



## The role of emotion in the learning process: Comparisons between online and face-to-face learning settings

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### ABSTRACT

As the presence of online and hybrid coursework at institutions of higher education has increased, so too has interest among educators and scholars in understanding personal and contextual factors that predict success in different types of learning environments. The purpose of the present study was to examine the relations among temporally-ordered variables, including beginning-semester self-efficacy, utility value, and relevance of instruction, mid-semester emotions (hope, frustration, and anxiety), and end-of-semester learning strategies in a sample of 291 graduate students ( $N = 219$  for the traditional education group and  $N = 72$  for the distance education group) enrolled in an introductory research methods course. Multigroup path analyses were performed to test the equality of path coefficients among the two groups. Results demonstrate that the groups differed with respect to several paths, including the paths from: extrinsic utility value to anxiety and to hope; relevance to hope; and frustration and anxiety to learning strategies. Implications for research, theory, and practice are discussed.

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### 1. Introduction

As the presence of online and hybrid coursework at institutions of higher education has increased, so too has interest among educators and scholars in understanding personal and contextual factors that influence student choice in learning medium and in turn, which factors predict success in different types of learning environments. Researchers have discovered that student preference for online learning environments and engagement with online material is related to student self-efficacy for online learning (Artino, 2010; Clayton, Blumberg, & Auld, 2010), self-efficacy for computer use and for self-regulation (Spence & Usher, 2007), and learning orientations that involve independence and organization (Hoskins & van Hooff, 2005). Students may view online environments as offering benefits with respect to collaboration, self-regulated learning, and information seeking over those offered in more traditional classrooms (Lee & Tsai, 2011) and some research suggests that students participating in online learning environments evidence greater achievement than their peers in face-to-face classes (e.g., Lim, Kim, Chen, & Ryder, 2008).

Empirical research is only beginning to surface about the motivational and emotional processes which unfold between enrollment choice and eventual course outcomes that might be similar or different for students in online compared to traditional face-to-face courses. Much research on online environments has focused on

course design and instructional strategies that influence student participation and performance (see Osborne, Kriese, Tobey, & Johnson, 2009 for discussion). Researchers concerned with differences between online and traditional classrooms and how students experience blends of the two also highlight the importance of student perceptions of the learning environment and student motivation during the learning process in predicting positive learning strategies and outcomes (e.g., Ginns & Ellis, 2007; Lee & Tsai, 2011). One other aspect of student experience that is just beginning to enter the research dialog about online learning is student emotion.

During the past decade, emotion has emerged as a vital element of the learning process but many questions remain about emotion in education (Pekrun, 2005). Research has identified both classes of emotion and specific discrete emotions as predictive of student academic outcomes with a range of student populations (e.g., Ainley, 2006; Goetz et al., 2012; Linnenbrink-Garcia, Rogat, & Koskey, 2011). Further, empirical evidence supports the theoretical notion that one way student emotional experience influences academic outcomes is as a conduit for a range of personal and contextual variables (Artino, La Rochelle, & Durning, 2010; Daniels et al., 2009). The majority of research on the role of emotions in academic learning has centered on traditional, brick-and-mortar classroom learning situations. What is less known is how emotions function in online learning environments and whether the predictors and outcomes associated with academic emotions are similar or different from traditional classroom environments. Thus, the purpose of this study is to explore the role of emotion in the learning process by investigating whether relations among motivational factors, emotions, and academic learning strategies are consistent or differ for

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students learning in different modalities in a graduate-level research methods course.

## 2. Relevant literature and theoretical framework

Wosnitzer and Volet (2005) called for more research on the role of emotions on the learning process in online environments, citing theoretical and empirical work in general education as evidence of the importance of understanding the origin, direction, and impact of emotions in learning. Responding to that call, the literature on emotions in online learning environments has grown in recent years. Research has focused on in-depth description of both the arousal and expression of emotion during online learning tasks, often related to collaboration, taking into account the role of social partners and the features of the task in contributing to emotional development (e.g., Jarvenoja & Jarvela, 2005; Smith, 2008; Wosnitzer & Volet, 2005; Zembylas, 2008). Another emerging topic reports instructional techniques and course design that can be used to enhance student emotional experiences and engagement with online coursework (e.g., Michinov & Michinov, 2008; Shank, 2009). A third literature strand has quantitatively considered emotion as a personal factor that influences student learning and performance (e.g., Artino, 2010; Artino & Stephens, 2009). This line of research is situated within social-cognitive views of self-regulated learning and considers achievement emotions as a crucial aspect of the learning process, one which involves a complex interplay between personal and contextual factors (Pekrun, 2006). The present study seeks to complement the last area of research.

### 2.1. Emotion in the learning process

The control-value theory of achievement emotions posits that students' motivational beliefs, perceptions of their learning environment, cognitive quality, and other environmental factors influence students' control and value appraisals of academic situations, which in turn predict student emotions and eventual learning and achievement outcomes. The relationships among the elements of this model are thought to be dynamic and reciprocal (Pekrun, 2006). Adaptations of this model, in combination with theory from self-regulated learning, have been used in research on online learning environments. The model most commonly applied in online research is a social-cognitive model of self-regulated learning that includes personal factors, consisting of motivational beliefs and achievement emotions, predicting personal behaviors related to cognitive strategy use, and academic outcomes (Artino, 2009a; Artino, 2009b).

Much of what is known about achievement emotions stems from research with students participating in traditional educational settings. Pekrun and his colleagues have identified enjoyment, hope, pride, relief, anxiety, shame, hopelessness, anger/frustration, and boredom as commonly occurring academic emotions in undergraduate student populations across class, learning, and test-related situations (Pekrun, Elliot, & Maier, 2009; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011; Pekrun, Goetz, Titz, & Perry, 2002). Positive emotions, such as enjoyment, hope, and pride, have been positively associated with intrinsic motivation, effort, self-regulation, and more sophisticated learning strategies (Pekrun et al., 2011), whereas negative emotions such as anger/frustration, shame, anxiety, and boredom have been associated with reduced effort, lower performance, increased external regulation, and decreased self-regulated learning strategies (Artino, 2009b; Daniels et al., 2009; Pekrun et al., 2009).

There is limited research on discrete emotions in online learning contexts. Discrete emotions that have been investigated with respect to online learning in higher education include anger/frustration, boredom, and enjoyment. Artino and Stephens (2009) found that when frustration and boredom were paired with self-efficacy and task value to create adaptive and maladaptive motivation-emotion profiles, students with more adaptive profiles reported higher levels

of self-regulated learning strategies, greater course satisfaction and performance, and motivation to enroll in future online courses. Other research with online students indicated that boredom and frustration were negatively related to course satisfaction and continuing motivation; however, they were unrelated to the use of elaboration as a learning strategy. Additionally, boredom negatively predicted metacognition whereas the relationship was positive for frustration (Artino, 2009b). In other research, the three discrete emotions did not distinguish between students who reported preferring online or face-to-face courses (Artino, 2010), nor were students taking online courses in their area of professional core more or less likely to experience negative emotions than non-core students (Artino, 2009a). This emerging literature has not yet tested temporally-ordered process models of self-regulated learning, such as those outlined in the literature on traditional classroom settings (e.g., Artino et al., 2010; Daniels et al., 2009), which include emotion as an outcome of motivational perceptions and an antecedent of learning strategies. The literature on the role of emotions in online higher education environments lacks depth in two areas addressed by the present study (1) understanding how emotion fits into the process of learning, and (2) investigation of other discrete emotions experienced during online courses, such as hope and anxiety.

### 2.2. Antecedents and consequences of emotion in online learning

Emotions serve a variety of functions in the academic environment, including promoting or undermining behavioral and cognitive engagement, self-regulation of learning activities, and achievement (Linnenbrink-Garcia & Pekrun, 2011). Research searching for the source of student achievement emotions has identified a complex and varied pool of proximal and distal antecedents of student emotion, (Ainley, Corrigan, & Richardson, 2005; Assor, Kaplan, Kanat-Maymon, & Roth, 2005; Jarvenoja & Jarvela, 2005; Op't Eynde & Turner, 2006; Pekrun et al., 2002; Ruthing et al., 2008). Yet, perhaps the most important implication of achievement emotions to emerge from the literature is that achievement emotions are malleable, emerging from person-environment transactions, and may reflect academic adjustment (Pekrun et al., 2011; Schutz, Hong, Cross, & Osbon, 2006). Thus, the study of the antecedents and consequences of achievement emotions in a variety of situations (such as testing or during coursework) and settings (i.e., traditional or online courses) is crucial for understanding how to create learning environments that can promote positive emotional experiences, which in turn enhance student learning and performance.

In the present study, three predictors of course-related emotions were investigated: self-efficacy for learning research methods, perceived task value of research methods, and perceived relevance of instruction. Self-efficacy, or student beliefs and expectations about their capabilities (Bandura, 1977; Usher & Pajares, 2008), has been considered one aspect of student control beliefs in the classroom (Pekrun et al., 2011). Higher self-efficacy has been consistently related to higher levels of positive emotions, such as hope, pride, and enjoyment and lower levels of negative emotions such as anger/frustration, shame, boredom, and hopelessness (e.g. Goetz, Cronjaeger, Frenzel, Ludtke, & Hall, 2010; Pekrun et al., 2011). Research on self-efficacy in online learning has predominantly investigated self-efficacy for computer use or online learning (see Moos & Azevedo, 2009 for review). Self-efficacy for subject learning in relation to student emotion in online settings has been investigated on a limited scale in mathematics (Spence & Usher, 2007) and never in relation to learning research methods material at the graduate level. Thus, the present study included student perceptions of self-efficacy for learning research methods material as an antecedent to student course-related emotion.

The second antecedent of student emotion included in the present study was student task value. Prior research in online environments has demonstrated a positive association between task value and

learning strategy use (Artino, 2009a; Artino, 2009b; Artino & Stephens, 2006). Research has also demonstrated that task value shares an important association with academic emotions (Artino, 2009b; Pekrun et al., 2002; Pekrun et al., 2011). Task value has been conceptualized in many different ways, but one major component of task value is utility value (Eccles & Wigfield, 1995). Utility value is defined as “the value a task acquires because it is instrumental in reaching a variety of long- and short-range goals” (Eccles & Wigfield, 1995, p. 216). If students develop beliefs about the utility value of understanding research to improve their classroom practice, they should be more likely to have more positive emotional experiences in learning situations.

The theoretical frame for this study suggests that students' subjective experiences of their learning environment, which may include features such as instructional support or task characteristics, should shape student academic emotions as well as their use of learning strategies (Artino, 2009a; Artino, 2009b; Pekrun, Frenzel, Goetz, & Perry, 2007). Further, research operating within a self-determination paradigm posits that not all academic activities are intrinsically motivating, but through providing external supports, such as a rationale as to why an activity is useful or relevant to students' lives, students may internalize the value of engaging in activities that may not be particularly compelling or intrinsically interesting (Deci & Ryan, 1985; Reeve, Jang, Hardre, & Omura, 2002; Ryan & Deci, 2000). Fostering relevance is one such external support, which refers to actions that help students understand the connection of the academic material to their own interests and goals (Assor, Kaplan, & Roth, 2002). When students perceive instruction to be successful at fostering relevance, they are more likely to experience positive affect in learning situations and greater engagement (Assor et al., 2002; Deci, Eghrari, Patrick, & Leone, 1994). In graduate-level education courses, instructional strategies to foster relevance may include connecting course material to real-world or practice applications. Perceived relevance of instruction has not yet been subject to empirical investigation in relation to emotion in online settings with students of higher education.

Student learning strategy use serves as the outcome of student emotional experience in the current investigation. Meaningful learning strategy use is one element of self-regulatory behavior and is typically conceptualized as a mediator between personal and contextual characteristics of students of higher education and actual student performance (Pintrich, 2004). Research on student emotions with respect to college-student learning has often focused on predicting academic achievement and performance (Daniels et al., 2009; Pekrun et al., 2009), at times bypassing student engagement, strategies, or attitudes that should lead to better performance. Theoretically, positive emotions should lead to more flexible strategy use (Isen, 2008) and conversely negative emotions should lead to less meaningful strategy use, but that premise has been only minimally investigated in online environments (Artino, 2009b; Artino & Stephens, 2009).

Researchers have suggested that learning online “requires considerable autonomy and self-direction” (Artino & Stephens, 2009, p. 572), perhaps even more so than in traditional learning environments as control for learning is shifted from the teacher to the student (Hartley & Bendixen, 2001). If positive student emotion contributes to more adaptive patterns of self-regulated learning, as indicated by various researchers (e.g. Artino & Stephens, 2009), then understanding the processes associated with student emotional experiences in online environments becomes a critical task. As suggested by Schutz et al. (2006), emotional experiences involve person-environmental transactions that exist within particular activity settings. In education, those activity settings are the classroom, and Schutz and his colleagues recommend focusing inquiry on emotion in the activity setting where the transactions occur. Therefore, if emotions exist as a result of person-environment transaction within certain activity settings, educators and scholars may pose questions as to whether there may be something different about the nature of the person-environmental transaction in online settings as compared to traditional settings. And if the nature

of that transaction does differ, then it is possible that the relative influence of antecedents of emotion or the strength of emotion in predicting academic outcomes may vary across settings. It is beyond the scope of the present study to investigate the nature of the transactions in the different settings, so instead, the present study focuses on the relations among the antecedents and consequences of emotions across activity settings.

### 3. The present study

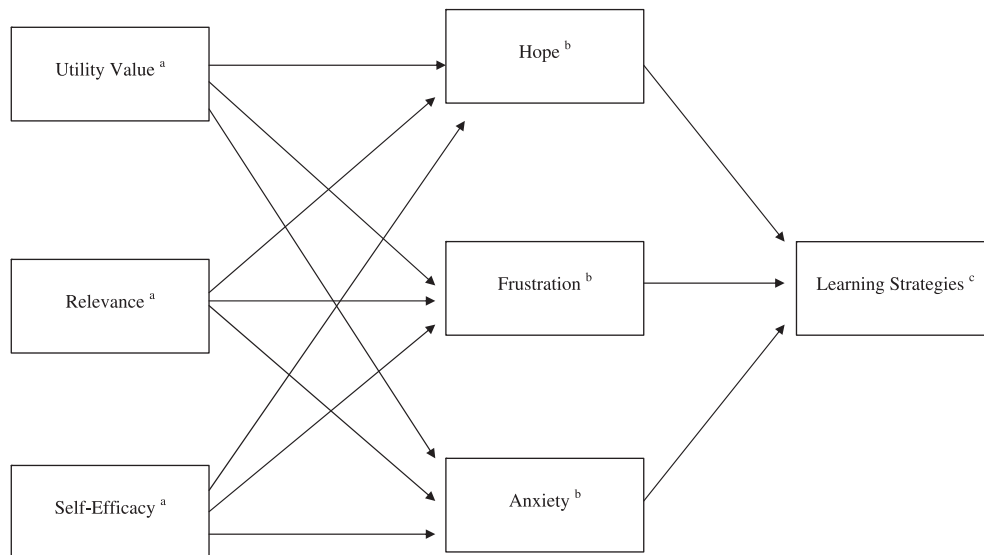
Graduate-level research methods coursework was selected as the context for the present study for two reasons. First, the research methods course is a required course for all students enrolled in a master's program in the college of education. Little research has been conducted with education majors about their experiences with research, but research with psychology students has noted that few students express interest, enthusiasm, or positive attitudes for taking research and statistics courses (Sizemore & Lewandowski, 2009). Anecdotal information from graduate students in research methods courses would suggest that this population may also lack enthusiasm for this type of course, leading the researchers to believe that this course might be a rich venue for identifying a range of positive and negative emotions related to the course itself. Second, the research methods course is offered as a distance and a traditional face-to-face course, providing a venue for comparison between the two modalities.

There is no overwhelming theoretical or empirical justification to suggest that predictors and outcomes of academic emotions should differ for students in traditional or online formats. The lack of empirical evidence as to the learning process for distance education students led to the framing of this study as exploratory, posing research objectives rather than hypotheses. The first objective of this study was to test a model based on the work of Pekrun (2006) and Artino (2009a, 2009b), investigating the role of emotion in the learning process for both traditional and online students in graduate-level research methods courses offered in a college of education. The conceptual model guiding the study design and analyses is shown in Fig. 1. According to Fig. 1, extrinsic utility value, perceived relevance of instruction, and academic self-efficacy at the beginning of the semester are antecedents of mid-semester academic emotions of hope, frustration, and anxiety, respectively. The academic emotions are predictors of semester-end learning strategy use. The second objective of the study was to investigate whether there were differences in the model relationships across students in online and face-to-face settings.

## 4. Method

### 4.1. Participants and design

Participants were 291 graduate students enrolled in both face-to-face and online sections of an introductory research methods course offered at a southwestern university located in a large urban area. The traditional face-to-face and online sections of the course were similar in many ways. An analysis of syllabi of courses offered during the study period indicated that both traditional and distance courses were taught by faculty members, adjunct professors with doctoral degrees, and graduate assistants pursuing doctoral degrees. At least one faculty member taught both traditional and distance education sections. Both formats had a cap of 30 students per section and were designed to be completed within a single semester. The distance courses were asynchronous in nature. The traditional course instructional format consisted of combinations of lecture and group work, with the emphasis typically on lecture. The distance courses all included video or audio lectures and discussion activities, with variations of other types of assignments. Participation and discussion expectations were more formalized in distance education courses and more heavily weighted than in traditional formats. In both



**Fig. 1.** The hypothesized path model for distance education and traditional groups. Key: <sup>a</sup> time 1 variables (beginning of semester), <sup>b</sup> time 2 variables (mid-semester), and <sup>c</sup> time 3 variables (end-of-semester).

formats, one of four introductory textbooks was used and both types of classes evaluated students by a combination of tests and quizzes, a final project usually consisting of some kind of research article critique, and participation or homework.

Students reported on a range of demographic and course history items, although not all students chose to respond to these questions. Fifty-three (18%) of participants were male and 132 (45%) were female (37% of participants did not respond). Participants' age ranged from 21 to 68 ( $M = 33.5$ ,  $SD = 9.97$ ), with over 75% seeking master's degrees in education with a variety of emphases (e.g., educational leadership, sports education leadership, and curriculum and instruction), and 113 (39%) reporting that they currently work as teachers. The ethnic breakdown of the participants who reported this information was as follows: 21 (7%) Hispanic; 120 (41%) Caucasian; 15 (5%) African-American; 21 (7%) Asian-American/Pacific Islander; and 8 (3%) Other/Mixed (37% unreported). In terms of previous exposure to research methods or statistics, 74 (25%) participants reported having previous experience with research methods courses and 92 (32%) had received previous training in statistics. Finally, 166 (57%) students reported having previously conducted research in some way.

The study design was correlational in nature. Students responded to questionnaires at three points during a single semester. All exogenous variables (i.e., utility value, relevance, and self-efficacy) were taken from time 1, all emotion variables (i.e., hope, frustration, and anxiety) were taken from time 2, and learning strategies (the outcome) were taken from time 3. Hence, although different time points were used, the study is not longitudinal because the focus was on different, albeit temporally-ordered, variables across the semester. No attempt was made to draw causal inferences from these data, as the intent was to describe students' experiences in distance education and traditional/face-to-face graduate-level introductory research methods courses through a variety of measures.

## 4.2. Materials and instruments

### 4.2.1. Demographics

A 10-item demographic questionnaire was developed by the researchers to solicit information such as age, gender, degree and emphasis, ethnicity, and prior exposure to research methods and statistics courses. In addition, questions were included that asked students to report previous experience conducting research (e.g., action

research, using the research literature to understand a problem in the classroom, and using research to enhance professional practice).

### 4.2.2. Academic emotions

Pekrun, Goetz, and Perry's (2005) Achievement Emotions Questionnaire (AEQ) was used to gauge students' achievement emotions in relation to the course. Only items related to emotions before and during class were included for the present study. Although the AEQ measures a range of positive and negative activating and deactivating emotions in line with the control value theory of achievement emotions (Pekrun et al., 2002), only the positive activating emotion of hope (8-item scale) and the negative emotions of anxiety (10-item scale) and anger/frustration (4-item scale) were used in this study. Sample items include, "I am full of hope (hope, before class)," "I feel anger welling up in me (frustration, during class)," and "I feel scared (anxiety, before class)." Students responded on a five point Likert scale from "strongly disagree" (1) to "strongly agree" (5). Instructions were provided to fit either setting. When responding to items related to before class, online students were instructed to "please indicate how you feel before signing in to access the material"; when responding to items related to during class, online students were instructed to "please indicate how you feel when you're working on the material".

The course-related AEQ has demonstrated acceptable reliability in previous studies, with alpha levels ranging from .84 to .95 for hope, .85 to .91 for frustration, and .89 to .91 for anxiety (Ouano, 2011; Pekrun et al., 2005). Cronbach's alphas for the scales used in the present study, by setting, are located in Table 1.

### 4.2.3. Motivation

The motivational factors of self-efficacy and extrinsic utility value were also measured. Self-efficacy was measured using a 7-item scale adapted from the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich, Smith, Garcia, and McKeachie (1991), which included items such as "I'm certain that I can master the skills taught in research methods this year," and "I can do almost all the research methods coursework if I don't give up." Self-efficacy items were answered on a 7-point Likert scale ranging from "Not at all true of me (1)" to "Very true of me (7)". Internal consistency reliability coefficients for the self-efficacy scale range from .89 to .93 in previous research (e.g., Hadwin, Winne, Stockley, Nesbit, & Woszczyzna, 2001; Pintrich et al., 1991).

**Table 1**  
Descriptive statistics and reliability coefficients for relevance, motivation, emotions, and learning strategies by group.

Variables	Distance <sup>a</sup>			Traditional <sup>b</sup>		
	M	SD	α	M	SD	α
Motivation						
Self-efficacy	5.42	0.92	0.88	5.76	0.81	0.89
Utility value	4.88	1.09	0.70	4.98	1.26	0.82
Relevance	4.73	1.04	0.90	5.56	0.91	0.90
Emotions						
Hope	3.49	0.50	0.80	3.69	0.61	0.87
Frustration	2.10	0.74	0.75	1.80	0.70	0.80
Anxiety	2.51	0.83	0.93	2.18	0.71	0.90
Learning Strategies	3.77	0.60	0.91	4.00	0.54	0.90

<sup>a</sup> N = 72.

<sup>b</sup> N = 219.

The extrinsic utility value scale was adapted from the work of Eccles and Wigfield (1995) and measured students' value of the tasks. The 2-items for this measure were "How useful is learning research methods for what you want to do after you graduate and go to work?" and "How useful is what you learn in research methods for your daily life outside school." Possible responses ranged from "Useless (1)" to "Moderately useful (4)" to "Very useful (7)". The inter-item correlation between these two items in the present study was moderate,  $r = .67$ .

4.2.4. Perceived relevance of instruction

An instrument designed for this study was developed to assess perceived relevance of instruction using items loosely adapted with the authors' permission from the work of Assor et al. (2002); Nix, Fraser, and Ledbetter (2005); and the Teacher as Social Context instrument (TASC; Belmont, Skinner, Wellborn, & Connell, 1992). Sample items were, "The instructor provides examples of how research methods connects to real life," and "The instructor discusses how I can use the information I'm learning in this course." Students rated their agreement to these 8 items on a 7-point Likert scale ranging from "Not at all true (1)" to "Very true (7)".

4.2.5. Learning strategies

Greene, Miller, Crowson, Duke, and Akey's (2004) measure of meaningful strategy use was used to assess students' learning strategy use with the course material. This 12-item instrument includes items such as, "Before a quiz or exam, I plan out how I will study," "If I have trouble understanding something I go over it again until I understand it," and "When I study I am aware of the ideas I have or have not understood." Students responded to these items on a five point Likert scale from "strongly disagree" (1) to "strongly agree" (5). Greene et al. reported the Cronbach's alpha value for the measure to be .88.

4.3. Procedures

The research was approved by the university's institutional review board prior to the commencement of any data collection activities. A convenience sample of students was recruited from traditional and distance education settings of the graduate level introductory research methods course, and those who participated received course credit. All survey items were completed online via the Educational Psychology Department's Experiment Management System. Upon clicking on the research study link, students were taken to the electronic informed-consent form where they read brief information about the study. Subsequently, students were taken to the questionnaire if they voluntarily agreed to participate in the study. Data were collected at three points during the semester: following two

weeks of instruction, mid-way through the semester at week 7, and two weeks prior to the end of the semester. Students had seven days to complete the study, albeit once they began the survey, students were expected to complete it in its entirety in one session (i.e., with no breaks).

4.4. Data analysis

Descriptive statistics, including internal consistency reliability coefficients for each measure, (see Table 1) and correlations (see Table 2) were conducted for all variables across pertinent time points. All data were screened for univariate and multivariate outliers according to the procedures outlined by Tabachnick and Fidell (2007) using the International Business Machine (IBM) Statistical Package for the Social Sciences (SPSS) Statistics 19. No extreme outliers that would otherwise undermine the trustworthiness of the data were detected. Prior to data analysis, additional testing procedures detected several cases with missing data for both groups in the sample using EQS 6.1 (Bentler, 2005). The missing value analysis demonstrated that 83 cases (37.9%) in the traditional education group and 12 cases (16.7%) in the distance education group had missing data. In order to verify that the missing data pattern was missing completely at random (MCAR), Little's MCAR  $\chi^2$  statistics (Little & Rubin, 1989; Schaeffer & Graham, 2002) were requested from the missing values analysis. A significant  $\chi^2$  (i.e.,  $p < .05$ ) would suggest that the pattern of missing data is not MCAR (i.e., missing not at random [MNAR]), which poses a problem for interpretation of results because they may be biased due to systematic differences in non-responses. However, the result of this test for the present data was non-significant for both groups, Little's MCAR  $\chi^2$  (34) = 32.55,  $p = .53$  (distance education group) and Little's MCAR  $\chi^2$  (46) = 60.05,  $p = .08$  (for the traditional education group), suggesting that the missingness pattern in the data was MCAR.

In order to include all possible available data, maximum likelihood (ML) estimation (expectation maximization) was utilized to impute the missing data via EQS 6.1, thereby yielding 291 available cases for analysis, 72 for the distance education group and 219 for the traditional education group. This ratio (approximately 5:1 in favor of traditional education courses) reflects the typical enrollment among face-to-face/traditional and distance education courses at this university's College of Education. Furthermore, data were tested for univariate and multivariate assumptions, including multivariate normality (skewness and kurtosis), multicollinearity, and reproducibility of the correlation matrix via residual analysis using EQS 6.1, in order to proceed with the path analysis with observed variables. Regarding multivariate normality, Bentler (2005) stated that any data with Mardia's Normalized Estimate (MNE) > 6.0 is considered to be multivariate non-normal; the more the value of MNE differs from 6, the greater the violation of multivariate normality. The data demonstrated moderate kurtosis for the traditional group (MNE for Multivariate Kurtosis = 11.27); hence, the ML robust (MLR) statistics were requested and interpreted in lieu

**Table 2**

Zero-order correlations between motivational factors, relevance, emotions, and learning strategies by group.

Variable	1	2	3	4	5	6	7
1. Utility value	–	.53**	.34**	.26**	–.33**	–.01	.33**
2. Relevance	.63**	–	.38**	.39**	–.36**	–.18**	.32**
3. Self-efficacy	.30*	.32**	–	.53**	–.39**	–.49**	.29**
4. Hope	.47**	.31**	.30*	–	–.56**	–.57**	.59**
5. Frustration	–.38**	–.51**	–.21	–.57**	–	.54**	–.42**
6. Anxiety	–.35**	–.36**	–.52**	–.61**	.59**	–	–.09
7. Strategies	.38**	.03	.13	.49**	–.09	–.09	–

Note. The traditional education group (N = 219) correlation matrix is along the upper diagonal while the matrix for the distance education group (N = 72) is along the lower diagonal.

\*\*  $p < .01$  (two-tailed).

\*  $p < .05$  (two-tailed).

of the ML normal distribution statistics. MLR procedures provide adjusted fit indices (e.g., S-B  $\chi^2$ , \*CFI, \*NNFI, \*IFI, and \*RMSEA and its \*CI<sub>90%</sub>) that correct for moderate-to-severe violations of multivariate normality. Additionally, MLR procedures adjust/correct standard errors and the statistical significance of the unstandardized path coefficients, taking into account multivariate non-normality. All other assumptions were met.

Multi-group structural path analysis was performed to evaluate the invariance of path coefficients among the distance education and traditional education groups using EQS 6.1 (Bentler, 2005). First, a fully-constrained, fully-saturated baseline model was established for both groups to examine the feasibility of the hypothesized path model presented in Fig. 1 by specifying the 12 direct paths and three error covariances (anxiety, frustration; anxiety, hope; and frustration, hope) and by imposing equality constraints on all direct paths and covariances. Subsequently exploratory model trimming (Wald test for dropping parameters) and model building (Lagrange Multiplier [LM] test for adding parameters) procedures were interpreted in an effort to improve overall model fit of the baseline model. Next, equality constraints were individually removed for each parameter (i.e., freely estimated) that reached statistical significance at the  $p < .05$  level using the multivariate LM  $\chi^2$  univariate increment test for releasing equality constraints. This procedure was repeated until no further parameters' LM  $\chi^2$  univariate increment reached statistical significance. This model was then deemed the final model. Releasing equality constraints for any given parameter indicates that the parameter in question differs statistically significantly across the distance education and traditional education groups. Finally, the  $\Delta$ S-B  $\chi^2$  (scaled chi squared difference) test was conducted to compare the null (i.e., fully-constrained, fully-saturated) model and the final model (i.e., released equality constraints).

## 5. Results

The Pearson product-moment correlation matrix presented in Table 2 demonstrates that most of the correlations among the variables were moderate.

### 5.1. Equality among groups

Before proceeding with the multigroup path analyses, a series of analyses were conducted, including one independent samples *t*-test (for age as a continuous variable) and three binary logistic regressions to ascertain whether the two groups (distance education and traditional education) were homogenous in terms of pertinent demographic variables—age, gender, previous experience with statistics, and previous experience with research methods. Course type served as the independent variable in all of the analyses, with each of the demographic variables serving as the dependent variable respectively. The results were all statistically non-significant, age,  $t(181) = 0.13$ ,  $p = .90$ , gender,  $\chi^2(1) = .02$ ,  $p = .86$ , previous experience with statistics,  $\chi^2(1) = 2.47$ ,  $p = .11$ , and previous experience with research methods,  $\chi^2(1) = .08$ ,  $p = .77$ . Therefore, because the groups did not significantly differ with respect to these demographic variables, they were not included as controls in the subsequent path analyses.

### 5.2. Path models

#### 5.2.1. Baseline model

The baseline model for both groups with equality constraints imposed on all path coefficients and covariances specified in Fig. 1 demonstrated adequate fit to the data, S-B  $\chi^2(24, N = 291) = 48.2671$ ,  $p < .05$ , \*NNFI = .92, \*IFI = .96, \*CFI = .96; however, the residual indices were relatively large, standardized root mean square residual (SRMR) = .10, \*RMSEA = .06, 90% CI [.03, .08]. None of the respecifications suggested by the Wald test and LM test made theoretical sense based on the

researchers' knowledge of the theory and variables under study. Hence, no respecifications were made to the baseline model.

#### 5.2.2. Final model

The final model with all statistically significant equality constraints released fit the data well, S-B  $\chi^2(18, N = 291) = 16.5712$ ,  $p = .55$ , \*NNFI = 1.00, \*IFI = 1.00, \*CFI = 1.00, and exhibited low residuals, SRMR = .05, \*RMSEA = .00, 90% CI [.00, .05]. The correlations between the exogenous variables (utility value, self-efficacy, and relevance) as well as the error correlations between all of the emotions variables were within normal range and statistically significant (see Table 3). However, none of these relationships differed significantly among the groups.

#### 5.2.3. Test of differences among nested models

As is evident from Table 4, the S-B Scaled  $\Delta\chi^2$  test between the fully-constrained baseline model and the final model is statistically significant at the  $p < .001$  level of significance. Therefore, one can conclude that the final model is a significant improvement in terms of fit when compared to the fully-constrained baseline model. Furthermore, this significant difference between the models indicates that those equality constraints which were released are statistically significantly different between the distance education and traditional education groups. These differences among the two groups are reviewed and interpreted next.

### 5.3. Differences in path coefficients among the distance education and traditional education groups

Fig. 2 contains the final model with all path coefficient estimates and explained variances ( $R^2$ ) included. The  $R^2$  values for the endogenous variables were moderate to high, ranging from .20 to .51. The path coefficient from extrinsic utility value to anxiety was significantly different among the two groups. Whereas this path coefficient was non-significant and negative for the distance education group, it was significant and positive for the traditional education group. Moreover, the path from utility value to hope was significant for the distance education group but non-significant for the traditional education group. A reverse pattern was found in the path from relevance to hope, which was significant for the traditional group but non-significant for the distance education group. Interestingly, the path from self-efficacy to hope, while significant for both groups, was significantly stronger in the traditional education group than the distance education group. The final two significantly different path coefficients among the groups involved paths from emotions to learning strategies. The paths from frustration to learning strategies and anxiety to learning strategies were significant for the traditional education group but non-significant for the distance education group. The

**Table 3**

Correlations among exogenous variables and among emotions error terms.

Parameter	Distance <sup>a</sup>	Traditional <sup>b</sup>
	Pearson's <i>r</i>	Pearson's <i>r</i>
<i>Exogenous</i>		
UV, SE	.33	.33
UV, REL	.59	.54
REL, SE	.30	.39
<i>Error</i>		
H, F	-.51	-.43
H, A	-.51	-.46
A, F	.49	.52

Key: UV = extrinsic utility value; SE = self-efficacy; REL = relevance; H = hope; F = frustration; A = anxiety.

Note. All correlations were statistically significant at  $p < .05$ .

<sup>a</sup> N = 72.

<sup>b</sup> N = 219.

**Table 4**  
Satorra–Bentler scaled  $\chi^2$  difference test results between fully-constrained model and final model.

Model	S-B $\chi^2$	df	SCF <sup>a</sup>	CD <sup>b</sup>	$\Delta df$	TRd <sup>c</sup>
Fully-constrained <sup>d</sup>	48.2671*	24	1.2988			
Final <sup>e</sup>	16.5712 <sup>ns</sup>	18	1.3493			
S-B $\Delta\chi^2$ test results				1.1473	6	35.1519**

<sup>ns</sup>Statistically non-significant.  
<sup>a</sup> Scaling correction factor.  
<sup>b</sup> Difference test scaling correction.  
<sup>c</sup> S-B scaled  $\Delta\chi^2$ .  
<sup>d</sup> Baseline model with all path coefficients and covariances constrained to be equal in both groups.  
<sup>e</sup> Final model with all statistically significant equality constraints released using the multivariate Lagrange Multiplier univariate increment test for releasing equality constraints.  
 \*  $p < .05$   
 \*\* S-B scaled  $\Delta\chi^2$  test is significant at  $p < .001$ .

remaining paths in Fig. 2 did not significantly differ among the two groups.

**6. Discussion**

The present study investigated the motivational perceptions, emotions, and learning strategy use of graduate students participating in online and face-to-face sections of research methods courses over the course of a semester. Analyses were conducted to test a conceptual model in which student task value beliefs, self-efficacy for research methods, and perceived relevance of instruction influenced course-related emotions of hope, frustration, and anxiety; emotions then predicted student-reported use of meaningful learning strategies. The strength and direction of the antecedents and consequences of student emotion for students in the different settings were compared using multigroup path analyses.

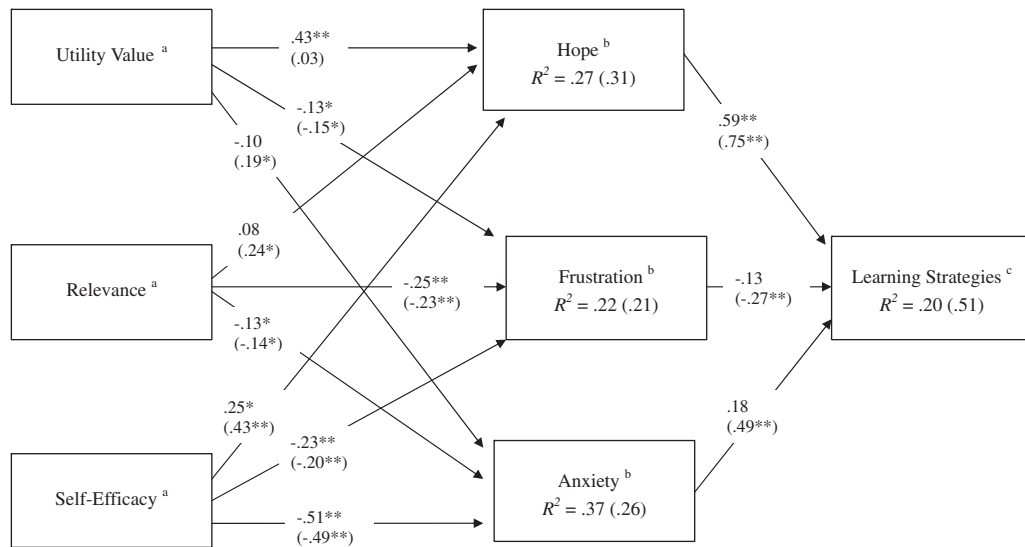
Overall, the results of this study are consistent with Rozell and Gardner's (2000) findings that general models of cognitive, motivational, and affective processes may be applicable to computer-related settings. For the most part, the findings from the present study concur with prior theory and research related to emotion, motivation, and self-regulated learning (Artino et al., 2010; Pekrun, 2006) and extends that literature to an investigation in distance

education settings of temporally-ordered variables. The results suggest that student emotions play a key role in understanding student meaningful use of strategies to enhance learning of a difficult subject and that emotional adjustment can be largely predicted by domain-specific motivational beliefs. The extent to which traditional and distance education students differed on aspects of the model and results that diverged from prior research and theory are discussed in the following sections, along with detailed findings that are congruent with prior research and theory.

**6.1. Antecedents of achievement emotions**

The sources of mid-semester student emotion differed somewhat for students in traditional and distance education settings. Self-efficacy for learning research methods was the most consistent predictor of student emotions across settings. Perceived self-efficacy was a negative predictor of moderate strength for frustration and anxiety. Although self-efficacy was a positive antecedent for hope in both conditions, the relation was stronger in the traditional setting, suggesting that student sources of optimism related to the research methods course in distance environments might be more nuanced than in face-to-face environments. These findings are in line with cross-sectional and longitudinal investigations of efficacy and these discrete course-related student emotions (Artino et al., 2010; Pekrun et al., 2011), suggesting that students who feel more capable of learning research-methods material are more likely to have more positive emotional experiences later in the course.

The measure for self-efficacy used in the present study was in line with current recommendations to refer to a specific context and assess capability rather than ability (Klassen & Usher, 2010). However, this study asked students to assess their capability in their research methods course, rather than self-efficacy for computers or online learning. This is a departure from the majority of research on self-efficacy in online environments (see Spence & Usher, 2007 for an exception). Previous research has demonstrated that online students tend to be more efficacious with respect to online learning than their traditional peers (Artino, 2010). Without a measure of computer-related or online self-efficacy, it is difficult to know if and how much student self-efficacy for learning about research methods might have been influenced by their perceived efficacy for being effective in an online environment. However, one study that assessed



**Fig. 2.** The final path model for distance education and traditional education groups. Path coefficients and R<sup>2</sup> values outside of the parentheses are for the distance education group whereas those in parentheses are for the traditional education group. Key: <sup>a</sup> time 1 variables (beginning of semester), <sup>b</sup> time 2 variables (mid-semester), and <sup>c</sup> time 3 variables (end-of-semester). \* $p < .05$ , \*\* $p < .001$ .

different types of efficacy did not find a significant relationship between computer self-efficacy and math grade self-efficacy or self-efficacy for self-regulated learning (Spence & Usher, 2007).

According to the theoretical frameworks used for the present study, task value beliefs are also an important factor underlying students' situational appraisals that contribute to students course-related emotions (Artino, 2009a; Artino, 2009b; Pekrun, 2006). In the present study, students' beliefs about the value of research-methods content for their current and future lives differentially predicted hope and anxiety, but similarly predicted frustration, for the two groups. For the distance education setting, students with more powerful utility beliefs were more hopeful about the course and had lower levels of frustration mid-semester. However, utility value did not predict student anxiety in distance education courses, as is consistent with previous work with medical students (Artino et al., 2010) but not with studies using undergraduates (Pekrun et al., 2011). In contrast, utility value did not act as a strong source of student emotion in traditional settings, showing a weak negative relationship with student frustration, weak positive relationship with anxiety, and no relationship with hope. With the exception of distance education students' utility value predicting hope, task value beliefs were not particularly powerful sources of student emotion. Although the strength of the associations is weaker than previous research has shown (e.g., Pekrun et al., 2011), the effects may be reflective of the required nature of the course in a college of education. Indeed, this may be a reflection of the sample selected for this study. For instance, it is possible that graduate students in distance education settings may enter research methods courses with a generally more positive attitude toward required courses, or at least a more neutral attitude, an appraisal which in turn may be reflected in lower levels of negative affect.

The inclusion of perceived relevance of instruction offers a new dimension to understanding student emotion in distance education settings. Interestingly, perceived relevance of instruction was a significant predictor (with nearly identical effects) of mid-semester negative emotions for both groups. Students who felt that the instructor was able to connect the material to the real world had lower levels of negative emotions by the middle of the semester. This finding is congruent with previous research with younger students demonstrating that provision of relevance is a powerful force in reducing disaffection from academic life (Assor et al., 2005; Jang, Reeve, & Deci, 2010; Reeve, Jang, Carrell, Jeon, & Barch, 2004). However, the finding that hope was not related to perceived relevance for the distance education group suggests an alternate mechanism for the development of that activating emotion in online environments.

Taken together, these findings may suggest that the resources students bring with them to their graduate-level coursework via distance education formats may have a greater impact on the development of achievement emotions, particularly hope, in the course than efforts made by the instructor to support student learning through provision of relevance. However, it should be noted that the measure of perceived relevance of instruction was taken shortly after the semester began. Previous research has reported that students may have difficulty mastering new tools associated with online courses, may struggle at first to form relationships with teachers and peers, and may notice the lack of immediate feedback inherent to asynchronous learning environments (e.g., Zembylas, 2008). Any of these challenges could limit student interactions with instructors or instructional material designed to foster perceived relevance during the first few weeks of the term and in the present study, the average level of perceived relevance did appear lower for distance than general education students. Future research and theoretical development should continue to explicitly consider how perceptions of the instructor develops in online environments, what types of strategies instructors might use to enhance the relevance of content in distance education, and how instructional support relates to student emotion.

## 6.2. Achievement emotions and meaningful learning strategy use

Students' optimism about learning and participation in their research methods course was a strong predictor of their meaningful use of learning strategies, signaling the importance of creating a situation in which students feel they can be successful when learning about challenging coursework. Moreover, the prediction of strategy use from hope was consistent across settings. Although the predictive relationship between hope and learning strategy use has not been extensively investigated, these findings are consistent with research demonstrating a positive association between hope and sophisticated study strategies, such as elaboration (Pekrun et al., 2002; Pekrun et al., 2011). Further, previous research has found that hope facilitates academic performance (Pekrun et al., 2009). The findings from the present study may suggest that, in line with theoretical assumptions (Artino, 2009a; Artino, 2009b; Pekrun, 2006; Pintrich, 2004), one way in which performance is enhanced is through the promotion of positive and flexible use of learning strategies. The extent to which effects of hope on performance is mediated through strategy use in face-to-face and distance education courses, and whether learning strategies differ depending on the setting, is fodder for future research.

The effect of students' negative emotions on learning strategy use showed a more variable, and somewhat surprising, pattern of results. Most notably, neither frustration nor anxiety was a predictor of strategy use for distance education students, but both emotions predicted strategy use for face-to-face students. In previous research with online students, frustration did not predict elaboration, although it was predictive of other aspects of self-regulated learning (Artino, 2009b). Researchers have suggested that one benefit of asynchronous online learning is that students are afforded flexibility as to pacing of engagement with course material (Hartley & Bendixen, 2001; Rudestam, 2004). The findings from the present study may be reflective of such a benefit in that the damage to self-regulated learning by any frustration or anxiety students felt related to their research methods coursework may be limited by the nature of online work. In other words, perhaps students are able to adopt more adaptive coping strategies for diffusing negative emotions in an environment where they have more choices with how to engage with course-material. The online environment may afford different opportunities for emotion regulation than traditional environments. Schutz et al. (2006) suggest that one way for students to regulate emotion is to take steps to regain task-focus through a process of reappraisal. This type of emotion regulation takes place during the experience of the emotion in an effort to modulate the response and diffuse the effects of negative emotion (Gross, 1998; Tyson, Linnenbrink-Garcia, & Hill, 2009). For instance, perhaps online students take more breaks, may have time to reflect before writing or studying, or are able to search for answers or material to clarify confusing or frustrating material at their own pace (Rudestam, 2004). The control-value theory of emotion (Pekrun, 2006) suggests that appraisal processes precede emotional experience, yet the idea of reappraisal of emotion and the use of strategies to modify the effects of emotions is in keeping with the reciprocal, dynamic process views of motivation, emotion, and cognition reflected in the control-value theory and other perspectives on academic emotions (Op't Eynde & Turner, 2006). Future research should consider whether online environments support adaptive emotion regulation strategies and how these strategies influence cognitive engagement and performance.

Turning to findings for traditional students, results indicated that students with higher levels of frustration were more likely to use less meaningful learning strategies. This finding is consistent with prior research on self-regulated learning (Pekrun et al., 2002; Pekrun et al., 2011) and performance (Pekrun et al., 2009). However, our results



told a surprising story with respect to course-related anxiety. In contrast to much of the research on test-related anxiety and the majority of research on course-related anxiety (see *Zeidner & Matthews, 2005* for review), our findings indicated that higher levels of anxiety predicted more meaningful strategy use. This type of result is not without precedent, however. Previous research has shown that course or learning related anxiety shares a negative association with mastery goals (*Daniels et al., 2009*) and self-efficacy, but not task value (*Artino et al., 2010*) and in turn, anxiety has been associated with decreased student performance (*Artino et al., 2010; Daniels et al., 2009; Pekrun et al., 2009*). Other research has failed to detect similar relationships with performance (*Díaz et al., 2001*) or has found that high achieving students have higher levels of anxiety (*Yip, 2009*). Further, some evidence suggests that there may be different types of anxiety, such as facilitative or debilitating anxiety, that may lead to different responses during academic situations (*Munz, Costello, & Korabik, 1975*).

Theoretically, the contradictory findings of previous research and the present study may not be surprising when considering descriptions of the complex relations between cognition, affect, and arousal (*Royce & Diamond, 1980*) based on the learning and stimulus strength research of Yerkes and Dodson (*Yerkes & Dodson, 1908* cited in *Hancock & Ganey, 2003*). Although research has found varying degrees of support for the inverted-U effect associated with the Yerkes Dodson Law (see *Teigen, 1994*), the basic premise behind conceptions associated with motivational and cognitive concepts is that an optimal level of arousal (or anxiety, as denoted by some conceptualizations) is needed for peak performance. This effect may be helpful for interpreting the relations between anxiety and student outcomes. Too little or too much anxiety is likely to debilitate action (*Tyson et al., 2009*). Thus, findings suggesting that high anxiety is related to low performance may be on the declining side of the inverted U and findings suggesting a positive relationship would be on the facilitative side of the U. Therefore, although anxiety is typically considered a negative, activating emotion, there may be situations when anxiety facilitates positive action (*Cassady & Johnson, 2002*).

The average level of anxiety in our sample of traditional students was quite low, thus it is possible that students experiencing “higher” levels of anxiety were truly more reflective of moderate anxiety levels. The students in this sample were master's level students in a course required for their graduate program. One might imagine that such students may have low levels of intrinsic motivation for the subject matter, but understand the necessity of adequate performance. These students may also have a wide range of learning strategies from which to draw. Further, the course topic may be considered a relatively difficult task to learn. In such a situation, moderate anxiety levels and a relatively difficult task may enhance strategy use rather than debilitate adaptive functioning as might be the case if anxiety levels were higher. The description of such an inverted U effect has been widely described as the Hebb curve (*Hebb, 1955*), sometimes viewed as an extension of the Yerkes Dodson Law (*Teigen, 1994*). This finding and interpretation should be received with caution due to the relatively radical departure from previous research. Additional research should be conducted to determine if the finding can be replicated, to determine if perceived difficulty of learning research methods has an impact on student anxiety and strategy use, to determine whether there is an inverted-U effect between anxiety and strategy use, and to identify possible alternative explanations for such a relation.

## 7. Limitations

As with any research involving human subjects, the present study is not without limitations. As such, the results should be interpreted cautiously. The study involved a convenience sample of graduate students enrolled in an introductory research methods course; thus, students self-selected to participate (i.e., volunteered). Consequently,

the design was nonexperimental and correlational in nature. Moreover, the path model presented is not intended to be a discussion of change in individuals across time, as students who began the semester with more positive motivation likely maintained a high level throughout the semester. Also, the unequal sample sizes among the groups are problematic. Students may have been prone to bias in self-reports because they may have felt threatened, inadequate, or fearful that their responses may have reflected negatively on their performance (*Schaeffer, 2000*). Moreover, students may have been prone to responding similarly across measurement points (*Biggs & Das, 1973*), which is especially likely in situations such as those of the present study, in which the data were collected in such short time spans. Likewise, it is plausible that graduate students, the population of interest to the study, are already highly motivated individuals who exhibited high positive emotion (hope) and relatively low negative affect (anxiety and frustration). Therefore, students may already come to the learning setting with a higher propensity toward engagement, deeper and more meaningful learning strategies, and more positive attitudes.

Next, although this study sought to describe the role of emotion in different settings, data about the nature of those settings and if and how they differed with respect to teacher pedagogy, instructional format and tools, and peer interaction, (*Haugen et al., 2000; McCrory, Putnam, & Jansen, 2008; Solimeno, Mebane, Tomai, & Francescato, 2008*) among others, was not collected for the present study. Thus, it is not possible for this study to further the discussion about how emotion develops in the context of various online interactions or courseware familiarity or usage (e.g., *Zembylas, 2008*). Further, this study was centered on understanding antecedents and outcomes of emotions in relation to learning about the course content in online and traditional environments. Previous research has demonstrated that students who choose to take online courses may differ from their more traditional peers in relation to efficacy, knowledge, and competence for online learning (e.g., *Clayton et al., 2010*). The present study did not assess these constructs, thus it is unknown if and to what extent these constructs might influence student self-perceptions, emotions, and strategy usage related to the content and whether computer-related constructs might serve as a unique contributor to the development of student emotions in distance education.

Finally, only one model was investigated by the researchers. As with any research endeavor using path analysis or SEM, it is possible that alternate explanatory models that better capture the relationships among the variables exist, such as a model capturing both direct and indirect relationships. Similarly, the present study investigated only a small set of predictors and outcomes of student emotions, as well as a limited set of emotions, whereas previous research has identified numerous other important variables in understanding the role of emotions in learning (e.g., *Pekrun et al., 2009*).

Despite these limitations, the researchers believe that the present study offers new insights to scientific investigations regarding the role of emotions in predicting learning outcomes in online/distance education courses, and thus, represents a unique contribution to the literature on online learning environments.

## 8. Conclusions

There have been few studies in the research literature which examine the role of emotions in graduate students in distance and traditional environments. Moreover, to our knowledge, no research has yet explored the temporal relations among the variables investigated in this study involving graduate students. Understanding the way that students' perceptions of utility value, relevance of instruction, and academic self-efficacy interact with positive and negative emotions within different types of learning environment is critical. Equally as important is knowing how these factors predict learning

outcomes, such as meaningful learning strategies, while learning unfamiliar and intimidating material, such as research methods. Understanding this process is a first in a series of steps in uncovering instructional strategies to more adequately meet these students' educational needs. This objective becomes even more pressing given the fact that more and more institutions of higher education are moving toward hybrid learning environments as well as adding more distance education courses to their course offerings. By investigating the relations among these factors, we hope to discover ways to increase students' motivation and positive affect while decreasing experiences of negative affect. The findings from the present study imply that this may be accomplished through such methods as increased relevance of instruction (How does this course impact my life and professional practice?) as well as more concrete connections to personal and professional goals (What value do I find in these tasks? How useful do I find them?).

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