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Think, feel, act: motivational and emotional influences on military students' online academic success

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Abstract This study employed a social-cognitive view of self-regulated learning to examine how several personal factors relate to academic success in an online course. Service academy undergraduates ($N = 481$) completed a survey that assessed their motivational beliefs (self-efficacy and task value); negative achievement emotions (boredom and frustration); and several outcomes that included their use of self-regulated learning strategies (elaboration and metacognition), course satisfaction, and continuing motivation to enroll in future online courses. Results from several multiple regressions revealed that task value beliefs were the strongest and most consistent positive predictors of elaboration, metacognition, satisfaction, and continuing motivation; whereas self-efficacy beliefs were moderately strong positive predictors of satisfaction and continuing motivation only. On the other hand, students' boredom and frustration were statistically significant predictors of metacognition, with boredom emerging as a negative predictor and frustration unexpectedly emerging as a positive predictor. Furthermore, both boredom and frustration were negatively related to satisfaction and continuing motivation. Taken together, results from this study provide some insight into the complex relations between students' thoughts, feelings, and actions in an online course. Theoretical and empirical implications are discussed, as are study limitations and future directions.

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Introduction

What are the motivational, emotional, and behavioral characteristics of students who succeed in online learning situations? How do personal factors, such as motivational beliefs and achievement emotions, relate to the use of self-regulated learning strategies and other measures of academic success in an online course? Are negative achievement emotions experienced during online learning always associated with maladaptive learning behaviors? These are important questions, yet they have been largely neglected in educational research (Bernard et al. 2004; Pekrun 2006). These questions principally guided this investigation.

Goals of the study

A central challenge for educators and researchers alike is to better understand the nature of online learning (Bernard et al. 2004). With the rapid growth of web-based technologies, online learning has emerged as a legitimate alternative (or supplement) to traditional classroom instruction (Larreamendy-Joerns and Leinhardt 2006; Tallent-Runnels et al. 2006). Notwithstanding the dramatic expansion of online learning, little is known about the personal factors that contribute to success in these extremely independent learning situations (Abrami and Bernard 2006; Bernard et al. 2004). Instead, research in the field has been dominated by atheoretical, group-comparison studies that assess the learning outcomes of online versus traditional classroom students (Zhao et al. 2005). Although valuable in their own right, such group-comparison studies have yielded very little generalizable knowledge for the theory, research, and practice of online learning (Bernard et al. 2004; Gunawardena and McIsaac 2004). In response to these problems, the current study employed a social-cognitive view of self-regulated learning to examine the relations between students' motivational beliefs, negative achievement emotions, and several measures of academic success in an online course. In doing so, this study contributes to our understanding of how students learn online. Furthermore, this study provides some preliminary guidance for the theory, research, and practice of online learning (Bernard et al. 2004; Gunawardena and McIsaac 2004), while at the same time offering important theoretical and empirical extensions of self-regulated learning as previously studied in traditional, classroom-based contexts (Pekrun et al. 2002; Pintrich et al. 1993; Zusho et al. 2003).

Theoretical framework

Research on self-regulated learning began more than two decades ago to answer the question of how students adapt their cognition, motivation, and behavior to become

masters of their own learning processes (Zimmerman 2008b). Self-regulated learning is a multidimensional construct that considers the self-directed processes and self-beliefs that learners use to transform intellectual abilities into academic performance and skill. As such, models of self-regulated learning describe a recursive cycle of cognitive, motivational, and behavioral activities that are central to learning and knowledge construction (Azevedo 2005; Zimmerman 2000a). In short, self-regulated learning is composed of numerous proactive processes that ultimately lead to superior learning and performance. Some of these self-regulatory processes include planning and goal setting prior to learning, monitoring one's progress during learning, and self-evaluating one's performance after learning (Zimmerman 2008a).

Early views of self-regulated learning assumed that effective self-regulation is particularly important during personally directed activities, such as independent study, self-selected reading, and information gathering from electronic sources (Zimmerman 2008b). Recently, several educational researchers (Lynch and Dembo 2004; Miltiadou and Savenye 2003; Whipp and Chiarelli 2004) have recognized this theoretical assertion and have started using self-regulated learning as a framework for studying online learning—a context that is highly autonomous and seems to require considerable self-direction (Dabbagh and Kitsantas 2004; Hartley and Bendixen 2001). In addition, these contemporary researchers have argued that using such a theoretical framework is beneficial in that it moves online learning research beyond group-comparison studies and gives investigators an informative lens through which to view the personal factors that contribute to success in online environments.

The model presented in Fig. 1 was adapted from Pekrun (2006); it forms the theoretical foundation of the present study. In particular, this model takes a social-cognitive approach to academic motivation, emotion, and self-regulation and

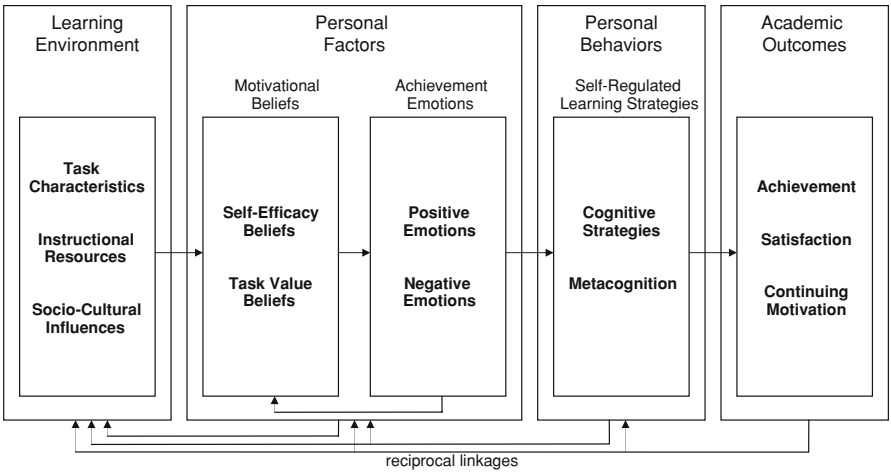

Fig. 1 A social-cognitive model of academic motivation, emotion, and self-regulation (adapted from Pekrun 2006)

proposes that contextual features of the learning environment affect students' motivational beliefs about their capabilities and the value of learning activities. In turn, these beliefs influence discrete achievement emotions, such as enjoyment and anxiety (Pekrun 2006), which then facilitate (or inhibit) the use of various self-regulated learning strategies, such as elaboration and metacognition (Pekrun et al. 2002; Pintrich 1999). Finally, these adaptive learning strategies link directly to positive academic outcomes, such as achievement, satisfaction, and continuing motivation to take future courses (Pintrich 1999). It is important to note that this model assumes the relationships between the various components are reciprocal; that is, they can mutually influence one another (Zimmerman 2000a).

For the purposes of this study, three components of the model were examined: personal factors (motivational beliefs and achievement emotions), personal behaviors (use of cognitive and metacognitive learning strategies), and two academic outcomes (satisfaction and continuing motivation). In terms of motivational beliefs, two constructs were considered. The first is academic self-efficacy, which can be defined as students' judgments of their capabilities to successfully perform academic tasks (Bandura 1997). Generally, research has shown that self-efficacy beliefs positively influence many academic outcomes, including individuals' choice of activities (Bandura and Schunk 1981), level of effort (Salomon 1984), use of analytic thinking strategies (Wood and Bandura 1989), persistence in the face of difficulties (Lent et al. 1984; Robbins et al. 2004), and academic achievement (Lent et al. 1984; Robbins et al. 2004). There is also ample evidence (e.g., Pintrich and De Groot 1990; Pintrich et al. 1993; Zusho et al. 2003) that self-efficacy beliefs provide individuals with "a sense of agency to motivate their learning through use of such self-regulatory processes as goal setting, self-monitoring, self-evaluation, and strategy use" (Zimmerman 2000b, p. 87).

The second motivational belief examined in this study was task value, which can be defined as students' judgments of how interesting, important, and useful a course is to them (Eccles and Wigfield 2002). Like self-efficacy, task value beliefs are assumed to positively relate to students' motivation, performance, and learning. In fact, research has typically demonstrated that task value beliefs positively predict many important outcomes, such as cognitive engagement (Pintrich and De Groot 1990; Pintrich et al. 1993), choice of future learning activities (Eccles and Wigfield 1995, 2002), and academic achievement (Pintrich et al. 1993; Zusho et al. 2003). Based, in part, on these findings, Schunk (2005) has concluded that students who find learning activities interesting, important, and useful are more likely to use adaptive learning strategies and perform well on those activities.

Achievement emotions represent the second set of personal factors in the conceptual model. Although research on emotions and their relations to learning and achievement is lacking, the last 5 years have seen a substantial increase in theoretical and empirical contributions to this area of inquiry (Linnenbrink and Pintrich 2002, 2004; Pekrun 2006). For instance, Pekrun (2006) has proposed a control-value theory of achievement emotions. Briefly, control-value theory defines achievement emotions as discrete emotions that are associated with achievement-related activities. The enjoyment that often comes from learning, boredom experienced in a classroom, or frustration when dealing with difficult academic

tasks are just a few examples of achievement-related emotions. According to control-value theory (Pekrun 2006), positive and negative achievement emotions are determined, in part, by students' motivational beliefs, with competence perceptions (e.g., self-efficacy beliefs) and subjective value (e.g., task value beliefs) thought to be two of the most important antecedents of achievement emotions. Along with valence (positive or negative emotions), control-value theory identifies activation (activating or deactivating) as an important dimension of achievement emotions (Pekrun et al. 2002). Although limited, research findings have indicated that achievement emotions are related to students' use of learning strategies and various measures of academic success (Pekrun et al. 2002). Specifically, positive activating emotions have been found to facilitate the use of flexible, deep processing strategies, like elaboration, organization, and metacognitive self-regulation; whereas negative activating emotions have been associated with the use of more rigid, shallow processing strategies, like simple rehearsal. Likewise, negative deactivating emotions have been found to reduce attention and lead to the use of more superficial, shallow processing strategies. This study focused on negative achievement emotions because earlier work with a similar sample revealed that many students had negative feelings about online learning (Artino and McCoach 2008). What is more, limited empirical work in online settings has suggested that several factors specific to online learning (e.g., social isolation and the potential to experience technical problems) may result in a plethora of negative emotions, such as anxiety, boredom, and frustration (Zembylas et al. 2008).

In terms of personal behaviors, the conceptual model identifies two learning strategies that were assessed in the current study: elaboration, a cognitive processing strategy where students focus on extracting meaning, summarizing, or paraphrasing (Zusho et al. 2003), and metacognition, a strategy where students monitor, control, and regulate their own cognitive activities and behaviors (Flavell 1979; Pintrich 1999). Generally, research has revealed that elaboration and metacognition are extremely beneficial behaviors when it comes to long-term retrieval of information, transfer of learning, and overall academic performance (Alexander et al. 1998; Hamilton 1997; Wang et al. 1990; Zimmerman and Martinez-Pons 1990).

Finally, the conceptual model includes three measures of academic success, two of which were considered in this study: satisfaction and continuing motivation. From a self-regulated learning perspective, satisfaction is important because this type of self-reflective reaction to learning situations may ultimately influence one's subsequent efforts to learn (Zimmerman and Tsikalas 2005). Moreover, several scholars have identified student satisfaction as an important outcome in online settings, with students' end-of-course satisfaction predicting course drop-out rates and intentions to enroll in future online courses (Chiu et al. 2007; Chyung 2001; Roca et al. 2006).

Continuing motivation is the second measure of academic success considered in this study. More than 30 years ago, Maehr (1976) defined continuing motivation as "the tendency to return to and continue working on tasks away from the instructional context in which they were initially confronted" (p. 443). Since then, continuing motivation has been employed as a key behavioral indicator of student motivation (e.g., Kinzie and Sullivan 1989; Klein et al. 1994). Specifically, because

student motivation cannot be observed directly, continuing motivation (operationalized as a student's choice of tasks) can be used to infer the presence of motivation. In fact, as an instance of behavioral direction—of making a choice to participate in an activity free from external pressure to do so (Maehr 1976)—continuing motivation represents a classic index of academic motivation and one that has been used extensively in educational psychology research (Schunk et al. 2008).

Research questions

Using a social-cognitive model of self-regulation as its theoretical framework, this study examined how students' motivational beliefs and negative achievement emotions relate to their self-regulated learning behaviors and academic success in an online course. In doing so, this study answers recent calls to move beyond group-comparison studies in online learning research and, instead, to focus on those personal factors that contribute to success in online settings (e.g., Bernard et al. 2004).

The present study addressed two research questions:

1. After controlling for demographic and experiential variables, how are students' personal motivational beliefs (self-efficacy and task value) and negative achievement emotions (boredom and frustration) related to their self-reported use of elaboration and metacognition?
2. After controlling for demographic and experiential variables, how are students' personal motivational beliefs and negative achievement emotions related to their academic success, as measured by their satisfaction with an online course and continuing motivation to take future online courses?

Method

Participants

A convenience sample of 481 undergraduates (sophomores and juniors) from a US service academy were invited to participate in this study. The sample included 398 men (83%) and 83 women (17%); the high percentage of males in this sample is consistent with the undergraduate population at this service academy. The mean age of the participants was 20.5 years ($SD = 1.0$; range 19–24).

Instructional materials

The instructional materials consisted of a self-paced online course developed by the US Navy. Self-paced online courses are a specific type of online learning in which students use a web browser to access a learning management system and complete web-based instruction at their own pace. While completing such courses, students do not interact with an instructor or other students. In the present study, the self-paced online course was delivered through Navy *e*-Learning, the US Navy's official learning management system. This system, which functions as the single entry

portal for all distance learning in the US Navy, is designed to provide anytime, anywhere education and training to the Navy's more than 1.2 million active-duty and reserve personnel. As of 2004, Navy *e*-Learning hosted, tracked, and managed more than 3,966 self-paced online courses (Persons 2004).

The online course used in this study was the first part of a two-stage training program in flight physiology and aviation survival training, and the course was required for all service academy undergraduates. The online course was composed of four, 40-min lessons, and each lesson incorporated text, graphics, and video. In addition, each lesson ended with a quiz that consisted of 12–15 multiple-choice, declarative knowledge-type questions. Students who did not score at least 80% on any given quiz were required to return to the beginning of the lesson, review the material, and then retake the quiz. Quiz items were drawn from a pool of questions, and thus each time an end-of-lesson quiz was attempted, the items were slightly different than the previous assessment. Upon successful completion of the online course, students advanced to the second stage of their training, which consisted of traditional instruction at a local training unit.

Procedures

Participants were contacted via email by their service academy instructor and were provided with directions for accessing the learning management system and completing the self-paced online course. Once logged into the system, students had the ability to proceed through the course at their own pace, logging in and out of the course as necessary until they successfully completed all four lessons.

Approximately 3 weeks after completing the online course, service academy students arrived at a local training unit for the face-to-face portion of their instruction. Prior to any classroom instruction, students were invited to complete an anonymous, 15-min survey. The voluntary survey was administered as a paper-based, self-report questionnaire, and students did not receive compensation for completing the survey. All students who completed the online course also completed the questionnaire (response rate = 100%).

Instrumentation

The study instrument was composed of 50 items divided into two sections. The first section included 41 Likert-type items with a response scale ranging from 1 (*completely disagree*) to 7 (*completely agree*). These 41 items were further subdivided into eight subscales designed to assessed students' motivational beliefs (self-efficacy and task value), negative achievement emotions (boredom and frustration), use of cognitive and metacognitive learning strategies (elaboration and metacognition), overall course satisfaction, and self-reported prior knowledge.

Motivational beliefs

Two subscales from Artino and McCoach (2008) were used to assess students' personal motivational beliefs: (a) a five-item *self-efficacy* subscale designed to

assess students' confidence in their ability to learn the material presented in a self-paced online format and (b) a six-item *task value* subscale designed to assess students' judgments of how interesting, important, and useful the online course was to them. Sample items from this section include "I am confident I can learn without the presence of an instructor to assist me" (self-efficacy) and "It was personally important for me to perform well in this course" (task value).

Negative achievement emotions

Two subscales adapted from the Achievement Emotions Questionnaire (Pekrun et al. 2005) were used to assess students' negative achievement emotions: (a) a five-item *boredom* subscale intended to assess students' course-related boredom and (b) a four-item *frustration* subscale designed to assess students' course-related frustration, annoyance, and irritation. Sample items from this section include "While completing this online course I was bored" (boredom) and "While completing this online course I felt frustrated" (frustration).

Self-regulated learning strategies

Students' use of cognitive and metacognitive learning strategies was assessed with items derived from the Motivated Strategies for Learning Questionnaire (Pintrich et al. 1993): (a) a four-item *elaboration* subscale designed to assess students' use of elaboration strategies (e.g., paraphrasing and summarizing) and (b) a nine-item *metacognition* subscale intended to assess students' use of metacognitive control strategies (e.g., planning, setting goals, monitoring one's comprehension, and regulating performance). Sample items include "While working through this online course I tried to relate what I was learning to what I already know" (elaboration) and "While working through this online course I set goals for myself in order to direct my activities" (metacognition). Although the two learning strategies variables were self-reported strategies, for brevity, they are referred to as *elaboration* and *metacognition* in the remainder of this article.

Satisfaction

Students' overall satisfaction with the online course was assessed with a three-item *satisfaction* subscale adapted from Artino (2008). Sample items include "Overall, I was satisfied with my online learning experience" and "This online course met my needs as a learner."

Prior knowledge

Students' self-reported prior knowledge of the online course material was measured with a five-item *prior knowledge* subscale. This subscale assess students' familiarity with the four terminal learning objectives; that is, students' appraisal of how much they knew prior to completing the online course. Sample items include "I could

identify the methods used to prevent motion sickness in flight" and "I was familiar with how the different sensory systems function in flight."

Section two of the survey was composed of nine items, including background and demographic questions and three individual items used as variables in this study:

Online technologies experience. Online technologies experience was assessed with a single self-report item: "Compared to other Midshipmen, how experienced are you with online computer technologies (for example, using a web browser, surfing the Internet, etc.)?" The response scale ranged from 1 (*extremely inexperienced*) to 7 (*extremely experienced*).

Online learning experience. Online learning experience was assessed with a single self-report item: "Compared to other Midshipmen, how experienced are you with self-paced online learning (for example, courses like the online portion of this course)?" Again, the response scale ranged from 1 (*extremely inexperienced*) to 7 (*extremely experienced*).

Continuing motivation. Continuing motivation (Maehr 1976) to take future online courses was assessed with a single self-report item: "Considering your experience with this online course, would you choose to enroll in another self-paced online Navy course in the future? Please answer this question as if the choice were completely up to you." The response scale ranged from 1 (*definitely will not enroll*) to 6 (*definitely will enroll*).

Results

Results are divided into three main sections: (a) confirmatory factor analysis (CFA) aimed at validating the hypothesized survey structure, (b) descriptive statistics and correlation analysis, and (c) multiple regression analysis focused on exploring the unique variance explained by students' beliefs and emotions on the four outcomes.

Confirmatory factor analysis

Using AMOS 7.0 (Arbuckle 2006), a CFA was conducted to examine the convergent and discriminant validity of the eight-factor, 41-item survey. Maximum likelihood estimation was used to estimate the parameters, and a chi-square test was conducted to assess model fit. Generally, a non-significant chi-square result indicates a good model fit (Kline 2005). However, because the chi-square test is affected by, among other things, the sample size and the size of the correlations in the model, researchers do not normally rely on the chi-square test as the sole measure of model fit. Therefore, several additional fit indices were considered together with the chi-square test. These indices included the chi-square/degrees of freedom ratio (also referred to as the normed chi square), the comparative fit index, and the root-mean-square error of approximation.

Taken together, the CFA substantiated the hypothesized eight-factor structure of the survey. In particular, all model fit statistics fell within recommended standards

(Hu and Bentler 1999): the chi square was statistically significant, χ^2 (436, $N = 471$) = 860.333, $p < .001$; however, the normed chi square (1.97) was less than 2.00, the comparative fit index (.955) was slightly greater than .95, and the root-mean-square error of approximation (.046) was less than .06.

Descriptive statistics and correlation analysis

Using SPSS 15.0, Cronbach's alpha coefficients were calculated for the subscales to assess the internal consistency reliability of the scores. As indicated in Table 1, all alpha coefficients were well within the desired range, with actual values of .82–.92 (see guidelines in Gable and Wolfe 1993). Next, descriptive statistics for the measured variables were calculated (see Table 1). As indicated, six of the seven variables measured on a 7-point Likert-type scale had means at or above the midpoint of the response scale; while one variable (frustration) had a mean slightly below the midpoint. The mean score for continuing motivation (3.93; measured on a 6-point Likert-type scale) was also above the midpoint of the response scale. Standard deviations for these eight variables ranged from 1.07 to 1.45, and visual inspection of the associated histograms revealed that all variables, with the exception of frustration, were negatively skewed. The distribution for frustration showed a slight positive skew.

Pearson correlations indicated that self-efficacy and task value were statistically significantly related to each other ($r = .32$, $p < .001$) and to students' negative achievement emotions and several measures of academic success. In particular, students' perceived self-efficacy was negatively related to their boredom ($r = -.27$, $p < .001$) and frustration ($r = -.27$, $p < .001$) with the online course, and positively related to their self-reported use of elaboration ($r = .27$, $p < .001$) and metacognition ($r = .18$, $p < .001$) strategies. Self-efficacy beliefs were also

Table 1 Pearson correlations, (Cronbach's Alphas), means, and standard deviations for the primary variables of interest ($N = 481$)

Variable	1	2	3	4	5	6	7	8
1. Self-efficacy	(.91)	.32	−.27	−.27	.27	.18	.41	.36
2. Task value		(.88)	−.41	−.39	.56	.61	.66	.41
3. Boredom			(.84)	.58	−.28	−.35	−.52	−.46
4. Frustration				(.89)	−.23	−.22	−.52	−.43
5. Elaboration					(.82)	.59	.50	.29
6. Metacognition						(.89)	.54	.33
7. Satisfaction							(.92)	.59
8. Continuing motivation								(–)
M	5.32	4.87	4.02	3.36	4.81	4.12	4.77	3.93
SD	1.12	1.09	1.32	1.45	1.08	1.07	1.20	1.17

Note: Continuing motivation was measured on a 6-point, Likert-type response scale from 1 (*definitely will not enroll*) to 6 (*definitely will enroll*). All other variables were measured on a 7-point, Likert-type agreement response scale. All correlations are significant at the $p < .001$ level

positively related to satisfaction ($r = .41$, $p < .001$) and continuing motivation ($r = .36$, $p < .001$). Likewise, the extent to which students valued the online course was negatively related to their boredom ($r = -.41$, $p < .001$) and frustration ($r = -.39$, $p < .001$), and positively related to their elaboration ($r = .56$, $p < .001$) and metacognition ($r = .61$, $p < .001$). Task value was also positively related to satisfaction ($r = .66$, $p < .001$) and continuing motivation ($r = .41$, $p < .001$). Overall, these results indicated that when considered individually, students' motivational beliefs explained from 3% to 44% of the variance in the various measures of online academic success (weak to very strong effects; Cohen 1988).

In terms of students' negative achievement emotions, Pearson correlations revealed that boredom and frustration were statistically significantly related to each other ($r = .58$, $p < .001$) and to all measures of academic success. In particular, students' boredom was negatively related to their self-reported elaboration ($r = -.28$, $p < .001$), metacognition ($r = -.35$, $p < .001$), satisfaction ($r = -.52$, $p < .001$), and continuing motivation ($r = -.46$, $p < .001$). Likewise, the extent to which students reported being frustrated with the online course was negatively related to their elaboration ($r = -.23$ $p < .001$), metacognition ($r = -.22$, $p < .001$), satisfaction ($r = -.52$, $p < .001$), and continuing motivation ($r = -.43$, $p < .001$). Overall, these results indicated that when considered individually, students' negative achievement emotions explained from 5 to 27% of the variance in their use of learning strategies, satisfaction, and continuing motivation (weak to strong effects).

Multiple regression analysis

To explore the unique variance explained by students' beliefs and emotions on the four adaptive outcomes, four multiple regressions were conducted. In these analyses, elaboration, metacognition, satisfaction, and continuing motivation were used as the dependent variables; self-efficacy, task value, boredom, and frustration—along with five control variables (gender, age, online technologies experience, online learning experience, and prior knowledge)—served as the independent variables. The independent variables used in the regression analyses were selected on the basis of their purported relations to the four outcomes, as reported elsewhere (e.g., Artino 2007, 2008; Chiu et al. 2007; Joo et al. 2000; Roca et al. 2006).

As indicated in Table 2, results revealed that all four models explained statistically significant amounts of variance in the outcomes. Model effects were strong, ranging from $R^2 = .34$ for continuing motivation to $R^2 = .57$ for satisfaction. Examination of the standardized beta coefficients suggested that task value was the strongest and most consistent individual predictor. Specifically, task value was a positive predictor of elaboration ($\beta = .51$, $p < .001$), metacognition ($\beta = .57$, $p < .001$), satisfaction ($\beta = .46$, $p < .001$), and continuing motivation ($\beta = .17$, $p < .001$). Self-efficacy was a significant positive predictor of satisfaction ($\beta = .20$, $p < .001$) and continuing motivation ($\beta = .17$, $p < .001$) only. In terms of negative achievement emotions, both boredom and frustration were significant negative predictors of satisfaction ($\beta = -.18$ and $-.19$, respectively) and continuing motivation ($\beta = -.22$ and $-.18$, respectively); whereas boredom emerged as a

Table 2 Regression summary statistics for the four dependent variables: elaboration, metacognition, satisfaction, and continuing motivation

Variable	Elaboration			Metacognition			Satisfaction			Continuing motivation		
	B	SE *B*	*β*	*B*	SE *B*	*β*	*B*	SE *B*	*β*	*B*	SE *B*	*β*
Self-efficacy	.07	.04	.07	−.02	.04	−.02	.21	.04	.20**	.18	.04	.17**
Task value	.50	.04	.51**	.58	.04	.57**	.51	.04	.46**	.17	.05	.17**
Boredom	−.07	.04	−.08	−.15	.04	−.18**	−.16	.04	−.18**	−.20	.04	−.22**
Frustration	.03	.04	.04	.08	.04	.10*	−.16	.03	−.19**	−.14	.04	−.18**
Model summary	$R^2 = .35$, $p < .001$			$R^2 = .39$, $p < .001$			$R^2 = .57$, $p < .001$			$R^2 = .34$, $p < .001$		

Note: Summary statistics were calculated after controlling for gender, age, online technologies experience, online learning experience, and prior knowledge. Continuing motivation was measured on a 6-point, Likert-type response scale from 1 (*definitely will not enroll*) to 6 (*definitely will enroll*). All other variables were measured on a 7-point, Likert-type agreement response scale

* $p < .05$; ** $p < .001$

negative predictor of metacognition ($\beta = -18$, $p < .001$), and frustration unexpectedly emerged as a positive predictor of metacognition ($\beta = .10$, $p < .05$).

Discussion

The present study examined students' thoughts, feelings, and actions in the context of an online course. In particular, this study employed a social-cognitive model of self-regulation to investigate how motivational beliefs and negative achievement emotions relate to several adaptive outcomes. These outcomes included students' use of cognitive and metacognitive learning strategies, overall satisfaction with an online course, and continuing motivation to take future online courses. The following sections describe, in detail, the extent to which the findings reported here support and extend the relationships depicted in the conceptual model (see Fig. 1).

Research question 1

Research question 1 addressed how students' motivational beliefs and negative achievement emotions relate to their use of self-regulated learning strategies in an online course.

Motivational beliefs

Social-cognitive theories of self-regulated learning highlight the importance of adaptive motivational beliefs in all phases of self-regulation (Schunk and Zimmerman 2008). From this theoretical perspective, it is not enough for students

to have knowledge of cognitive and metacognitive strategies; they must also be motivated to effectively utilize those strategies to improve learning and performance (Pintrich and De Groot 1990). Findings from this study generally support this view. Specifically, task value beliefs were the strongest and most consistent positive predictors of both elaboration and metacognition (βs = .51 and .57, respectively); that is, students who believed the course was interesting, important, and useful also reported using more learning strategies. This finding is consistent with prior research in both traditional (Pintrich 1999; Pintrich and De Groot 1990; Pintrich et al. 1993; Zusho et al. 2003) and online settings (Artino and Stephens 2006; Hsu 1997). Moreover, the consistency and strength of the relationship between task value and both elaboration and metacognition suggests that positive task value beliefs may be critical in online learning situations. That is, in highly autonomous contexts where students do not interact with an instructor or other students, adaptive motivational beliefs, such as the extent to which students value a course, may be vital for initiating and sustaining cognitive and metacognitive engagement (Zimmerman and Tsikalas 2005). Certainly, however, more controlled studies that utilize longitudinal or experimental designs are needed to ultimately determine the direction of influence between task value beliefs and the use of various learning strategies.

The associations between students' self-efficacy and their use of self-regulated learning strategies were weaker and less consistent than those described above. In particular, when considered alone, students' self-efficacy for learning in a self-paced online format was positively correlated with both elaboration and metacognition (rs = .27 and .18, respectively), although the effects were weak. However, after accounting for the other predictors in the two regression models, self-efficacy beliefs did not add unique information to the prediction of either elaboration or metacognition. One explanation for this unexpected finding is the somewhat general nature of the self-efficacy scale used in this study. As Pajares (1996) cautioned, "because judgments of self-efficacy are task and domain specific, global or inappropriately defined self-efficacy assessments weaken effects" (p. 547). Therefore, a researcher attempting to explain an academic outcome, for instance, is more likely to find a strong relationship between self-efficacy and the outcome if the efficacy scale follows two theoretical guidelines: (a) it assesses specific aspects of the task and (b) the specificity corresponds to the characteristics of the task being assessed and the domain of functioning being analyzed (Bandura 1997). Accordingly, omnibus measures of general, *contextless* dispositions have relatively weak predictive power; whereas domain-linked measures of self-efficacy tend to be good predictors of numerous academic outcomes (Bandura 1997; Pajares 1996).

Although the self-efficacy scale employed in this study is certainly not contextless, it is broad, particularly when compared to other self-efficacy scales that have been used to measure students' confidence for completing specific tasks in very narrow academic domains (e.g., a scale for measuring adolescents' algebra self-efficacy; Bandura 2006). Therefore, it is not completely surprising to find that this rather broad self-efficacy scale did not explain unique variance in either elaboration or metacognition. However, while the measure did not explain unique variance in students' behavioral engagement, it does appear to have explanatory power with respect to students' satisfaction and continuing motivation to enroll in

future online courses (see the discussion of research question 2 below). Nonetheless, future research should consider the extent to which other, more domain-specific self-efficacy scales might better explain students' self-regulatory behaviors in online settings.

Achievement emotions

Along with motivational beliefs, social-cognitive theorists have recently addressed the importance of achievement-related emotions and their influence on cognitive engagement and learning (Linnenbrink and Pintrich 2002, 2004; Pekrun 2006; Pekrun et al. 2002). In general, control-value theory (Pekrun 2006) assumes that "activating positive emotions facilitate the use of flexible, creative learning strategies, and activating negative emotions (e.g., anxiety) more rigid strategies like simple rehearsal. Deactivating emotions (e.g., boredom) are held to lead to superficial, shallow ways of processing information" (p. 326). Overall, findings from this study largely support these theoretical assumptions. Specifically, when considered individually, both boredom and frustration were negatively correlated with elaboration and metacognition (*r*s ranged from −.22 to −.35), indicating that students who were bored and/or frustrated where less likely to employ these adaptive learning strategies. However, after accounting for the other variables in the regression model, neither boredom nor frustration was a statistically significant predictor of elaboration. In contrast, both boredom and frustration were significant predictors of metacognition, with boredom emerging as a negative predictor ($\beta = -.18$) and frustration unexpectedly emerging as a positive predictor ($\beta = .10$). In all cases, correlation and regression coefficients were larger for boredom, a negative deactivating emotion, than for frustration, a negative activating emotion. In other words, boredom appeared to be more closely tied to the outcomes of elaboration and metacognition than frustration. Because boredom and frustration are highly correlated with each other, it seems premature to draw firm conclusions from this finding. However, it does align with previous research in traditional classrooms, which has found that negative deactivating emotions, such as boredom, tend to have stronger and more harmful effects on cognitive engagement and learning than negative activating emotions (Pekrun et al. 2002). Moreover, recent empirical work has suggested that boredom may be one of the most frequently experienced and deleterious emotions in academic settings, yet one that has received very little attention by educational researchers (Pekrun et al. 2008).

The finding that frustration positively predicted metacognition, after accounting for the other variables in the regression model, is noteworthy and may have important theoretical and practical implications. For example, Wosnitza and Volet (2005) theorized that "in a solo online-learning environment, emotions are typically directed at the *self*, the *task*, or the *technology*" (p. 455). In this study, although it is unclear exactly why students reported being frustrated, one might speculate that feelings of frustration were likely self directed (e.g., frustration because the learner had difficulty understanding the material), task directed (e.g., frustration because the task was unclear), and/or technology directed (e.g., frustration because of problems with the course management system and/or Internet connectivity; Wosnitza and

Volet 2005). If, for example, students experienced self-directed frustration because they struggled with the course material and the way in which it was presented, it would make sense that these individuals might also report using more metacognitive control strategies in an effort to improve comprehension. Close inspection of two survey items from the metacognition subscale clarify this point: (a) If I became confused about something I read, I went back and tried to figure it out, and (b) If course material was difficult to understand, I changed the way I studied it.

The scenario described above is just one explanation for why frustration positively predicted metacognition. Although inconsistent with the empirical work of Pekrun and his colleagues (e.g., Goetz et al. 2006; Pekrun et al. 2002), this novel result corroborates the theoretical suggestion that "negative activating emotions may well facilitate the use of specific kinds of learning strategies, even if such effects do not appear in more consistent ways when self-report measures of learning strategies are used" (Pekrun et al. 2002, p. 99). In fact, other researchers (e.g., Lane et al. 2005; Ma 1999) have found empirical support for the notion that negative activating emotions may actually improve academic performance, particularly in students with high self-efficacy. Thus, the finding that frustration positively predicted metacognition suggests that, under certain conditions, frustration during online learning may actually promote metacognitive engagement. This proposal, however, is very tenuous and is certainly not meant to imply that courses should be designed to intentionally frustrate their learners. If nothing else, this novel finding is further evidence of the multifaceted, dynamic interplay between cognition, affect, and behavior (Linnenbrink and Pintrich 2004).

Research question 2

Research question 2 addressed how students' motivational beliefs and negative achievement emotions relate to their overall satisfaction with the online course and continuing motivation to take future online courses.

Motivational beliefs

In addition to predicting cognitive and metacognitive engagement, task value and self-efficacy beliefs are thought to influence other important academic outcomes (Bandura 1997; Eccles and Wigfield 2002; Pajares 1996; Schunk and Zimmerman 2008). For instance, previous research in online settings has shown that students who find a learning activity interesting, important, and useful, as well as those who are confident they can perform the actions necessary to attain their goals, tend to be more satisfied and motivated than their counterparts with less-adaptive beliefs (e.g., Artino 2007, 2008; Lee 2002). Moreover, several other studies (e.g., Joo et al. 2000; Lynch and Dembo 2004; Wang and Newlin 2002) have revealed that positive task value and self-efficacy beliefs are associated with superior academic achievement. Findings from this study corroborate this previous work. Specifically, results from the two multiple regressions indicate that task value beliefs were the strongest positive predictors of satisfaction ($\beta = .46$) and moderately strong positive predictors of continuing motivation ($\beta = .17$); whereas self-efficacy for learning

online emerged as a moderately strong positive predictor of both satisfaction and continuing motivation (βs = .20 and .17, respectively).

Achievement emotions

Control-value theory (Pekrun 2006) proposes that achievement emotions impact learning and performance through their influence on such factors as attention, motivation and effort, and the use of cognitive and metacognitive learning strategies. The present findings support and extend this theory by providing evidence that achievement emotions are also related to other important outcomes, such as satisfaction with an online course and continuing motivation to take future online courses. In particular, both boredom and frustration were consistently negatively related to satisfaction and continuing motivation (*r*s ranged from −.43 to −.52). Furthermore, after accounting for the other variables in the regression model, boredom and frustration were the strongest individual predictors of continuing motivation ($\beta = -.22$ and $-.18$, respectively). These findings indicate that students' satisfaction and intentions to enroll in future online courses may be closely linked to their negative achievement emotions. These results are important if one considers that, from a self-regulated learning perspective, self-reflective reactions, such as satisfaction, are thought to "influence one's forethought regarding subsequent efforts to learn in cyclical fashion" (Zimmerman and Tsikalas 2005, p. 267). Additionally, these results provide further evidence of the close connection between affect and motivation (Linnenbrink and Pintrich 2004; Pekrun 2006). That is, because student motivation cannot be observed directly, continuing motivation is often used to infer the presence of motivation (Eccles and Wigfield 2002; Maehr 1976; Schunk et al. 2008). Thus, it appears that students who were bored and/or frustrated with the online course were also less motivated.

Limitations and future directions

Several important limitations should be considered when interpreting the current results. First, this investigation employed a very simple, cross-sectional, post-only design (Shadish et al. 2002). Although cross-sectional designs often benefit from high construct validity (Judd and Kenny 1981), findings from this correlational study are extremely limited with respect to the inferences that can be drawn. Accordingly, more controlled studies that utilize longitudinal or experimental designs are needed to disentangle questions of causality. Second, the study sample surveyed here is extremely homogenous. For instance, the majority of service academy undergraduates are men, most are unmarried with no children, and none are physically disabled. Moreover, service academy undergraduates are generally considered to be high-ability students (United States Naval Academy 2007). Therefore, results from this study have limited generalizability beyond the present sample (Shadish et al. 2002).

A third important limitation is the use of self-reports to examine students' beliefs, emotions, and behaviors. Like all surveys, the instrument used in this study has

reliability and validity limitations (e.g., social desirability and mono-method bias; Thorndike 2005). Particularly important in the present study are the threats to construct validity that are inherent to measuring emotions and behaviors with a questionnaire. With respect to emotions, some have argued that "this style of measurement cannot provide direct access to emotions as they unfold during the learning process" (Wosnitza and Volet 2005, p. 452). Likewise, in terms of measuring how students actually employ self-regulated learning behaviors and how those tactics are strategically changed during learning, some scholars have maintained that self-reports are severely limited (e.g., Hadwin et al. 2007). Altogether, these measurement limitations suggest that future work should include alternative techniques for assessing the various aspects of academic self-regulation (e.g., think-aloud protocols and log file analysis; Hadwin et al. 2007). Additionally, it seems that no single instrument or technique is sufficient to measure self-regulated learning; instead, a combination of assessment tools is probably necessary to capture what students actually think, feel, and do in various academic contexts (Boekaerts and Cascallar 2006).

Conclusions

Online learning is rapidly becoming a critical ingredient in the education and training of today's contemporary students. Despite the growing educational importance of online learning, practitioners and researchers alike know little about the thoughts, feelings, and actions that contribute to academic success in highly autonomous online situations (Bernard et al. 2004; Dabbagh and Kitsantas 2004).

The present study addressed this under-explored area by examining the relations between several personal factors in an online course. Taken together, the findings presented here make a significant contribution to the theoretical and empirical literature on academic motivation, emotion, and self-regulation. Notwithstanding methodological limitations, these results are particularly noteworthy because they shed some light on the links between achievement emotions and several adaptive academic outcomes, relationships that have been largely neglected in educational research (Linnenbrink and Pintrich 2002; Pekrun 2006).

In addition, results from this study further inform our understanding of online learning. Specifically, now that online learning has reached a more fully developed stage, comparative research is being replaced by investigations, such as this study, that attempt to elucidate learning efficacy and expand learning theory into online contexts. To this end, findings from the present study highlight the importance of students' motivational beliefs and negative achievement emotions in explaining their self-regulation and academic success in an online course. Accordingly, it seems that social-cognitive models of self-regulated learning may be useful to both practitioners and researchers as they strive to better appreciate the personal factors that contribute to successful online learning. Ultimately, pursuing such theoretically driven work has the potential to advance the field by providing much-needed direction for the theory, research, and practice of online learning.

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