Chapter 5.18
Gender Differences and Hypermedia Navigation:
Principles for Adaptive Hypermedia Learning Systems

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ABSTRACT

Adaptive hypermedia learning systems can be developed to adapt to a diversity of individual differences. Many studies have been conducted to design systems to adapt to learners' individual characteristics, such as learning style and cognitive style to facilitate student learning. However, no research has been done specifically regarding the adaptation of hypermedia learning system to gender differences. This chapter therefore attempts to fill this gap by examining the published findings from experimental studies of interaction between gender differences and hypermedia learning. Analysis of findings of the empirical studies leads to a set of principles being proposed to guide adaptive hypermedia learning system design on the basis of gender differences in relation to (i) adaptive presentation and (ii) adaptive navigation support.

INTRODUCTION

Hypermedia systems have increasingly attracted the attention of educators and designers because of the adaptability that they afford individual learners (Large, 1996; Magoulas, Papanikolaou, & Grigoriadou, 2003). The potential of hypermedia learning systems rests in their ability not only to allow the retrieval and display of different media such as text, graphics, videos, and audio, but also to present information in a non-linear format and to accommodate learners with different characteristics (Jonassen & Grabinger, 1993; Nielsen, 1995). Such systems allow learners great navigation freedom and non-linear interaction with information. Learners are able to access and sequence information in accordance with their information needs (Lawless & Brown, 1997), which may enhance learning and "promote cognitive flexibility" (Triantafillou, Pomportsis, & Demetriadis, 2003, p. 89).

However, the great flexibility that hypermedia provides to learners also presents problems with regard to cognitive overload and disorientation (Conklin, 1987; Marchionini, 1988). Empirical evidence reveals that learners with individual differences benefit differently from hypermedia systems (Calisir & Gurel, 2003; Ford & Chen, 2000; Kim, 2001; Large, Beheshti, & Rahman, 2002; Last et al., 2002). One possible solution to cope with the problems is using adaptive hypermedia (Brusilovsky, 1996; Brusilovsky et al., 1998). Adaptive hypermedia systems possess the ability to adapt information to the specific needs of each individual learner by building a model of the user's goals, knowledge, and preferences (Brusilovsky, 2001). It is therefore the ideal way to accommodate the diversity of individual differences in hypermedia learning. Many studies have been conducted to develop systems that attempt to adapt to individual differences, including learning style (Carver et al., 1996; Gilber & Han, 1999; Specht & Oppermann, 1998) and cognitive style (Triantafillou et al., 2003; Magoulas et al., 2003). However, no research has been done regarding the adaptation of hypermedia learning systems to gender differences.

Gender differences have long been recognized as an important factor in student learning. Recent research reveals that gender differences also have a significant effect on student learning in hypermedia systems, with males and females demonstrating different navigation patterns and preferences toward hypermedia systems thus requiring different user interfaces and navigation support (Campbell, 2000; Large et al., 2002; Roy & Chi, 2003). This indicates that as the use of hypermedia learning systems has increased, so has the need to develop effective hypermedia systems that are adaptable to learners with gender differences.

In order to make hypermedia systems more efficient in catering for both genders, principles drawn from empirical evidence are urgently needed to guide the effective design of adap-

tive hypermedia learning systems. This chapter focuses on two core themes. Firstly, the chapter looks at how gender differences influence student learning in hypermedia systems by examining and analyzing gender differences using evidence from relevant experimental studies. Specifically, the analysis groups the research into four categories considered as important issues in the literature: attitude and perception; information seeking strategies; media choice; and learning performance. Secondly, building on the findings of the empirical studies, a set of principles is proposed to guide the design of adaptive hypermedia learning systems, addressing issues related to adaptive presentation and adaptive navigation support, and taking into account gender differences.

This chapter starts by examining and analyzing previous research on gender differences and hypermedia learning. Then it discusses the implications of gender differences for the design of adaptive hypermedia systems and presents principles and guidelines for designing adaptive hypermedia learning systems that accommodate individual differences through system adaptation on the basis of gender differences. Finally, conclusions are presented and future research areas are briefly discussed.

RESEARCH ON GENDER DIFFERENCES AND HYPERMEDIA LEARNING

As hypermedia systems have become more widespread in educational settings, a growing body of research has been conducted to examine gender differences in hypermedia learning. Research suggests that gender differences have significant effects on students learning with regard to their information seeking strategy, navigation pattern, and preference toward the presentation of different media. However, no research has specifically looked at adaptation of hypermedia learning systems with respect to gender. This

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