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HYPERMEDIA "WWW" FOR LIFELONG LEARNING

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Hypermedia environments allow users to access different information supported by text, video, sound, graphics and pictures, and the possibility to go through that information via different paths according to their interests or needs (Conklin, 1987). These environments have been pointed out as potentially successful sources for learning due to their non-linear organisation of information. However, some navigation problems have arisen. Large amounts of information and a huge number of links lead to learners disorientation. This disorientation in complex environments has been referred to as *lost in hyperspace* (Conklin, 1987; Kim and Hirtle, 1995).

Cognitive Flexibility Theory developed by Rand Spiro and associates offers a constructivist theory of learning and instruction that emphasizes the real-world complexity and ill-structuredness of many knowledge domains (Spiro et al., 1991). They argue that neglecting problems related to content complexity and irregularity in patterns of knowledge use leads to learning failures. These learning failures are characterized by conceptual oversimplification and the inability to apply knowledge to new cases. Their solution to learning deficiencies related to domain complexity and irregularity requires the presentation of the same items of knowledge in a variety of different ways and for a variety of different purposes. Multiple perspectives allow the learner to build a deep understanding of the subject matter and to develop cognitive flexibility. When learners have to deal with new situations they can assemble knowledge flexibly and transfer it to the new situation (Jacobson, 1990; Jacobson et al., 1995; Carvalho and Dias, 1997).

To develop cognitive flexibility, flexible learning environments are required. Hypermedia systems due to their multidimensional and non-linear presentation of knowledge are ideally suited for fostering cognitive flexibility. The user doesn't feel lost in a hypermedia environment developed according to Cognitive Flexibility Theory (Spiro e Jehng, 1990) as you could verify on our experiment (Carvalho and Dias, 1997).

Cognitive Flexibility Theory is case-based and each case should be divided into mini-cases, which are the focus of instruction. Spiro and Jehng (1990) refer to them as "bite size chunks". Another important aspect of the theory is the selection of themes which allow the multiple perspectives mentioned above.

The developed hypermedia prototypes, according to this theory, have three paths with no pre-established sequence to navigate on them. One of them focuses on the deconstruction of each mini-case through several themes that apply to it. Each explanation about how a theme applies to that particular mini-case offers a new perspective and consequently new and deep understanding is

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built. Another path presents a topic which is related to one, two or more themes. This topic allows the learner to go through pertinent mini-cases and respective themes. The learner "criss-crosses" the mini-cases in many directions with different intentions according to the designer's pre-specification. The last path allows the learner, according to his needs or curiosity, to search for a combination of cases and themes. A list with search results will show up.

In our research, we have validated the theory, applying it to literature, particularly to the study of a novel (Carvalho and Dias, 1997). We used three groups to validate the theory and to analyse the importance of each path on learning. Our sample was a volunteer one, third-year university literature students. In short, we concluded that the group who worked with all Cognitive Flexibility Theory (CFT) facilities had the best results. The second group who hasn't had access to "criss-cross" in any direction, got similar results to the CFT group. We think that these results are due to the fact that literature students are familiar with "criss-crossing" novels for answering a topic. The third group, had no access to the explanation of how a theme applies to a particular mini-case. This group had the lowest results. We may conclude that the "deconstruction" process is an important one, at least in the literature field.

The students answered to a Questionnaire of Opinion about the hypermedia they had been working on and they reported to have enjoyed the experience. Moreover, they would like to have other hypermedia to support their modules, because they realised that they could learn a lot in a few time, they could learn at their own pace and have control over their learning. They enjoyed feeling as autonomous learners in this experiment.

We think that autonomy is a very important skill that students have to attain during their course and it is a vital one during their lifelong learning process. The world is changing so fast that professionals need to update frequently their knowledge. Sometimes it is possible to attend some courses, but other times we have no time, we need to access information very quickly. When we need fast and reliable information the World Wide Web is a relatively "new" solution for looking for information and for lifelong learning.

The concept of lifelong learning was first introduced by Edgar Faure and his associates in 1972 and subsequently adopted by Unesco as a blueprint for educational reform (Knapper, 1988). Later on Henri Holec's report for the Council of Europe in 1979 gives attention to the concept of permanent education. If learning is to take place throughout life, such learning cannot be confined to formal educational institutions. Adult learners sometimes want or have to undertake a course but they can't afford to go to university, so distance education appears as a solution for further education.

Distance education is a solution in several countries like Austria, Canada, ex-USSR, China, South Korea and Thailand where great physical distances limit access to school. Distance education has relied on traditional media like print, audio tapes, radio, and television. Even the British Open University relies basically on traditional media. Hypermedia environments, specially open environments such as the WWW are recent and adequate sources for distance education. They are a motivating support for learning because the intensive level of interaction between learner and the information is a stimulating and active form of learning. Learners can look for information at their own pace, according to their goals and they get more easily involved in the learning process. The learning process is flexible in regard to the times and places in which learning can take place. Effective lifelong learners are continually reflecting on previous learning and experience, reconfiguring it into new schemes of experience (McNair, 1996). Autonomy is as much about attitude and motivation as about

circumstances (McNair, 1996) so we intend to offer an opportunity for literature students and teachers to learn through distance education something about the novel "O Primo Basílio", by Eça de Queirós, a renowned Portuguese author of the 19th century.

Our hypermedia "O Primo Basílio: múltiplas travessias temáticas" (*Cousin Basílio: multiple thematic criss-crossing*) is now being implemented on the World Wide Web. We believe that hypermedia and particularly the World Wide Web can be the future for both distance and lifelong learning.

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