

Design and development of a Computer Assisted Instruction (CAI) system in the area of bibliographic instruction

Soňa MAKULOVÁ – Stella KOROBILI

Introduction

The academic community in almost all disciplines is faced with new information sources continuously. Many library resources have been replaced by electronic ones.

The purpose of this study is to demonstrate a Computer Assisted Instruction hypermedia system that helps librarians and faculty to provide marketing students of TEI of Thessaloniki with the necessary competencies to locate and interpret the information they need. The product was one of the outcomes of the PhD thesis DESIGN AND DEVELOPMENT OF AN INTERACTIVE MULTIMEDIA TOOL:

A MODEL FOR A BIBLIOGRAPHIC INSTRUCTION COURSE IN A GREEK ACADEMIC INSTITUTION that was defended in June 2004 by Stella Korobili at the Department of Library and Information Science, Comenius University.

In attempting to prepare the instructional material, there were several concerns:

- the epistemological basis for the design and use of a hypermedia system,
- the technology that will facilitate students learning,
- the preferences of faculty, students and librarians regarding the content of the material,
- the links that will help learners to acquire knowledge in multidimensional ways,
- how evaluation of the performance of students will be handled.

The Epistemological Basis for the Design of a Hypermedia System

One of the goals was to develop a CAI hypermedia system which is consistent with the principles of instruction arising from constructivism. As a result this instructional material has been based on the following assumptions:

- Instruction should be considered as the process of helping learners to build their own knowledge and abilities through their interactions with texts, other people, and their own critical reflections (Brooks and Brooks, 1999).
- Learners should be helped to construct or interpret their own meaningful representations of the external world based on their own culture, experience, values, needs and desires.

This different perspective of knowledge has different implications to instructional design. Instruction should allow people the freedom to construct their own personal theories of the environment and should not try to impose the knowledge that the teacher or the authors of course texts construct (Lorsbach and Tobin, 2002).

For constructivists there is a need for instruction to take into consideration how each one learns and what each one knows. The emphasis is placed on the learner and not on the educator.

„This means that the paradigm of instruction has to change from standardization to customization, from a focus on presenting material to a focus on making sure that learner’s needs are met – a ‘Learning – Focused’ paradigm“ (Reigeluth, 1996).

In addition, constructivists state that information cannot be isolated of the content and knowledge cannot be acquired independent of the surrounding environment, because learners cannot identify how information will be used if it is presented in isolation. Learners should be presented with a problem to solve or project to conduct, with related cases, which will enable them to examine prior experiences and relate them to the current problem (Jonassen & Rohrer-Murphy, 1999). Jonassen (1994) suggests that constructivist design process should be concerned with designing environments, which support the construction of knowledge and provide a meaningful, authentic context for learning and using the knowledge that learners construct. Reigeluth (1996) emphasizes also the need for active learning through the use of authentic tasks. „This, in turn, requires a shift from passive to active learning. It requires a shift from decontextualized learning to authentic tasks“ (p. 14). Therefore, the development process of instructional design focuses on designing learning environments and not instructional sequences. There is no beginning task that must be completed before others. The same issues are addressed recursively over the design process and stakeholders take an active part and have a decisive input in the process of instructional design (Willis, 1995).

A learner may acquire skills and knowledge through the experience provided by acting in a simulated environment. Active simulations are excellent to relate the theoretical concepts to practice, the abstract to the concrete. “Simulations can be used to support vicarious experience in real or imagined worlds. They may support observation, exploration or task based activity” (Boyle, 1977, p. 36). In addition, multimedia can ask students to interact with the information, or use it, so as to integrate in a way the new information into their existing knowledge structure. Students can respond to questions and receive immediate feedback. This feedback should be considered as part of the construction of knowledge.

Methodology

Over the years, many instructional design (ID) models have been proposed. Most of the ID models were based on behavioral and information processing theories of learning. These models have dominated the field for over three decades and they have been criticized recently by a number of scholars. Willis (1995) criticized instructional system design models because of their behavioral foundation and listed eight characteristics of these ID models that he considered undesirable: the process is sequential and linear; planning is top down and “systematic”; objectives guide development; experts, who have special knowledge, are considered critical and central to ID work; careful sequencing and the teaching of subskills are important ; the goal is delivery of preselected knowledge; summative evaluation is critical; objective data are critical (p. 11).

The particular model that has been chosen for the design and development of the computer assisted instruction (CAI) system is the „Recursive, Reflective Design and Development (R2D2) model“ (Willis, 1995; Willis, 2000; Willis & Wright, 2000). This instructional design model uses two guiding principles, recursion and reflection through the entire design and development process of creating instruction. These two principles are the characteristics of a constructivist model in which the sequence is not linear. It may start at any of several points and may progress along with many different paths. Issues that are discussed in the beginning may appear again and again in more details during the development process. Even the goals may change radically during the development process. From this point of view constructivist instructional design is recursive or iterative.

Another principle that is equally important for the R2D2 model is the participation of stakeholders, including end-users, in the development of the instruction, not just in the evaluation process. In this study recursion was an ongoing issue in the form of feedback, which was provided by different groups. The revisions of the product derived from reflection from the stakeholders, which were: the end users (students of the Marketing Department), discipline experts (faculty of the Marketing Department), content experts (faculty of the Library Science Department and Librarians), instructional designers (students and faculty of the Informatics Department) and a graphic artist.

With respect to learner analysis, three studies were carried out. There were questionnaires addressed to the students and faculty of the Marketing Department and interviews addressed to librarians. However, learner analysis was also treated as an ongoing process since these stakeholders participated also to the design and development process of the product.

Design and Development of the CAI System

The format of this product consists of a five-part instructional package from which the user may choose activities. The product starts with a main table of contents screen, which introduces the sections of the program. Unlike a traditional table of contents, the sections are presented by a graphic. A circle in different color represents each section. The sections on the CD-ROM fall into five general categories: 'Overview', 'Hyperlinked text', 'Examples', 'Evaluate yourself' and 'Glossary'.

The 'Overview' introduces the students to the resources of the library and to basic approaches in doing research. Since the process of library research is thought as a series of interlinked problems to be solved, an overview of it was considered necessary. By reading or listening to the overview, the learner will be able to have a good sense of the interconnectivity of the different stages of the research process.

The 'Hyperlinked text' is a document, which presents the information in text only. It includes the following units: Preparing a topic for research, identifying the information sources of the library, applying research strategies and online searching techniques on a variety of databases, retrieving information from networking sources and finally evaluating and citing the retrieved information sources. The learner may choose from the contents pull-down menu any module to read, or any page of each module, if he/she feels like it. However, the learner may also read all the chapters from top to bottom.

In addition to the 'Hyperlinked text' the product includes also a database of examples and questionnaires which incorporate feedback for self-evaluation. The end user has the option to use any of these sections, or use them all. During the 'Hyperlinked text' students not only read about the topic in hand, but they can also carry out the examples of the text they read, or execute the exercises of the module, any time they feel like doing this.

In order to develop learning experiences or reinforce learned concepts students have the possibility to practice through the examples. The Examples section allows the users to materialize what they have learned in the Hyperlinked text. The examples can be accessed through the Hyperlinked text, by clicking on their titles, but also the learner can use this database by itself, allowing him/her to see the examples and execute searches either in sequence or choosing from the contents of the Examples section. Each example has a distinctive title, which helps the end user to decide which one he/she wants to see or execute. The examples are accurate reproductions of printed and electronic sources and incorporate simulation of real online simulation and graphics. Accuracy is strongly emphasized so that students will become acquainted with the library resources they are going to use for their assignments. As for the electronic sources knowledge can not be gained by reading a text. Hands-on experience is

required. The examples are based on resources that the library owns, on the OPAC and on CD-ROM or on online subscription services that the library of T.E.I. offers through its site. Since students need to know why they need to learn something and they are better motivated to learn when they see connections between instruction and real life situations, the examples are based on a scenario. This scenario refers to a working situation of a marketer who needs to examine the Societal Marketing concept. The marketer needs to examine the role of Ecological Marketing concept with regard to the cosmetics branch.

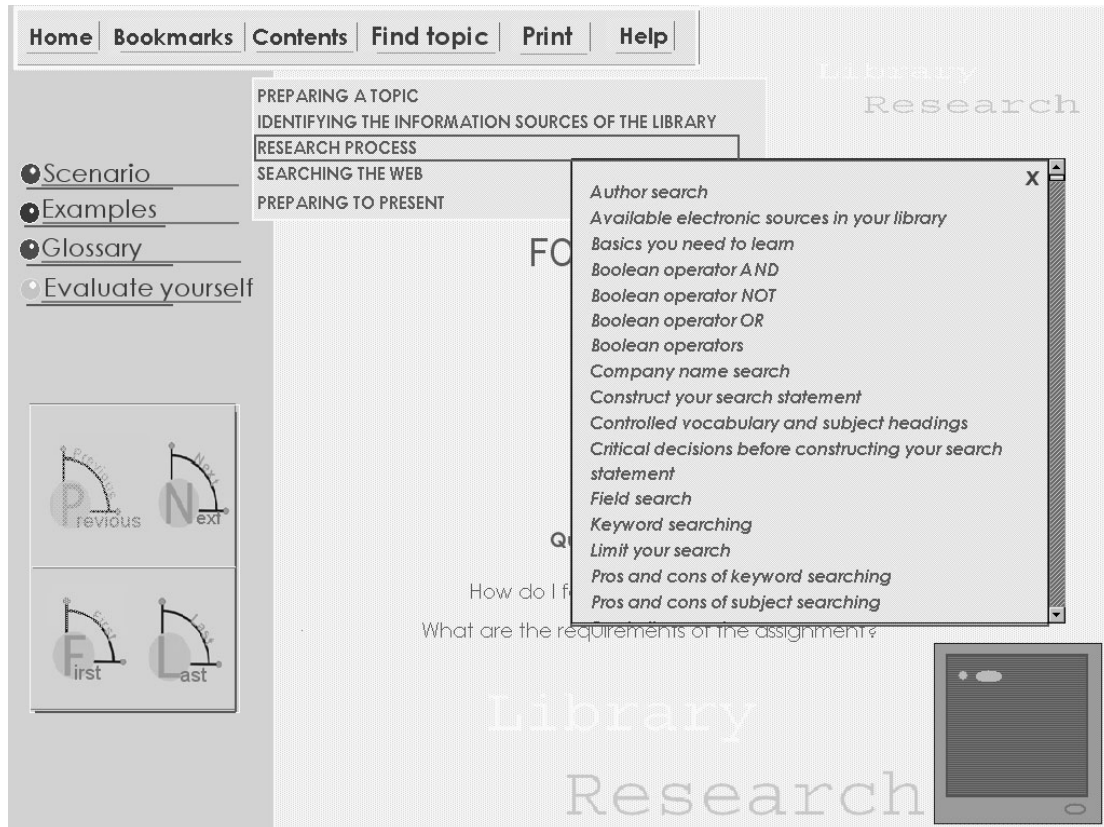


Figure 1 A page of a module of the 'hyperlinked text'

Students are encouraged to apply what they have learned in the exercises. To encourage student motivation, a self-evaluative component was included in the tutorial. The Evaluate yourself section is a series of questions that are posed to students who, individually or in small groups, may give their own answers on the computer. The objective was to allow students to use this part any time they wanted to explore their skills. A student may choose to do the exercises for a particular module after determining that it is the one most pertinent to his or her real life need. The Evaluate Yourself section contains animation and original graphics to illustrate various points. Some of the more sophisticated exercises involve typing as if performing real searches, while other exercises involve identifying parts of citations or an online public access catalog record, by clicking on them. In other exercises students have to use the mouse to drag words and put them in the right position. Once learners write, or choose their answer, they can see feedback, which is incorporated throughout the Evaluate yourself section. In other words, with the choice of each answer, the user learns not only if the answer is right or wrong, but also is given added information, which clarifies why the answer is right or wrong. Feedback is reminiscent of what students have read in the Hyperlinked Text section. Finally, the fifth section, Glossary includes definitions of all the terminology included in all other parts. The user may have access to the definitions any time he/she identifies the need. The definitions are presented orally and in writing.

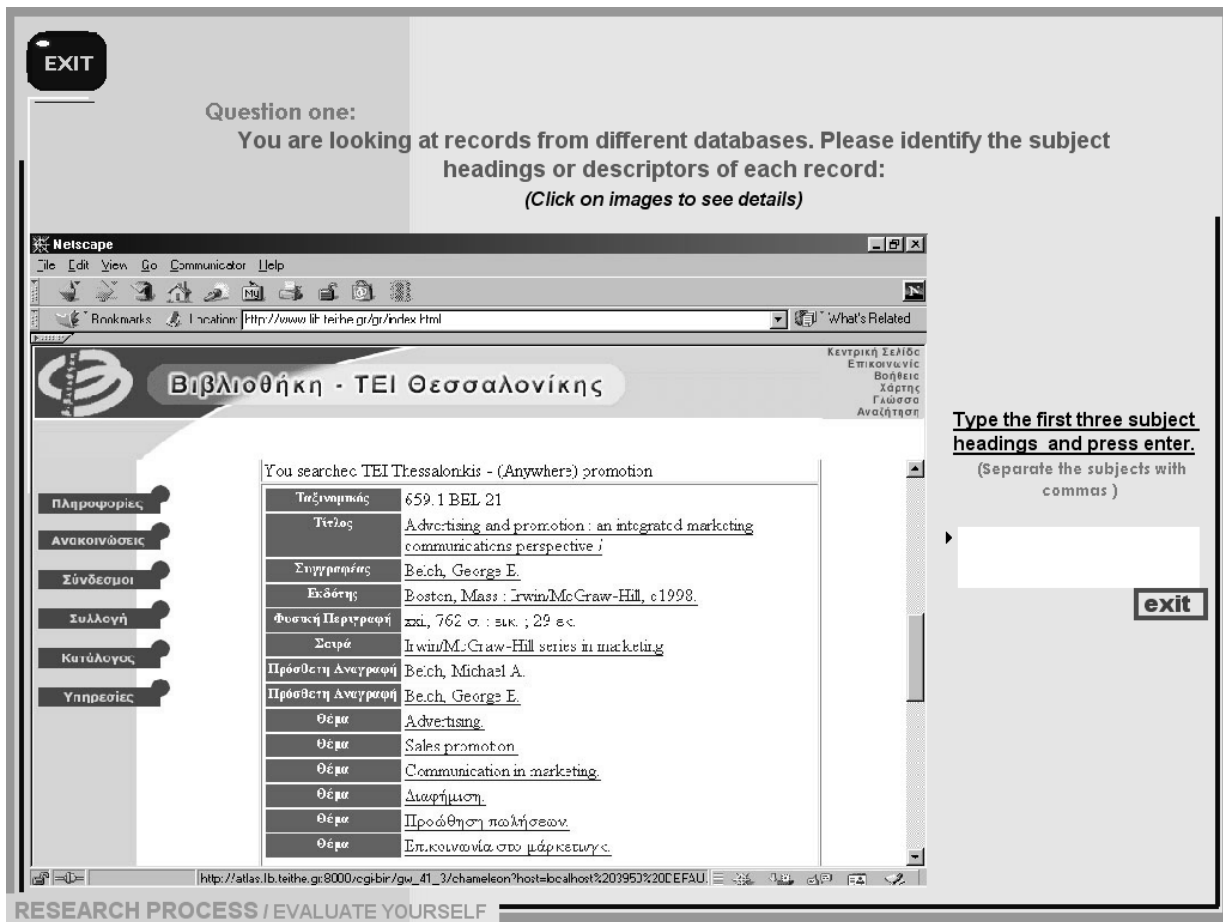


Figure 2 A screen of the 'Evaluate yourself' section

This CAI system allows students to follow a variety of pathways and control their return to any page they need at any given point. Very often the use of more than one window at the same time allows several functions to take place. The examples, definitions of important terminology, related pages and suggestions appear as a window within the window to allow simultaneous comparison and reinforcement of learned concepts. The 'Related pages' buttons allow learners to discover relationships with other pages included in the 'hyperlinked text'. The 'Keep in mind' buttons make suggestions and remind learners of other functions interconnected with the material they have in hand. The titles of the pages in the form of questions, as well as the 'Keep in mind' or 'Related pages' buttons have been used to make learners to examine and reflect to the problem. These buttons contribute to the promotion of non-linear thinking and make learners responsible for organizing information in multiple ways. In an effort to allow learners to further organize information in their own way and reflect on their own knowledge, there is the possibility for user-created bookmarks. "Bookmarks" allow learners to preserve records of the pages they prefer. They can focus their attention on their own choices, at their own time, reducing the load of information that is provided.

The learner is also allowed to print out the text, although hypertext cannot be printed out without losing its basic characteristics. Some learners might need to read the text at their own time. Other facilities provided are searching through pull-down menus the titles of the pages, and keyword searching. The learner can search, using the "Find" capability, any word from the titles of the pages, which are descriptive enough to allow keyword searching. Full-text searching is not included, since it retrieves many irrelevant records and creates confusion.

Conclusion

The presented CAI is an excellent tool for providing library instruction. Its main characteristics are:

- It is discipline-oriented. Students are more receptive to library instruction when they can see that there is an immediate benefit to their courses and/or assignments. They do not have to deal with all the sources that their library owns, but only with those that are useful for their information needs.
- It is based on authentic tasks. Instruction is placed in context and presents real needs for the students for the development of multiple learning experiences.
- It offers more than a medium. Text, graphs and sound are used to enhance learning. Animation and simulation of the research process are also included. These allow students to embed the same concept through different media and channels.
- It is flexible. Navigation aids provide students with a degree of freedom, allowing them to choose what they need to learn. Students can select instruction topics respecting the increased variety of student backgrounds, aptitudes, interests, learning needs and so on, allowing the advancement of their own learning, independently of others.
- It teaches concepts. Students are taught concepts as well as the mechanics of online searching. They are taught what is an index, or a thesaurus, how a database is constructed, what Boolean operators are, or what search engines or the invisible web is, or how they should evaluate resources. In the same time through 'Examples' they are shown the mechanics of online information retrieval.

Bibliography

Bednar, A. K. et al. (1995). Theory into practice: How do we link? IN: Algin, G. J. ed. Instructional technology: Past, present and future. 2nd ed. Englewood, Colorado, Libraries Unlimited, 100-112.

Bender, L. J. and Rosen, J. M. (2000). Working toward scalable instruction: Creating the RIO tutorial at the university of Arizona Library. *Research Strategies* 16 (4), pp. 315-325

Bren, B., Hillemann, B. and Topp, V. (1998). Effectiveness of hands-on instruction of electronic resources. *Research Strategies* 16 (1), pp. 41-51.

Brooks, J. G. & Brooks, M. G. (1999). In search of understanding: The case for constructivist classrooms. Upper Saddle River, New Jersey, Merrill Prentice Hall.

Boyle, Tom (1977). Design for multimedia learning. New York, Prentice Hall.

Bransford, J. D. et al. (1988). Learning with technology: Theoretical and empirical perspectives *Peabody Journal of Education* 64 (1), 5-26.

Caspers, J. S. (1998). Hands-On instruction across the Miles: Using a Web tutorial to teach the literature review research process. *Research Strategies* 16 (3), pp. 187-197.

Dewald, N. H. (1999). Web-based library instruction: what is good pedagogy? *Information Technology and Libraries* 18 (1), 26-31.

Dewald, N. H. (1999). Transporting good library instruction practices into the Web environment: an analysis of online tutorials. *Journal of Academic Librarianship* 25 (1), 26-31.

Jonassen, D. (1994). Thinking technology: Toward a constructivist design model. *Educational Technology* April, 34-37.

Jonassen, D., H., & Rohrer-Murphy, L. (1999). Activity theory as a framework for design constructivist learning environments. *Educational Technology Research and Development* 47 (1), 61-79.

Korobili, S. and Tilikidou, I. Characteristics and perceptions of faculty and students of the Marketing Department of TEI of Thessaloniki concerning information literacy. Unpublished.

- Liber, O., Olivier, B. and Britain, S. (2000). The TOOMOL project: supporting a personalized and conversational approach to learning. *Computers & Education* 34, pp. 327-333.
- Lorsbach, A. and Tobin, K. (1997). Constructivism as a referent for science teaching. National Association for Research in Science Teaching (NARST). [Internet] Available from: <http://www.exploratorium.edu/ifi/resources/research/constructivism.html> [20 January 2005].
- Newby, J. (2000). Evolution of a library research methods course for biology students. *Research Strategies* 17, pp. 57-62.
- Olson, J. A. (2000). How to encourage students in a library instruction session to use critical and creative thinking skills: A pilot study. *Research Strategies* 16 (4), pp.309-314.
- Reigeluth, C. M. (1996). A new paradigm of ISD? *Educational Technology* 36 (3), pp. 13-20.
- Reigeluth, C.M. and Squire, K. (1998). Emerging work on the new paradigm of instructional theories. *Educational Technology* 38 (4), 41-47.
- Sarmaniotis, C. and Tilikidou, I. (1998). Research of the information needs of faculty and students. Thessaloniki, T.E.I. of Thessaloniki (in Greek).
- Savery, J., R., Duffy, T. M. (1995). Problem-based learning: An instructional model and its constructivist framework. *Educational Technology* 35 (5), 31-38.
- Sein, M. K. et al. (1993). Visualization ability as a predictor of user learning. *International Journal of Man-Machine Studies* 39, 559-620.
- Willis, J. & Wright, K. E. (2000). A general set of procedures for constructivist instructional design: The new R2D2 model. *Educational Technology* 40 (2), 5-20.
- Willis, J. (1995). R2D2 A recursive, reflective instructional design model based on constructivist-interpretivist theory. *Educational Technology* 35 (6), 5-23.
- Willis, J. (2000). The maturing of constructivist instructional design: Some basic principles that can guide practice. *Educational Technology* Jan-Feb., 5-16.
- Yang, S.U. (2001). Synergy of constructivism and hypermedia from three constructivism perspectives—social, semiotic, and cognitive. *Journal of Educational Computing Research* 24 (4), pp. 321-361.
- Publication was done within the research grant project VEGA 1/2481/05 The Use of Information as a part of information behaviour in education and science.*

Elektronický doručovací systém MyBib eDoc

Katarína MARUŠIAKOVÁ – Daniela TÓTHOVÁ

Obsah termínu „dodávanie dokumentov“ sa vďaka technologickému pokroku posledných rokov presunul od procesu dodávania papierových kópií, ktoré si používateľ musel prísť osobne objednať a prevziať, k dodávaniu elektronických kópií bez nutnosti priamej fyzickej prítomnosti objednávateľa.

Pojem „dodávanie dokumentov“ (DD), resp. elektronické dodávanie dokumentov (EDD), teda v súčasnosti znamená, že všetky transakcie pri dodávaní dokumentov sú vybavované elektronicky - od objednávky cez príjemcu až po konečný dokument v elektronickej podobe (Planková). Pretože termín elektronické dodávanie dokumentov v niektorých výkladoch zahŕňa aj nákup dokumentov alebo ich častí v elektronickej podobe prostredníctvom komerčných dodávateľov či agentov a tiež súčasť ponuky nakladateľstva, prípadne niektorého zo sprostredkovateľov (napr. subskripčnej agentúry) pri sprístupňovaní elektronických verzií periodík alebo