

LIBRARIES ADDRESS THE CHALLENGES OF ASYNCHRONOUS LEARNING

Joanne Eustis

Director, Planning and Program Review
Information Systems, Virginia Polytechnic Institute and State University
Blacksburg, VA 24061 (540) 231-3489 eustis@vt.edu

Gail McMillan

Director, Scholarly Communications Project, University Libraries, Virginia Polytechnic Institute and State University, P.O. Box 90001
Blacksburg, VA 24062-9001 (540) 231-9252 gailmac@vt.edu

ABSTRACT

As asynchronous learning becomes the norm throughout academia, changes are taking place in campus information systems. The entity responsible for serving the information needs of the university is the academic library and it has choice but to change dramatically. In fact, academic libraries have a history of being aggressive in adapting state-of-the-art technologies. One can point to decades-long involvement with the development of online catalogs and the use of shared cataloging utilities. Libraries continue to strive to retain a centrality to academic teaching and learning by taking on new roles or revising traditional services, eliminating the physical boundaries of the building and services that are time-dependent.

Libraries have, however, been slower to adjust their organizational structures and processes to leverage their potential. Replies to a recent survey of Association of Research Libraries (ARL) indicate that change in the responding libraries at this time is incremental rather than dramatic, evolutionary not revolutionary. Patterns are also emerging relative to resource reallocation and the formation of partnerships with other university units that reflect new emphases and priorities.

We will analyze the results of the ARL survey and demonstrate principally through two examples of innovative information delivery initiatives. VIVA, the Virtual Library of Virginia, was proposed by the state's Library Advisory Council in 1993 to encourage collaboration among the Commonwealth's institutions of higher education in order to share resources and support the electronic dissemination of information across the state. Academic libraries are also providing new sources of online information, such as Electronic Theses and Dissertations (ETDs), by developing electronic submissions, online archiving, and Web access, as well as bringing to the forefront the discussion of issues such as copyright and publishers' control of academic publications. Network-based access to information resources is changing higher education, and the opportunities offered by asynchronous learning networks are challenging libraries to adjust their policies, processes, and services.

KEYWORDS

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Joanne Eustis

Information Systems, Virginia Polytechnic Institute and State University; eustis@vt.edu

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I. THE INSTITUTIONAL CONTEXT

A university is a relatively unique social institution because of its singular mission. Unlike other social institutions, the university is a community of learners who come together to support and enable the learning process through increasing, preserving, and disseminating knowledge. Contributing to the distinctive quality of an academic institution in the past was a generally uncritical acceptance by society of the academic culture. When referred to as “ivory towers,” universities and their faculty members in particular were often perceived as a world apart from the demands of accountability and profit.

In recent times, however, most institutions of higher education have had to reconsider policies and procedures in the face of closer outside scrutiny. Traditions such as tenure, shared governance, and the focus on conventional degree programs are being challenged and modified as a result of pressure from governing boards and state legislators. Rising costs and declining budgets demand increased efficiency, while changing demographics require programs that are responsive to a more diverse population of learners. The result is that academia is being compelled to operate more like industry in considering the needs of its clients. Reductions in state support at a number of public universities combined with additional regulation are leading to a renegotiation of institutional roles as state agencies. Both the benefits and constraints that state support imposes are being reconsidered in light of new economic realities. [1]

While changing technology is not the cause of these phenomena, computing and telecommunications technologies are perceived by many to have the potential to deliver asynchronous instruction that will enable higher education to respond to its critics, meet assessment requirements, and garner sufficient revenue to remain viable in a new century. In response to user needs and changing computer technologies, libraries, in their role as the major information provider for institutions of higher education, have moved beyond automated access tools such as online catalogs and indexed databases. Online, libraries also deliver network-based journals, theses and dissertations, images, class materials, and regional and international news reports. Libraries collaborate with others in the academy

(teachers, editors, and researchers) as well as with commercial publishers to provide online access to materials that support all learners, whether on campus or off--the traditional teacher and learner as well as those using networks for asynchronous education.

Until the early 1990s Virginia Tech's learning community operated primarily in the time-honored manner. Faculty-centered education was imparted to students who resided locally, extension services were provided by field faculty and staff in the conventional way throughout the Commonwealth, and library services were largely delivered in the customary, building-centric manner. More recently, however, innovators throughout the university, including those in the library, have developed new processes that use the network to provide access to extended campus learners. A thoughtful and well articulated reason for this change can be found in the document *1996-2001 Update to the [Virginia Polytechnic Institute & State] University Plan*. Under the category "planning assumptions," President Paul Torgersen states:

. . . we must not only anticipate but lead the *revolution in information technology* that gains momentum daily. The end of distance as a determining factor in the cost of communication; the advances in teaching and learning made possible by interactive digital technology; the opportunities to combine knowledge in new ways to create new visions; and the power to reach out to the community, the Commonwealth, and the world--all of these afford us enormous opportunities but also risks if we fail to take advantage of them. Finally, *changing demographics as well as shifting patterns of education and employment* require that we become more agile and responsible to the demands for our services--statewide, nationally, and internationally.[2]

Participation in the technology "revolution" as prescribed in the *Update to the University Plan* requires a transformation of policies, processes, and the interactions among the constituent groups that make up the university community. Through the use of technology during the next ten years, Virginia Tech is afforded, as President Torgersen stated, "enormous opportunities" while, at the same time, the members of the university community are confronted with tremendous challenges. The intent of this paper is to describe just two of the opportunities as they relate to libraries and to describe how Virginia Tech is addressing the challenges of asynchronous learning.

A. Institutional Change

It is one thing to have the technological potential to extend educational programs and improve instructional quality and faculty productivity, but quite another to re-engineer the academy. In recent years many books have been published that point to a decline in the quality of universities, especially relative to undergraduate education. These range from constructive, thoughtful critiques like Ernest

Boyer's *Scholarship Reconsidered* and Derek Bok's *Universities and the Future of America*, to the shrill polemics of Charles Sykes' *ProfScam*. In all cases, the fundamental thrust of these works is that America's colleges and universities must be convinced, in the words of Ernest Boyer, "to rethink their relevance in today's world." [3]

This call for relevance and change reflects the fact that universities have delivered instruction, and their libraries have delivered resources and services in the same way for decades. The causes are many, including the lack of resources for rewards which, despite efforts to the contrary, continues to emphasize research to the neglect of undergraduate education and a user service orientation. The atomized discipline-centered organizational structure of academia also militates against innovation.

One more factor which makes the response to current attacks so difficult is that critics are measuring the success to higher education's restructuring efforts by applying corporate values rather than those criteria by which universities are accustomed to judging themselves. Donald Kennedy, former president of Stanford University, wrote,

[T]he traditions of the academy strongly favor individuality and creativity. Freedom of action is highly valued. Accountability is viewed as much less important than independence. The introduction of norms that emphasize hierarchy, team loyalty, and discipline is difficult, not because they are not worthwhile values, but because these values are not deemed especially important for teaching or scholarship. They create a dissonant kind of bewilderment, if not outright hostility. [4]

Asynchronous instruction and the delivery of information through the network are by their nature collaborative, not solitary activities.

B. The Market

If in fact digital technology prevails and institutions of higher education are able to extend their reach and deliver networked learning materials throughout the world, then the market will be another factor driving the transformation of higher education. A national or international information infrastructure permitting the distribution of quality instructional materials that may be purchased from a number of sources and transmitted to an individual's workstation will eliminate time and space constraints and allow structured but asynchronous learning. Up to this time, students largely have been a captive audience, and educators have considered the market for networked, electronic course materials primarily to be non-traditional students or "distance learners." In the future, efficient cost-effective learning for traditional as well as non-traditional students will be delivered on demand by access to remote learning resources through affordable communications and information technology. In that case, one might wonder what the impact on colleges and universities will be if the

best calculus course originates at MIT, the best statistics course at Virginia Tech, or the most effective language teaching at Middlebury College, and these classes can be delivered anywhere on the globe at a reasonable cost.

Each week the *Chronicle of Higher Education* announces another information technology initiative by one of the nation's leading educational institutions or related enterprises. For instance, on 16 May 1997 the *Chronicle* noted "when Stanford University's High Wire Press first put scientific journals on the Internet two years ago, the idea sounded revolutionary to many editors and readers. Now its executives say online scientific publishing is a dream come true: Online journals are reaching readers faster than their printed counterparts, are easier to search, and are breaking into new markets in foreign countries where it is expensive to receive thick American journals through the mail. The operation is based at Stanford's Cecil H. Green Library. A staff of 17 works with journal editors to design their online editions and then converts each issue's contents to a form that is readable on the Web." [5]

In such an environment, a number of questions present themselves concerning the relationship between students and universities:

- Will students choose to purchase and enroll in open market, widely available networked courses regardless of institutional affiliation?
- Will students continue to be content having all or most of their courses taught at a particular institution?
- Will a calendar of semesters, summer breaks, and credit-for-contact hour continue to be the rule?
- What will a plan of study look like in a networked environment? Who will design it? And, who will award the degree?
- Will institutions assist students in choosing appropriate instructional materials from outside sources rather than providing an entire program of study?
- What about tuition payments and residency requirements?

In considering these questions, it becomes clear that information technology will increase the amount of choice students have relative to instructional content and style by changing the way students, educators, and educational institutions interact.

What about the relationship between students and libraries in this new environment? In fact, learners often realize before teachers the importance of the role libraries play for students engaged in distance education, as was revealed in two recent surveys. [6] Additionally, accreditation may play an important role in motivating universities to provide strong library support of distance education, according to both the Southern Association of Colleges and Schools' accreditation criteria (1994) [7] and the

Association of College and Research Libraries' "Guidelines for Extended Academic Library Services" (1997 draft revision).[8] The changes in information technology will modify the mechanics of higher education's degree-granting process, which in turn will require educational support services such as those provided by libraries to be delivered through the network. As a consequence, higher education as we know it today will be changed radically.

C. Academic Libraries

What does all this mean for academic libraries? Like the institutions with which they are affiliated, libraries must meet the challenges of:

- decreased resources
- increased costs
- pressure for additional productivity and accountability
- information proliferation
- network-based information delivery
- changing patterns of scholarly communications
- asynchronous and off-campus instruction
- the importance of computer and telecommunications expertise

Libraries are responding to these forces. Unlike higher education in general, however, academic libraries have been aggressive in adapting state-of-the-art technologies, as evidenced by their decades-long involvement with the development of online catalogs and shared cataloging utilities. As these online catalogs moved from in-house to Internet access systems, libraries took the initial steps to extend many traditional resources and services beyond the constraints of the campus and to make them available to nontraditional and extended-campus users. Other recent improvements include electronic reserve systems providing online course materials, hosting works such as online journals edited by the faculty members, graduate student works such as electronic theses and dissertations, and totally automated document delivery and automated interlibrary loan systems. At a 1997 meeting of the American Library Association, it was reported that the revision of the 1990 "Guidelines for Extended Academic Library Services," included the statement:

The library has primary responsibility for identifying, developing, coordinating, and providing library resources and services which meet both the standard and the unique information needs of the extended academic community.[9]

Despite encouraging technology initiatives, however, libraries have been slow in adjusting their organizational structures and processes to leverage their potential. In the words of Vartan Gregorian, president of Brown University, "The new technology per se is not a revolution--the revolution is the difference that technology makes in how we organize, structure, and empower our lives." [10] Replies

to a 1996 Association of Research Libraries (ARL) survey indicate that change in the libraries at this time is incremental rather than dramatic. It is possible, nonetheless, to see patterns emerging particularly relative to resource reallocation and the formation of partnerships with other university units that reflect new priorities and emphasize new networked resources and services.

II. THE SURVEY

The 1996 survey published in *Library Reorganization and Restructuring* was designed and conducted in response to a request from ARL for documentation about organizational change in libraries. Fifty-three of the 108 member libraries, all from institutions of higher education, responded to the survey. Seventeen indicated they had completed a library-wide reorganization within the last three to five years or currently were engaged in such a reorganization. Twice as many, 34 libraries, replied that they had completed, were engaged in, or were planning the reorganization of specific units. Those units which were most often cited as affected were reference, acquisitions, cataloging, collection management, and interlibrary loan.

A. Formal Planning Process

Only 25 libraries responding to the 1996 ARL survey indicated that they have a formal planning process in place. However, 47 libraries were noted in the 1995 ARL survey, *Strategic Planning in ARL Libraries*, as having been involved in a planning process within the past six years.[11] The majority of those answering the 1996 survey have had a planning process in place five years or less. Library administrators, librarians, and to a lesser extent library staff and outside consultants, are noted as participants in library planning efforts. There seems to be little involvement by other members of the university community. This is surprising in the light of numerous recent articles in library literature describing the new user-centered organizational library model.

Twenty-two libraries conduct a regular update or review process of their plan. Organizational change in the responding libraries is being driven by a number of factors. Among the respondents 34% attribute their organizational changes to information technology while 30% note declining resources as an important force influencing change. Other important factors contributing to the need for change are the availability of networked information (26%) and new patterns of scholarly communication (23%).

B. Outcomes

As a result of library-wide restructuring, one-half of the libraries have reallocated personnel, with most of the movement being from technical to public services. There has been increased funding in 17 libraries to support training and staff development. In addition, 17 libraries have reallocated resources to automation and networking units. Nine libraries have entered into partnership with other academic libraries in connection with their reorganizing activities, and an equal number have applied for grants from outside agencies. Six libraries have hired professionals without an accredited library degree.

In the process of restructuring and in response to decreased resources, 23 libraries have lost support staff and 20 libraries reported a decline in their numbers of professional positions. The most cited outcomes of library reorganizations are the combining of units within the libraries, new partnerships with other university units, greater emphasis on networked information, new or expanded user services, elimination of some services, and a decreased emphasis on catalog maintenance and on the collection of print materials.

C. Documentation and Assessment

Eight libraries contributed documents to SPEC Kit 215 as a result of their reorganization. Although 17 libraries noted that they regularly evaluate their services, only two libraries have included an evaluation process in their new plans. This is a matter of concern. Although one may debate the relevance and usefulness of outcome measures and evaluation, regulatory requirements, increased scrutiny of higher education, and new management techniques would appear to require an assessment of any new program or plan.

D. Conclusions from the Survey

The survey data provided predictable conclusions. The challenge for research libraries during this time of transition is to maintain current services while building an infrastructure to support the information needs of the next century. In the early '1990s, 44 academic libraries (members of ARL) produced strategic plans which "revitalized thinking, and enabled the libraries to review services and effect organizational change." [12] With several notable exceptions, research library restructuring and organizational change in the mid-nineties takes place at a slow pace. This situation primarily is attributable to declining resources, increased costs of materials, and the ability of communications technology to deliver information to the desktop. Libraries appear to be making continuous adjustments on an ad hoc basis rather than planning for comprehensive change.

III. THE VIRGINIA EXPERIENCE

In the state of Virginia and at Virginia Tech, there are two initiatives currently underway that move libraries a giant step forward in the delivery of networked information. The first, the Virtual Library of Virginia (also known as VIVA) involves all of the Commonwealth's academic libraries, while the second, the Electronic Theses and Dissertations Project, is a nationwide effort led by Virginia Tech.

A. Virtual Library Of Virginia (VIVA)

In the early 1990s Virginia began to build support for the lifelong learning essential to promote economic development for the people of the Commonwealth in the information age. In the summer of 1993 the Subcommittee on Networking of Virginia's Library Advisory Council (LAC) proposed the foundation for the Virtual Library of Virginia. [13] VIVA's mission is two-fold: It seeks to improve access for its faculty and students to collections, both the shared access to online library resources and the coordination of collection development, by Virginia's academic libraries. It also strives to enhance support of interlibrary lending among all VIVA libraries. Its goal is to accomplish this through equitable, cooperative, and cost-effective ways. For the first biennium (1994/96), LAC requested \$5.5 million in state funding.

The original proposal was carefully crafted to appeal to as many of the state's legislators as possible. VIVA is a consortium of the 39 state-assisted colleges and universities: nine four-year comprehensive colleges and universities, 24 community and two-year branch colleges, and the six doctoral institutions. Participation by the community colleges was particularly important because there is a branch of the Virginia Community College System in every legislative district. Also participating in planning were the 28 independent/private institutions which now enables all of Virginia's institutions of higher education to benefit from cooperative purchases whenever possible.

Initially funded at \$5.24 million for 1994/96, the project was led by the VIVA Steering Committee, which established a small number of on-going working groups. The task of supporting the electronic dissemination of VIVA's information resources is the responsibility of the libraries at the six doctoral-granting institutions. These hubs service their regions by operating as the central archive and the single source of access for purchased databases stored at individual sites for the use of all of Virginia's libraries. The VIVA leadership Steering Committee is made up of the library directors of the six institutions, plus representatives from the four-year colleges, the community colleges, and the private or independent institutions.

1. VIVA Implementation

In an attempt to answer some of the difficult, pragmatic questions involved in such an ambitious undertaking, VIVA's leadership developed "Principles of Selection Criteria." [14] Establishing a model for asynchronous learners, the "Statement of Principles" reveals that "VIVA seeks to provide students and faculty anywhere in the Commonwealth [with] convenient access to the information resources needed to support the missions of its parent institutions, including distance education and other evolving programmatic initiatives." VIVA is positioned strategically to exploit fast-moving changes in scientific and scholarly communication, to be a catalyst for such change, and to facilitate the cost-effective acquisition and distribution of intellectual resources which are specialized or which lend themselves to shared access.

The twelve "Selection Criteria" provided substance to the VIVA philosophy and established near-term as well as long-range goals. For example, widespread access to general bibliographic databases was an early high priority, while a later goal was to identify basic electronic titles to which all libraries should have access. Selected electronic collections must be accessible within the technological environment at all the state-supported campuses, and an important criterion in choosing a general bibliographic database was the ability to identify which titles are held at the local library.

VIVA delineated interlibrary loan (ILL) guidelines that would benefit all the participating institutions. Among the specific practices are not charging members for ILL services, completing ILL transactions within 48 hours, and being as generous and responsive as possible. Also among the minimum standards is the directive to act in accordance with the US copyright law.

2. Early Success

Within the first year of operation VIVA established the technology base necessary to deliver information in all electronic formats to all the academic libraries. VIVA also purchased a number of electronic collections, including online indexes, full-text English and American literature databases, the *Britannica Online*, and the *Oxford English Dictionary*. Negotiations for additional collections are ongoing; most recently, *CIS Congressional Compass* and *Dow Jones Academic Edition*, have been added.

An Internet homepage established VIVA's Web presence and became a source of information about the project and its collections. VIVA's leadership continues to seek opportunities to deliver information faster and more inexpensively and encourage cooperation with scholarly and scientific societies. VIVA also strives to retain the organizational and technical flexibility necessary to respond to the rapidly changing marketplace.

Once basic virtual library user needs had been met, VIVA negotiated for the more specialized scientific and scholarly resources. The participating institutions also contribute unique Virginia materials scanned into digital formats, demonstrating preservation and expanded access to unique and at-risk resources. It takes significant amounts of library staff time in service to the citizens of the Commonwealth for VIVA to function and make progress.

3. Progress to Date: What Has VIVA Received for Its Money?

As conceived at the initial Library Advisory Council meeting, VIVA would meet important criteria. VIVA has improved access for its faculty and students to collections, both shared access to online library resources and the coordination of collection development with enhanced support of interlibrary loan among the VIVA libraries. It serves the core value of Virginia's academic libraries, connects with societal needs, and looks beyond organizational boundaries--these seemed to be somewhat out of reach in 1993. When VIVA received a similar level of funding for a second biennium, 1996/98, Gordon Davies, former director of Virginia's State Council of Higher Education, declared: "The virtual library project provides evidence that investment in cooperative technologically-based projects can produce new ways of doing business and dramatic changes in efficiency and effectiveness." [15]

Through VIVA, databases that would have cost \$12.5 million if purchased by individual institutions, are available for statewide use at one-third the cost. [16] VIVA has purchased reference materials (such as *Britannica Online*, *Oxford English Dictionary*, and *Books in Print*), indexes and journal resources (OCLC's FirstSearch and 58 databases including *Expanded Academic Index*, *General Business File*, and *Health Reference Center*); and full text materials (Project Muse, Academic Press's IDEAL, Chadwyck-Healey's *African-American Poetry*, and *English Verse Drama*). From the first funded biennium to the second, the focus of VIVA moved beyond the initial goals of working together, eliminating unnecessary duplication, and avoiding creating a new central bureaucracy, to improved interlibrary loan, expanded electronic collections, cooperative collection management, and access to special collections.

While the special collections projects did not receive any funding during the first biennium, five doctoral institutions received \$20,000 each in 1996/97. Prior to funding, Virginia Tech created a homepage listing each institution and providing a link to its Special Collections Department's homepage. As other VIVA institutions created homepages, these links were added. Included are many links to text files describing the manuscript collections (finding aids, inventories, and guides). With VIVA funding, each institution was able to digitize some of the described materials described. Some libraries also purchased equipment, software, and hired student workers who scanned and/or identified the digitized images and created derivative thumbnails from the "archival" images. The initial digitization focused on Civil War materials and a regional history approach to network access

for students in the Commonwealth. With continued funding at a lower level, the VIVA Special Collections Departments are turning to digitizing materials that can be used by schools in the celebration of the Commonwealth's 400th birthday in 2007. In addition, the VIVA Special Collections Committee is pooling some of its funding to hire a grant writer since VIVA is once again turning its focus on purchasing resources and services, rather than digitizing local collections.

User authentication will become more of an issue as increasing numbers of students use independent Internet service providers such as American Online, SprintLink, and Inffinet. With access to some VIVA resources initially dependent upon students using their campus networks so that IP (Internet Protocol) addresses were validated spring 1997 saw the implementation of three prototype 'user authentication' projects (at Virginia Tech, George Mason University, and Old Dominion University). To make this work as smoothly as possible Virginia Tech students and faculty, for example, can configure the Netscape proxy, using their campus PID (Personal Identification) or email userID and password, to reach VIVA resources fairly easily.

The combined benefits to VIVA's 39 public institutions of higher education on 52 campuses means that both purchased collections as well as unique digitized materials are available through additional VIVA-funded equipment, services, and technical assistance. Cooperative electronic collection development and management has lead to financial benefits for the institutions and, therefore, for the state. The Advisory Committee's most recent budget proposal summarizes well the role Virginia's libraries play in the state's effort to revitalize higher education through technology. "As institutions of higher education restructure to improve faculty and staff productivity, use technology, enhance learning, and avoid duplication, VIVA enables libraries to play an important role in that transformation by providing networked information resources that can be used by teachers and learners in a "virtual" learning environment." [17]

B. Scholarly Communications Project

Virginia Tech's Scholarly Communications Project (SCP) is a local technology initiative that supports the Electronic Theses and Dissertations (ETDs) initiative and complements VIVA. In addition to purchasing databases and resources, VIVA provides a central access point to digital resources originating from the participating libraries such as those available from the SCP.

Since 1989 SCP has created a variety of partnerships with units and individuals within the university community to produce unique online resources particularly suited to asynchronous learning and the beginning of the virtual library. Through partnerships with individual faculty, the SCP publishes 17 electronic journals. SCP staff designed the electronic reserve system that hosts online class materials and a unique and growing digital image database, among other things. In a partnership begun four years ago with the Graduate School, SCP developed and implemented procedures for online student

submission of approved theses and dissertations, resulting in permanent archiving and timely public access to graduate student works. As of September 1997, over 500 ETDs are available through the World Wide Web from Virginia Tech.

Electronic theses and dissertations are deserving of attention today because they clearly demonstrate the results of student, faculty, administrative, and library collaborations that benefit the new teaching and learning environments. The project is also an example of how libraries (independently and through collaboration) continue to improve services and increase the wealth of information available even during continuing fiscal restrictions.

1. Electronic Theses and Dissertations

For decades university libraries and archives have stored and occasionally circulated, the final products of graduate students' education--doctoral dissertations and masters' theses. One of the newest forms of online scholarship, these graduate student works are being affected by the ready availability of the Internet and the World Wide Web in colleges and universities, as well as many homes. The reasons are many and impact higher education in ways not felt for quite some time. With ETDs libraries have taken the initiative to address issues such as online archiving, unrestricted access vs. limited access, and intellectual property considerations, all of which generate questions about who should control academic publications and library resources at institutions of higher education. One issue that has come to the forefront is the role of scholarly publications in the lives of the professoriat. Once one begins to doubt the constructs of the "ivory tower," then peer review and the role of publications in the tenure process come into question and ETDs may make it more difficult for their authors to become traditional, published faculty.

a. How the ETD Initiative Operates

Begun at Virginia Tech but now being adopted by nearly two dozen other universities nationwide and abroad, the assumptions of the ETD initiative are many, including:

- Universities will learn about digital libraries, as they collect, catalog, archive, and make ETDs accessible to scholars beyond the host academic community.
- Universities will learn how to unlock the potential of their intellectual property and productions.
- Technology and knowledge sharing will move forward more rapidly as graduate research results become more readily and more completely available.
- Graduate students will learn about electronic publishing and digital libraries, applying that knowledge as they engage in their research and build and submit their ETDs.

- Graduate education will improve through more effective sharing, including literature reviews and bibliographies.
- Students can save money producing their final research projects.
- Libraries will serve more users without increasing demands on staff, eliminating the need to bind, stamp, security strip, and label, as well as to circulate and reshelve materials.
- Lifelong access will be available to browse, search, and follow links to related works and resources on the Internet/Web.
- Timely public access to current research is available all day, everyday--never checked out and never overdue.
- No additional shelf space will be needed in university libraries and archives.

In addition to the long term benefits for the future professoriat, the preparation and the sharing of drafts fits well among the tenets of asynchronous learning--the independence of time and place of the participants. Asking for ETDs in a format such as Acrobat's PDF (Portable Document Format) was important, especially as a proof of concept, so that authors and their readers would neither be tied to one computer type (e.g., PC or Mac) nor to a single word processor (e.g., Word, TeX, Word Perfect). In addition, the Acrobat notes feature enables the exchange of editorial comments without requiring the exchange of the full document over the potentially crowded telecommunications network. Although a student and her committee members can be physically remote from each other, the committee members can each review the PDF draft of the ETD and put their individual comments in notes throughout the draft document. They export their notes, sending them to the student, perhaps as an e-mail attachment. These comments can be automatically imported into the exact page locations in the student's draft of the ETD. This eliminates the off-campus student's problem of trying to meet with various faculty members as well as the communication problem encountered when a committee member leaves town on sabbatical, for example. Asynchronicity need not inhibit progress toward completion of graduate studies when electronic theses and dissertations are the accepted form of the terminal work.

The finished product, once approved by the Graduate School, also allows the library to expand its role as a virtual library. Especially important is the library's ability to increase the size of its digital collection without having to increase the staff for processing and continued maintenance of the collection. Because future asynchronous learning does not tie a student to an educational institution, a Networked Digital Library of Theses and Dissertations (NDLTD) will also contribute to maximizing access and services by encouraging both distributed and centralized access.

Regional access to ETDs may also be available through library services such as the Monticello Electronic Library and the CICNet (Committee on Institutional Cooperation Network) of the Big Ten universities. Centralized commercial services will be available through UMI (University Microfilm

International) and OCLC's Electronic Collections Online. Distributed access is currently available because many online library catalogs comply with international interoperability standards (Z39.50) and in the future Dienst or Open Text may search across dispersed and remote ETD. Distributed and regional digital libraries that will benefit all learners need to continue to pursue cooperation, collaboration, and interoperability.

What else will it take to make this variety of resources, access methods, and services available for the distance learner? Grassroots support from faculty as well as students and collaboration between disparate university components is necessary. Support through formal channels and university governance is important, as is informal encouragement to learn new procedures and to develop new techniques that will exploit the potential creative expression that an ETD could be. (For example, see two innovative ETDs.[18]) The NDLTD has a strong steering committee of representatives from a variety of professional associations (e.g., the Council of Graduate Schools and the Coalition for Networked Information), institutions (e.g., Online Computer Library Center), government agencies (e.g., National Science Foundation and the US Department of Education), and businesses (e.g., Adobe and UMI). At Virginia Tech there also exists an advisory committee with representatives from each of the eight colleges. These two groups make recommendations that may become formal policies and procedures for the Virginia Tech ETD initiative.

b. Catalyst for Change

Another role that ETDs are playing is as a catalyst for change among commercial enterprises, such as publishers and aggregators. Some publishers fear the competition that unlimited access to an ETD may give to a derivative article in a commercial scholarly journal. This concern has received national attention through reports on National Public Radio[19] and in the *Chronicle of Higher Education*[20], the *New York Times*,[21] and various regional newspapers. Contrary to the popular press's reports, many editors recognize the vast difference between the original chapter in a dissertation and the drastically rewritten to become a scholarly journal article that is submitted to rigorous peer reviews before being accepted for publication. Frequently in these cases the ETD could be a reference citation included in the article where interested readers could get other details surrounding the article.

Recently some graduate students have begun to publish articles prior to including them as chapters in their dissertations. This causes new problems when authors relinquish *all* their copyrights to the publishing agents because, when the graduate students are ready to complete their dissertations, they must seek permission from the publishers (or other copyright holders) to include their own articles as chapters in their own dissertations. The publishers often are reluctant to diminish the popularity of their journals and give up possible revenue by letting the original authors establish (through their universities) free Internet access to the articles/chapters/dissertations. Naturally, the universities feel

that the publishers should not be in the position of dictating when or how their graduate students' works can be made available. After all, the mission of a university such as Virginia Tech, and other land grant universities in particular, is to disseminate the knowledge that is gained as a result of the study, teaching, and research of its faculty, students, and staff.

When publishers continue to feel threatened by the exposure of the full ETD on the Internet, access has been restricted to the originating campus. This definitely impedes the work of other researchers who are denied online access, as well as restricting cooperating library privileges previously available through interlibrary loan. Every learner then becomes a slave to the place, if not the time constraints, that are even more limiting than traditional library services and dissertations sitting on the library's shelves.

That publishers can so influence universities to restrict access to their students' research and that of the future professoriat, should be overcome with time. The current situation benefits only commercial enterprises and does a disservice to researchers expecting at least the level of access equivalent to the works on paper (e.g., interlibrary loan). Universities that are working together to improve this situation and move asynchronous learning into the virtual university will have to tackle copyright issues and others associated with delivered education.

ETDs are an example of how libraries address effectively almost every one of the factors that make change in higher education inevitable, especially pressure for additional productivity, network-based information delivery, and the importance of computer and telecommunications expertise. ETDs did not become a reality, however, during five years of academic discourse; not until the library was consulted by the Graduate School did progress begin. The processes and procedures now formalized were developed by library staff, thus establishing the foundation of the Networked Digital Library of Theses and Dissertations. This demonstrates one of the pivotal roles the library plays in the university community and the library's importance to move teaching and learning beyond the constraints of time and place.

IV. CONCLUSION

There are a number of actions that recommend themselves to academic libraries as they address the challenges of serving asynchronous learners in addition to the traditional students

- Develop partnerships with other institutions, vendors, and publishers to create new technology-based information delivery systems
- Develop partnerships with computing and telecommunications units on campus

- Invest in equipment and training for library personnel so that they will be well prepared for future generations
- Work with academic faculty to support the development of network accessible courseware
- Realign the reward system to match new priorities
- Design, develop, and implement new assessment measures and processes
- Exploit the potential of electronic libraries and reserve systems to support designated courses and to offer 24-hour consultation
- Provide improved facilities for the introduction of new technologies and modes of information delivery systems

Always remember, “the network is the center of the universe.”

David Roselle [22]

former Virginia Tech Provost

current President of the University of Delaware

By the year 2020, there will be more options for people who want an education beyond high school and many of these students will have different constraints and aspirations than do today’s students. Technology-mediated asynchronous learning and network-based information delivery holds great promise for future learners. The innovation required to meet their needs will change what libraries do and the way they do it, and libraries have demonstrated that they are up to the challenge.

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