



Chapter VI

Web Learning with Nestor®: The Building of a New Pedagogical Process

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When designing a new computer-supported course, special attention has to be devoted to the design of human-computer interaction (HCI). When the course is Web-based and thus takes the form of an hypermedia, then navigation issues are some of the main concerns in the course HCI design : Special attention should be given to the design of the course structure and to the navigation features which very often come as an outcome. This is even more important in the educational domain where learners are novices in the domain to be learned, and thus, efficient navigational aids cannot be based on their knowledge of the domain structure. This is a key recommendation when the course is a stand-alone closed hypermedia corpus. But more and more often, new Web-based courses take advantage of interesting resources which can be found on the Web and tend to let the learner free to wander on the open Web. Then a smart design of the course navigation model, although still crucial, is not sufficient. New navigation aids have to be incorporated in the browser itself. For this purpose, we have developed NESTOR, a new Web browser which provides learners with means allowing them to organize their navigational experience. NESTOR's approach is to provide an interactive, stimulating environment where the learner's expertise is deployed, rather than drawing on knowledge held in some expert model as in a knowledge-based system. In that view, we suggest that NESTOR promotes a constructivist approach to Web navigation support. Experimentation of NESTOR at EM-Lyon has been conducted during the last school-year in the domain of information and IT management in network companies with a population of a hundred graduate students. A specific Web-based course called "The Net Comp@ny" has been developed for this purpose. Both the constructivist approach which underlies the NESTOR software, and the pedagogical approach which was chosen to teach the domain combine and lead to the building of a new Web-based pedagogical

process. As coined by Kaptelinin with much soundness, the design of a new software tool ultimately amounts to the design of a new activity.

PART I : THEORETICAL BACKGROUND: HUMAN COGNITION AND WEB NAVIGATION

Accessing information on the Web: New Challenges for Electronic Navigation and Knowledge Construction

Navigation, whether in the physical world or on the World Wide Web, is a process whereby people determine where they are, where everything else is, and how to get to particular objects or places. Navigation in electronic information spaces is the process through which learners experience the domain content. The importance of navigation as a way to interact with computers has grown over the recent years. It appeared with hypertext, was popularized with the development of the World Wide Web, and it is about to pervade our micro computer's desktop through Microsoft's Active Desktop features.

However, navigation in an hypermedia information space—such as the Web—was undoubtedly considered too quickly as an exercise of freedom or even as a game promoting personal exploration and learning. If navigation incontestably constitutes an activity more open than the querying of a data base, it is not however a natural activity, imitating the processes of human mind. Hypermedia, contrary to a persistent idea, does not reproduce the organization of knowledge such as it would exist in human psyche. If the hypertext network structure is different from the hierarchical structure of data bases, it does not have the associative complexity of the bio-psycho-emotional, socio-cultural intelligence of human beings. When human thought unfolds, the subject establishes meaningful associations; in hypertext navigation, the user's associative path consists in activating links which have been prepared by another person, the hypertext designer.

There is a long history of research focusing on hypermedia usability and problems of hyperspace navigation, but these studies were performed on closed hypermedia corpus; whereas the World Wide Web is an open corpus which has new characteristics which call for more investigation.

Empirical studies shed light on Web user navigation strategies: (Catledge and Pitkow, 1995) confirm the observation of three categories of behavior (Cove et al., 1988):

- search browsing (when search is directed to a known goal),
- general purpose browsing or surfing (when search is guided by likelihood of interest),
- and serendipitous browsing (random browsing).

Bernstein (1991) argues that the value of hypertext lies in its ability to create serendipitous connections between unexpected ideas. Catledge and Pitkow also observe a behavior well known from pre-Web studies : users rarely traverse more than two layers in the hypertext structure before returning to an entry point. They note that “users tend to operate in one small area within a particular site”, using heavily the “back” command to explore the hypermedia subspace across a “spoke and hub” structure.

Users disorientation in closed hypermedia corpus (i.e. moderated information space) has been recalled for long. Like others (Ashmore, 1997), we observed that a graphical feedback—a map of the visited information subspace (Zeiliger, 1997), can «ease inadequacies in Web navigation» (Cockburn and Jones, 1996). Today, several Webmap-based new

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