

- What tool is being searched?
- Is there controlled terminology, such as standard subject headings?
- Are multiple resources being searched at one time?
- What keyword (uncontrolled) search options are available?
- How are catalogs and other resources updated?
- What search options are available? Simple? Boolean? Others?
- Is it Z39.50 compliant for searching other Z39.50 libraries?

*Figure 2.* **ILS Search Features**

| Vendor | Web | Keyword Searching | Controlled Term Searching | District Wide Searching | Search Across Resources |
|---|---|---|---|---|---|
| Book Systems, Inc. | Yes | Yes | Yes | Yes | Search multiple files |
| Brodart Automation Division | Yes | Yes | Yes | Yes | LePac NET Gold |
| COMPanion Corp. | Yes | Yes | Yes | Yes | Search ALL |
| Dynix | Yes | Yes | Yes | Yes | Information Portal |
| Follett Software Company | Yes | Yes | Yes | Yes | One Search |
| Sagebrush Corp. | Yes | Yes | Yes | Yes | Visual search feature |

## The MARC Record

As MARC remains a standard encoding system for cataloging information, understanding the bibliographic record and the basics of Machine-Readable Cataloging is important. Many vendors selling materials to school districts also supply catalog card sets or catalog records in electronic formats. The availability of this assistance does not preclude understanding the basics of how a catalog works, different techniques for searching catalog files (all formats), or the distinction between keyword searching and searching using personal names, corporate names, and subject headings that have been verified against a standard list of official forms of name or subject headings (authority control).

It is important to understand how the ILS handles authority control. Specific MARC tags come under authority control, where the forms of names are standardized. Example: Shulevitz, Uri What this means is that if a student or teacher inputs a variant spelling of the name Shulevits, Uri, the authority file module will display a result: Shulevits, Uri See Schulevitz, Uri. In some systems, the searcher is automatically taken to the correct spelling of the name. All of this, however, is based on the correct linking of the variant spellings of names to the authorized spellings of names. When there are many variant spellings, like with the name Tchaikovsky, the authority control module provides the alternatives so that nothing is missed. Without the authority control, the student or teacher needs to know all the variant spellings in order to locate all materials by or about the person. Another issue is how people as authors of a work or same people as the subject of a work are searched. How is keyword searching conducted? What MARC tags are searched and are note fields searched in addition to the authority controlled fields?

In addition, when working with a vendor for purchasing materials and ordering cataloging records, there are options that the SLMS can consider. Some of the decision areas would include: Sears or Library of Congress Subject Headings, Dewey Decimal or Library of Congress Classification, level of cataloging, types of notes, etc. The critical issue is that the materials are consistently cataloged following national cataloging standards and the records are consistent with other materials in the catalog, authority control is conducted, and that a mechanism for correcting records be established.

When moving from the local online catalog with MARC tagged bibliographic records to larger systems, there may or may not be any controls over the search terminology. Knowing this helps in the formulation of a search strategy, or multiple strategies for retrieving reliable results.

*Figure 3.* **Display, Cataloging and Standards**

| Vendor | Screen Display | Cataloging | Management | Standards |
|---|---|---|---|---|
| Book Systems, Inc. | Standard & image-based searching | MARC21, Authority Control | ----- | Z39.50 |
| Brodart Automation Division | Standard | MARC21, Authority control, Cataloging of websites, Retrospective conversion | Media Minder | Z39.50 |
| COMPanion Corporation | Standard & Icon displays | MARC21, Authority control, Cataloging of websites | ----- | Z39.50 |
| Dynix | Windows-based desktop display; Standard & Icon displays | MARC21, Authority control | ----- | Z39.50 |
| Follett Corporation Companies | Standard & Kid-Friendly help | MARC21, Authority control | ----- | Z39.50 |
| Sagebrush | Standard & Icon displays | MARC21, Authority control | ----- | Z39.50 |

## Searching

A core consideration in guiding students and teachers to effectively search the databases and catalogs is understanding the distinction between searching by keyword anywhere in the document, description of the document, in a subject heading, or by using authorized subject headings or thesaurus terms where the terminology has been standardized. Using controlled term searching will limit the number of search results. Figure 4 illustrates the results of various database searches.

***Figure 4:*** **A search for CATS**

| Topic of Interest | Google | Library of Congress Keyword | Library of Congress Keyword Subject | Library of Congress Authorized Subject Heading |
|---|---|---|---|---|
| Cats | 14,300,300 | 8,027 | 6,019 | 5,710 |
| Cats – Fiction | 985,000 | 2,879 | 2,738 | 2,645 |
| Cats – History | 2,040,000 | 214 | 113 | 52 |
| Cats – Periodicals | 24,800 | 16 | 8 | 8 |

The millions of results in the Google search covers cats, the animal, mascot, and the abbreviation for the word catalog. There are no controls over the meaning of the term cat. The search on Cats – History yielded a fine article on the history of cat litter, with no information about the history of cats.

The Library of Congress Subject Headings is an authorized list of subject headings widely used in American libraries. The subject headings are also MARC tagged as a 650 00 Cats $x Fiction. The heading and subdivisions are verified against the subject heading list and standard listing of subdivisions. The Sears Subject Headings List is another list commonly used in school library media centers. When a subject heading is assigned, the item is about that subject. There are fewer search results, but the results are more reliable and are on topic.

When searching across different resources, understanding how the database is constructed and how each of these resources is searched is critical to determining an effective search strategy and the reliability of search results. Where web resources have been cataloged using the standard cataloging tools, the cataloger can use the Library of Congress Subject Headings to select subject terms that cover the content of the web site. The result is a precise and educationally appropriate result.

## State Educational Standards

National educational initiatives and state educational standards are core to the mission of the School Library Media Center. States and national organizations adopt standards to ensure quality within their state or content area. Standards reflect the need to provide a broad range of fully cataloged and processed media that provides balanced viewpoints and makes the collection accessible and relevant to the educational curriculum. In addition, continual evaluation of the collection allows the SLMC to meet the diverse student and teacher needs.

Providing access to library media center resources is only part of the picture. It is essential to keep current, stay diverse and be aligned with state educational standards. Both the COMPanion Corporation and the Follett Software Corporation referenced alignment with state educational curriculum and access to lesson plans linked to core educational objectives. The other systems discussed above may have this alignment, but no mention was identified.

## Conclusion

Clearly, the catalog record is a key ingredient for access, but understanding how various catalogs interface, the power of controlled terminology (authority control), and how to convert information from paper format into MARC are important considerations. All of these areas are important to maximize the access to resources needed by student and teacher alike, the resources that the SLM specialist uses to place the SLMC at the center of a community of learners.

Along with the provision of simultaneous access to catalogs, databases, and websites with a single search, the ease of "metasearching" warrants guidance as to how to select and interpret the resources retrieved. It is an exciting role for the School Library Media Specialist – to partner with teachers to expand the learning opportunities with technology.

Core to all of this are standards: educational standards, communication protocols, encoding standards, authority control, and displays that are clear and easy to navigate. These times, with so many available opportunities, are challenging. With forethought and vision to the future, the student and teacher will benefit from SLM Center resources from home, school, or wherever they may be.

The School Library Media Center uses catalogs of various types, and materials organized in different ways and will continue to acquire resources from many sources. A successful SLMS understands how those catalog describe, organize and retrieve the resources. The result is an effective student searching and efficient use of the SLMC resources.

## References

ILS Systems:

Book Systems, Inc.
721 Clinton Avenue, Suite 11
Huntsville, Alabama 35801
Products: eZ Cat, Atriuum, WebOPAC, Concourse
http://www.booksys.com; 1-800-2196571

Brodart Company
Automation Division
500 Arch Street
Williamsport, Penn. 17701
Products: DartClix 4 Kids, Precision One, Media Minder,
LePac NET Gold, Amlib
http://divisions.brodart.com/automation/index.htm;
1-800-233-8467, ext. 6548

COMPanion Corporation
1831 Fort Union Blvd.
Salt Lake City, Utah 84121
Products: Alexandria Automation System, Easy Entry,
Alexandria WEB, NetLink, Net Trekker, SearchALL, Sneak Peek
http://www.goalexandria.com; http://www.companioncorp.com
1-800-347-6439

Dynix Corporation
400 West 5050 North
Provo, Utah 84604
Products: Horizon Information Portal, Horizon Kid's
Information Portal, Horizon Cataloging
http://www.dynix.com; 1-800-288-8020

Follett Library Resources
1340 Ridgeview Drive
McHenry, Illinois 60050
Products: TITLEWAVE and TitleWise
http://www.flr.follett.com/; 888-511-5114

Follett Software Corporation
1391 Corporate Drive
McHenry, Illinois 60050-7041
Products: Find-It-All Knowledge Links Collection (One Search, WebPath Express),
http://www.fsc.follett.com; 1-800-323-3397

Sagebrush Corporation
3601 Minnesota Drive, Suite 550
Minneapolis, Minn. 55435
Product: Accent, Athena, Pinpoint, Spectrum Suite, WebMARC
http://www.sagebrushcorp.com; 1-800-328-2999

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School Library Journal. Every issue contains articles on library automation, searching, technology product information.

State Educational Standards:

Developing Educational Standards: Library Media. Maintained by Charles Hill and the Wappingers Central School District in New York. http://edstandards.org/StSu/Library.html (May be searched by organization, by state, by country)

CHAPTER 8

# *A Community of Learning: The Digital School District*

**Joseph Marrone, Karlton Chapman and Daniel W. Fuller**

*The creation of a community of learners is a reality to the Quaker Valley School District. A discussion of the multi-million dollar project reveals problems encountered and lessons learned. Included is a review of the infrastructure of the voice, video and data networks plus an overview of the impacts on learners at various contact points in the learning community.*

## A Community of Learning

The concept of a digital school district is an attractive vision to educational, political, and business leaders. It speaks of the future and innovation. The challenge lies in transforming the vision to reality. The Quaker Valley School District (QVSD) in Sewickley, PA is making the vision real. QVSD is a four school district that includes the public library as part of the district. They are responsible for the learning environment of almost 2000 students with over 140 faculty members.

Standard and Poor's considers the district a demographic anomaly. The community of approximately 14,000 residents represents the entire spectrum of socio-economic backgrounds from the most affluent to those qualifying for the federally funded Free and Reduced Lunch Program. The demographic makes the district a living laboratory to cross the digital divide. The challenge was to close or eliminate the gap between the haves and the have-nots.

The district closed this gap by providing every student in grades 3 to 12 with a laptop and a wide variety of traditional and electronic learning tools. By forging partnerships, QVSD created a multiplier effect on the project dollars to extend far beyond the laptops for students. In the end, QVSD transcended their goal for a Digital School District. The result is a learning community, electronically uniting the public library, schools and homes.

## The Vision

> *If students do not learn the way that we teach, we must teach the way that they learn.*
> -Seymour Papert

On paper, the Digital School District (DSD) began when they won a competitive, multi million-dollar grant from the Pennsylvania Digital School District initiative to fund a five-year program in 1999. In reality, QVSD began planning a digital school district with the commitment that every student learns at their own pace and in their own way. The district devoted their resources to the development of a world-class school district with a commitment to excellence. This commitment is reflected in their mission: to excel at educating students how to become knowledgeable, self-directed, lifelong learners and ethical responsible citizens (QVSD, 2000). The district's motto says it more succinctly: Excellence in Education Gets Results.

The leaders of QVSD believe that technology improves the learning environment for every student. They understand how appropriately placed technology seamlessly supports a learning environment and raises student engagement to a new level for all students. QVSD rejected technology for the sake of technology. QVSD envisioned a learning environment where the opportunities for learning are not limited by time, space, or geography. The vision began with the unglamorous task of building renovations and strategic planning, but always with an eye on the future.

The district found the opportunity to give life to the vision in the Pennsylvania Digital School Districts initiative. In 1999, the Commonwealth of Pennsylvania made funds available in a competitive grant process and funded three districts as demonstration projects. In the process of developing their proposal, the district dramatized their vision with a video entitled "A Day in the Life of Katie Hogan." The video demonstrated the impact of technology on a student during a typical school day in the future digital school district. The philosophy of sharing drove the preparation of the proposal. QVSD made it clear that securing the funding would not just benefit their community, but the larger community of the world.

All projects have a vision, which is their focus. The defining difference in the QVSD project and other projects is the depth of the commitment to the vision. It is the result of the work of the senior leadership of the district and the board of school directors. Gaining commitment is a complex and in exact activity (Gladwell, 2000). The commitment process is evolutionary. QVSD leaders realized early in the process that the vision needed to be sold to the community of learners and they still continue to sell

their vision of the DSD. They understand that everyone, students, staff and community members, committed different things at different points in the project. Winning that commitment plus retaining and renewing the commitment of the stakeholders was iterative and constant. To determine the key factors of the process of gaining support would fill a book. However, without support, little is possible. The District recognized that making commitments was a key element of the program, the critical success factor.

The district also found inspiration in the work of Jukes and McCain (2000) who identified four technology trends for the first decade of the twenty-first century:

- Global digital networks
- Technological infusion
- Strategic alliances
- Personal computers for everyone

They took their digital networks and made them ubiquitous in the community. Technology was infused in every process but not mandated. There was room for traditional methods and processes. QVSD created alliances with vendors and grew those relationships/alliances into partnerships. They embraced the concept of one-on-one computing by providing a computer for everyone in the district.

## The DSD: A Learning Community at Work

Driven by a vision and supported by their mission, the DSD became a reality and a compelling story. At some point, the evaluation of the entire project answers the question of what happens when every student has access to a computer and digital resources twenty-four hours a day, seven days a week. Considering the issues regarding community identification, this question may never be satisfactorily answered. It is a different technology, content rich environment and learning community.

The depth of integration of educational and instructional technology found in QVSD is profound. It is a laboratory in educational reform. QVSD examines the speculation and theories of the impacts of voice, video and data technologies from the past thirty years. Not all the theories relate to technology. To build a learning community, the issues are political and social as well as to applied technology.

From the beginning, there were vocal critics of the project (Dailey, 2001). These critics asked two pointed questions. Was this simply a case of money following money where a wealthy school district became richer at the expense of poorer districts? Would the money be better spent on increasing the number of teachers and lowering class sizes?

The school board and senior administration responded with reasoned and thoughtful responses. In their presentations, representatives of QVSD repeatedly cited three reasons that drive organizations to change: safety, return on investment (ROI), and improved quality. The questions about the use of the monies test the ROI reason. One example related to the implementation of a new Student Information System (SIS). The net result was the time for one process was reduced from five minutes daily in the previous system to thirty seconds in the new system. That time savings when spread across the entire district results in the savings of time equal to one new, first time teacher's salary and benefits. The project demonstrated how appropriate technology, thoughtfully applied, provided additional time for instruction.

Philosophically, the district chose to guide the project using two reference points. First they lived their mission. They made decisions based on excellence in education. Second, technology was the servant. Technology infused into the learning community supported the process of learning without being the focus or the outcome. The use of technology for the sake of technology was discouraged. The members of this learning community understood they had options, including traditional methods as well as technology. The learners chose the method based on the way they learn.

The learning community is a matrix of relationships between people, places, technology, and the process of learning. The map of relationships presents a technology problem rarely confronted by educators. The mitigation of inherent social and political problems was the only route to excellence. Making the student the center of the learning community defines the rules of that learning community. The student is presented with new options to help deal with the barriers of time and place. A two-way communication beyond the traditional boundaries of the school district is encouraged and expected. The school district values the participation of every citizen and every citizen, in turn, values the school district.

## The Student

From kindergarten until high school graduation, the student is the focus of the project. In kindergarten, students learn ethical behavior, especially the ethical use of technology. Through the second grade they use technology in teacher controlled settings such as a virtual field trip to an art museum or guided practice with a mouse in a computer lab.

In the third grade, independent interaction begins when every student receives a laptop with wireless access, providing one-to-one computing twenty-four hours a day, seven

days a week. This access to district resources is a key principle in overcoming the digital divide. It drives the decisions for connecting to the library's digital resources.

The student first makes contact with the digital school district in the classroom via a wireless access point (WAP) or hot spot. The WAP provides access to resources of the school library, the district, the public library and the entire community. Each classroom connects to three different networks. The three networks, voice, data, and video, are the backbone of the DSD.

Early in the project, the technology team identified battery life as a major impediment to the process of learning through technology so each classroom was equipped with a charging station. The software installed on the laptop is an age and grade appropriate set defined by the district. The application of these tools creates a bridge for the student to cross the digital divide.

The teacher has a set of tools complementary to the student. It is wider and more robust with a higher level of access to the networks. Their laptop has hardware upgrades and the software includes classroom management and curriculum tools. They control the voice and video networks found in the classroom. Teachers guide students into the community of learners with carefully planned and executed lessons each day. Teachers encourage the participation of parents, using voice and email. While there is no requirement for teachers to use a personal web page, 70% of all teachers do. Here they post lessons, assignments, and related class materials for access by students and their parents after school hours and from remote locations.

Parents use the data networks to access the grades of their students from home or their workplace. They communicate with their student and the instructional staff via email and voice mail. The parents are given introductory technology training and a comprehensive notebook of instructions as part of the process. Checking assignments posted on the teacher web page changes the dynamic and quality of conversation with their students about school and homework.

## The School Library

Each building in the QVSD has a library staffed by a full-time certified teacher librarian. These librarians are actively involved in teaching classes, conducting in-service for teachers, and working individually with students and teachers. The library facility is rich in print and digital content. It looks like a school library has for

many decades with shelves of books, current periodical collections, tables and chairs, a reference area, bright displays, and a circulation desk. Adjacent to the library is a computer lab. Every student in the school uses the library to learn. The librarian serves two functions for the students. One is to guide them further along the road into the learning community, teaching skills to emphasize critical thinking. The other is managing the library and the technology housed in it.

The library is the commons area of the learning community. It is the students who make the library a community. Students work with their laptops open and online. Others take notes in long hand. They burn a CD or a DVD with the content of a project or to back up their data. To the side is an imaging station. It is a tool for students who need to reset their software configuration on their laptops. A group in the lab works on a digital video project for class using the digital video editing tools. Another student works on Cisco certification.

The librarian co-teaches with teachers and they promote reading as the critical skill for students of the information rich environment. They teach a wide range of topics from ethical computing to copyright and fair use. These are complex topics and difficult to teach in a "rip, mix, and burn" world (Lessig, 2001).

The library is the head for the video network in the school. The library has the ability to broadcast and distribute video throughout the building on demand. The library manages a hybrid collection of print and digital content. The tools extend beyond automated circulation. The system manages approved Internet sites imbedded into the online public access catalog (OPAC). The browser based interface for the OPAC includes a federated searching option to translate a single query by a student into a search across the local holdings, the ACCESS PA State Union Catalog, the commercial databases available through Power Libraries, and approved Internet sites. The results returned to the student ordered by source of result.

## The School

The center of the world for most students is their school. If the students are technologically aware, they see a variety of technology supporting their local learning community. The school houses the local servers for the data network and print services. There are switches for the voice and video networks. The lunchroom uses an automated system. The office staff and the teaching staff access and use the SIS to manage attendance, schedules and grades for every student.

## The District

The QVSD provides another level of contact for students. While the physical infrastructure is easily identified, they also provide the planning and management to make the DSD successful. The district level staff plan for what is over the horizon and constantly monitor student outcomes for course corrections. Before they set a technology direction, they ask the question "Does this add value to the process of learning?" Only when the question is answered with a "yes" do they act. They collect evidentiary data and act after analysis.

The district sets and enforces policy. It covers a wide range of policy decisions from the establishment of technology standards to curriculum. District Administrators ensure the district is complying with state and federal legislation, most recently No Child Left Behind (NCLB). The only side that students recognize on a daily basis is the enforcement in disciplinary situations. QVSD avoided creating a discipline policy that is technology specific. The use of inappropriate materials by students is the same infraction whether committed with digital or print materials.

The program and technology set used by the district office are varied. At a program level, the district supports the students and staff. This support includes in-service training on a weekly basis to teaching and support staff. Students see these important members of the learning community modeling learning behaviors. The district technology staff provides training for parents as each new wave of students move through the third grade. Critical functions of the district are centralized, including the firewalls, email, voice and video networks. The district has also centralized the email function and the web servers. It houses mission critical servers for the school libraries and other essential curriculum related products. The technology staff insures the data network from the laptop to the Internet is functioning. They operate a sophisticated support center for the schools, the district, the public library, and the home. District Administrators seek partnerships and negotiate vendor contracts.

## The Public Library

In a situation unique for Pennsylvania, the School District operates the Sewickley Public Library (SPL). This provided an opportunity to link the SPL tightly to the learning community while preserving the identity of the SPL. The result is a public library with innovative technology programs and services supporting students of all ages.

The SPL technology infrastructure is aligned with QVSD. Network hotspots are available inside the SPL as well as wired access. Though they use a different library automation system than the schools, their holdings are available to students via ACCESS PA and they utilize Power Libraries. The SPL leverages their relationship with the school district to provide after school programs. The public library is thus part of the learning community.

## At Home

Perhaps no other aspect of the QVSD DSD is as important as the manner in which the district utilizes technology to increase participation by parents and care givers in the process of learning. Through a partnership with the local cable franchise, each home is wired into the district infrastructure with a WAP. This concept of wiring the home goes far beyond public relations or demonstrating how to find a creative partnership with a vendor. It changes the dynamic for students when they leave their school building in two critical ways.

First, students with a particular need are given access to the learning program, which is not possible in the traditional school district model. The DSD gives access to students who have a long-term illness or to students spending time outside of the United States. QVSD is not interested in being a cyber charter school. Far from it. They value the essential interpersonal contact between students and the various members of their learning community. But, when the occasion arises, it allows the DSD to be responsive to individual student needs.

Second, parents are active participants in the learning community. Early in the implementation, the administration and management staff noted an unexpected phenomenon in the usage statistics. Access from home went far into the night, beyond the times expected for student use and resumed early in the morning before students left for school. The analysis revealed that parents were using home computers or the student's laptops to access the network.

Anecdotally, students report parents know grades before the students do. Parents speak to their children about grades and assignments with more information than in the past. In the past, parents always emphasized good grades, but now they have the information to help make educational decisions for their children.

## The Community

With this combination of resources, QVSD involves the extended community. For example, QVSD conducted a program for senior citizens to learn how to file their rent rebate online from home. The staff provided training for any citizen to find their tax assessment and how to file for an appeal. The relationship with the extended community goes far beyond sports or musical performances. Every citizen belongs to the community of learners.

## Infrastructure and a Digital School District

Technology infrastructure in QVSD does not exist in a vacuum. The purpose, implementation, and use of technology is driven by the mission statement of QVSD. The mission is reflected in the district strategic plan, the operational technology plan, and the subset of plans to deliver the technology to the learner. Throughout the process, plans are related specifically to the curriculum and instruction within the district. It goes far beyond the physical level of the three QVSD networks: voice, data and video. The plan is a combination of people and technology to implement and support the process of learning.

The emphasis on planning is a key to the success of the DSD in QVSD. The plans are living, breathing documents used to update and constantly change all of the time. It is not possible to provide the students, faculty, staff, parents, and the community of learners with the level of acceptable support, let alone excellent support without careful consideration.

## Data – The Core Network

The lifeblood of a digital school district is data. The wires and WAPS are the beginnings of the network used to add value to the process of learning. The data network serves the needs of learners at all levels in the district, classroom, library, building, district, public library and the home. The interoperability requirements with each level and between levels further complicate the tasks of access, protection, and preservation. The infrastructure also supports centralized software configuration and building or distributing software solutions. The district chose to provide both approaches instead of philosophically didactic either approach. Guided by providing excellent service to learners, the design of the data networks infrastructure emerged.

The need to provide access to learners in a seamless manner defined the beginning point of the networks. The result created two levels of data servers: building and district. Also, in creating two types of servers there was the desire for fail-safe technology to avoid points of failure in critical systems. The need for redundancy and data backup were other considerations.

The school building houses a wiring closet with file servers for their core system and for print services. The wires for the networks and all the WAPs form the center of a spider web in the wiring closet. The wire closet also houses the network switches (Marconi DS 2000) to allow access to printing and other services, plus access to the next level of server at the district.

The district examined a variety of factors to determine the configuration of servers and services. At one point, they centralized all servers at the district. They changed to a decentralized model because of the potential for lost connections between the buildings. In reality, there were less than a handful of occurrences where connections between buildings were lost. The desire to eliminate opportunities for single point of failure drove their decision to become decentralized. Other considerations were included traffic patterns and network performance. There are additional services in each building as well. For example, the CISCO and CAD labs have their own servers. There is also a mixture of servers providing Windows services and Apple servers as needed.

Within the building, QVSD uses a gigabyte Ethernet uplink. To connect the variety of networks together, a Marconi ESR 6000 is utilized. This gathers the web of wires from each floor in a building together. Depending on the number of floors in a building, this configuration is repeated.

## The District Network

Between the buildings, a fiber optic cable transmits all three networks: data, video and voice. The data connection between buildings is a fast OC12 Asynchronous Transfer Mode (ATM). The ATM provides the technology that collapses all of the fiber runs into one run. The result is that voice, video and data all share the single fiber wire between buildings. The district uses two other fiber runs between the buildings for security and for backup.

Throughout the planning process, the technology team focused on the future and what might happen at some point in the life of the student. The wiring strategy is an

example of the concept of future proofing. QVSD adopted this approach to plan for upgrades and obsolescence in the technology. The plan calls for the district to convert to new Federal Communication Commission (FCC) standards for telephone. The QVSD wiring configuration allows the district to convert to voice over the fiber phone system seamlessly. QVSD also planned for the obsolescence of their video system. They created a migration path for HDTV in 2006. These strategies were in place in the 1995-96 draft of the initial planning document. QVSD synchronized their vendor contracts to expire in the time frames targeted to allow the district to refresh the systems with new technology.

All of the data runs join in the district at a large router, an ESR 6000. Here the district has their servers for core applications. These are the applications where it is more efficient to operate centrally then feed back to the buildings. One set of servers operates applications for email, libraries, curriculum packages, and the student information systems. Another set of servers run the calendar, web services, and database servers. One additional critical server found at the district handles the security firewalls and the district Internet connection.

The district also houses the network controllers. This includes the Radius and the VPN authentication devices plus the DNS and DHCP. This is essential considering the amount of network communication done over the Internet.

A final piece of technology is the Network Operation Center (NOC). The NOC is a direct connection to Marconi, monitoring the network constantly. The NOC identifies problems instantly, such as a WAP failure in one of the buildings, and initiates a call to the district support staff to investigate and repair. Before the district staff arrives, Marconi diagnoses the problem and allows the support staff to be prepared for a specific hardware or software problem.

The district also has two network connections to the SPL. One is the business connection for the core servers. The other is the general public access network for both networked public access stations and the WAP devices.

## Voice and Video

The voice and video connections are standard configurations. Each classroom has a phone. Wires run from each phone to a standard phone block and then to the standard phone switch in each building, a Meridian Option III. Using the fiber network between buildings, phone traffic is joined at a larger phone switch, the Meridian

Option 6100, and access to the district's telecommunications provider. The district voice mail services are housed at the district also.

The video network begins with a coaxial cable in each classroom running back to the wiring closet. It is a two-way video system. By utilizing the camera carts in the middle and high school buildings, a classroom teacher is able to serve video to the network. This capability allows multi-cast broadcasting or two-way video conferencing. The quality of the video output from the system is broadcast quality, not compressed. The video travels over the district network to the head at the district. It is rebroadcast out to either the classrooms in the district or the community.

## People Support the Infrastructure

QVSD has a full-time staff of five at the district level to support the three network infrastructure. In addition, each building has a building technology coordinator (BTC). The BTC position is an additional duty for extra pay for a classroom teacher in the building.

Structurally, the district level staff has one manager, two systems technicians, a systems engineer, and a service center manager. There are four BTC positions reporting to their respective building principal. The emphasis is on user satisfaction and streaming bureaucracy. This approach puts a high value on cross training and adjusting responsibility to balance the workload evenly among the staff. The district support staff and the BTC never allow bureaucracy to interfere with teachers and students in the process of learning. The keys are flexibility and accountability.

## Supporting Learners

Basically, QVSD attempts to anticipate potential problems before they happen. The strategy has two approaches: one is to train everyone thoroughly and constantly while the other is to collect and analyze data about the systems and their use. This approach keeps technology as a tool for the process of learning.

Training begins with the preparation of the support staff. When a new program or piece of hardware is introduced, one member of the support staff becomes the primary on the technology and another person becomes the secondary. The primary's responsibility is to become the local expert. They attend vendor training sessions, read and digest all documentation, and participate in online discussions dedicated to the product and its support. They are ready to respond to any known issues. The secondary understand the basic overview and operation of the product and common problems. They are ready to respond if the primary is unavailable.

Training is provided in the form of seminars and mass training for the entire teaching staff if necessary. Training also provides orientation sessions for students, parents and interested community members. The district goes to great lengths to provide materials for training and reference at all levels.

## The Process of Support

The approach to support is proactive to supporting the learning process. The staff is in each building as often as they are in the district setting, visiting each building on a regular schedule each week. The role of the BTC is critical. They provide direct support to students and teachers at the building level. One of the key parts is the BTC's role in distinguishing between operator and technology issues.

To deal with most technology problems, the district has a system in place to report the problem and escalate it to the district support team as needed. The student or teacher enter the problem into an online work order, available from any workstation in the district. The process then flows electronically to the building principal. This is for financial oversight should the requested repair have a cost. From there it is moved to the BTC. If it is within the scope of the BTC, they complete the task and report the work order closed in the system. If the problem is beyond their scope, they escalate it to the district support staff. If necessary, it is escalated to the support manager. In most cases, the work orders stop with the district staff when they visit the building in the next twelve to twenty-four hours. In the case of an emergency, the system is bypassed and the call goes directly to the manager of support.

The online system provides valuable data to track trends and identify underlying problems. The data reported is summarized then analyzed in support of the goal of being analysts driven in decision-making. The data identifies the source of the problem and the cause. If the operator is the problem, the analysts drive the development of new training. The online system is a fact base to take to vendors if the technology is the source of the problem. In two cases, they identified potential industry-wide problems to vendors because of the district's volume of use. In a situation where 1600 students use the technology from 7 AM to 11 PM, the failure rate data is valuable to the vendor.

The support team keeps the network running and available for use 99% of the time. The district schedules the majority of the upgrades and repairs for nights, weekends and holidays. The laptops used by students are revolving pieces. The support team removes the laptop needing repairs and replaces it with another ready for the student. At any given time, about 5% of the laptops are removed from the student pool and

replaced with another. Each building has spares to quickly handle the replacements and provide each student with access to the process of learning. The implementation of imaging stations handles the vast majority of problems for the students. The most common problem for the student is corrupted applications or systems. The other problem is the old-fashioned forgotten password and that still takes manual intervention to solve.

## Conclusion

QVSD created a community of learners because the focus of their effort was the student. They avoided the trap of infusing technology for the sake of technology without considering the impact it has on the process of learning. They also remained true to their mission to provide excellence in education. This meant they made decisions to improve the system constantly. Results expressed in improved learning have the greatest value in the creation of the DSD.

The approach of QVSD is different; they dared to take an approach to technology some critics found disagreeable. Particularly because of the perception of QVSD being a wealthy district in the local press, the critics asked pointed questions about the right of the district to win the grant and if the money was better spent on more teachers in other districts. QVSD understood they faced criticism and answered the critics thoughtfully and with reasoned arguments. The project also reinforces once again that problems facing education and the implementation of technology are more influenced by cultural and political issues than engineering the technical aspects. In an era where the political debate is dominated by NCLB, a district that is not myopically focused on high stakes testing is an easy target for critics. The situation demonstrated that everyone does not appreciate risk taking and everyone does not welcome change.

The focus on learners and relentlessly promoting excellence are key lessons from the DSD project. Technology is pervasive, but it remains a tool of the learner and is acceptable only when it delivers excellence. The decision to provide access to learners via a wireless network in school, at home and throughout the community allows the technology to serve the learner and eliminate time and place as barriers to learning. The importance of utilizing three networks in the district, voice, video and data, cannot be underestimated. Managing them as logical parts of the learning process versus centralized management regardless of function gives flexibility to the DSD lacking in other models, even the traditional models with a site-based bias.

The evaluation of this DSD project is years away from a comprehensive analysis of the impacts. The preliminary evaluations of this particular grant are promising. Even more exciting are the non-scientific, but compelling stories from the learners and their teachers. They report that something special happened in QVSD as the result of the implementation of a DSD. In the final analysis, the group appearing to benefit the most from the DSD is not the wealthiest or the least disenfranchised group. It is the large group in the middle that finds itself left behind most often. This is where appropriate use of technology focused on learners pays dividends to society and justifies making changes to the process of learning.

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CHAPTER 9

# *Statewide Efforts to Support Digital Libraries in K-12 Schools*

**Daniel W. Fuller**

*Numerous states have funded database access via the Internet for either the K-12 market and/or their entire citizenry. This study surveyed these statewide services to examine their growing impact. Data included the following areas: funding, content, organization, access, measurement outputs, and demographics. Four conclusions emerged from the study regarding the definition of digital libraries, content, financial support, and relationships to learning theory and information literacy needs. The next steps for research are discussed.*

Since the early 1990's, Internet access to digital collections for K-12 schools has proliferated throughout the United States. During the 2002-03 school year, a study of both the database sites and their content was conducted to ascertain the state of this national effort.

The concept for the research began with conversations among library science educators about the value and impact of digital materials in school libraries. The discussion prior to the census focused on the proliferation of K-12 digital sites for students throughout the U.S. and what value and impact those sites provide to schools. A survey of the literature produced a wide variety of material, most of which discussed the technical aspects of creation or the issues surrounding formation and development of the specific state site. The search produced little information about the current availability in statewide digital libraries for schools.

It was clear from the literature that a great deal of funding went into the development of statewide K-12 oriented websites during the previous decade. The sites were created through numerous projects and from a variety of sources. That is, no one model of statewide access prevailed. It was also clear that funding levels were uneven. Articles either described the evolution of the statewide effort or noted the startup efforts of a fledgling group providing a new database site.

After reviewing the literature, two general research questions emerged. First, what is the current state of support for statewide digital collections for schools? Second, what evidence exists to support the use of the statewide digital collections by students in K-12 schools? To answer the first question, a baseline for services provided by statewide digital libraries needed to be identified. To answer the second, an examination of the current methods of measurement and assessment had to be conducted. With this in mind, a census of the various states was undertaken in the spring of 2003.

## Methodology

Research focused on sites in the 50 states of the United States. Inclusion in the census required two factors: one, the target of the site was primarily K-12 students and two, the financial sponsorship of the site emanated from state monies. The census excluded US protectorates and the District of Columbia. The census began with an examination of official web sites of each state beginning with the state-level departments of education and state libraries to find candidates matching the criteria. If sponsorship of such a site was not found, a phone call or email was sent to state officials responsible for providing leadership to K-12 schools. In these cases, states identified regional agencies or quasi-state agencies responsible for the development and maintenance of libraries of digital materials for schools. They also identified shared projects that included K-12 schools in their portfolio. The results identified 50 Internet sites in 45 of the 50 states meeting the criteria. Five states lacked a site matching the criteria at that time, even if active efforts existed to establish one. Five states had two unrelated sites meeting the criteria. The complete list of sites is in Appendix A.

At the same time as the development of the list of the location of sites, a second effort focused on creating a list of elements to be enumerated on the sites when visited by the census taker. The elements included: demographics, funding, content, selection, access, reporting and evaluation, functionality, and support for students and education professionals. Demographics included information about the grade levels provided, founding date of the project, and the agency or unit responsible for the site. Funding questions observed start-up and ongoing maintenance costs, dollar amounts, and the funding source. The survey of content included both free and fee-based resources included on the site. The census takers reported all fee-based content databases and only free resources appearing multiple times across the states. The exceptions were union catalogs and approved lists of Internet sites by professional groups such as the American Library Association (ALA) and the American Association of School Librarians (AASL). Content criteria included the process selecting materials and written policy statements for the sites. The issues surrounding access

included not just physical access but also the license management of digital materials. If the sites included a report of use or a methodology for identifying usage, the census taker noted it. Functionality issues included appearance and the use of federated searching or similar technology. Support of students and education professionals included workspace, tutorials, information literacy skills, and lesson plans. Appendix B outlines the specifics relating to these categories.

The census takers practiced identifying these elements together and, if they found anomalies, they contacted the principal investigator for guidance to categorize the anomalous item. Data collection of the specific elements was recorded using a spreadsheet. Census takers completed a worksheet for each site. A summary sheet from all the sites provided the cumulative data by linking the appropriate cells from each site to the summary sheet.

## Findings

The mean average beginning date for the sites is 1997. The earliest date was 1992 but the years 1998 and 1999 accounted for the greatest number of new sites starting. Six states plus the District of Columbia did not have sites: Hawaii, Illinois, Kansas, Montana, New Mexico, and Vermont, although most reported having a site in the planning stage. Five more states had two sites delivering similar resources to the K-12 target group: Alaska, North Carolina, Oklahoma, South Dakota, and Virginia. The population number (N) used for calculating percentage was 49.

Most often the grade level targeted by the sites was Middle School (sometimes identified as Junior High School) (94%) followed closely by the High School grades (92%). The sites provided specific content for elementary grade level students in 69% of the sites. Only 18% provided a universal search engine. This correlated directly to the same percentage of sites providing only web pages and no access to online fee-based databases. The fee-based databases provided more than financial challenges to the sites. The different sites identified them in a variety of ways, but most often by vendor name. In several cases, the sites used the product name and did not associate that product with the vendor, even when the same vendor provided more than one product. Considering the consolidation in the marketplace in the past three years, the confusion is understandable. EBSCO products appeared in 49% of the sites. InfoTrac was found in 38%. 29% of sites identified ProQuest. SIRS and Gale were in 26% and OCLC in 16%. However, ProQuest family products appeared in the largest number of sites. This illustrates the active acquisition strategy ProQuest pursued in the years prior to the census.

State Union Catalogs appeared in 51% of the sites. Curiously, in one state with two sites, one site included the Union Catalog and the other did not. A little over a third of the sites (36%) included access to other library catalogs. 45% of the sites provided access to a database not considered fee based. Britannica, Kids Almanac, and Encarta each appeared in a handful of sites.

On the other hand, 53% of the sites provided access to free Web sites. Yahooligans appeared on 26% of the sites followed by Home Grown Lists of sites (20%), then Ask Jeeves in 16%, then Ask ERIC in 8%. Significantly, the ALA list of "700 Great Websites for Kids" appeared only three times.

Only six sites provided access to lesson plans for teachers. Of the six, four were from in-house sources, usually user contributed. 10% of the sites included BigChalk (a ProQuest product). Homework help as a category appeared in 31% of the sites, but the Homework help was by email-based and done in-house. Even though most commercial sites provide tutorials for users, only 26% of the sites offered them. These were all linked to the vendor sites. 95% of the sites made no mention of Information Literacy skills. Three sites did. Two were based on a state model. One was the Big 6. Workspace appeared in 36%, most often for teachers (26%). Student and Librarian workspace appeared in 16%.

License management was handled most often with a password and or User Authentication (57%). The next most common approach was the statewide library card (20%), followed by IP (14%), individual user registration (6%), and driver's license number in one case. 51% of the sites had evidence of the use of a selection policy to add resources to the site. 42% of the sites indicated the use of an evaluation or advisory committee for the selection of materials. The next group was simply pricing or the request for proposal approach (RFP) with 28%. Additionally, ten percent of the sites indicated they pilot tested resources prior to including them in the digital array of library materials.

The measurement and evaluation of services in all cases but one were limited. The results were not shared publicly on the site. The precision of the evaluation was limited to counts prepared by vendors, counters of web hits on the site, and anecdotal evidence collected by the group administering the site. A typical case indicated the site wished to do more evaluation and provide more precision, but the funds were invested in content rather than evaluation. Surveys of users were the instrument of choice of these sites if they had the resources. Most vendors provide basic survey instruments to users as part of their service.

Financial information was not available in all cases. However, the numbers available indicate that sites getting started averaged almost two million dollars in initial funding ($1,943,357). The costs of maintaining the sites over time increased to over three million per year ($3,312,727). The source of funding identified most often was the state's legislature followed by LSTA grants. Finding creative sources was evidenced by the number of unique responses of funding for startup and maintenance.

## Conclusions

While the goal of the census was limited to defining the state of support for statewide digital library sites and finding evidence of use, there are four conclusions can be drawn from this first census.

1. Statewide sites are the most cost effective manner to provide shared electronic resources.
2. Sites reflect the overall lack of definition of libraries of digital resources identified with the adjectives digital, virtual, and electronic.
3. Site content was eclectic and not directly related to student outcomes, curriculum, or published guides of K-12 recommended sites.
4. Little or no evidence exists to demonstrate the relationship of the projects to learning theory or to information literacy needs.

The limited financial information from the sites and conversations with administrators of the sites indicated the sites were given significant discounts by the vendors of online digital content. By any measure, the millions spent to acquire databases for the sites were far less than the cost to acquire and install the databases at individual school sites. The vendors find tremendous economy of scale by treating the state as one account. The support and maintenance of the individual school sites becomes the issue for the state site to address, leaving the vendor maintaining a single account at the state level. In certain sites, the schools and the public libraries joined together in purchasing, earning even more discounts. This allowed them to purchase specialized content for the individual site level for specific courses or curriculum. In difficult budget times, the cost effectiveness of the site is a driver in the effort to create and maintain the sites.

The terms digital, virtual, and electronic lack precise meaning with reference to statewide sites. They are used interchangeably and with little relationship to content provided. This is true in literature devoted to the subject. Levy (2000) suggests the use of multiple names to describe similar information resources relates to the lack of a specific purpose for these digital libraries. The issues described in 2000

are the same today. While they are libraries, in the sense they are collections of resources, they lack the sense of organization and service the term library implies. The content provided varies widely from site to site. As with any successful automation project, in a library setting or in business, the mission of the project is the key element. The sites struggle without a written mission statement.

One of the reasons for the lack of curriculum connections is simply the newness of the digital library concept. However, it has to be noted that in the age of No Child Left Behind (NCLB) and dwindling financial resources, the failure to connect to NCLB is an egregious error. The development of statewide sites for K-12 students must connect to school curriculum and student outcomes. Their development was simultaneous to the emergences of state standards and creating strong links between learning activities and resources. The sites used an approach of getting a little of everything and organizing it without a clear need or purpose for the material.

The potential benefits of the Internet are many. The literature recounts the potential, but in practice reverts to electronic versions of traditional materials. The Internet never delivers the potential for addressing multiple learning modalities or finds a model in contemporary learning theory. They also provide little help for students in desperate need for guidance and critical thinking. While there are a myriad of technical reasons impeding the development of visual and auditory resources on the Internet, these resources are not found in the statewide sites. The reasons for the disconnect between learning theory and information literacy is found in the original purpose of the projects of being consortia for buying resources. Finding traditional resources and providing them economically to members of the consortia was their purpose. As the statewide database sites continue to evolve, attention to learning theory and the information literacy needs of students has to be addressed.

## Next Steps

With basic demographic and content information determined, the next step is to follow-up with annual censuses of the sites. It is now possible to determine what the initial baseline requirements for a statewide site serving K-12 students are. If the sites intend to remain functional and useful, they need to address learners directly and the curricular needs of the K-12 schools the sites support.

In the next census, census takers hope to find changes and trends in the manner the sites operate and evolve over time. By comparing the baseline information about who, what, where, why, and when to new findings, the direction and factors influencing

sites emerge. Careful attention is planned for the assessment of the impact of budget constrains in 2004 and beyond. Measurement of use and effectiveness is another area for special consideration in the next census. To date, the reports and evaluation have the theme of what has happened and why more funds are necessary. The development of meaningful measurements to continue support is a factor for future success.

Statewide digital libraries have a place in the process of learning. The sites need to focus their efforts on student learning and curricular connections to be viable in the second decade of the century. The potential is great.

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## Appendix A

### Virtual Library Sites

Alabama

http://www.avl.lib.al.us/databases/index.shtml

Alaska

http://sled.alaska.edu/kids.html

http://www.library.state.ak.us/databases/home.html

Arizona
http://www.ade.state.az.us/students/kids.asp
Arkansas
http://arkedu.state.ar.us/students/students_links_p1.html
California
http://www.clrn.org/home/
Colorado
http://www.aclin.org/WebZ/Authorize?sessionid=0&next=kidsparentsteachers/index.html&bad=error/authfail.html&autho=WebZGuest&password=WebZGuest&style=default
Connecticut
http://www.iconn.org/
Delaware
http://www.lib.de.us/
Florida
http://www.firn.edu/
Georgia
http://triton3.galib.uga.edu/cgi-bin/homepage.cgi?style=kids&_id=82414b9b-1086633427-7120&_cc=1
Idaho
http://www.lili.org/education/lilischl.htm
Indiana
http://www.inspire.net/inskid.html
Iowa
http://www.silo.lib.ia.us/for_ia_libraries/databases/index.html
Kentucky
http://www.kyvl.org/
Louisiana
http://www.doe.state.la.us/DOE/LCET/k12onlinedb.htm
Maine
http://libraries.maine.edu/mainedatabases/kids.htm#
Maryland
http://www.sailor.lib.md.us/
Massachusetts
http://www.mlin.lib.ma.us/flash3.html
Michigan
http://www.michigan.gov/hal/1,1607,7-129-15490---,00.html
Minnesota
http://www.pals.msus.edu/webpals/

Mississippi
http://nt.library.msstate.edu/magnolia/
Missouri
http://www.sos.state.mo.us/library/reference/
Nebraska
http://www.nlc.state.ne.us/databases/
Nevada
http://www.ccsd.net/schools/library/index.html
New Hampshire
http://www.nhewlink.state.nh.us/schools/databases.html
New Jersey
http://www.njstatelib.org/cyberdesk/eresources/Electronic_Resources2.html
New York
http://unix2.nysed.gov/gate/remotedb.htm
North Carolina
http://www.nclive.org/
http://www.ncwiseowl.org/
North Dakota
http://ndsl.lib.state.nd.us/ElectronicResources.html#K12
Ohio
http://www.infohio.org/
Oklahoma
http://www.odl.state.ok.us/prairie/index.htm
http://www.odl.state.ok.us/kids/OKidsIndex.html
Oregon
http://www.empnet.com/library/
Pennsylvania
http://www.powerlibrary.net/
Rhode Island
http://www.ridoe.net/students/homeworklinks.htm
http://www.ri.net/RILINK/index.html
South Carolina
http://www.state.sc.us/scsl/discus/home.html
South Dakota
http://www.sdstatelibrary.com/forkids/
http://www.sdstatelibrary.com/
Tennessee
http://www.state.tn.us/sos/statelib/tel/index.htm

Texas
http://tlcic.esc20.net/default.htm
Utah
http://pioneer.utah.gov/
Virginia
http://www.lib.virginia.edu/education/databases/overview.htm#selective
http://www.teenspoint.org/
Washington
http://www.librarysmart.com/
West Virginia
http://librarycommission.lib.wv.us/E-resources.htm
http://www.wvdl.org/index.html
Wisconsin
http://www.wiscat.lib.wi.us/
http://www.badgerlink.net/
Wyoming
http://gowyld.net/wyoming/wykids.html
http://gowyld.net/dbases.html

## Appendix B

State:
Name of Site/URL:
K-12 Portal Site Name/URL

Agency

Grade Levels _Elementary (K-6) _Junior High (7-8) _Secondary (9-12)

Resources:
Universal Searching Engine _Yes _No
Description:

Fee based Online Databases _Yes _No
Names:

Fee based Web Sites _Yes _No
Names:

State Union Catalog _Yes _No
Name:

Other Library Catalogs _Yes _No
Names and Level(s):

Free Online Databases _Yes _No
Names:

Free Websites _Yes _No
Names:

Lesson Plans _Yes _No
Names:

Other Resources _Bigchalk _Home work or tutoring
Names:
Tutorials or online lessons _Yes _No
Names:

Use of Information Skills Model
Name:

Workspaces: _Students _Librarians _Teachers
License management:
Selection process of content: _Written policy_Committee _Pilot Tests _Pricing

Funding Sources: _Startup – dollars _Ongoing – dollars

# *Author Biographies*

Karlton Chapman is Associate Director of Administrative Services for the Quaker Valley School District in Sewickely, PA.

Daniel W. Fuller, Ph.D., is an Assistant Professor in the School of Library and Information Science at San Jose State University. He holds degrees from Indiana University of Pennsylvania and the University of Pittsburgh where he earned his Ph.D. Dr. Fuller teaches in the areas of management and library automation systems. He conducts research in the area of information technology and online teaching and learning. Dr. Fuller also taught as an adjunct faculty at the University of Pittsburgh. Before joining San Jose State University's SLIS faculty, he was the Executive Director of Sales and Marketing for Follett Software Company. He has also worked as a school librarian.

Jesse Holden is acquisitions librarian for the Robert Crown Law Library at Stanford University. He received his M.L.I.S. from San Jose State University, and has held a variety of access and technical services positions. He is interested in libraries' role in the evolving economy of the electronic information marketplace.

Deborah J. Karpuk, Ph.D., is Associate Professor at the School of Library and Information Science, San Jose State University. She teaches cataloging, classification, serial publications, library technical services, knowledge structures and library management. Prior to joining the faculty of San Jose State University in 2002, Dr. K taught at the University at Buffalo and has taught as adjunct faculty for Syracuse University, University of North Texas, Texas Woman's University, and the University of Arizona. Dr. Karpuck also has an active research and practice interest in the evolution of the traditional classroom setting into virtual instructional forums.

David V. Loertscher has degrees from the University of Utah, the University of Washington and a Ph.D. from Indiana University. He has been a school library media specialist in Nevada and Idaho at both the elementary and secondary school levels. He has taught at Purdue University, The University of Arkansas, The University of Oklahoma, and is presently a professor at the School of Library and Information Science at San Jose State University. He served as head of the editorial department at Libraries Unlimited for ten years and is President of Hi Willow Research & Publishing. He has been a president of the American Association of School Librarians.

Joseph Marrone is the director of Administrative Services of the Quaker Valley School District in Sewickley, PA. Dr. Marrone earned a MLS degree from Clarion University of Pennsylvania and a Ph. D. from Penn State University.

Kathleen Smoot is the library media teacher at Wilcox High School in Santa Clara, California. She earned her library media specialist credential at the School of Library and Information Science at San Jose State University. Professional interests include reading young adult literature, promoting any kind of literature to teens, and participating in the exciting, ever-changing world of digital school libraries. When away from the books and computers, she might be found planting rare herbs in her community garden plot, or hiking local trails.

Sandy Tao is an Associate Fellow at NLM. She earned MLIS degree from San Jose State University in May 2004. Her professional interests include Bioinformatics and Medical Informatics.

David Villancio-Wolter is a library media teacher in Los Angeles, California. Part of his role as information specialist for his school includes managing the school's instructional network, and leveraging the recent build-up in school technology infrastructure to strengthen the place of the school library as the literary, information, and research hub of the school. His current interests include integrating curriculum, information literacy, and technology through collaborative projects with content area teachers.

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