CD-ROM Use in e-Learning

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Abstract

The government of Egypt has devoted substantial resources to the area of educational technology in recent years. In order to provide the growing population of Egypt with quality, accessible, and numerous educational opportunities, both the government and the private sector are willing to develop alternative programs and delivering methods. The Internet is unquestionably an exciting medium for the delivery of educational content today. However, there are factors built into the Internet as it now functions that clearly limit the richness and depth of what an instructor can offer his or her students. This paper explores how CD-ROM technology can be used to augment e-learning courses.

Key words

e-learning, program usability, CD-ROM, Web-based.

Introduction

Beckstorm *et al.* (2004) carried out an investigation about Egypt readiness for e-learning deployment. Their report presented a summary of two significant government initiatives that should positively further the realization of e-learning in Egypt, namely the Internet and personal computer initiatives. Regarding the Internet initiative the Ministry of Communications and Information Technology (MCIT) is maintaining a free Internet access nationwide since 2002, with users paying only local dial up phone tariffs. As for the personal computer initiatives, affordable PCs and laptops have been made available to students and professionals with the option of monthly repayments of a low interest loan.

To bridge the digital divide in Egypt, MCIT launched the bold IT Club (ITC) initiative, designed to promote awareness and affordable access to IT to all Egyptian citizens including those in underprivileged areas. The main aim was to make Internet accessible and affordable to people with little or no prior experience of IT. In December 2003, there were 618 clubs with another 300 planned soon, each with an instructor available to train users in basic computer skills, software applications and web design. So far, about 100,000 users have made use of the ITCs (United Nations' report 2005).

E-learning is considered as a means of alleviating conventional educational problems that Egypt faces potentially providing solutions to challenges caused by overcrowded classrooms and lack of transportation. While Internet-based tuition is becoming increasingly prominent in higher education, there are clearly limits to the richness and depth of what instructor can offer their students.

Limitations of technical proficiency on the part of instructors and students can be overcome with training. Other limitations, however, are harder to circumvent. One of the most significant is the limitation in access and connection speed outside urban centers like Cairo. The majority of universities in these areas of the country benefit from better connectivity to the Internet than do many of their e-learning students in other regions of the country. One consequence of this disparity is that e-learning instructors must either reduce the sophistication and amount of the material distributed via the Internet or accept the loss of prospective students. Unfortunately, the students left behind are usually the very ones most bereft of educational alternatives and most in need of distance education.

This paper argues that CD-ROM technology, when used as a means for storing and sharing data, can ameliorate the current limitations of e-learning courses often been viewed as a competitor to the Internet. This view is perhaps based on the differences between both the content creation tools and the type of content normally associated with each medium. While CD-ROM production is normally the realm of professional content creators using complex tools, the Internet has developed as a medium for which almost anyone can create content. Over time, the public has confused the properties of the content normally associated with CD-ROMs with the properties of CD-ROMs as a delivery vehicle. It is the author's contention that, when CD-ROMs are used to deliver content made by tools used primarily for the Internet, the resulting hybrid has properties very advantageous to the e-learning instructor. CD-ROMs can be viewed in Internet terms as packaged bandwidth delivered at ultra-high speeds. Clearly, CD-ROMs cannot replace all the interactivity of an Internet-based course nor can the content be updated in real-time. On the other hand, most content in an e-learning course remains static for the duration of the course. Considering the poor connections available in most Egyptian cities, CD-ROMs become an attractive method for transporting static information, particularly if it is voluminous. As a complimentary method of delivering content worldwide, the CD-ROM is more than a convenience in many parts of the country; it may be the only realistic means by which Internet-based courses can be made fully available for many students. DVD disks are natural successors to CD-ROM, but are not yet in wide enough use in Egypt to be a viable alternative at this point in time.

A CD-ROM can be used to browse the web off line as it has the capacity to store vast amounts of textual content, including entire web sites. In the project on which this paper is based, text files, power point presentations and tests for entire course were transferred to a CD-ROM.

This paper will explain how CD-ROMs has been used in a Web-based Graduate Diploma in Computer Science (WBGDCS) project to allow students to access critical supplemental materials without necessarily having to connect to the university's server.

All courses were distributed on CDs pre-packaged with the necessary software (Browser, RealPlayer plug-in, Macromedia Flash plug-in, etc.). The project group opted to use CDs as a primary medium for distribution rather than the Internet for a number of reasons:

- **Portability**: CD-ROM drives are ubiquitous today and CDs therefore provide a medium that is accessible to a large percentage of users, regardless of their Internet connectivity.

- **Bandwidth concerns** : All of the WBGDCS courses were multimedia-intensive, and it is not always feasible to stream audio and video over the Internet due to network congestion and other factors. Furthermore, not everyone has access to high-speed Internet connections and thus for these users attempting to download large files such as PowerPoint presentations can be cumbersome.

- **Cost-efficiency**: CDs are a very low cost medium while still possessing a storage capacity for large amounts of content. Indeed, each WBGDCS course fitted on a single CD.

Technological Advantages of the Hybrid Internet/CD-ROM

An additional benefit of distributing content via CD-ROM is that the content creator does not need an expensive stream server, since the video is running from the CD-ROM. Moreover, in the author's experience, the quality of a video played from a CD-ROM is almost always better than the quality offered by an Internet connection.

Using a CD-ROM does not preclude the complimentary use of the Internet; it merely provides an alternate vehicle for the transmission of static content. Valuable Internet features not found in CD-ROM technology, like e-mail and discussion groups, can be allocated at available bandwidths. To use a CD-ROM, the student need not own a computer, though access to a computer is essential. Fortunately, access to computers can often be found at faculties, libraries, work places, Internet Cafes, and the homes of friends. One of the advantages of using an Internet-based CD-ROM is that it can be used without having to install any new programs on the host computer. This is an important attribute, given that public computers are often set up to forbid the installation of software. As long as the computer has an Internet browser, data can be read directly from a CD-ROM, as if it were a web site. Since the computer does not have to be connected to the Internet while a CD-ROM is being used, the user does not need to worry about accumulating charges or taking a telephone line out of service.

Requirements for a CD Project

Not every Internet project can benefit from the use of CD-ROMs. The content to be delivered must be specific enough to be containable within the 650 mega -byte limit of a CD-ROM. Multiple CD-ROMs are possible, but may be unwieldy.

The content needs to be fairly static. If the information is likely to be erroneous or out of date before the end of the project or the course, it should not be transmitted on a CD-ROM. Of course, updated CD-ROMs can be sent out if new data becomes available. The problem is that arrival and delivery times must be guaranteed once a project with a specific completion deadline is underway. The content creator can still use a CD-ROM if most of the data is relatively static and the parts of the data that do change can be isolated and delivered either via a website, e-mail or by additional CD-ROMs. The content of the WBGDCS CD was static. The student's, however, were dynamic. We therefore used a logon page (as shown in figure 1) to check the users' identity and for each test we recorded his/her result in a database stored on their computer.
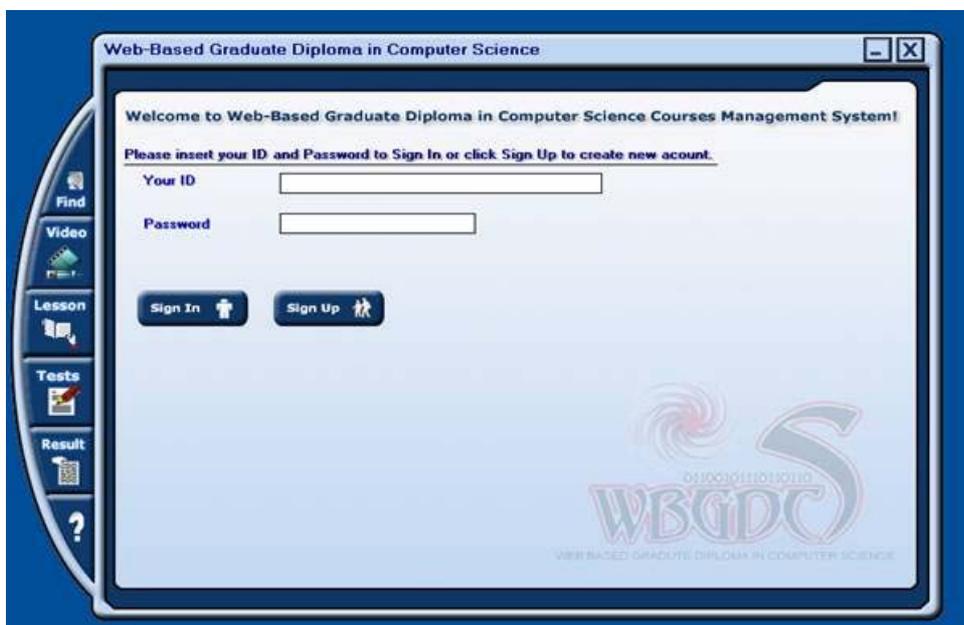
Figure 1. Logon page

Design principles underpinning the development of WBGDCS CD

The design of the WBGDCS CD was underpinned by a number of social constructivist principles about the nature and process of effective learning, principles which have underpinned the design and evaluation of much recent multimedia. Foremost amongst these are the key constructs of: 'situated cognition' and 'cognitive apprenticeship' (Brown, Collins & Duguid, 1989; Lave & Wengler, 1991); 'scaffolding' (Herrington & Oliver, 1997; Mc Loughlin, Winnips & Oliver, 2000; Winnips, Collis & Moonen, 2000); 'authentic learning and assessment contexts' (Lebow & Wager, 1994); and learner reflection and responsibility for learning (Jonassen, 1991; Herrington & Standen, 2000; Squires, 1996). The WBGDCS CD was informed in particular by Herrington and Oliver's (1995) list of criteria fundamental to the design and development of multimedia within a constructivist model (extrapolated from a review of literature on situated learning).
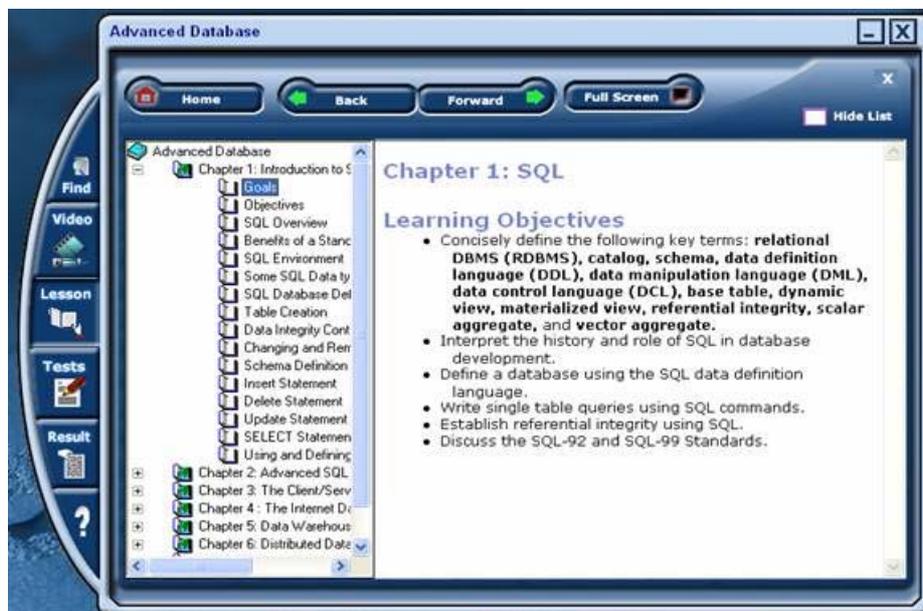
Figure 2. Easy navigation

Navigation

As both Laurillard (1993) and Elin (2001) note, a key challenge in the design of instructional and educational multimedia is to ensure that, while users are provided with quality content that supports learning processes, they are also provided with transparent control over how they investigate, interact with and interpret the domain knowledge of a multimedia application. Navigation control for effective usability (Nielson 1994, Elin, 2001) was incorporated into the WBGDCS CD as illustrated in figure 2:

- At the top, there are *Home*, *Back* and *Forward* buttons for navigation through the content of the course.

- At the left, a hyperlinked *Table of Contents* communicates the hierarchical nature of the hypermedia linking structure (Oliver & Herrington, 1995) and provides users with a 'map' of the contents.

- A *Find* function allows users to look for a specific word across the course, as shown in figure 3. If the user looks for example for 'asp', the two results shown will be presented.

- A *Video* function allows users to watch a video lesson of a course.

- A *Test* function allows them to practice as shown in figure 4. The questions of the current chapter will be presented with a new navigation button at the top of the screen, and includes *Previous Question*, *Finish*, and *Next* Question as well as a timer. Once a student presses the *Finish* button, the report of the current test will be displayed as presented in figure 5.

Find page

Figure 3. Find page

Test page

Figure 4. Test page

Results for current test

Figure 5. Results for current test

- A *Result* function allows users to see the report and grades for all the tests they have completed. Moreover the correct answers will be available for the learners to enhance their understanding (see figure 6).

- A *help (?)* function with advice on how to use the CD.

Usability and Reuse

Although the emphasis on software usability has grown in the past twenty years since software designers and developers attempted to incorporate principles of human-computer interaction into their work, some designers have suggested that concerns for usability have not been truly integrated into the design and development of educational software (Levi & Conrad 2000; Pavlik 2000).

In our project we worked from the outset in close collaboration with the developers who first created a template which was then used for all WBGDCS CDs. The result is that all WBGDCS CDs have a standard user interface thus providing the necessary consistency.

Evaluation

While no formal evaluation of the CD-ROM has been conducted, anecdotal reports suggest that the primary source of problems with the CD was the user's lack of familiarity with *Find* function since it was designed to search first over the Internet and not on the CD. When no Internet connection was found, a warning message appeared which caused confusion among the students. Most learners were excited and pleased with the CD. However, a small, but significant, group was disappointed, not because they did not

have access to computers but rather because they had assumed the CD-ROM would not operate on their operating systems. For the most part, their assumptions were incorrect, but their concerns highlighted the need for strengthening the students' belief in this approach to learning.

Conclusion

The fragile and expensive Internet connections make CD-ROMs a valuable alternative as bandwidth issues will probably continue to exist for some time. With the advent and broad distribution of reasonably priced DVD technology, the reasons for using "stored bandwidth" will become even more obvious. In fact, DVD technology will allow for the inclusion of high quality video and other resources that go beyond the capabilities of the Internet at this point in time.
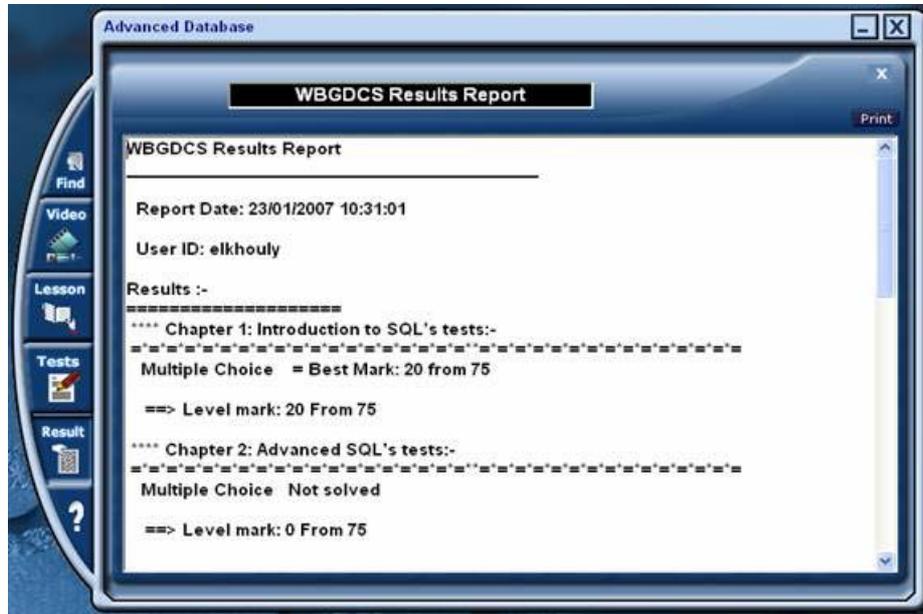

Figure 6. Test results for all chapters

The primary "lessons learned" from this Project include:

- A combination of CD-ROM-based and web-based courses can be used to develop comprehensive content delivery media, and many of the features and tools embedded within a CD-ROM such as learner logger, standardized browsers and plug-ins, and an extended search facility carried over well to this new domain.

- The intuitive interface of the CD-ROM, its user-friendly navigation, and the easy installation process were crucial for reaching the broader WBGDCS community of learners.

- The fact that the WBGDCS CD only operates on Windows platforms was not a major issue.

Acknowledgments

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