Journal of Advanced Academics
jaa
Volume 20 ✣ Number 4 ✣ Summer 2009 ✣ pp. 568–601

Beyond Grades in Online Learning:

Adaptive Profiles of Academic Self-Regulation Among Naval Academy Undergraduates

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For years, educational psychologists have known that students who are motivated to learn tend to experience greater academic success than their unmotivated counterparts (Schunk, Pintrich, & Meece, 2008). One reason motivated students succeed is that they are prone to use various cognitive and metacognitive strategies that help make learning more efficient and effective (Flavell, 1979). Simply stated, most academically successful students are highly motivated, self-regulated learners (Pintrich, 2003).

Unfortunately, not all students are highly motivated, self-regulated learners. Many students do not feel competent enough to master what is being taught or fail to see the value of what they are learning (Pintrich, 1999); some are too bored, angry, or anxious to ever become academically engaged (Pekrun, Goetz, Titz, & Perry, 2002); and others do not know how or simply fail to use effective learning strategies (Pintrich & De Groot, 1990). Students like these may struggle in traditional classrooms, but when faced with learning online, they may be even more disadvantaged. This conjecture is based, in part, on the highly autonomous nature of learning online, where "students must exercise a

Educational psychologists have long known that students who are motivated to learn tend to experience greater academic success than their unmotivated counterparts. Using a social cognitive view of self-regulated learning as a theoretical framework, this study explored how motivational beliefs and negative achievement emotions are differentially configured among students in a self-paced online course. Additionally, this study examined how these different motivation-emotion configurations relate to various measures of academic success. Naval Academy undergraduates completed a survey that assessed their motivational beliefs (self-efficacy and task value); negative achievement emotions (boredom and frustration); and a collection of outcomes that included their use of self-regulated learning strategies (elaboration and metacognition), course satisfaction, continuing motivation, and final course grade. Students differed vastly in their configurations of course-related motivations and emotions. Moreover, students with more adaptive profiles (i.e., high motivational beliefs/low negative achievement emotions) exhibited higher mean scores on all five outcomes than their less-adaptive counterparts. Taken together, these findings suggest that online educators and instructional designers should take steps to account for motivational and emotional differences among students and attempt to create curricula and adopt instructional practices that promote self-efficacy and task value beliefs and mitigate feelings of boredom and frustration.

summary

Artino, A. R., Jr., & Stephens, J. M. (2009). Beyond grades in online learning: Adaptive profiles of academic self-regulation among Naval Academy undergraduates. *Journal of Advanced Academics, 20,* 568–601.

high degree of self-regulatory competence to accomplish their learning goals" (Dabbagh & Kitsantas, 2004, p. 40).

Purpose of the Study

Using a social cognitive view of self-regulated learning as a theoretical framework (Pintrich, 2000; Zimmerman, 2000), the purpose of this study was two-fold: (a) to explore and describe how students' motivational beliefs (self-efficacy and task value) and negative achievement emotions (boredom and frustration) are differentially configured among students in a self-paced online course, and (b) to conduct extreme groups analyses with students in the most and least adaptive motivation-emotion configurations in an effort to explore the associations between these two configurations and five measures of academic success (i.e., students' use of elaboration and metacognitive learning strategies, course satisfaction, continuing motivation to take future online courses, and final course grade). In doing so, the present study goes beyond course grade as the sole measure of academic success and provides insight into other important outcomes, such as the use of self-regulatory behaviors and the desire for further instruction in online learning contexts.

Background and Theoretical Framework

A central challenge for educational research today is to better understand the nature of online learning (Bernard et al., 2004). With the rapid expansion of Internet-based technologies, online learning has emerged as an accepted and increasingly popular alternative to traditional classroom instruction (Tallent-Runnels et al., 2006). For example, a recent survey of 2,500 U.S. colleges and universities by the Sloan Consortium found that the number of students taking at least one online course more than doubled from 1.6 million in 2002 to 3.5 million in 2006 (Allen & Seaman, 2007). Despite this extraordinary growth, very little is

known about the attributes, skills, and behaviors that contribute to student success in online learning (Bernard et al., 2004).

Instead, research in the field has been dominated by atheoretical, group-comparison studies that have assessed the attitudes and achievements of online learners versus traditional classroom students. Taken together, results from these investigations have generally found no statistically significant differences in various outcomes, including, for example, end-of-course grades and course satisfaction (e.g., Bernard et al., 2004; Phipps & Merisotis, 1999; Sitzmann, Kraiger, Stewart, & Wisher, 2006). Although valuable in their own right, such group-comparison studies have provided very little generalizable knowledge for the theory, research, and practice of online learning (Bernard et al., 2004; Gunawardena & McIsaac, 2004). Important to the objectives of the current study, previous research has focused only limited attention on personal factors, such as motivation and emotion, that are known to affect learning and performance in traditional academic settings (Schunk et al., 2008).

Self-Regulated Learning

As online learning has matured, so too has research and theory in the area of academic self-regulation (Boekaerts, Pintrich, & Zeidner, 2000). Academic self-regulation, also referred to as self-regulated learning, has been defined as "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features of the environment" (Pintrich, 2000, p. 453). Self-regulated learners are generally characterized as active participants who efficiently control their thoughts, feelings, and actions to positively impact their own learning (Schunk & Zimmerman, 1998, 2008).

In the last 10 years, several scholars have suggested that online learners—even more than traditional classroom students—require motivation and self-regulation to stay engaged, guide their cognition, and regulate their effort (Dabbagh

& Kitsantas, 2004; Hartley & Bendixen, 2001; Schunk & Zimmerman, 1998). This proposition stems from the belief that learning on the Web requires considerable autonomy and self-direction (Allen & Seaman, 2007; Hartley & Bendixen, 2001). By definition, learning "online" means learning without some of the critical temporal, spatial, and intellectual supports provided in a traditional classroom learning environment. Specifically, the latter provides a structured and planned time and space dedicated to learning and comes equipped, in most cases, with a responsive teacher who can organize and scaffold that learning. However, the "freedom" of online learning offers fewer of these tangible supports, thereby requiring students to manage, monitor, and regulate the time, place, and progress of their learning (Dabbagh & Kitsantas, 2004; Moore & Kearsley, 2005). Thus, as a mode of instruction, online learning appears to shift primary management and control of learning from the teacher to the student (Gunawardena & McIsaac, 2004). With this shift, educational researchers have turned to social cognitive models of academic self-regulation as frameworks for studying autonomous online learners (e.g., Miltiadou & Savenye, 2003; Whipp & Chiarelli, 2004).

Theories of self-regulated learning have long been used by educational psychologists as a means of better understanding how successful students adapt their beliefs and behaviors to improve learning in traditional classrooms. In general, investigations have consistently found that students with adaptive motivational beliefs use more effective self-regulated learning strategies and, as a result, outperform their counterparts with less-adaptive beliefs and behaviors (Pintrich, 1999; Pintrich & De Groot, 1990; Pintrich, Smith, Garcia, & McKeachie, 1993; Zusho, Pintrich, & Coppola, 2003). For example, in a study of 458 college undergraduates enrolled in an introductory chemistry course, Zusho et al. (2003) assessed students' motivational beliefs (e.g., self-efficacy for learning, task value, and goal orientation) and cognitive strategy use at three time points over the course of one semester. Results indicated that students' self-efficacy and task-value beliefs were positively related to strategy use and were

statistically significant predictors of course performance (final course grade), even after controlling for prior achievement.

Although limited, much of the research on self-regulation in online contexts has focused on identifying the motivational, cognitive, and behavioral characteristics of effective self-regulated learners, as well as assessing how these components link to one another and to other favorable outcomes. Using primarily correlational methods, the majority of these studies have emulated the early research on self-regulated learning in traditional classrooms (e.g., Pintrich & De Groot, 1990; Pintrich & Garcia, 1991). In general, these investigations have attempted to discern if the relationships found in conventional classrooms generalize to online situations. In particular, this research has focused on understanding the relations between students' motivational beliefs and their academic performance in online situations.

Motivational Influences on Self-Regulation. Social cognitive theories of academic self-regulation emphasize the importance of students' motivational beliefs throughout the cyclical phases of self-regulation (Schunk & Zimmerman, 2008). As Pintrich and De Groot (1990) argued, "knowledge of cognitive and metacognitive strategies is usually not enough to promote student achievement; students also must be motivated to use the strategies as well as regulate their cognition and effort" (p. 33). In particular, a social cognitive approach assumes that effective self-regulation depends, in large part, on students' self-efficacy for performing specific learning tasks (Bandura, 1997; Schunk & Ertmer, 2000; Zimmerman, 2000). According to Schunk (2005), "self-regulated learners are more self-efficacious for learning than are students with poorer self-regulatory skills; the former believe that they can use their self-regulatory skills to help them learn" (p. 87). Consistent with these theoretical assumptions, results from empirical studies have revealed that when compared to their counterparts with lower perceived self-efficacy, efficacious students report greater use of learning strategies (Artino & Stephens, 2006; Joo, Bong, & Choi, 2000); greater satisfaction with online learning (Artino, 2007, 2008; Lim, 2001); increased

likelihood of enrolling in future online courses (i.e., greater continuing motivation; Artino, 2007; Lim, 2001); and superior academic performance (Bell & Akroyd, 2006; Joo et al., 2000; Lynch & Dembo, 2004; Wang & Newlin, 2002).

Task value is another motivational construct that has received some attention in the online learning literature. Eccles and Wigfield (1995) have defined task value as the extent to which learners find a task interesting, important, and useful. On the whole, a limited number of studies in online contexts have revealed that task-value beliefs positively predict students' use of cognitive and metacognitive learning strategies (Artino & Stephens, 2006), academic performance and satisfaction (Artino, 2008; Miltiadou & Savenye, 2003), and continuing motivation (Artino, 2007). Beyond these few studies, however, little is known about how students' task-value beliefs relate to other adaptive outcomes in online environments.

Emotional Influences on Self-Regulation. Recently, motivation researchers have acknowledged the importance of achievement-related emotions and their impact on cognitive engagement and learning. In fact, several scholars have begun integrating discrete achievement emotions into theories of academic motivation and self-regulation (Linnenbrink, 2006; Linnenbrink & Pintrich, 2004; Pekrun, Elliot, & Maier, 2006; Pekrun et al., 2002). For instance, Pekrun (2006) has conceptualized a control-value theory of achievement emotions that delineates hypothesized linkages between students' motivational beliefs, achievement emotions, and learning and performance. According to control-value theory, positive and negative achievement emotions are determined, in part, by students' motivational beliefs (also referred to as their cognitive appraisals). Furthermore, the effects of emotions on learning and performance are thought to be mediated by several cognitive and motivational mechanisms, such as students' use of learning strategies, effort allocation, and persistence (Pekrun et al., 2002).

Using control-value theory as a framework, Pekrun et al. (2002) summarized several studies conducted with university

students in traditional classrooms. In general, these researchers have found that achievement emotions are related to students' use of learning strategies and various measures of academic success (Pekrun et al., 2002). Specifically, in a cross-sectional study of 230 university students, negative achievement emotions (anger, anxiety, and boredom) correlated negatively with motivational variables (interest and effort) and measures of learning strategies use (elaboration and metacognitive regulation); whereas positive emotions (enjoyment and hope) related positively to these same outcomes (all effects were moderate to strong; Cohen, 1988).

The Current Investigation

Findings from nonexperimental, correlational studies of online learning seem to support results from research in traditional classrooms, indicating that students' motivational beliefs about a learning task are related to beneficial academic outcomes. The extant literature, however, suffers from several limitations. First, many of the studies have used course grades as their sole performance outcome. And second, previous studies are rather limited with respect to the range of personal factors investigated. Although self-efficacy and task value have received some emphasis, few studies have considered the effects of other personal factors, such as achievement emotions—factors that many social cognitive theorists now acknowledge as critical to an understanding of individual learning and performance in academic settings (Linnenbrink & Pintrich, 2002; Pekrun et al., 2002; Picard et al., 2004).

Considering the limitations described above, the current study was designed to go beyond grades as the sole metric of academic success and to explore the role of both motivation and emotion as explanatory factors in various types of academic success. Specifically, this study examined the importance of students' self-efficacy and task-value beliefs, as well as their levels of boredom and frustration, on not only course grades but also their use of self-regulated learning strategies, course satisfaction, and continuing motivation. In doing so, this study was intended to fur-

ther inform our conceptualizations of academic self-regulation in online contexts, thereby providing much-needed guidance for the theory, research, and practice of online learning (Bernard et al., 2004; Gunawardena & McIsaac, 2004).

Method

Participants

A convenience sample of 481 undergraduates (sophomores and juniors) from the U.S. Naval Academy were invited to participate in this study. The sample included 398 men (83%) and 83 women (17%). The uneven percentage of males in this sample is representative of the undergraduate population at this military 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 U.S. Navy. Self-paced online courses are a specific type of online training in which students use a Web browser to access a course management system and complete Web-based courses at their own pace. While completing these courses, students do not interact with an instructor or other students.

The online course was the first part of a two-stage training program in flight physiology and aviation survival training required for all Naval Academy undergraduates. Upon successful completion of this online course, students advanced to the second stage of their training, which consisted of traditional instruction at a local training unit.

The online course was composed of four 40-minute lessons. Each lesson included text, graphics, video, interactive activities, and end-of-lesson quizzes that consisted of 12 to 15 multiple-choice 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. A student's final grade in the course was computed as the average of the four end-of-lesson quizzes. Because the online course was designed as a mastery learning experience, considerable range restriction in the grade measure was expected. Ultimately, this type of range restriction has the effect of downwardly biasing effect sizes (Cohen, Cohen, West, & Aiken, 2003), thereby making it more difficult to find statistically significant relationships.

Procedures

Approximately three weeks after completing the self-paced online course, students arrived at a local training unit for the face-to-face portion of their instruction. Prior to any classroom training, all students were invited to complete an anonymous, self-report survey. Participation in the survey was completely voluntary and 100% of the students completed the survey.

Instrumentation

The instrument used in this study 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*). In the present study, 36 of these 41 items were further subdivided into seven subscales designed to assess students' motivational beliefs (self-efficacy and task value), negative achievement emotions (boredom and frustration), use of cognitive and metacognitive learning strategies (elaboration and metacognition), and overall course satisfaction. The Appendix provides a list of the items in each subscale.

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* sub-

scale designed to assess students' judgments of how interesting, important, and useful the online course was to them.

Negative Achievement Emotions. Two subscales adapted from the Achievement Emotions Questionnaire (AEQ; Pekrun, Goetz, & Perry, 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.

Self-Regulated Learning Strategies. Students' self-reported use of cognitive and metacognitive learning strategies was assessed with items derived from the Motivated Strategies for Learning Questionnaire (MSLQ; 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). The items included in this section were similar to the original MSLQ, except that some items were reworded to reflect the online nature of the course. Although the two learning strategies subscales assessed self-reported strategies, for brevity, the variables 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).

Section two of the survey was composed of nine items, including demographic and background items (e.g., gender, age, and experience with online learning) and one individual item designed to assess students' *continuing motivation* (Maehr, 1976) to take future online courses: "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 (c) person-centered analyses focused on the individuals in the study rather than the variables (Peck & Roeser, 2003).

Confirmatory Factor Analysis

Prior to analysis, the data were screened for accuracy and missing values. Following data screening, several CFAs were completed on the items included in the first part of the instrument. Factors identified in the CFA were then subjected to reliability analysis, and the final subscales were identified based on these analyses. The variables used in the subsequent analyses were created by computing a mean score for the items associated with a particular subscale (i.e., the variables were unweighted composite scores).

Several CFAs were conducted to examine the convergent and discriminant validity of the seven-factor, 36-item instrument (Kline, 2005). Specifically, an iterative procedure (Kenny & Milan, 2007) was used to collect validity evidence for the measurement model being employed in this study. First, a preliminary CFA was conducted to examine the factorial structure of the entire, unmodified instrument. Next, four separate CFAs were conducted. Three were completed on the items associated with the three construct sets: motivational beliefs (self-efficacy and task value), negative achievement emotions (boredom and frustration), and learning strategies use (elaboration and metacognition). The fourth CFA was completed on the remaining factor (satisfaction). Based on these results, items were elimi-

nated in an effort to improve model fit (Brown, 2006). A final CFA was then conducted on the modified, seven-factor instrument (i.e., the entire instrument minus the deleted items), and the convergent and discriminant validity of the resulting instrument were assessed.

Listwise deletion of cases with missing data was used. There were 471 cases with no missing values on the 36 Likert-type items. Based on previous studies (Artino, 2008; Artino & McCoach, 2008; Pekrun et al., 2002; Pintrich et al., 1993), the 36 observed variables were hypothesized to load onto seven distinct latent variables: self-efficacy, task value, boredom, frustration, elaboration, metacognition, and satisfaction. Regression weights for 29 of the 36 items were freely estimated (one item per factor served as a marker variable). In addition, covariances between the seven factors were freely estimated.

Table 1 provides a summary of the resulting goodness-of-fit indices for the original, seven-factor model with 36 items. Overall, results indicated that the model fit was adequate (Hu & Bentler, 1999; Kline, 2005): the chi-square was statistically significant, χ^2 (573, N = 471) = 1588.275, p < .001; however, the normed chi-square (NC = 2.78) was less than 3.00, the comparative fit index (CFI = .913) was less than .95, and the root-mean-square error of approximation (RMSEA = .061) was slightly greater than .06. Although the overall fit statistics for the original seven-factor model were considered adequate, Brown (2006) warned that "the acceptability of the model should not be based solely on indices of overall model fit" (p. 173). That is, global indices may mask the fact that some of the relationships among the observed variables in the sample data have not been reproduced adequately by the hypothesized model (Brown, 2006). Therefore, Brown recommended that researchers examine standardized residuals and modification indices to identify local areas of model misfit.

In an attempt to improve the fit of the hypothesized seven-factor model, four separate CFAs were conducted on portions of the instrument, and standardized residuals and modification indices were examined. Standardized residuals represent differ-

Table 1

Fit Indices for the Measurement Models Tested (*N* = 471)

Model	χ^2	*df*	NC	CFI	RMSEA
Original 7-Factor Model (36 Items)	1588.275***	573	2.78	.913	.061
Modified 7-Factor Model (28 Items)[a]	658.791***	329	2.00	.961	.046

Note. **NC = normed chi square = χ^2/df; CFI = comparative fit index; RMSEA = root-mean-square error of approximation.**

[a]**Eight items were deleted based on results of the four previous CFAs: SE-5, TV-2, BOR-4, BOR-5, FRU-3, ELA-3, MET-7, and MET-9 (see Appendix for a list of all survey items).**

***$p < .001$.

ences between the model-implied covariance matrix (i.e., the predicted matrix) and the observed covariance matrix; as such, they reflect possible sources of model misfit. Standardized residuals with absolute values greater than 1.96 are considered statistically significant (Brown, 2006). Modification indices "reflect an *approximation* of how much the overall model chi-square would decrease if the fixed or constrained parameter was freely estimated" (Brown, 2006, p. 119). Modification indices of 3.84 or greater suggest that the overall fit of the model could be statistically significantly improved by, for example, adding a correlated error (Brown, 2006). Correlated errors are specified when some of the shared variance between two observed items is not explained by the latent factor (i.e., some of the shared variance is due to an outside cause; Brown, 2006). In survey development, this often occurs when items are redundant, have similar wording, and/or are differentially prone to social desirability. Although correlated errors can be specified according to modification indices, there should be a compelling empirical, conceptual, or practical reason for doing so (Brown, 2006). In this study, however, because the objective of the CFAs was to validate the hypothesized survey structure—and not simply to produce the best-fitting model—correlated errors were not specified. Instead, large modification indices, particularly those with outlying values, were identified. Next, the items associated with the large modification indices

were inspected, and problematic items were deleted (see recommendations in Brown, 2006).

Based on the results of the four CFAs, eight survey items were trimmed and a final CFA was conducted on the modified survey (i.e., the entire instrument minus the eight deleted items; see Table 1 for a list of the deleted items). The 28 remaining observed variables were hypothesized to load onto the same seven latent variables: self-efficacy, task value, boredom, frustration, elaboration, metacognition, and satisfaction. Regression weights for 21 of the 28 items were freely estimated (one item per factor served as a marker variable). In addition, covariances between the seven factors were freely estimated.

Table 1 provides a summary of the resulting goodness-of-fit indices for the revised, seven-factor model with 28 observed variables. When compared to the original model, all fit indices were much improved in the modified model. What is more, all fit statistics were within recommended guidelines for a good fit between the hypothesized model and the observed data (Hu & Bentler, 1999; Kline, 2005). Chi-square was still statistically significant, χ^2 (329, N = 471) = 658.791, p < .001; however, the NC was 2.00, the CFI (.961) was greater than .95, and the RMSEA (.046) was less than .06. Finally, standardized residuals and modification indices were examined to identify any localized areas of model misfit. Overall, no localized areas of strain could be identified (Brown, 2006).

Ultimately, results from the six CFAs conducted in this study suggested several survey modifications that resulted in a refined, more parsimonious version of the instrument. The resulting 28-item, seven-factor survey appeared to be psychometrically sound, with reasonable factor structure. Additionally, based on the results of the factor analyses described above, reliability analyses were run on the items retained in the seven subscales. As indicated in Table 2, Cronbach's alphas for the seven subscale scores were good (i.e., > .80; see guidelines in Gable & Wolfe, 1993).

Table 2

Descriptive Statistics for the Measured Variables (N = 481)

Variable	α	No. of Items	*M*	*SD*	Skewness			Kurtosis		
					Statistic	*SE*	Critical Ratio	Statistic	*SE*	Critical Ratio
Self-Efficacy	.91	4	5.32	1.12	-.63	.11	-5.73[a]	.57	.22	2.59
Task Value	.88	5	4.87	1.09	-.56	.11	-5.09[a]	.40	.22	1.82
Boredom	.84	3	4.02	1.32	-.15	.11	-1.36	-.23	.22	-1.05
Frustration	.89	3	3.36	1.45	.30	.11	2.73	-.36	.22	-1.64
Elaboration	.82	3	4.81	1.08	-.46	.11	-4.18[a]	.66	.22	3.00[a]
Metacognition	.89	7	4.12	1.11	-.31	.11	-2.82	.56	.22	2.55
Satisfaction	.92	3	4.77	1.20	-.71	.11	-6.45[a]	.67	.22	3.05[a]
Continuing Motivation	—	1	3.93	1.17	-.54	.11	-4.91[a]	-.11	.22	-0.50
Course Grade	—	—	89.10	3.66	.41	.11	3.73[a]	-.04	.22	-0.18

Note. Critical ratio = statistic / standard error. 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 Likert-type variables were measured on a 7-point response scale. Course grade ranged from 80 to 100.

[a]Values were outside the recommended acceptable range of ± 3.0 (Tabachnick & Fidell, 2007).

Descriptive Statistics

Descriptive statistics for the measured variables are provided in Table 2. 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) also was above the midpoint of the response scale. Standard deviations for these eight variables ranged from 1.08 to 1.45, and visual inspection of the associated histograms showed that seven variables (self-efficacy, task value, boredom, elaboration, metacognition, satisfaction, and continuing motivation) were negatively skewed. On the other hand, the distribution for frustration showed a slight positive skew. Furthermore, kurtosis critical ratios indicated that five of the eight variable scores (self-efficacy, task value, elaboration, metacognition, and satisfaction) were positively kurtotic (i.e., too peaked). In contrast, three of the eight distributions were slightly negatively kurtotic (i.e., too flat). Finally, course grade had a mean of 89.10 and a standard deviation of 3.66; its distribution was also positively skewed.

Although the distributions for most of the measured variables deviated from normality, these deviations were not unexpected. For example, it was not surprising to find that scores for students' motivational beliefs and use of learning strategies were negatively skewed. Naval Academy students tend to be highly motivated, high-ability students (United States Naval Academy [USNA], 2007), and one would anticipate that these students would rate themselves high on motivational and cognitive aspects of academic beliefs and behaviors.

Person-Centered Analyses

Person-centered analyses focus on the individuals in a study rather than the variables (Peck & Roeser, 2003). By examining students who have different configurations of motivational beliefs and negative achievement emotions, we hoped to learn more

about how actual groups of students differed on the five outcomes. Specifically, we wanted to compare students who we hypothesized would have adaptive motivation-emotion profiles (i.e., high motivational beliefs/low negative emotions) to those with less adaptive profiles (i.e., low motivational beliefs/high negative emotions).

To create these groups, we first took the extreme thirds for each variable. Next, we cross-tabulated the four variables (self-efficacy, task value, boredom, and frustration) to see which students remained in each cell. Specifically, we retained students who were in the highest third for the motivational beliefs variables and in the lowest third for the negative achievement emotions variables, as well as those in the lowest third for self-efficacy and task value and in the highest third for boredom and frustration. By contrast, students who were high on self-efficacy and task value, but only in the middle of the distribution on the other variables, for example, were dropped from these analyses.

Next, we compared the two extreme groups on the five measures of academic success. A one-way multivariate analysis of variance was conducted to determine if there were differences in these five outcomes when comparing students with adaptive motivation-emotion profiles versus those with less-adaptive profiles. Statistically significant differences were found, $F(5, 47) = 28.01$, $p < .001$. Results for the univariate F-tests are presented in Table 3. As indicated, students with the adaptive motivation-emotion profile exhibited significantly higher mean scores on all five outcomes when compared to students with the less adaptive profile. The effect for the mean difference on course grade was moderate; all other effects were large (Cohen, 1988).

Discussion

Educational psychologists, as well as classroom teachers, have long known that highly motivated, self-regulated learners tend to experience greater academic success than their unmotivated, less-regulated counterparts (Schunk et al., 2008). The current study examined the importance of motivation, as well as the added

Table 3

Mean Group Comparisons of Elaboration, Metacognition, Satisfaction, Continuing Motivation, and Final Course Grade by Two Motivation-Emotion Profiles

	Motivation-Emotion Profiles					
	High Motivational Beliefs/ Low Negative Emotions (n = 25)		Low Motivational Beliefs/ High Negative Emotions (n = 28)			
Variable	*M*	*SD*	*M*	*SD*	Univariate $F_{(1, 51)}$	Cohen's *d*
Elaboration	5.39	1.23	3.89	1.10	21.91***	1.29
Metacognition	5.06	.98	3.26	.97	44.95***	1.85
Satisfaction	6.33	.65	3.42	1.19	119.03***	3.11
Continuing motivation	5.36	.64	2.82	1.36	72.51***	2.49
Final course grade	89.64	3.80	87.57	2.87	5.07*	0.63

Note. Continuing motivation was measured on a 6-point Likert scale; course grade ranges from 80 to 100. The remaining variables were measured on a 7-point Likert-type agreement scale.

*$p < .05$.

***$p < .001$.

influence of negative emotions, in explaining students' self-regulation and other measures of academic success in an online course. Taken together, results from this study suggest that students learning online, like their classroom counterparts, possess different configurations of academic motivation and negative achievement emotions—configurations that are associated with a range of self-regulated learning and overall academic success.

In particular, findings from this study indicate that students with adaptive motivation-emotion profiles also experienced much greater success than their less-adaptive counterparts, as measured by their reported use of self-regulated learning strategies, course satisfaction, continuing motivation, and final course grades. These results not only support the extant literature on motivation and self-regulation in traditional classrooms (e.g., Linnenbrink & Pintrich, 2004; Pintrich, 1999), they also offer an important expansion of this empirical work by demonstrating that several processes and relations are equally robust in online learning situations.

In addition, this investigation adds to the educational psychology literature by considering students' achievement emotions as important contributors to their academic success in online contexts. Consistent with control-value theory (Pekrun, 2006; Pekrun et al., 2002), findings indicate that students who reported less boredom and frustration (along with more positive motivational beliefs) also experienced superior academic outcomes. Although this result was not unexpected, it is noteworthy because it sheds some light on the links between achievement emotions and several adaptive outcomes—relationships that have been largely neglected in educational research, in general (Linnenbrink & Pintrich, 2002; Picard et al., 2004), and online learning research, in particular (Wosnitza & Volet, 2005; Zembylas, Theodorou, & Pavlakis, 2008).

Educational Implications

Due to the post-only, self-report nature of this study, definitive implications for online learning are rather difficult to extract.

Nevertheless, results from this study provide course developers, instructors, and policy makers with a heightened awareness of the thoughts, feelings, and actions that characterize successful online learners. From a practical standpoint, institutions considering, or presently using, online learning may be able to apply these insights to improve their students' overall experience and academic performance in online learning. Given that the current investigation focused on a self-paced learning environment, the implications discussed below are written with this format in mind. However, course developers, instructors, and policy makers of other online formats also may find the following suggestions useful. In fact, these proposals may be especially helpful in online formats where an instructor is "present" and able to promote adaptive motivational beliefs and positive achievement emotions.

First, online learning has finally reached a more mature stage and is now considered by many to be a legitimate alternative (or supplement) to traditional classroom instruction (Tallent-Runnels et al., 2006). Consequently, comparative research is being replaced by investigations, such as this study, that attempt to explain learning processes and expand learning theory into online contexts. In particular, findings from this study reveal the importance of students' motivational beliefs and negative achievement emotions in explaining their use of self-regulated learning strategies and overall academic success in a self-paced online course. Thus, it seems that social cognitive models of self-regulation may be useful to both researchers and practitioners as they endeavor to better appreciate how students go about learning in online environments.

Second, although the extreme groups examined in this study constituted only about 11% of the total sample, these learners are extremely important in that one might consider them to be the most promising and most struggling students. And although the grade difference found in this study was marginal (due, in part, to restricted range in final course grade; Cohen et al., 2003), the differences between these students on other important metrics of academic success were very large. So, while students with

the least adaptive motivation-emotion configurations did not receive vastly lower grades than their counterparts with highly adaptive configurations, they did report less cognitive and metacognitive engagement, much less satisfaction with their learning experience, and much less desire to participate in future online learning. These latter two outcomes are immensely important with respect to long-term educational attainments, particularly for corporate and military organizations, where ongoing education and training of workers is necessary to keep pace with the ever-changing global economy (Fletcher, Tobias, & Wisher, 2007; Resnick, 2002). Organizations hoping to maintain their competitive advantage need their "learners" to be motivated by and positive about training experiences they are offered. As the present study shows, such learners not only engage more deeply in the learning material and gain more from the educational opportunities before them, they also are more satisfied with those experiences and more likely to *choose* future opportunities to update their knowledge and skills (Chiu, Sun, Sun, & Ju, 2007; Roca, Chiu, & Martinez, 2006).

Finally, results from this study suggest that positive motivational beliefs and lower levels of negative emotions are generally associated with greater cognitive and metacognitive activity, increased satisfaction and continuing motivation, and higher course grades. In practical terms, implications can be based on the basic assumption that learning and performance will likely be improved when adaptive motivational beliefs are bolstered and negative achievement emotions are minimized. Thus, it seems that instructional designers and policy makers would do well to address those areas of course design and delivery that are apt to have a positive impact on students' beliefs and emotions. This could include, for example, (a) promoting self-efficacy for learning online by encouraging students to set challenging, proximal learning goals (Zimmerman, 2008); (b) addressing task value beliefs and relevance by utilizing authentic, problem-based learning activities (Artino & Stephens, 2006); (c) minimizing boredom by providing students with opportunities to select, organize, and integrate new information into their existing

knowledge structures (Mayer, 2002); and (d) curtailing frustration by ensuring that the technology is reliable, accessible, and usable (O'Regan, 2003). In the end, however, the most important step toward improving self-paced online learning may be for instructional designers and students alike to simply become aware of the close interrelations between motivation, emotion, and academic self-regulation, as highlighted by the findings of the current study.

Study Limitations

Three important limitations should be considered when interpreting these results. First, the sample used in this study was extremely homogenous. In particular, student demographics are somewhat different than those of the average undergraduate. For instance, the majority of Naval Academy students are men, most are unmarried with no children, and none are physically disabled. Moreover, Naval Academy undergraduates are generally considered high-ability students. For example, standardized test scores for the class of 2011 were well above the national average, with 69% and 84% of students scoring above 600 on the verbal and math components of the SAT, respectively (USNA, 2007). National SAT statistics for 2007 college-bound seniors were considerably lower, with only 21% and 25% of students scoring above 600 on the verbal and math components, respectively (College Board, 2007). Therefore, results from this study have limited generalizability beyond the present sample (Shadish, Cook, & Campbell, 2002).

Second, this study utilized a fairly simplistic, cross-sectional, post-only design (Shadish et al., 2002). This type of nonexperimental design is extremely limited with respect to the inferences that can be drawn; that said, such designs often benefit from high construct validity and provide opportunities to collect rich and detailed cross-sectional data (Judd & Kenny, 1981).

Finally, the use of an extreme groups approach has been criticized by several methodologists (e.g., Preacher, Rucker, MacCallum, & Nicewander, 2005). For example, Preacher et al.

(2005) argued that by removing and ignoring a large proportion of a sample, researchers have no idea what the missing data could have told them. That said, Preacher et al. have also suggested several productive, justifiable uses for the extreme groups approach, one of which is to "maximize the power for detecting the presence of an effect" (p. 188). In the current study, the extreme groups approach was used, in part, to detect a hypothesized effect (i.e., differences in course grade)—an effect that otherwise would have been masked by the range restriction in the grade outcome. Nonetheless, findings from this study should be interpreted with care.

Conclusions

Overall, results from this study provide some insight into the complex relations between personal factors, self-regulated learning, and academic success in an online course. Notwithstanding the study limitations described above, these findings principally support the existing literature on self-regulation in classroom-based contexts (e.g., Pekrun et al., 2002; Pintrich, 1999; Pintrich et al., 1993; Zusho et al., 2003). Specifically, the findings reported here substantiate the social cognitive notion that students' motivational beliefs and negative achievement emotions are related, in essential ways, to their self-regulatory behaviors, satisfaction, continuing motivation, and academic achievement. These results are important because they further inform our understanding of both online learning and academic self-regulation.

Consistent with the limited research in online contexts (e.g., Bell & Akroyd, 2006; Joo et al., 2000; Lynch & Dembo, 2004; Wang & Newlin, 2002; Whipp & Chiarelli, 2004), results from this study suggest that social cognitive theories of self-regulation provide a useful framework for understanding student success in online situations. Accordingly, future studies should continue to apply such multidimensional models of learning to further enlighten our understanding of the complex relations between students' thoughts, feelings, and actions during online learning.

Additionally, future work should examine whether interventions designed from a self-regulated learning perspective—that is, those intended to bolster students' beliefs and emotions—can actually improve learning and performance in highly independent online learning contexts. Ultimately, engaging in such work has the potential to advance the field by providing added guidance for the theory, research, and practice of online learning.

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Author Notes

An earlier version of this manuscript was presented at the 2008 annual meeting of the American Psychological Association, Boston, MA.

The first author is a military service member. The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, or the U.S. Government.

Appendix
Survey Items Contained in the Unmodified, Seven-Factor, 36-Item Instrument

Using the scale below, select the extent to which you agree with each statement.

completely disagree 1	mostly disagree 2	tend to disagree 3	neutral 4	tend to agree 5	mostly agree 6	completely agree 7

Self-Efficacy

The following statements relate to your beliefs in your ability to learn with self-paced, online courseware (such as the online portion of this Navy course).

SE-1 Even in the face of technical difficulties, I am certain I can learn the material presented in an online course.

SE-2 I am confident I can learn without the presence of an instructor to assist me.

SE-3 I am confident I can do an outstanding job on the activities in a self-paced online course.

SE-4 I am certain I can understand the most difficult material presented in a self-paced online course.

SE-5 Even with distractions, I am confident I can learn material presented online.

Task Value

The following statements relate to your opinions regarding the value of the online portion of this Navy course.

TV-1 It was personally important for me to perform well in this course.
TV-2 This course provided a great deal of practical information.
TV-3 I was very interested in the content of this course.
TV-4 Completing this course moved me closer to attaining my career goals.
TV-5 It was important for me to learn the material in this course.
TV-6 The knowledge I gained by taking this course can be applied in many different situations.

Boredom

Participating in an online course can induce different emotions. Please indicate how you felt while completing the online portion of this Navy course.

BOR-1 I was bored.
BOR-2 I felt the course was fairly dull.
BOR-3 My mind wandered.
BOR-4 I was uninterested in the course material.
BOR-5 I thought about what else I would rather be doing.

Frustration

Participating in an online course can induce different emotions. Please indicate how you felt while completing the online portion of this Navy course.

FRU-1 I felt frustrated.
FRU-2 I was angry.
FRU-3 I felt as though I was wasting my time.
FRU-4 I was irritated.

Elaboration

The following statements relate to various learning strategies you may have used while completing the online portion of this Navy course.

ELA-1 I tried to relate what I was learning to what I already know.
ELA-2 I tried to make all the different ideas fit together and make sense to me.
ELA-3 I made up my own examples to help me understand the important concepts.
ELA-4 I tried to connect what I was learning with my own experiences.

Metacognition

The following statements relate to various learning strategies you may have used while completing the online portion of this Navy course.

MET-1 If I became confused about something I read, I went back and tried to figure it out.
MET-2 If course material was difficult to understand, I changed the way I studied it.
MET-3 I asked myself questions to make sure I understood the material I was studying.
MET-4 I tried to think through each topic and decide what I was supposed to learn from it, rather than just reading it over.
MET-5 I tried to determine which concepts I didn't understand well.
MET-6 I set goals for myself in order to direct my activities.
MET-7 If I got confused during online activities, I made sure I sorted it out before proceeding on to the next section of the course.
MET-8 I kept track of how much I understood, not just if I was getting through the material.

MET-9 I stopped once in a while and went over what I had learned.

Satisfaction

The following statements relate to your overall satisfaction with the online portion of this Navy course.

SAT-1 Overall, I was satisfied with my online learning experience.

SAT-2 This online course met my needs as a learner.

SAT-3 I would recommend this online course to a friend who needed to learn the material.