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Examining How Students' Typical Studying Emotions Relate to Those Experienced While Studying with an ITS

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Abstract. We help advance the research on emotions with a preliminary investigation of differences between 116 students' typical studying emotions and those they experienced while studying with an ITS. Results revealed that students reported significantly lower levels of negative emotions while studying with an ITS compared to their typical emotional dispositions toward studying.

Keywords: emotions, affect, intelligent tutoring systems, pedagogical agents

1 Introduction

Achievement emotions are critical because of the impact they have on our success and failure in important and influential domains such as learning and success in school [1]. Emotions can support achievement by fostering motivation, focusing attention and limited cognitive resources on achievement-related activities and promoting adaptive information processing and self-regulation strategies [1]. While research has focused on the emotions learners tend to experience while interacting with these systems, little is known about how students' general academic emotional tendencies compare with those experienced during these, often novel, interactions [2]. Understanding how students typically feel while studying is valuable because of its potential to inform user models and design more adaptive ITSs [3]. Moreover, comparisons provide an affective benchmark to help researchers appreciate affective benefits or shortcomings that systems have when compared to students' academic status quo.

In this study, we investigated the effect of administering the achievement emotions questionnaire (AEQ [1]) prior to learners' interaction with MetaTutor and half-way through their interaction with it on the negative emotions they reported experiencing. We were particularly interested in learners' negative emotions because of the deleterious impact they can have on learners' experience with the system, self-regulated learning skill use, and achievement. Our hypothesis was that learners would report lower intensity levels of these emotions while studying with MetaTutor on account of lower appraisals of instrumental task value [4, 5]. In other words, because MetaTutor is a low stakes studying environment, like many ITSs, students can focus on content and process practice and mastery without concern for grades [3].

2 Methods

2.1 Participants and experimental conditions

One hundred and sixteen undergraduate students ($N = 116$, 17-31 years old, $M = 20.9$ years, $SD = 2.4$; 64.6% female; 62.9% Caucasian) from two North American Universities, studying different majors and with various levels of prior knowledge participated in this study. Each participant received \$50 upon completion of the study.

2.2 The ITS, experimental procedure, measures and data sources

System overview. MetaTutor [5, 6] is an ITS where four pedagogical agents (PAs) help students learn by prompting them to engage in SRL processes. A table of contents links to 38 pages (with text and images) on the human circulatory system.

Experimental procedure. The experiment involved two different sessions separated by one hour to three days. During the first one (30 to 40 min. long), participants filled and signed a consent form and completed the AEQ trait questionnaire (see below), a demographics survey, and a pre-test on the circulatory system. During the second session (90 min. long), participants used MetaTutor to learn about the circulatory system. Participants had exactly 60 minutes to interact with the content during which they could initiate SRL processes or do so after a PA's prompt. After MetaTutor offered students a 5 min break (halfway through), it asked them to fill out the 'during studying state' emotion subscale of the AEQ. At the end of the session, participants were given a post-test. All participants completed their sessions individually.

Measures. The during studying trait emotions subscale (AEQ [1]) was used to measure the emotions learners' typically experience while studying. This AEQ subscale consists of 45 items and measures anger (5 items; $\alpha = .81$), anxiety (6 items; $\alpha = .78/.81$), shame, (7 items; $\alpha = .85/.89$), hopelessness, (5 items; $\alpha = .86/.91$), boredom, (9 items; $\alpha = .89/.94$). The same questionnaire was administered following the optional pause a second time, with changes in wording (based on [1, 2]) to assess the emotions learners experienced while they interacted with MetaTutor. Cronbach's Alpha indicated that internal reliability was acceptable for each subscale (admin 1/ admin 2) for both administrations of the AEQ.

3 Results

Five paired sample t-tests were run to examine whether significant differences existed between learners' typical emotions experienced during studying (AEQ 1) and the emotions they reported while studying with MetaTutor (AEQ 2). Outlier screening was performed and outlying scores were replaced with the next most extreme score. AEQ 1 and 2 differed significantly for all negative emotions: anger, anxiety, shame, hopelessness, and boredom. Specifically, emotions were higher during typically studying session than learners' interaction with MetaTutor (see Table 1).

Table 1. Learners' emotions during typical vs. MetaTutor studying sessions

AEQ Variable				AEQ 1		AEQ 2	
	<i>t</i>	<i>df</i>	<i>p</i> < .05	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Anger	5.13	112	<i>p</i> < .05	2.18	.81	1.99	.81
Anxiety	10.40	112	<i>p</i> < .01	3.02	.87	2.15	.83
Shame	8.70	112	<i>p</i> < .01	2.56	.96	1.84	.82
Hopelessness	2.70	112	<i>p</i> < .01	1.87	.85	1.61	.70
Boredom	3.04	112	<i>p</i> < .01	2.55	.81	2.27	1.00

4 Discussion

Results supported our hypothesis that achievement emotions reported during learners' interactions with MetaTutor would be lower in intensity than those reported beforehand that reflected how learners typically felt while studying. Experiencing lower levels of negative activating and de-activating emotions tends to be beneficial to students' academic achievement. Future research should examine learners' appraisals of value and their relationships to achievement emotions in typical academic achievement situations (e.g., studying) versus interactions with ITSs.

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