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ABSTRACT

This paper describes the development of a database-driven World Wide Web-based tutorial to support pre/in-service teacher education in learning Web page creation. The paper focuses on querying the tutorial database. Advantages, disadvantages, software and hardware, and revisions are reported. Contains 10 references. (MES)

Leaner-centered WBI Tutorials

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Abstract: Current online tutorials were limited to one-way distribution. The learner was unable to negotiate what they wanted to learn and how they wanted to learn. A database-driven tutorial was designed to implement learner-centered pedagogy. A web-based database-driven tutorial was used to support pre/in-service teacher education in learning of web page creation. Pros, cons, and revisions are reported in this paper.

Current Problems

Current computer-based tutorials have been constructed with a linear approach; learners go through a long list to select one, or more, tutorial(s). Contrary to the learner-center instruction theory, current tutorial design does not provide an opportunity for the learners to negotiate and reflect on what they need and want to learn. The tutorial "feeds" learners information that is unnecessary mingled with information they need. The tutorial instruction is not individually customized. The current schemas require time-consuming efforts to select the desired tutorial. These maneuvers neither provide the opportunity for learning nor encourage critical thinking during the learning process.

Database-driven Instruction

Database-driven web-based tutorials engage more critical thinking and interaction in the learning process and are proposed to solve the deficits discussed above. This new design for a web based instruction (WBI) tutorial was applied to a graduate level course, EMC 598 Internet for Teachers, to support the creation of web pages. In this class, students learned how to integrate Internet technology into their classrooms. The content of the tutorial is creation of a web page utilizing three different HTML editing applications. Each time tutorial support for web page creation is accessed, a search function is required (Fig. 1) and performed that displays a duplicate of the current tutorial design (Fig. 2). The learner is required to negotiate, specify, and analyze their needs, then conduct a search on the database by specifying different field search criteria. The learner is able to specify the search criteria, subjects, and levels of skills, applications, and search parameters to negotiate the learning process. After the search is conducted, the database will generate the results with multimedia components, text, still images, and an animated demonstration with audio. The learner is not forced to accept all of the components rather the learner can customize their preferred components to engage this learning process. This design demonstrates a true learner-centered instruction.

Querying the tutorial database is the first phase of the Database Instructional Project, while filling in the database and designing the database structure are the second and third phases of the project. This paper focuses its discussion upon querying the tutorial database.

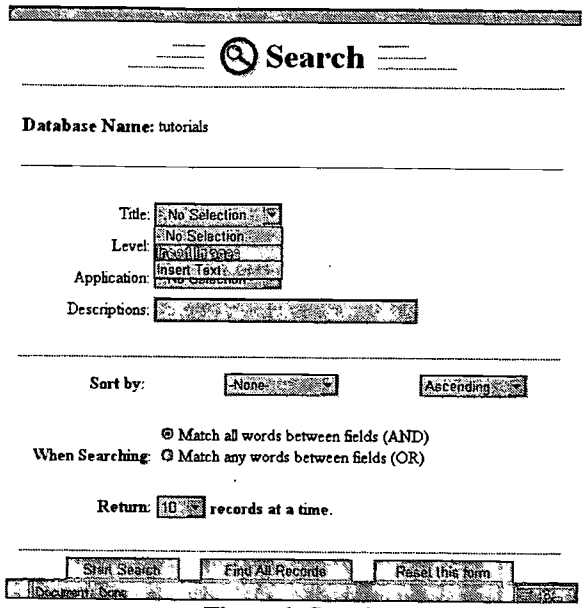

Figure 1: Search

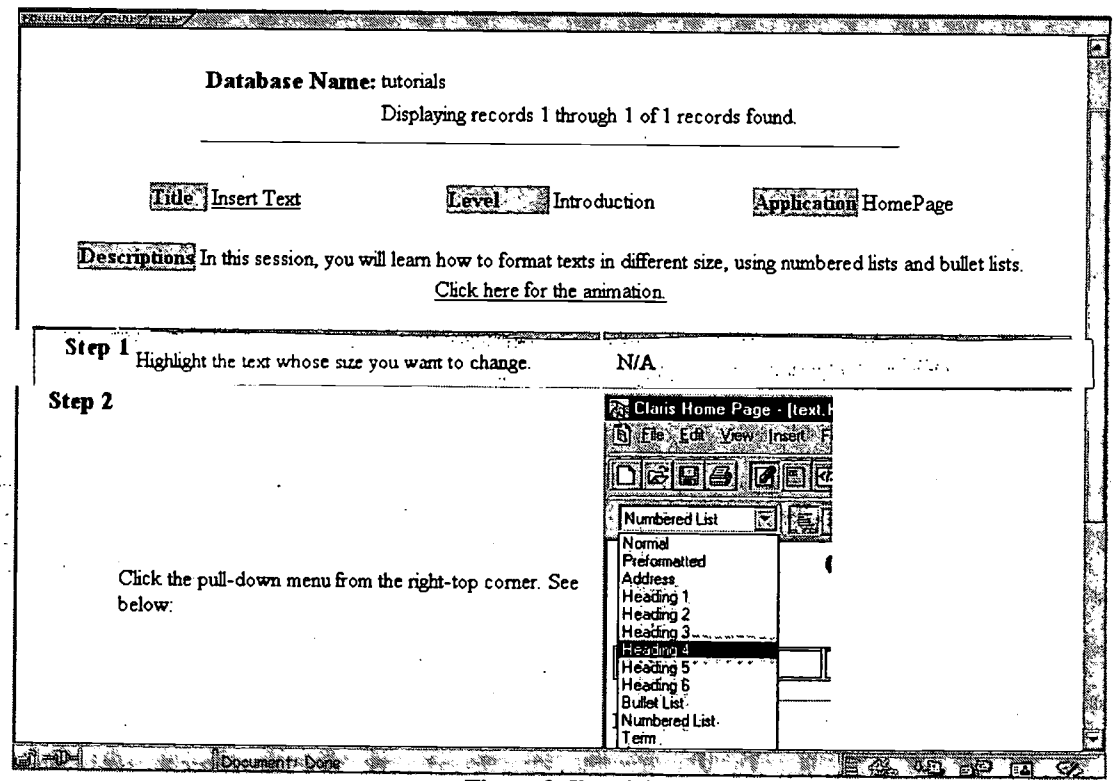

Figure 2: Tutorial

Rationale

Students are engaged in critical, creative, and complex thinking through utilization of learner-centered WBI tutorials. Querying a database requires that learners evaluate the questions and determine a strategy of searching

and sorting to answer their query. For example, to learn how to insert texts, learners need to search the field of subjects, identify their HTML levels, and evaluate the media format field. Thereby, learners are required to recognize fallacies, verify information, recognize patterns, and identify assumptions, ideas, and sequences of information, while comparing and contrasting information, using logical deductive thinking, and identifying causal relationships.

Fewer creative thinking skills are involved in querying a database. Querying a database requires learners to predict, speculate, visualize, and intuit responses. Answering queries effectively requires that learners develop a "feel" for the database and its contents.

A number of complex thinking skills are required for querying a database. Learners need to sense and formulate problems and apply problem-solving skills. Decision-making requires that learners make a selection and evaluate their choices when the search results are available. If the search results are not satisfactory the learners are required to find alternatives as an element of the problem solving process. These designing, problem solving and decision-making processes engage learners in developing complex thinking skills.

Literature Review

Literature reporting the use of a database to support instruction is scant. A few articles regarding knowledge-oriented database designs and designs producing thinking skills were identified. Rooze (1988-1989) observed that preparing and searching a database would help students analyze, synthesize, and evaluate data, but stressed the need to distinguish between teaching how to process information and how to think. Further, Rooze (1988-1989) appreciates the database as a tool in teaching social studies but maintains that the primary goal is to teach thinking skills. Watson and Strudler (1988-1989) designed a lesson based on Taba's Inductive Thinking Model that provided a set of strategies to enhance the teaching of higher order thinking skills with the use of databases. Students were expected to analyze, synthesize, and evaluate information to engage in higher order thinking.

Knight and Timmons (1986) discussed the advantages and limitations of database software in meeting the educational objectives of history instruction. Many studies on utilization of databases were conducted in the field of history education. They all concluded that the database helped students to appreciate the content, strengthen critical thinking skills (Little, 1995; Mernit, 1991; Miller, 1995), and produce a higher order of thinking (Pon, 1984).

Database instruction on the Internet is a giant step forward. Student publishing and peer evaluation were used to enhance learning by graduate students on a web-based database-driven system of instruction (Tu, 1999). Tu (1999) concluded that web-based database-driven instruction enhanced students' critical thinking, and knowledge construction, and provided learner-center environments. More interactions were identified as well. In this class, students post their assignment to the proper web fields, such as the title field, the body text field, keyword fields for the title and the target audience, and submit it. The assignments were converted into an HTML format and a searchable database upon submission because the keyword fields are created at the same time. Students are asked to evaluate each other's assignments by using an online evaluation form. Evaluations were available immediately after they had been submitted. It was concluded that web-based database-driven student publishing and peer evaluation increase the level of interactions.

Database is used to support instruction in problem solving. Foyle and Yates (1993) supported the use of databases in problem-solving activities. They concluded that when students developed their own databases they acquired significant social study skills and history skills.

Databases can also be used in computer-mediated communication (CMC) and in multimedia and hypermedia knowledge base instructions (Jonassen, 1996). Using a database to support CMC allows information retrieval and manipulation. One who has experience with manipulating data structure will be able to transfer to information-retrieval processes. This transfer will enhance their ability to search for information in any kind of knowledge base on CMC. Databases also provide a structure for developing multimedia and hypermedia knowledge bases. Database creation permits learners an opportunity to structure and manipulate information in a format that positively affects the use of information processes.

Advantages

The process of creating and manipulating a database is inherently constructive, meaning that learners are actively, mentally engaged in learning rather than merely reading or responding to questions. Knowledge construction is fostered through the intentional searching process and by linking information to the learner's own schema. Critical to the knowledge construction process is the articulation of the learner's behavior while performing a database search. This search facilitates and strengthens connections between elements of information and results in higher-order thinking and meaningful learning. This tutorial database, a learning environment that requires learners to reflect upon personal knowledge, and state their learning intentions, produces cumulative, progressive results for the group.

Another advantage of these database-learning strategies lies in the powerful searching and sorting capabilities of the database. The process of comparing concepts and relationships in the database is greatly facilitated by the speed and reporting capabilities of the tutorial database. Learners can search their databases in any number of ways, e.g. to provide an overview of all the subjects in certain HTML editing applications or to compare particular skills between or among different HTML editing applications, to arrange information to make more sense to them, to query all intermediate skills in certain applications or to use logical parameters, and/or to produce customized tutorials. This powerful querying ability allows learners to engage in different approaches to learn different web page creation skills.

WBI tutorial database, unlike other database designs, allows learners to access the Internet where browser access exists. The proprietary application is not required to access the tutorial database. The convenience of accessibility provides more opportunity for learners to engage in critical, creative, and complex thinking.

Disadvantages

The downside for the learner-centered WBI tutorial database was that the animated component required a plug-in for the client web browser. This caused several problems. The plug-in required for LotusCam was not installed on most web browsers. Therefore, it required the students to download and install the plug-in on their web browser. Many of students had difficulties installing the plug-in on their web browsers. Second, the AVI files require a great deal of server memory. With the tutorial growing, it fills the server memory quickly. Third, the web-based database-driven tutorials require a tremendous amount of time from the instructor or the instructional designer.

Software and Hardware

Various computer applications, FileMaker Pro, Claris HomePage, and Lotus ScreenCam, were used to create this tutorial database. FileMaker Pro 4.0 by FileMaker is used to create the database while HomePage by Claris is applied with use of CDML (Claris Dynamic Hypertext Language), a proprietary HTML, to create HTML pages. Collage Capture 1.0 and Lotus ScreenCam are used to create graphical tutorials and multimedia tutorials. The entire program is run on a PowerMac 7300/200 with 32 MB RAM installed as a web server.

Hardware requirement for installation of FileMaker Pro 4.0 is:

MAC
A Macintosh or Mac OS computer with at least 8 MB of RAM (16 MB or more recommended)
A CD-ROM drive
System 7.1 or later, or Mac OS 8 or later

PC
An Intel-compatible 486/33 PC or higher with 8 MB of RAM (16 MB or more recommended)
A CD-ROM drive
Windows 95 or Windows 98, Windows NT 3.51 or later, Windows for Workgroups 3.11, or Windows 3.1

Hardware requirement for installation of LotusCam for Windows 95 is:

PC
PCs 386 or higher
Windows 95
CD ROM media
VGA 16-color or higher graphics adapter and monitor
Parallel port or sound card-enabled device support by Windows 95
10 MB free recommended for recording

Hardware requirement for installation of Collage Capture is:

MS Windows version 3.1 or higher, MS Windows 95/98, or MS Windows NT, hard disk recommended
An IBM compatible 3-1/" high density floppy drive (for installation only)
2 MB of disk space to hold programs and files. Additional disk space is required to save your own images.
4 MB of available memory.

Hardware requirement for installation of Collage Capture is:

.PC
Windows compatible computer with a 486 processor or better
Windows 95 or NT 4.0 or later
12 MB RAM (16MB for NT)
CD-ROM drive (for installation)

Mac
Mac OS compatible computer with 68020 processor or higher
System 7.1 or later
12 MB RAM
CD-ROM drive (for installation)

Revisions

Several revisions are to be made after the student trials. First, the server is not robust enough. When a high demand occurs, the server was unable to process queries fast enough. This database is to be moved to a Microsoft Windows NT 4.0 server with a faster processor. Second, the plug-in required to run animated tutorials created downloading and installation difficulties. The file format for animated tutorials should be converted to a non-plug-in required file format or a common plug-in. Third, although FileMaker Pro 4.0 is able to process the tutorial database, it is not an efficient scalable database. During the publishing time, a plan moving from FileMaker Pro 4.0 to ColdFusion with Microsoft Access is planned.

Conclusions

Learner-centered WBI tutorial database empowers and engages learners in higher-order thinking, which results in better understanding. In this learning environment, learners are able to engage in interactivity with more independence, greater competency, and increased support. Querying the database in this tutorial database is the first phase of learning database instruction. The next two phases will engage in contributing, and designing the tutorial database. These two processes will advance learners' individual critical, creative, and complex thinking skills and engage them in constructive learning environments with collaborative learning and problem solving strategies.

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