



Literature Review

Learning style based individualized adaptive e-learning environments: Content analysis of the articles published from 2005 to 2014



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ABSTRACT

The studies on creating learning environments based on differences in learning styles have gained importance in recent years. Learning styles are one of the most important parameters in determining individual differences. Accordingly, traditional web-based learning environments have been replaced by individualized adaptive e-learning environments on the basis of learning styles which are more innovative. This study deals with the content analysis of the recent studies on Adaptive Educational Hypermedia (AEH) based on learning styles. 69 articles published from 2005 to 2014 were obtained through a comprehensive and detailed review. Afterwards, these studies were subjected to document analysis. The studies were categorized under the titles of purpose, nature, method, characteristics of examinees, level, data collection tool, learner modelling, learning styles, subject, and findings. Some of the studies offered a framework or proposed a model for AEH while others focused on the influence of AEH on academic achievement and learning outputs as well as learning satisfaction. This study examines the existing tendencies and gaps in the literature and discusses the potential research topics.

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1. Introduction

Learning is a complex and difficult process. Several parameters such as perception and operation of knowledge by individuals, their general skills, their developmental features, and environmental

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factors play an important role in this process. There is no doubt that learning process affected by a lot of different factors will offer different things to individuals. Results of several studies show that taking into consideration these differences while designing learning and teaching environments increases the effectiveness and efficiency of learning activities (Bozkurt & Aydoğdu, 2009; Demirtaş & Demirkan, 2003; Veznedaroğlu & Özgür, 2005). The environments where learning differences and learning needs are taken into consideration provide students with what they need (Brusilovsky, 2001). Integration of information and communication technology (ICT) into educational environments has made important contributions to learning processes (Drigas, Ioannidou, Kokkalia, & Lytras, 2014; Zhang, Ordóñez de Pablos, & Zhu, 2012). This technology has accelerated developments in e-learning environments and their individualization.

The terms of adaptive and adaptable are frequently used for the individualization of learning environments in literature (Lee & Park, 2008). The essential point in designing adaptive learning environments is making adaptation based on what is to be taken as a basis for adaptation. In other words, which features of students are to be used and how they are to be used are among research subjects. Learning style is one of the most important parameters to be used for taking into consideration individual differences while creating adaptive learning environments (Graf, Liu, Kinshuk, Chen, & Yang, 2009; Liegle & Janicki, 2006). Learning style is described, in general, as learning choices and learning differences of an individual (Dunn & Dunn, 1978; Felder & Silverman, 1988; Veznedaroğlu & Özgür, 2005). There are lots of studies investigating the efficiency and effectiveness of the learning environments created based on learning styles. These studies claim that learning taking place in the environments which are suitable for learning styles have positive effects on remembering and using knowledge and on the attitudes of students towards course/subject (Bozkurt & Aydoğdu, 2009; Demirtaş & Demirkan, 2003; Kraus, Reed, & Fitzgerald, 2001; Mutlu, 2006). Accordingly, there are also studies concluding that learning environments based on learning styles influence students' academic achievement positively (Kraus et al., 2001; Own, 2006; Özyurt, Özyurt, Güven, & Baki, 2014; Popescu, 2010; Shaw, 2012).

Adaptable teaching methods can be used in both traditional class environments and technology aided environments. It is not possible to perfectly implement them in traditional classroom environments. Crowded class environments may prevent teachers from paying a specific attention to each student, teaching based on his/her features, and behaving flexibly (Brown, 2007; Popescu, 2010). This adversity in traditional class environments can be eliminated through technology aided environments. Creating a learning environment for each student based on his/her own learning characteristics in e-learning environments, which are the products of technology, is easier than creating it in traditional classroom environments. (Graf et al., 2009; Özyurt et al., 2014). Adaptive e-learning environments, which are referred to as Adaptive Educational Hypermedia (AEH) in literature, can provide individuals with individualized environments such as different learning strategies and sources, support for solution, and interfaces taking into consideration individual differences. (Brusilovsky & Peylo, 2003; Yasir & Sami, 2011; Özyurt et al., 2014). According to several studies, adaptive e-learning environments based on specific learning styles are more productive, create higher satisfaction level, diminish learning time, and increase the academic achievement of students (Graf, Liu, & Kinshuk, 2010; Popescu, 2010; Sangineto, Capuano, Gaeta, & Micarelli, 2008; Tseng, Chu, Hwang, & Tsai, 2008; Wang, 2008; Özyurt et al., 2014). Despite many studies demonstrating positive aspects of AEHs, there are also a few studies emphasizing their negative aspects. As a matter of fact, it is claimed that AEHs have no effect on the academic achievement

and learning experiences of students (Akkoyunlu & Soyulu, 2008; Wang, Li, & Chang, 2006), and habits such as free-riding and biases stemming from traditional education decrease the efficiency of these environments (Özyurt et al., 2014).

1.1. Literature review

Recently, research on individualization of web-based learning environments has gained speed. In this sense, there is a parallel increase in the number of studies focusing on e-learning environments individualized based on learning styles. The theories of these studies date back to the 1990s. Such theories started to be put into practice in the mid-2000s, and various applications have been developed in different fields since then (Özyurt et al., 2014). Brusilovsky (2001) presented general architectures, models, and taxonomies regarding AEHs. Besides, there are also content analysis studies regarding technology supported learning environments (Hsu et al., 2012; Hwang & Tsai, 2011; Shih, Feng, & Tsai, 2008). However, these studies often deal with traditional e-learning environments and mobile learning environments.

The present study concentrates on AEHs based on learning styles. It aims to analyze the articles in this field published in refereed journals from 2005 to 2014 through content analysis. The study focused on the period between 2005 and 2014 because research on AEH started to become widespread as of the 2000s. Though the foundations of AEH were laid in the 1990s, research in this field was put into practice in the 2000s as a result of developments in ICT and software technologies. Document collection and review were completed in the second half of 2014, and preparation for publication started then. This is why; the present study dealt with the period between 2005 and 2014. This study is expected to contribute to determining the current situation of the field, what kinds of studies are needed in the field, and the current trends in the field. Furthermore, the study is significant in that it intends to determine the current trends about AEH based on learning styles and gaps in the literature, which will guide the future studies. Besides, the present study is also important because it shows the situation in Turkey in addition to the international literature. This is because; having information about the current situation is of vital importance for the integration of such innovative e-learning environment into Turkish education system. This study can contribute to the development of more efficient and productive AEHs. In addition, the study is expected to guide e-learning environment designers on how to create e-learning environments with a strong pedagogical background. In this sense, the study seeks answers to the following questions:

1. What are the purposes, study natures, and methods of the articles on AEHs based on learning styles published from 2005 to 2014?
2. What are the participants, levels, subjects/areas, and learner modelling of the articles on AEHs published from 2005 to 2014?
3. Which data collection tools were employed in the articles on AEHs published from 2005 to 2014?
4. Which learning styles were employed in the articles on AEHs based on learning styles from 2005 to 2014?
5. What are the basic findings/results and summaries obtained in the articles on AEHs based on learning styles published from 2005 to 2014?
6. What is the situation in Turkey in terms of the studies in this field?

2. Method

This study which examines the AEHs based on learning styles published in refereed journals from 2005 to 2014 was conducted

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