

WHO NEED TO HAVE THE ABILITY TO MONITOR LEARNING: HUMAN OR SYSTEM?

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ABSTRACT

Several educational researches focus on monitoring: being aware of one's learning, analyzing learning tasks, reviewing learners' progress and making appropriate decisions according to monitoring. Two extremely different approaches from cognitive science and computer science deal with this complex and multi-faced task. This study discuss the importance of both approaches, metacognition, developing humans' ability to monitor learning, and adaptation , developing systems ability to monitor learning by drawing upon the insights within the literature.

KEYWORDS: *Metacognition, adaptation, e-learning systems*

1. INTRODUCTION

Monitoring learning to be aware of a student ongoing progress is seen as one of the essential components of an effective instruction both in traditional and e-learning systems (Azevedo, 2005; Azevedo & Cromley, 2004; Pintrich, 2002; Elm and Woods; 1985). Many studies in educational research literature were focused on this a complex and multi-faced task. However when the relevant literature examined, it is seen that there are two extremely different approaches examining this concern. While in the one side there are thousands of studies interested with metacognition, developing humans' ability to monitor learning, on the other hand a large amount of study concerned with adaptation, developing systems ability to monitor learning (Hwang, Chen, Sadiev & Li, 2011; Kim, Park & Baek, 2009; Wall, Higgins & Smith, 2005; Azevedo, 2005; Pintrich, 2002; Zimmerman, 1998; Knutov, De Bra, & Pechenizkiy, 2009; Lee & Brusilovsky; 2012; Dolog and Nejd, 2007; Jovanic et al., 2009). This study aimed to question the roles of metacognition and adaptation for monitoring from two different fields, cognitive science and computer science by drawing upon the insights within the literature.

From the early intellectual views of Socrates, it is commonly agreed on nobody can be educated including the all knowledge which they need to have in her/his whole lives. For that reason

one of the most important aims of education is considered as providing students to acquire skills about life-long learning. Especially with the rapid nature of information change, the adoption of new knowledge and skills has become much more important today. While, five decades ago learning to drive a tractor was an enough job skill for 40 years, now using a software program may be satisfactory skill for about 18 months (Moe & Blodgett, 2000, p. 228). American Society of Training and Documentation stated that the amount of knowledge in the world is being double every 18 months (Gonzalez, 2004). As a result, much attention has focused on easily adopting new knowledge, technology and/or products (Drucker, 1994, p.8).

Learning to learn which is also called metacognition is handled as one of the key competences for lifelong learning including abilities such as assessing task difficulty, monitoring task progress, and evaluating one's own comprehension and knowledge (Nelson-Le Gall, 1981; Newman, 1998; Ryan & Pintrich, 1998). Metacognition is defined as having "the ability to pursue and organize one's own learning, either individually or in groups, in accordance with one's own needs, and awareness of methods and opportunities" (European Parliament and of the Council, 2006). It refers to the individuals' awareness about their own mental processes (Beran, Brandl, Perner & Proust, 2012) which leads

students monitor their learning processes, be aware own strengths/weakness and adapt themselves according to new conditions. With the constant scientific and technological innovation and knowledge change in the world, the ability of individuals to manage their own thinking and adjust to new knowledge and technologies is becoming more important than their current state of knowledge. If individuals become aware of how they learn by reflecting on experiences, monitoring cognitive processes, etc., then they can easily adapt to new developments. Therefore, one of the basic elements of current learning programs should be a focus on improving learners' thinking skills about thinking. Metacognitive abilities also becomes much more important in e-learning environments in which learners need to make their own decisions such as where to go next, how to learn or which learning strategies (Azevedo, 2005; Azevedo & Cromley, 2004; Pintrich, 2002; Elm and Woods, 1985).

“One size does not fit all” paradigm bring education area the need of customizing learning process according to the student characteristics. It suggests that learning should be relevant to students and it must be considered that students learn differently, they process and represent knowledge in different ways, and they prefer to use different type of resources (Riding & Rayner, 1997). With the widespread use of e-learning systems, instead of matching students with the better instructional design according to their properties in traditional courses, providing each learner the best content and navigation structure in web based environments began to prefer. For that reason, educational adaptive hypermedia systems have become a popular issue which focused on to develop systems intelligence to be able to understand students and to be able to provide appropriate solutions for each student. As a result, adaptation is handled as one of the major components of e-learning systems which lead system to monitor students' learning processes and adapt systems according to the conditions.

Personalized information access is concerned with user-centered perspective to better support the user context and focused on providing customized educational content and learning paths to individual learners to adapt to their needs (Brusilovsky, 1998; Dolog and Nejd, 2007). Educational adaptive systems aims to minimize hypermedia related problems, disorientation and cognitive overhead, and maximize learning (Ford &

Chen, 2001; Brusilovsky, 1998; Brusilovsky and Pesin, 1998; Höök, 1998; Juvina and Herder, 2005). Since the mid-nineties, various adaptation techniques were offered and adaptive features were explored in several different contexts. Today, with the solutions based on several technologies such as standards, semantic web techniques or data mining, developing adaptive systems has become easier (Jovanic et al., 2009, Vesin et al., 2012; Dolog and Nejd, 2007). By using standards, semantic annotations can be added to the pedagogical resources, learner's profile or learning design. These annotations may be interpreted with semantic web technologies and/or similarities among students/ learning objects can be search for with data mining approaches. By this way best materials may be identify and suggest to learners. So, popularity of adaptive systems is growing day by day and one of the basic elements of e-learning systems should be a focus on including adaptations.

This research is directly motivated by our experience with learned lessons through our doctorate theses. One of our theses was focused on reflective questions in a web based educational environment to improve students' metacognitive abilities and learning efficiency in means of time, performance and relevancy (Atasoy, 2009). The other thesis was explored adaptive navigation support for learners to reduce disorientation and improve learning performance (Somyürek 1, 2008). According to the researchers observations and obtained data in the first thesis, despite the fact that students took advantage of reflective questions to plan and evaluate their own learning processes, they also need an explicit guidance for the choosing the best educational resources in a faster manner. Second thesis also revealed that while link annotations were useful for students to see and choose which educational resource they need to study, they did not gain a general ability to think about choosing the best educational resources. After both studies, we began to think about integrated systems including both adaptation and learner meta-thinking supports to access the most relevant information regarding students' ongoing tasks.

2. DISCUSSION AND CONCLUSION

With rapidly change of educational resources, it becomes more and more important to help students find, organize, and use resources that

match their individual goals, interests, and current knowledge (Brusilovsky and Henze, 2007). For that reason, monitoring learning and improving it according to the obtained knowledge is a major skill requirement for e-learning environments. When a task is presented to the student in a web based environment, s/he needs to make time planning, choose appropriate pedagogical content, use prior knowledge and etc. To take necessary steps, student should have the related competency, metacognition. So, metacognitive strategies and activities such as modeling, thinking aloud or reflective questions should be integrated into the web based courses. Similarly, a system also may be aware of students' time management skills, prior knowledge and suggest her/him true strategy and appropriate contents for approaching the learning task. To make customized suggestions, system should have the related competency, adaptation. For that reason, adaptive techniques such as course sequencing, dynamic planning, link annotating should be integrated into the web based courses. As a result, a web based educational system should support both meta skills, one for student to help monitor herself/himself and one for systems to have the ability monitor its users.

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