Digital Libraries and Education

Trends and Opportunities

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Introduction

This article builds on work in the past few years, triggered by Ticer course [Roes, 1999] and consulting activities, notably for the Dutch Open University and the Amsterdam University for Professional Education. It attempts to identify strategic issues for libraries wishing to pursue a more active policy with regard to the changes affecting higher education due to the increased use of information and communication technologies (ICT). The article starts out by sketching the changes currently occurring in education. A study of the literature, carried out while preparing a new strategic plan for the libraries of Amsterdam University for Professional Education, identified five major areas in which libraries can develop strategies to enhance services for their patrons. The following domains are discussed: digital libraries and digital learning environments; digital portfolios; information literacy; collaborative course design; and the relation between physical and virtual learning environments. Next, possible implications for library staff regarding the changes are discussed. The article concludes with thoughts on alignment between library strategy and the strategy of the library's parent institution.

The changing world of education

Undoubtedly, there are profound changes going on in the educational system. These changes are needed because of ever growing pressure in the school systems themselves, partly because society itself is changing into one in which knowledge work becomes ever more important, and partly because of the very information and communication technologies which are transforming our economies. Both of these factors evoke change and offer a solution to the problems with which the educational system struggles. Carol Twigg and Michael Miloff [Twigg and Miloff 1998] analyzed the changing learning situation in the United States, and their analysis is also to a great extent valid for the European situation. By confronting trends and technological developments, they arrive at a vision of a "global learning infrastructure" in which the role of schools and universities will be drastically changed, a radical transformation of the educational system. They see the following trends:
• The number of students is still growing.

• Different types of students are asking for education; participation of women, older students, and students from ethnic minorities is growing. Different students bring different experiences with them.

• Increasingly, work and study are combined, and that leads to a need for more flexible learning arrangements in which the campus or school building is no longer central to the educational process.

• More generally, there is a trend towards lifelong learning.

• Lifelong learning leads to an emphasis on "learning to learn". Knowledge becomes obsolete at an ever-increasing rate in a knowledge economy, and knowledge workers need to be able to refresh their knowledge on a regular basis.

• Because of the differences between students, there is a need to accommodate different learning styles, customization and alternative learning routes. Courses have to take more into account the different experiences and backgrounds of students.

• Higher education institutions have long had a monopoly in providing education, but increasingly, companies and public bodies possess knowledge that can be reused for educational purposes, partly for in-house training (knowledge management) but also to offer to external markets.

• Education is under constant budget pressure, thus there is a need for more efficient and effective education.

• Students more and more are behaving like consumers who want to make informed choices about how and where they want to be educated, which implies students are no longer committed to one institution.

• Teaching staff will exhibit more job-hopping behavior than they did in the past.

• There are too many dropouts in the current educational system.

Information and communication technologies (ICT) have the potential to offer a solution for at least part of the problems mentioned above. According to Twigg and Miloff [Twigg and Miloff 1998):

• Through the Internet, course material can be offered independently of time and place. Modularization makes it possible to offer different and flexible learning routes.

• An ever-increasing number of students have access to the Internet, whether at home or on campus. Costs of Internet access will continue to drop.

• More and more information is made available through the web. Search engines assure the accessibility of this material. Groupware allows (a)synchronous communication between teachers and students -- worldwide.

• Online market research is quick and easy, and this market information can be combined with transaction log data allowing institutions to monitor consumer (i.e.,
In principle, a worldwide competition for education is possible and it is already apparent in the market for MBA courses. Carol Hughes [Hughes 2000] also foresees increasing competition in the delivery of information services for higher education, implying that libraries might lose their monopoly position in information services to their parent institutions. (Hughes' e-book company, Questia Media, is an example of a new competitor.)

In summary, Twigg and Miloff [Twigg and Miloff 1998] envisage a global learning infrastructure. One might envisage learning environments of the future as:

- being student-centered
- being interactive and dynamic
- enabling group work on real world problems
- enabling students to determine their own learning routes
- emphasizing competencies like information literacy to support lifelong learning

Through these elements listed above runs a common theme: the adoption of more active learning styles in which students take more responsibility for their own learning goals and for the ways in which to realize these objectives. Active learning implies that students don't limit themselves to resources supplied by their instructors, but also that the students search for new materials themselves in order to solve problems at hand and to develop their competencies continuously.

Since libraries in higher education find their raison d'être in supporting research and education, a relevant question is how libraries can and should transform themselves in order to cope with the changes in our educational systems. The following five strategic areas will be discussed in the next sections of this article:

- digital libraries and digital learning environments
- digital portfolios
- information literacy
- collaborative course design
- the relation between physical and virtual learning environments.

**Digital libraries and digital learning environments**

Digital libraries seem, no, are natural complements to digital learning environments. They are able to integrate the freely available information on the web with the more formal literature for which (increasingly consortium) licenses on electronic versions are arranged with publishers. These licenses enhance and replace traditional collection development policies. Digital libraries facilitate time and place independent information services for students, needed especially if active learning styles become more commonplace [Barnard...
Digital libraries are already available 24/7 from anywhere in the world, offering flexible arrangements for students/knowledge workers. Much work done over the past decade in developing digital libraries will have an important pay-off for educational innovation. The main issue, of course, is whether more active learning styles will become the norm, since many of today's courses are of a rather "self contained" nature in which educators present students with texts to work through in a linear way and assessment is too often based on whether or not a student is able to reproduce the texts prescribed by the teacher.

Two approaches in this respect can be identified. The first one, which takes the needs of specific courses as point of departure, can be seen mainly in the UK in projects like INSPIRAL and ResIDE [INSPIRAL and ResIDE]. INSPIRAL is a research project in England that investigates issues involved in linking virtual (or digital or managed) learning environments with digital libraries. It looks at technical, institutional and end-user challenges, with an emphasis on the last two aspects, and analyzes stakeholders' and learners' needs. Its point of departure seems to be how teaching staff can best be supported when designing digital learning environments and enriching these environments with resources available in digital libraries. This tailor-made approach is very much apparent in the ResIDE project where the focus is on the teachers and their courses. This model can be seen as analogous to the work of reference librarians putting together reserve collections to support courses.

Another approach, apparently more popular in the United States, has a different, more macro way of looking at digital library support for learning environments and concentrates on learning resources in general. An example of this approach is the National Science Foundation (NSF) national science, mathematics, engineering, and technology education digital library (NSDL) program [Wattenberg 1998, Zia 2000]. This program seeks to bring together a vast, centralized collection of learning resources supporting all possible kinds of education, ranging from K-12 to graduate and lifelong learning, into one big library for the nation -- and even beyond. As such, the NSDL approach is consistent with the large scale of many of the other NSF digital libraries projects.

To libraries and librarians, the NSDL approach seems more threatening; however, I think in both options there will still be a need for library staff to support educators with respect to the selection of adequate resources for a given course.

Librarians pursuing this aspect are well advised to learn more about the standards (e.g., IMS / Instructional Management Systems) being developed to protect investments in content development from the rapid developments in technology used in digital learning environments [Bacsich et al. 1999]. The issue here is that instructional content should be easily transferable from one platform to another. Related issues are integration with administrative systems and authentication. Donald Beagle [Beagle 2000] warns that another, related question, viz. compatibility of digital learning environments and library systems, is a neglected issue so far. The main problem seems to be managerial short-sightedness. In the Netherlands, for example, the common opinion of administrators seems to be that work on digital libraries doesn't need special attention anymore -- for which some valid arguments can be put forward -- and that the subject of ICT in education is an entirely different one from the subject of digital libraries. The point, of course, is that this view fails to incorporate the advantages of digital libraries, which are natural complements to digital learning environments.

**Digital portfolios**
Digital portfolios are new tools for student assessment and they are more than that as well. Initially, digital portfolios were developed as an alternative way of assessing student progress, with more emphasis on the learning process and the material results a student achieves throughout a course of study. By showing material results, the student can demonstrate that certain competencies have been acquired. At the same time, as a personal tool [Tillema 1998] the portfolio offers students the ability to closely monitor their own progress and to set new learning goals in the planning of their education. Additionally, a portfolio, which continues to grow during training, can be used in job interviews to show prospective employers the candidate's background in a much richer way. Digital portfolios work especially well in situations where students work with assignments to solve real-life problems and are free to manage their own learning process.

In discussions with educational innovators at Amsterdam University of Professional Education, the idea surfaced that (elements of) digital portfolios can be of wider use than just for assessment of an individual student's progress. Since the portfolios contain material results, these results might also be of interest to future students on which to build, much in the same way as the information chain works in scholarly work. By taking a knowledge management approach to digital portfolios, these results can be shared over the Internet or, more likely, the intranet. This implies a new task for the library in the management and indexing of these student portfolios in such a way that they too can be integrated with other information resources offered by the library. In this sense, digital portfolios are an extension of the first domain identified -- digital libraries and digital learning environments -- but now include the intranet. The emphasis here is on the institution as a knowledge organization, and the integration of that knowledge with other information resources.

**Information literacy**

Adding digital portfolios to the ever increasing amount of information available leads to a third domain in which libraries can play a more active role in support of educational innovation: information literacy. The concept of information literacy can be traced back to the 1970s and was originally connected to democratic ideals. Throughout the years, the view of information literacy has evolved towards a more technical one and has been connected to the development of the information society [Webber and Johnston 2000], a term which is now being replaced by the notion of the knowledge economy. A well-known definition of information literacy is the one developed by the American Library Association [ALA 1998]:

"[I]nformation literate [people] are not only able to recognize when information is needed, but they are also able to identify, locate, evaluate, and use effectively information needed for the particular decision or issue at hand. The information literate person, therefore, is empowered for effective decision making, freedom of choice, and full participation in a democratic society."

There are many more definitions of information literacy, but they all share an emphasis on personal competencies, which are usually broken down by the chain: recognition of an information need, development of a search strategy - query formulation and selection of sources, evaluation, synthesis, and effective use of the new information. Sometimes, correct citing is also seen as a crucial competency. In addition, information literacy is often mentioned together with the concept of critical thinking skills. Notice also how information literacy is conceptually closely linked to terms like "active learning", "problem-based learning", "student-centered learning", "lifelong learning", and "learning to learn". It is impossible to imagine an information illiterate knowledge worker. Hannelore Rader [Rader 1997] remarked that "[I]nformation literate [people] are not only able to recognize when information is needed, but they are also able to identify, locate, evaluate, and use effectively information needed for the particular decision or issue at hand. The information literate person, therefore, is empowered for effective decision making, freedom of choice, and full participation in a democratic society."
teaching environment because of their skills in collecting, evaluating, organizing and providing access to information." Information literacy can be seen as building on, but going way beyond, traditional library instruction. Increasingly, librarians will be involved in teaching classes --sometimes in close cooperation with faculty, sometimes in general skills courses. An important trend in the last few years is that library staffs are developing internet-based instruction modules. The Texas Information Literacy Tutorial <http://tilt.lib.utsystem.edu/> is an excellent example of this latter approach, which has gained widespread recognition in the library community.

**Collaborative course design**

Of course, librarians who are building expertise in developing web-based course material can also use this expertise in a more broad sense. The idea here is that -- in contrast with the traditional situation in which teaching staff develops courses on their own, and choose the way they teach and assess student progress (the teacher as king of his class) -- learning environments of the future will be designed by multi-disciplinary teams of experts. Experts in developing course material, programmers, graphical designers, and experts in assessment, all will work together in designing rich modularized learning environments that offer alternative learning routes to different types of students. However, many learning environments build on a model for which origins can be traced back to early distance education. In this model, students are given a "box" containing all the material for a course they need to master, so-called self-contained courses. An approach that, of course, made sense in traditional distance education where library support has always been a rather cumbersome issue [Unwin, Stephens and Bolton 1998]. Alan Bundy [Bundy 2000] remarks that digital learning environments lead some educators to use the technology to gain even more control over students. But if the emphasis is on developing competencies needed to become knowledge workers, and if work and learning are more interconnected, one might expect that learning environments will become more open. Students in such a model are expected to go beyond the primary learning materials offered by teaching staff and are expected to explore independently other information sources as well.

Again, if more active learning styles become the norm, then one can foresee a role for librarians in the multi-disciplinary teams developing learning environments such as those mentioned above. Librarians can add links to the resources -- print and electronic -- available in their collections and on the web. They can explain how information resources in a particular subject field are organized and how students can find their way in subject areas that are relatively new to them.

A nice example of this approach is the module DEsite <http://cwis.kub.nl/~dbi/instruct/eu/> developed at Tilburg University to explain the complexities of the decision making process in Europe. The module was developed in close cooperation between legal scholars and library staff. Lawyers explain the technical and legal aspects of the decision making process, and library staff show how to trace the many documents produced in this process in the jungle of European Union databases and web sites. Together they have built a learning environment that individually they could not have produced easily. The DEsite model shows the synergy that is possible, and the result is a rich learning environment for students and an electronic reference tool for lawyers active in this field.

**Physical and virtual learning environments**

Techno-enthusiasts tell us that virtual learning environments will suffice to satisfy the needs of future students. This is not to imply that people won't be working together, but they will
do this work time and place independently using groupware. This picture of a world of students and knowledge workers lonely behind their desktops denies the important social aspects of learning and working. John Seely Brown and Paul Duguid [Brown and Duguid 2000] remind us of the importance of the social context in which people give meaning to information and refer to (real, not virtual!) communities of practice as ideal learning environments. Noriko Hara and Rob Kling studied student frustrations with purely web-based learning environments [Hara and Kling 1999] and the results of their study reinforce this point. Students encounter many technical problems and miss the direct feedback inherent to class room situations where even the body language of the teacher gives important clues. Next to virtual learning environments, the physical learning environment will remain of importance too, and the two will probably coexist for generations to come.

The (physical) library is a learning environment ideally suited to support more active learning styles. Kerstin Fridén [Fridén 1996] studied the effects the introduction of problem-based learning had on the use of the library. She found that students made use of the library much earlier in their training, and the use was more intensive and more equally spread over the year.

If we look at recent developments in library architecture in the United States [American Libraries 1999] some trends in library functions become more visible. There is a clear trend towards more client-centered buildings instead of the collection-centered ones of the past. Some libraries experiment with lounge-like facilities and offer pleasant reading rooms, not just for individuals but also for groups. Integration of libraries with computing facilities is a clear trend, one that will present even more of a challenge now that multimedia computers are becoming the norm. Increasingly, the term "learning environment" or "learning center" is used for this kind of facility. It shows that, next to digital learning environments, there is also a need for physical learning environments where students and teachers find a wealth of resources and facilities, and where they can work, on their own or together, in order to learn and teach.

**Implications for library staff and organization**

The linking of digital libraries to digital learning environments, standards issues, knowledge-sharing, support in education, more active support of educational processes, classroom instruction, development of course modules in multi disciplinary teams, rethinking and redesigning library buildings-- all these issues have obviously profound implications for library personnel. Richard Biddiscombe [Biddiscombe 2000] sees a strong need for the library itself to become a learning organization. We might add that, now more than ever, lifelong learning becomes important for library staff.

Hannelore Rader [Rader 1999], a pioneer in this field, emphasizes leadership and innovative attitude of library personnel. She stresses the importance of developing partnerships between library staff and faculty. This requires a proactive approach: look at what is going on in education in your institution and show where library resources can enhance learning environments. In her view, library staffs have an advantage: they can build on their expertise in digital libraries, and they have a head start in using modern technology. Ultimately, in Rader's view, librarians should become partners in educational innovation.

Patricia Iannuzzi [Iannuzzi 1998] reported on developing library - faculty relationships at Florida International University. Organizational culture is the main obstacle in developing these relationships, and it takes time to change this culture. At Florida International University, the introduction of information literacy was seen as an opportunity for rethinking the role of the library. Iannuzzi warns that librarians think too much about how to
integrate information literacy in new initiatives, instead of wondering how information literacy can help these initiatives to succeed. Finally she gives some practical advice: keep informed, meet the key people, and get involved.

It can be expected that more active library support of educational innovation will give rise to new types of jobs. Some early examples are the academic technology specialists at Stanford University in the United States [<http://acomp.stanford.edu/atsp/>] and the learning technology officer at the University of Edinburgh in the United Kingdom [Alexander 2000]. The academic technology specialist is a hybrid function, combining library and ICT expertise, and the specialist's task is to support teaching staff in the use of new technology. Most of the time (about four days a week), these specialists work with faculty in their offices and classes, the remaining day of the week is used to exchange experiences. Edinburgh's learning technology officer acts as a bridge between library and academic staff to ensure that library expertise is properly exploited, a definition that seems a bit too library-centered.

On a larger scale, there could be organizational consequences. Much in the same way that digital library projects have led to closer cooperation, and sometimes mergers, between libraries and computer centers, educational innovation leads to closer cooperation between libraries, computer centers and educational support units. Examples of such cooperation include the University of Newcastle, Australia [O'Brien and Sidorko 2000], and the DINKEL Institute of Twente University in the Netherlands [<http://www.dinkel.utwente.nl/dinkel_en.html>]. Another option is to explore the possibilities of networked organizations in order to mobilize and combine the many different competencies spread throughout higher education institutions.

**Institutional and library strategies**

This article has sketched interesting challenges for librarians wishing to pursue a more active role in educational innovation. An important final question is whether there are organizational and strategic preconditions that must be met in order to succeed. In their reports on the America Library Power project, Carol Collier Kuhltau [Kuhltau 1999], and Norman Webb and Carol Doll [Webb and Doll 1999] stress that the most important condition is that there is a basic agreement between administrators, teachers and library staff on what kind of education an institution wants to give. Those schools advocating more active learning styles will benefit especially from increased cooperation. The pay-off for students is an increase in information literacy and critical thinking skills, core competencies for knowledge workers.

Even if there is no shared institutional vision on education, there is no excuse for librarians to wait and see. It just implies that they have to find alternative routes. One nice thing about networked organizations is that one can build them without the consent of administrators. With or without an institutional strategy, it is still a librarian's task to support teaching and learning, and to develop relationships with faculty further and in the direction of supporting their teaching. Librarians should talk with students and find out in which ways librarians can best accommodate student learning. Librarians can start small and develop ideas and projects in close cooperation with their patrons. Looking at examples of colleagues at other institutions to find out what works and what doesn't -- and why -- is a good place to begin. Librarians have, and can develop further, unique skills to support educational innovation and they have the opportunity to act as role models within their institutions. After all, library work *is* knowledge work.
References


**Notes**

(1) The views expressed in this paper are personal and do not represent those of Tilburg University nor its library. The author acknowledges comments on an earlier version of this paper by Rebecca Scholte, Head, Communication and Education, Tilburg University Computer Centre. However, responsibility for the content rests solely with the author.
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