The e-learning library: only a warehouse of learning resources?

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Abstract

The potentialities of information technology, together with economic concerns, have been forcing various organizations to go electronic in order to reposition themselves toward a sustainable future. This has also happened to libraries, whose primary value lies not only in their collections but also in their contribution to education through smart organization and management of collected information, which they make easily usable and accessible to users. The paper addresses these issues and discusses such aspects as what is meant by "learning", how can it be pursued and managed in the library environment, what is the functionality of the e-learning library, and how the e-learning resources are included and organized in the e-learning library.

Introduction

The booming of new learning methods built on an underlying foundation of computer and information technology (IT) over the past decades has offered various "solutions" to educational and training activities. Most of the early "solutions" were adaptations of text-based training delivered electronically. Today the "solutions" are more than duplicating non-electronic learning materials and transmitting them online – they are mainly embodied in the Internet environment, containing variant elements, such as virtual learning environments, online mutual interaction, and managed learning environments. Among the numerous present applications of e-learning are online training, distance learning, learning with threaded discussions or interactive bulletin boards, Web site-based curriculum, courses that post assignments online, correspondence course-style read-and-test programs, etc. (McLester, 2001).

Not all researchers and educators concur in these changes in educational methods and environments due to the concern of the possible dehumanization of the learning process (Self, 1996) and the volatility of computers (Oppenheimer, 1997). However, many proponents argued that e-learning is able to offer more choices that suit learners' flexibility, provide stimulus, reinforcement and instant feedbacks, foster interaction, and stimulate understanding and the recall of information. These claimed advantages have made e-learning very appealing.

While being devoted to make target users informed and knowledgeable, and to support the teaching, research, and instructional programs as well, libraries have long been an educational means equal in importance to instructional aids used in the classroom. By providing needed information to learners, instructors, scholars and scientists to work on and with, all types of libraries have played a very important role in the realization of educational principles.

Inspired by the dazzling potentialities of information technology, together with economic concerns, quite a few libraries have chosen "to go electronic or partly electronic" in order to reposition themselves toward a sustainable future. This repositioning strategy was adopted to help libraries extend the services of a traditional library by enabling activities such as access to materials outside the physical confines of the library. This strategy also shifted the library focus from the ratio of number of readers per book and the usable area for per reader to the speed of information delivery, the easiness of access needed information, etc. On the other hand, the advances of computer and networking technologies have made distribution and access to information remarkably easy even for

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those who are not information literate. These technologies are having a profound impact on the creation and use of learning materials.

In response to these collective developments, today's libraries cannot operate themselves as though it were a passive repository for printed and electronic materials. They need to be aware that in addition to storing an increasing collection and maintaining easy access to it, libraries need to play dual roles in the paper-based and digital worlds, and what the library is most capable of making contributions to learning is to enhance and increase the value of the learning process created by combining digitally delivered content with learning support and services (Waller and Wilson, 2001).

It is highly expected that in the electronic sphere the library should take further steps to seek means of providing for study and research to be carried out in close connection with tangible items and electronic services as well. This paper will, therefore, first discuss how "e-learning" can be pursued and managed in the library environment, and then explore the functionality of the e-learning library. Finally, how the e-learning resources and services are included and presented in the e-learning library is examined, and the tenets to attain the optimal condition are suggested.

Learning and its implications for the library

"Learning" denotes the acquisition of knowledge or skill by instruction or self-study. Psychologically, "learning" is defined as relatively permanent change, caused by experience, in an organism's behavior. Its study is central to psychology, interacting with the studies of concept formation and attainment, decision theory, perception, problem solving, reasoning, and development, and is one of the oldest in psychology, beginning with ancient Greek philosophical speculation about how humans acquire knowledge (Leahey, 2002).

Libraries have long been one of the primary sources used by instructors and learners to search and obtain learning resources. Even though libraries store valuable materials, their contributions to learning activities were not acknowledged proportionally in the past. The first reason was lack of public recognition of the importance of library materials for education. The second reason was that the majority of learners earned their certificates and/or degrees in physical classrooms. Visits to libraries were certainly beneficial to learners' knowledge accumulation, but such visits were not compulsory. The third

reason was that education used to emphasize rote learning and memorization of lectures and assigned reading, so learners showed little curiosity, initiative, or critical ability.

The situation was alleviated with the advancements of science and technology, and the increasing fragmentation and specializations in various fields which have caused teaching and learning activities in pursuit of a depth of specialized knowledge and a breadth of general knowledge of a specific field on a continuing learning term in order to sustain competitively. In consequence, the emphasis has been shifted from instructing activities to learning activities, which demands more learners' involvement and initiation. Meantime, the spirit of learning tends to focus on goal-directed construction of meaning, in-depth learning which is oriented to problem solving and decision making, learning embedded in real-life tasks and activities for thinking and communicating, and learning that builds on students' prior knowledge and experiences (Ravenscroft, 2001). These forces have been not only driving the education sector to think and create new means of delivering teaching and learning to meet new needs, but also spotlighting the auxiliary role libraries should play.

Traditionally, the main library mission is to provide the infrastructure aimed at supporting the creation, assimilation and leverage of knowledge. The way for conventional libraries to support learning includes the improvement of reading room collections and equipment, the quality of reference services and the general availability of books themselves. Although the truly electronic library, with all resources and services available online, is still far from being realized (Currier *et al.*, 2001), a growing number of libraries have offered WebPACs, and access to electronic journals, newspapers, reference sources, and virtual versions of library services, such as reservations, registration and reference enquiries. To enable users to use these resources and services effectively, many libraries also offer guidance and assistance to their users. All these efforts represent the content and help center to facilitate learning.

E-learning and the e-learning library

While the idea and concept of "e-learning" is becoming more prevalent, the question, "what is e-learning?" ought to be answered. The following are the definitions given by different people and organizations:
- Kaplan-Leiserson (2001): e-learning "covers a wide set of applications and processes such as Web-based learning, computer-based

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learning, virtual classrooms, and electronic collaboration. It includes the delivery of content via Internet, intranet/extranet (LAN/WAN), audio- and videotape, satellite broadcast, interactive TV, and CD-ROM".

- Stokes (2000): e-leaning "is a means of becoming literate involving new mechanisms for communication: computer networks, multimedia, content portals, search engines, electronic libraries, distance learning, and Web-enabled classrooms. E-learning is characterized by speed, technological transformation, and mediated human interactions".
- The Department of Education and Skills, UK (2002): e-learning include "a range of activities, from the effective use of electronic resources and learning technologies in the classroom, through to a personal learning experience enabled through individual access at home or elsewhere".
- Waller and Wilson (2001): e-learning "is the effective learning process created by combining electronically delivered content with (learning) support and services".

Generally speaking, e-learning denotes information and communications technology enhanced learning by delivering learning contents and activities via Internet, intranet/extranet, audio/video tape, satellite broadcast, interactive TV, and CD-ROM, i.e. via an environment consisting of hardware, software and personnel. E-learners learn in a multi-faceted learning programme that utilizes distance learning, interactive cable TV, and the Internet to connect learning environments to homes, places of work, and the community at large (Mason, 1999; Baker College System, 2002).

From the perspective of instructors and learners, it is difficult for them to build a relatively comprehensive personal collection and very time consuming to locate and retrieve distributed learning materials. Transition toward electronic environments, e-learning methods and expansion in learning subject information has brought more challenges than before. For example, some of them probably have the experience of using and creating electronic resources for teaching and learning, but the others either have only recently started to make use of these tools or have little or no experience of electronic resources at all. In addition, some instructors and learners may want to use information resided in other repositories. It is in these areas that the library can contribute by assisting both instructors and learners in searching and retrieving useful e-learning materials, or go even further to implement an electronic library system into an e-learning environment. Based on the delivery variety, e-learning covers a wide set of applications, processes and services, to which the electronic library is able to make contributions, such as:

- On-demand e-learning: providing learners with on-demand learning materials through electronic full-text and/or multimedia databases, the electronic document delivery service, VOD, etc.
- Live online e-learning: providing synchronous programs between a reference librarians and users through WAP technology.
- Knowledge based packages: constructing electronic databases containing learning contents in a searchable environment.
- Simulation-based learning: providing learners with interactive contents to learn on a simulation playing field; for example, this can be done through the virtual reality design in a digital library.

The library supporting e-learning should identify usable learning resources and services for each of the above, and then provide learning materials and seamless, integrated access to a range of resources across boundaries of media and across boundaries of curatorial tradition (Johnston, 2001). For these requirements, three fundamental questions need to be asked:

- What learning resources and services should be covered by the e-learning library?
- How to organize and present learning resources and services?
- How can the e-learning library accommodate the learning theories?

The scope of incorporated resources and services

From the primitive to the optimal condition, the e-learning library has four possible options for the provision of e-learning resources and services: the *laissez-faire* model; the intermediary model; the advanced model; and the quasi-all-inclusive model.

The e-learning library adopting the *laissez-faire* model is working independently, and providing the resources and services selectively without a deep understanding about the supported courses or programs. This raises the problems of the present limited coverage and a lack of quality control (Johnston, 2001).

The second option is the intermediary model – identifying and including the library's owned and accessible materials and services which are usable and valuable for each supported courses; for example, for each course the users are informed of the relevant materials owned by or accessible through the library, and provided with the alert service. To attain better effectiveness, it is suggested that the libraries form consortia

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themselves or partnerships with academic publishers to expand the e-learning resources for curricula (Johnston, 2001).

Since many learning materials need to be generated to support e-learning, the e-learning library had better include these materials, including the unpublished and non-textual resources, e.g. the video files recording vicarious field trips, the PowerPoint files provided by guest speakers, etc. To ensure the effectiveness of e-learning, the correlation between learning activities and learning theory should not be neglected (Ravenscroft *et al.*, 1998). For example, Stanford University, Apex Learning, and others discovered that to keep users interested, multimedia elements and interactivity are very important. McLester (2001) also emphasized the incorporation of graphics, interactions, competitions and skill-building challenges. As the creation of any multimedia materials will significantly increase the cost of a program and efforts, the e-learning library is suggested to work with instructors and learners to design and produce some materials which support such learning activities as storytelling, learning-by-doing exercises, and tailoring (Ravenscroft, 2001). To pursue this advanced model, the library needs to carry out essential cooperation with instructors and learners, in order to help create and revise learning materials and preserve these materials in their collections. This option also entails the problem that "academic staff may resist involvement of librarians in the provision of course materials and be suspicious of technology" (Currier *et al.*, 2001). Librarians "should develop a para-academic role transcending the boundaries of the library- subject librarians especially have a pivotal part to play here", and they "need to increase their understanding of pedagogy and to achieve more involvement than they presently have in institutional structures" (Currier *et al.*, 2001).

The fourth option is the quasi-all-inclusive approach which means the e-learning library should reproduce a collection of textbooks, newspapers, magazines, encyclopedias, images, maps, multimedia resources, notes, and the like, such as are used in the on-going, existing curricula and links to the relevant electronic resources. The primary focus of this aggregation is to include diverse learning materials that service the information needs of all the target instructors and learners at the highest level. This approach raises more questions;, e.g. is it worth doing, what kinds of libraries are in a better position for this approach, and in what contexts and from how many perspectives does this aggregation have to be represented?

Interface and access evolution

The e-learning library should organize and present the e-learning resources and services in a way that help users to locate and retrieve materials needed efficiently. The basic level is to arrange learning resources and services by function, subject or course, and present them via Web pages, which may include the WebPAC, an electronic journal list, the alert and document delivery services provided by the library and several subject-oriented resource lists. Since various tools have been used to assist in accessing, searching, navigating, and delivering information on the Internet, the second level is to incorporate the following tools into Web pages: (Sreenivasulu, 2000; Hodge, 2000; Electronic Education Report, 2001; Weibel, 1997):

- Internet-based tools, e.g. e-mail networks, mailing lists, electronic conferences, BBS, newsgroups, and forums;
- appropriate and user-friendly search mechanisms, e.g. free-text searching; controlled vocabulary, KOSs as aids to the selection of free-text keywords; natural language, Boolean parameters, and filtering mechanisms;
- indexing or classifying the resources using multiple schemes; and
- the application of metadata, such as the Dublin Core, for simple resource description in order to make e-learning resources more visible to search engines and retrieval systems, and to support interoperability.

The second-level library should also consider allowing users to search learning resources listed in the Web pages in a smarter way. These demands mainly happen when users want to search by article title instead of journal title and perform powerful searches of distributed learning materials as if they were part of a centralized resource.

The third level requires a further effort: cataloging e-learning items and making them searchable from the WebPAC. As the e-learning items are in various formats, accommodating these into WebPAC, fields 530, 590 and 856 need to be taken care of in order to indicate the location and access information (Weber, 1999; Jul, 1997). While creating a catalog record for individual items of courseware harbors some suspicions, incorporating bibliographic records for learning resources in local WebPAC allows the e-learning library not only to provide their users access to an integrated database of e-learning resources, but also to help users to find, through a single interface, books and learning resources alike with equal ease.

The highest level is to integrate the e-learning library into the e-learning system. E-learning

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systems can help instructors and learners keep track of individual skills and competencies, and locate, manage and track relevant learning activities by providing an environment where users can create, store, reuse, manage and deliver learning content from a central object repository, usually a database. E-learning systems usually have good search capabilities, allowing developers to quickly find the text or media needed to build learning content. E-learning systems can also enable users to submit and retrieve information and incorporate collaborative tools like chat, threaded discussions, email, white boards, Internet links, and so on, and these systems can help users keep track of learning progress, download and upload learning materials, and link to relevant resources.

Therefore, several functions exist in the e-learning library and the e-learning systems are very likely overlapped, such as providing learning materials and links to Internet resources, e-mail, mailing lists, electronic conferences, WWW, BBS, Newsgroups, forums, etc. The integration approach can avoid this annoyance. Besides, a reasonable integrated interface that allows access to the resources and services provided by the e-learning library and the learning system offers users the convenience of accessing simultaneous the WebPAC and several other databases with a single search query. This seemingly integrated system can be realized by different methods. For example, using "both front-end interfaces that convert differing search commands into one common command language and multi-language thesauri that translate terms used by one database into those used in another" (Vellucci, 1997), and describing the resources through a distributed metadata structure that is based on the XML standard and mapping such information to a centralized database to facilitate more efficient information retrieval (Papadakis *et al.*, 2002). These techniques of layering, exchanging, translating and mapping data also help to decrease the time, expense and proprietary problems involved without actually creating one genuine integrated system. However, some expected a genuine integrated environment where users have seamless, one-stop access to courseware, course programmes, timetables, exam programmes, learning resources, student records, move records between institutions, part of course in one institution, part in another, all library online functions, flexible and tailoring services, etc. (Ekmekçioglu and Brown, 2001).

The learning theory realization

It is not enough for the e-learning libraries to focus only on the collection, preservation and presentation of learning materials and services. To qualify themselves as an "e-learning library", they should try to correlate learning theories with their design.

The concepts of learning theories have been applied to the development of e-learning tools and systems for quite some time. The behaviorism ideas were realized through reinforcement schedules in the context of programmed instruction (Ravenscroft, 2001). To accommodate cognitive theory, Guimarães proposed to build the framework for the e-learning environment by providing learners with appropriate exercises in course pages, practical exercises with a problem solving structure, etc. (Guimarães *et al.*, 2000). Constructivists advocate that students be allowed and encouraged to take ownership of their learning thus ensuring that learning activities are more authentic and meaningful to them (Pantel, 1997). Meanwhile, since maturing Internet technologies are capable of providing an unparalleled technological foundation for designing innovative interactions that are highly engaging, communicative and participative, to formally render models of discourse into cognitive tools supporting effective educational dialogue and the design of pedagogical agents for "open worlds" have been suggested (Ravenscroft and Pilkington, 2000; Cook, 1998; Matheson and Ravenscroft, 2001).

These approaches are also addressing the need for the e-learning library to implement theoretically founded interaction models and designs that incorporate learning theories. For example, the e-learning library should preserve course resources provided by every individual instructor and break them into brief chunks, followed by questions and immediate feedbacks that reinforce correct responses (Ravenscroft, 2001). Tailoring and supplying just-in-time contents, effective media elements and learning maps can be used as means to comply with cognitive theory. A single best way of e-learning does not seem to fit all instructor and learners well, so the capability of providing personalized instruction and course contents is strongly expected. Therefore, it is important to apply different tactics to different instructors and learners, and this can be done through a "my e-learning library" system, in which "instructors", "learners", and "librarians" are allowed to log into the unique Web pages which contain individually relevant learning materials and massages. In addition, "my e-learning library" system can be designed to provide the visual learners with online course animations, hypertext or clickable diagrams and video clips, and the auditory learners with audio resources and archive digital audio files of

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class summaries on the Web (Ross and Schulz, 1999).

Another way to aiming for a much closer fit among learning theory, design, implementation and evaluation in the e-learning library environment is to integrate with the e-learning system, as many of the e-learning systems have incorporated some learning theories.

Conclusions

Libraries are essentially educational in purpose, but seeking momentous and meaningful manifestation in e-learning environments is not an easy process. Mere provision and connection to resources and services does not automatically provide a better learning environment for learners. Skilful guidance and tactical presentation from insightful involvement is required for designing the e-learning library. Most important of all, just as indicated by Mauger (2002), "What we need to realize is that e-learning is not smart *per se*. But it does require a smart environment". Therefore, the e-learning library needs to recognize and grasp the expectations of both instructors and learners, and get great support from its own staff and its parent organization. To these goals, three key recommendations are made. The first recommendation is to conduct a survey of student and faculty information-seeking and usage behaviors. The survey should not be limited to the use of library collections and services, but encompass all the resources that students and faculty use when they need information, in order to help libraries to understand how students and faculty find and use information, assess the quality of the information they find, and determine what information they want (Troll, 2001). The ensuing task is recommended to develop a series of case studies of libraries, content providers and educational organizations that have been innovative and successful in e-learning, and the cases studies will provide models to emulate or adapt (Troll, 2001). Thirdly, many believe erroneously that the implementation of an e-learning system marks the end of the initiative. To the contrary, it is only the beginning. Once in place, the e-learning library system must be evaluated, its effectiveness determined, and improvements and refinements incorporated on an on-going basis (Weaver, 2002).

Ideally, the e-learning library should have no difficulties to obtain learning materials from instructors, and feedbacks from learners. Thus, the library should encourage and build a culture of knowledge sharing, trust and willing collaboration, and maintain an atmosphere that is fair and
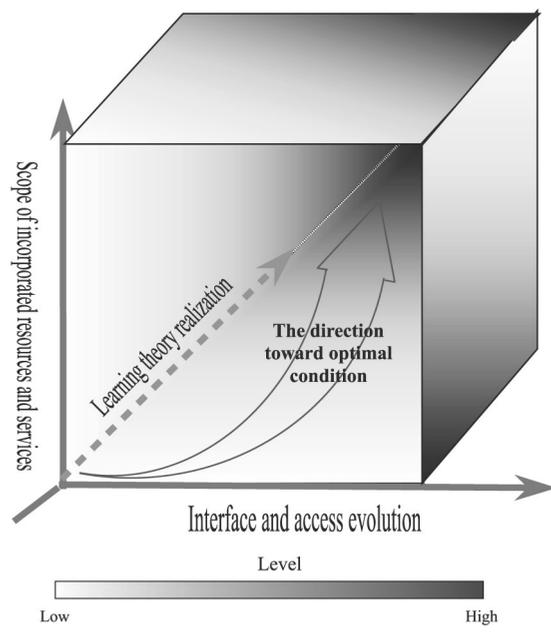
supportive. The e-learning library had better take the initiate to this approach by providing more value-added services and let it well recognized. For example:

- the library should involve actively in information literacy program; the program needs to match learners' and instructors' needs, and help them to construct knowledge map through the utilization of library collections and learning problem-solving strategies;
- the library should invite instructors and learners to determine the scope of the e-learning resources and the interface design and the access level; and
- the librarians should make good use of their expertise to assist instruction and learning activities, such as producing learning maps by applying the concepts of thesaurus and ontology (Guarino, 1995; Guarina and Giaretta, 1995; Qin and Paling, 2001), providing self-paced tests and Q&A, etc.

E-learning libraries can be categorized into different types, such as an electronic warehouse containing learning information, or a learning portal that offers instructors and learners consolidated access to learning resources from multiple sources. These types of "e-learning libraries" are able to establish a networked and Web-accessible information space in which users can discover, locate, acquire access to books, journals, archives, video, film, and sound recordings, online catalogs, finding aids, abstract and indexing services, e-journal and e-print services, digitized collections, geographic information systems, Internet resources, and other "electronic" holdings (Greenstein, 2000). However, this is not enough, "not so much because the technology is changing rapidly but because the audience is evolving more quickly than libraries may be prepared to accommodate" (George, 2002).

As shown in Figure 1, the preferable development of e-learning libraries can be assessed through three dimensions. Their success in supporting e-learning depends on the levels of enhancing the scope of incorporated resources and services, Interface and access evolution, and learning theory realization. In addition, these three directional developments are correlated; for instance, as mentioned earlier, the interface design should consider the application of learning theory.

The first prerequisite for the optimal e-learning library is the capacity to involve instructors and learners willing to share their resources and knowledge. Second, they should be able to provide all the relevant resources and services (i.e. the quasi-all-inclusive model), classify the resources

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Figure 1 The preferable development of e-learning libraries

and services into logical categories, and make the relevant materials easy to be searched and retrieved. Third, the e-learning library needs the right mix of:

- authoring and content-creation capabilities;
- support for a wide variety of content formats;
- robust model for creating and managing learning objects;
- scalable object repository;
- good search-and-browse capabilities;
- ability to personalize delivery of content;
- detailed tracking and reporting capabilities; and
- ability to allow users to trace and evaluate learning performance, take exams, and communicate with each other through a single interface.

Finally, no matter what kinds of e-learning libraries they are, they all require considerable efforts on the part of the involving library community and library managers to explore in some details how instructors and learners would act in the library supporting e-learning activities, what their needs and expectations are, and what the library can offer in an e-learning environment at present and in the future.

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