

Chapter 7.5

Can Cognitive Style Predict How Individuals Use Web-Based Learning Environments?

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ABSTRACT

This chapter considers the question of whether Web-based learning environments can be employed to effectively facilitate learning. Several questions are considered around this issue, principally whether variations in hypertext architecture, and individual differences in information processing are salient factors for consideration. Furthermore, whether the effectiveness of learning depends precisely upon how learning is defined. Finally, differences in hypertext navigational strategies are assessed in terms of whether these can be predicted by individual differences in cognitive style. The chapter ends by concluding that the research on Web-based instructional systems is to some extent promising, although the field of cognitive style is diverse, and realistic predictions regarding the use of this construct in instructional design is, as yet, tenuous.

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INTRODUCTION

One of the salient features of web-based learning environments is that they can provide an explicit structure to instructional material, which should ultimately facilitate the learning process. For example, such structures can be designed to explicitly indicate the conceptual links between related information. The following chapter assesses the degree to which this theoretical position can be supported by the extant literature. More precisely, this chapter reviews the literature on how web-based or hypertext-learning systems have been employed in an educational context. We will consider issues such as the most facilitative hypertext architecture for assisting the learning process. Later in the chapter the evidence on the extent to which cognitive style mediates the effects of architecture are reviewed. Finally, evidence will be assessed regarding the way in which users navigate hypertext and how this may influence their comprehending of its structure.

BACKGROUND

Web-based learning environments are structured around hypertext systems, which allow conceptually related pieces of information to be connected or linked. Information on one page in the system can be linked to a related piece of information contained in a separate page. Such systems are user driven, in as much as individuals can choose to be 'transported' or moved within the system to pages containing related information. Furthermore, web-based or hypertext systems can be structured in a variety of ways, and the way in which the system is structured is referred to as the system architecture. Typical architectures found in the literature are 'linear', where pages of information are linked sequentially, rather like they are in a book; 'hierarchical' where superordinate information is contained in pages higher up the system, and linked to more detailed information further down in the structure and 'relational', which is similar to the hierarchical architecture, although this structure also contains lateral links between conceptually related information at the more detailed level. This chapter considers the effectiveness of learning from web-based systems, and it is appropriate at this stage to consider the term 'learning', and the way in which it has been applied in the literature. Perhaps one of the most expedient notions of learning to consider in this respect is that offered by Bloom's Taxonomy of levels of learning (Bloom, 1968). In essence, Bloom advocated that learning could be arranged at different levels ranging from basic knowledge or recall, up to a more sophisticated type of learning manifest in evaluation or synthesis of material. The notion that learning can be applied at different levels is important to consider as we review the extent to which learning may be facilitated by web-based learning environments.

WEB-BASED LEARNING AND HYPERTEXT ARCHITECTURE

A useful starting point would be to question whether using different hypertext structures differentially affect learning performance. The earlier studies considering this question seem to suggest that mixed or relational web-based or hypertext systems appear to be the most facilitative. For instance in a study by Mohageg (1982) the issue of whether question answering performance would vary following delivery of learning materials via three different web structures or architectures was considered. The architectures used in this study were hierarchical, where the learning material was constructed such that more general information was contained higher up the structure, and more specific information lower down; network, where the information was structured in a complex system of links; and mixed which was a combination of the other two structures. The findings indicated that learning performance was poorest in the network architecture condition. However, there were no differences in learning performance in the other conditions. The interpretation of this finding was that as the mixed condition featured more links than the other conditions, this may have increased the learners' facility for learning. McDonald and Stevenson (1998) employed 30 undergraduate and postgraduate students in their study of web-based learning. They also used three hypertext architectures, which were hierarchical (as described above), non-linear (in which the information was constructed in a type of network) and mixed (hierarchical with lateral links). After using one of the three systems, participants answered ten questions on information they had read in the learning system. The findings revealed that those student participants who had used the mixed system found information quicker than participants in the other conditions, which is possibly due to the fact that the mixed architecture made it easier for the users to understand the overall structure. The

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