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Affective Tutoring System for Built Environment Management

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ABSTRACT

There are quite a lot of researche performed in the world, which prove that interest, stress and learning productivity of a learner to a large extent determine study results. Moreover, learning emotionality, pleasurableness and attractiveness, which help to increase its efficiency, are stressed by various researchers. Researchers have noticed, that a student's interest, stress, learning productivity and academic achievement are quite closely related. Experts have noticed that in order to cause interest, increase learning productivity and maintain stress in a rational level of a learner it is necessary to constantly change the learning subject with regard to situational and individual interest. For this reason, an *A*ffective *T*utoring System for Built *EN*vironment Management (ATEN), developed by the authors of the article is very suitable. The ATEN was developed and fine-tuned in the course of the TEMPUS project "Reformation of the Curricula on Built Environment in the Eastern Neighbouring Area". One of the ATEN innovations is that the System integrates the self-assessment and self-esteem measurement of students with multimodal biometric and intelligent methodologies and technologies. Affective Tutoring System for Built Environment Management can create a rational version of a learning process tailored to a specific student, taking into account such factors as how much the studies are interesting or difficult and the level of stress (with the help of biometric technologies). The System includes an automatic function that takes module topics and compiles an optimal set of personalised materials for a specific student. The case study submitted in this article partly demonstrates this developed System.

1. Introduction

1.1. Situational/individual interest and academic achievement

There are quite a lot of researches performed in the world (Dempsey & Warren-Forward, 2011; Hidi & Renninger, 2006; Jalongo, 2007; Rotgans & Schmidt, 2011, 2014; White-McNulty, 2012), which prove that situational and individual interest of a learner to a large extent determine study results. Jalongo (2007) stressed that in the studies of choice, learners usually select something that interests them. Any characterization of learning that disregards the role of motivation and interest is shortsighted at best and destructive at worst (Jalongo, 2007). Dempsey and Warren-Forward (2011) highlight a general agreement that interest orientated learning relies on the qualities of aspects of both individual and situational interest, and that learning, initially engaged by situational interest, can transform over time into dispositional individual interest. Dempsey and Warren-Forward (2011) indicate that interest orientated or interest based learning is strongly associated with positive learning outcomes.

Students' interests vary in how deeply or permanently they are located within students. Situational interests are the ones that are triggered temporarily by features of immediate situation. Unusual or surprising topics of discussion can arouse interest when they are first

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introduced (White-McNulty, 2012). Situational interest is construed as a motivational response to a perceived knowledge deficit. It is triggered in situations where this knowledge deficit becomes manifest, such as in the confrontation with a problem (Rotgans & Schmidt, 2014). Rotgans and Schmidt (2014) stressed that situational interest significantly increased after the problem stimulus was presented. Subsequently, situational interest gradually decreased. Common sense suggests that if a learner is interested in a particular topic, he or she will engage more extensively in that topic than another learner who is less interested in the topic. More engagement, that is, spending more time and effort on working on the topic, should lead to higher academic achievement. Situational interest was highly predictive for observed achievement-related classroom behaviors. The latter, in turn, proved to be a significant predictor of academic achievement (Rotgans & Schmidt, 2011).

Personal interests are relatively permanent preferences of the student, and are usually expressed in a variety of situations. In a classroom, a student may (or may not) have a personal interest in particular topics, activities, or subject matter. Therefore, as a balance, the best advice is probably to use strategies to arouse situational interest, and to assess students' responses to them continually and as honestly as possible. One way is to allow students to choose specific tasks or assignments for themselves, where possible, because their choices are more likely than usual to reflect prior personal interests, and hence be motivated more intrinsically than usual. In that case it also helps for the teacher to look for and point out the relevance of current topics or skills to students' personal interests and goals (White-McNulty, 2012).

Situational interest has been portrayed as a powerful educational construct because this type of interest – unlike individual interest, which is considered a stable predisposition – can be manipulated by instructional materials and is thus more or less under the direct control of educators. Research has shown that stimuli, such as challenging tasks, well-organized texts, or simply providing students with choices in the way they learn and what they learn, increase situational interest, which typically manifest itself, as a direct affective response, focused attention, and increased levels of learning (Hidi & Renninger, 2006).

Scientists (Maurice, Dörfler, & Artelt, 2014; Tella, Tella, & Adeniyi, 2009) have noticed, that interest and academic achievement are quite closely related. In general, personal interest in an academic topic or activity tends to correlate with achievement related to the topic or activity. As you might suppose, a student who is truly interested is more likely to focus on the topic or activity more fully, to work at it for longer periods, to use more thoughtful strategies in learning – and to enjoy doing so (Hidi & Renninger, 2006).

Experts have noticed that in order to cause interest of a learner it is necessary to constantly change the learning subject with regard to situational and individual interest. Ryan and Deci (2000) propose, whenever possible, to minimize boredom-related procrastination by connecting assignments to students' personal interests; in addition, teach students to find interesting aspects, or to find ways to make it interesting or challenging. According to Hidi (2001), research conducted over the past 20 years has demonstrated that both readers' well-established individual interests and their situational interests (elicited by text segments, topics, and themes) contributed to increased comprehension and learning. For this reason, an Affective Tutoring System for Built Environment Management, developed by the authors of the article is very suitable. The developed ATEN generates the conditions that constantly change the learning subject with regard to situational and individual interest. This is illustrated by the summarizing Fig. 2; furthermore Sections 2 and 3 provide more detailed descriptions. For example, historical statistical and biometric data; levels of stress, interest in learning and learning productivity of students over the course of a semester; ratings of good, average and low grades on exams (modules) as well as keywords describe a student's individual interest. Meanwhile biometrical statistical data in real time define situational interest (see Fig. 2).

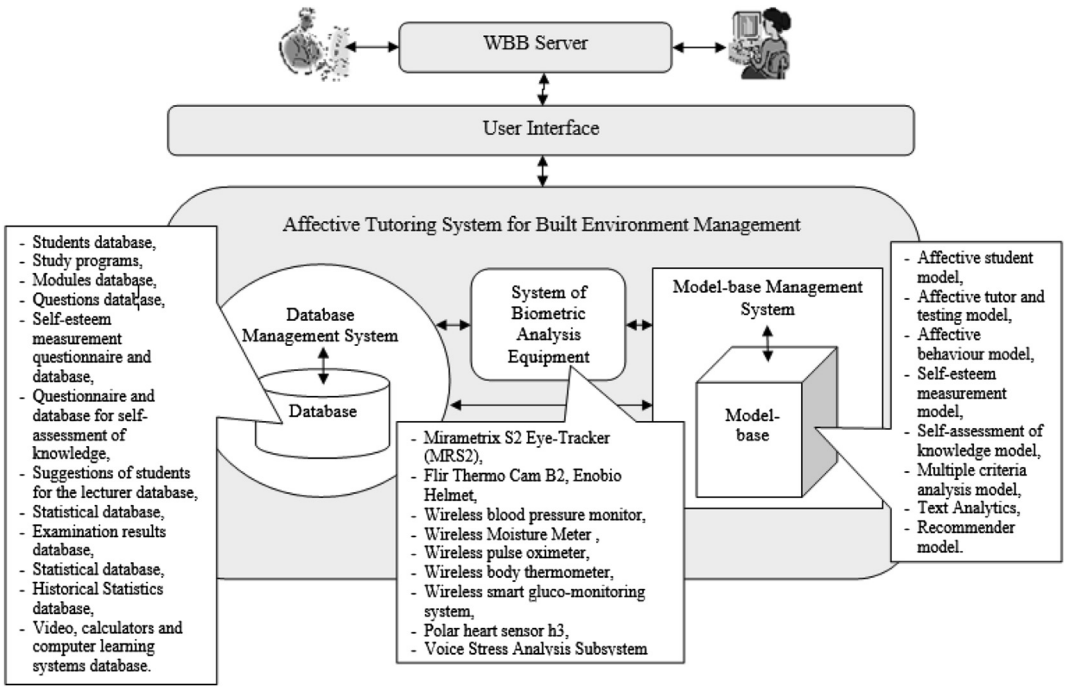

Fig. 1. Structure of the Affective Tutoring System for Built Environment Management.