Destination Irrational Procrastination:
An Exploration of the Role of Attributional Thinking and Self-Regulation on Procrastination in Synchronous Online Graduate Students

Karee Dunn and Takuya Hayakawa
The University of Tennessee, Knoxville

Abstract

The purpose of this study was to determine if internally directed attributions and perceived degree of engagement in self-regulation predicted the degree to which synchronous online graduate students procrastinate. Internally directed attributions to ability and effort and adaptive self-regulation of learning were selected as research suggests these variables are responsive to training (Greene & Azevedo, 2007; Hood, 2013). As a relationship among these variables had not yet been established in this population, the current results add to our burgeoning understanding of how to best support the success of our synchronous online graduate students.

Keywords: synchronous online learning, higher education, self-regulation, procrastination

Destination Irrational Procrastination:
An Exploration of the Role of Attributional Thinking and Self-Regulation on Procrastination in Synchronous Online Graduate Students

The purpose of this study was to determine if internally directed attributions and perceived degree of engagement in self-regulation predicted the degree to which students enrolled in a synchronous, online graduate course engaged in problematic procrastination. Internally directed attributions to ability and effort, as well as self-regulation, were selected as research suggests these variables are responsive to training during coursework (Blind & Blind, 2015; Greene & Azevedo, 2007; Hood, 2013). As a relationship among these variables has not yet been established in the synchronous online graduate student population, we sought to explore if such training efforts may be warranted or need further study. Procrastination is a particularly pervasive problem for online students (Klingsieck, Fries, Horz, & Hofer, 2012; Rakes & Dunn, 2010; Blind et al., 2013) and for adult students, like those in this study, that often have numerous demands, such as work, spouses,

children, or caring for older parents (Kerr, Rynearson, & Kerr, 2006; Rakes & Dunn, 2010; Rakes, Dunn, & Rakes, 2013). Ultimately, understanding these issues is important, as procrastination is predictive of poor academic performance in post-secondary online learning environments (Cerezo, Esteban, Sánchez-Santillán, & Núñez, 2017; Duru & Balkis, 2017) and particularly problematic for graduate students (Cao, 2012).

While synchronous course offerings are growing, little research informs what we know about synchronous online learners (Baker & Hjalmarson, 2019). The online synchronous graduate student population has remained largely unstudied; however, trends in higher education suggest that is critical to begin to better understand this population and their needs. Allen and Seaman (2013) revealed institutions of higher education overwhelmingly reported online learning opportunities as critical to their long-term strategic plans, growth, and success, with 6.7 million students reporting taking at least one course in an online platform in higher education (Martin & Parker, 2014).

Review of Relevant Literature

Zimmerman's (1998, 2000) social cognitive theoretical model to self-regulation served as the theoretical framework for this study. Zimmerman's (1998, 2000) three-phase, cyclical model of self-regulation captures how our behaviors and personal variables interact with and are affected by the environment to drive adaptive or maladaptive learning experiences. The three phases of this model of self-regulation are forethought, performance, and reflection.

In the forethought phase, the stage for learning is set. Learners establish what they want to learn through goal setting. The learner assesses the likelihood of success on various tasks and goals based on past experience that create expectancies for successes or failures, and he or she will determine if the requisite skills and knowledge are possessed to facilitate success on a given task (i.e., self-efficacy). Research has confirmed that variables in this phase, such as achievement goal orientation (Albert & Dahling, 2016; Diseth, 2011; Kistantas, Steen, & Huie, 2009), self-efficacy (Diseth, 2011; Honicke & Broadbent, 2016), the learner's perception of the value of and the utility of a given task (de Barba, Kennedy, & Ainley, 2016; Guo, Marsh, Parker, Morin, & Dicke, 2017), are predictive of engagement in self-regulated learning strategies in the performance phase and with academic performance. In this study, we examined the next two phases, the performance phase and the reflection phase.

Adaptive and Maladaptive Learning Strategies

The performance phase processes of self-regulation may be divided into two categories, self-control and self-observation, which affect learner's attention and action (Dunn, Lo, Mulvenon, & Sutcliffe, 2012b). In this study, we examined two learner characteristics within this phase, adaptive and maladaptive self-regulation. Senécal, Koestner, and Vallerand (1995) reported that adaptive self-regulation accounted for a quarter of the variance of their sample of college students' procrastination. They found that engagement in self-regulation, a sign of engagement with an academic task, decreases student procrastination. A number of other researchers have reported similar findings on student populations other than synchronous online students (Cerino, 2014; Garzón-Umerenkova, de la Fuente, Amate, Paoloni, Fadda, & Pérez, 2018; Wäschle, Allgaier, Lachner, Fink, & Nückles, 2014). Thus, we sought to test if this relationship holds true for synchronous online students. The underlying hypothesis is that engagement in adaptive self-

regulation decreases the likelihood that a learner will engage in maladaptive behaviors during the performance phase of the learning cycle.

Adaptive Learning Strategies. Adaptive self-regulation requires the learner to utilize the motivated processes of planning, monitoring, regulating, and resource management in order to achieve achievement goals and complete academic tasks (Zimmerman, 1990). A bevy of research indicates that when learners use adaptive self-regulated learning strategies, learning outcomes improve (de Barba et al., 2016; Lai & Hwang, 2016). For example, engagement in adaptive learning strategies helps learners achieve deeper levels of comprehension of complex curriculum (Jarvela et al., 2015; Labuhn, Bogeholz, & Hasselhorn, 2008). Moreover, research indicates engagement in effective, adaptive learning strategies are of even greater importance for online learners (Lai & Hwang, 2016), significantly predicting achievement in online higher education learning environments (Broadbent & Poon, 2015). For this study, adaptive academic self-regulation was defined as learning guided by metacognitive processes, driven—in part—by intrinsic motivation and by an inherently strategic nature (Dunn et al., 2012b; Zimmerman, 1990).

Examples of self-regulated learning behaviors or learning strategies include a wide array of actions, including, for example, setting aside time for studying, asking the instructor or a classmate for help, only highlighting one sentence per paragraph during a reading assignment, or self-assessing one's comprehension of key course concepts for a test. The aforementioned research not only supports engagement in adaptive, self-regulated learning strategies is important to successful learning for students of any age, but it also indicates use of adaptive learning strategies is of even greater import for online learners. However, little is known about synchronous online students and adaptive learning strategies; thus, this study will begin to help fill this gap.

Maladaptive Learning Strategies. The maladaptive aspect of the performance phase we examined was procrastination, specifically irrational procrastination. Irrational procrastination is ultimately a failure to effectively self-regulate (Rakes et al., 2013). Although any form of procrastination is typically counterproductive to effective learning, there is an exception, active procrastination. Active procrastination was defined as the purposeful, mindful delay of work that is strategically used to drive improved performance (Cao, 2012; Chu & Choi, 2005; Steel, 2007). Cao (2012) found undergraduate students are more likely to engage in this active or strategic form of procrastination and that graduate students are significantly more likely to engage in irrational or counterproductive procrastination.

Steel (2007) defined irrational procrastination as the voluntary delay of task completion that results in a decrease in quality and quantity of work, and ultimately poorer academic outcomes (Akinsola, Tella, & Tella, 2007; Morford, 2008; Rakes & Dunn, 2010; Schouwenburg, 1995). Procrastination leads to a number of negative outcomes for learners, including weaker goal commitment, less time on task (Morford, 2008), lower achievement (Akinsola et al., 2007), and decreased long-term learning (Schouwenburg, 1995). The detrimental effects of procrastination are more pronounced in the online learning setting (You, 2015). However, similar to adaptive self-regulated learning strategies, little is known about synchronous online learners and procrastination. This study will begin to help us understand the role of both adaptive and maladaptive learning strategies in the synchronous online graduate student population.

Irrational procrastination is more difficult to decrease through direct training, as compared to adaptive learning strategies (Wohl, Pychyl, & Bennett, 2010). Thus, we sought to examine if trainable aspects of adaptive self-regulation were predictive of procrastination in synchronous

online graduate students. If they are, then it will be important for future research to determine if training and improving adaptive self-regulated learning strategy use decreases procrastination, as it may be hypothesized that greater engagement in adaptive learning strategies will diminish opportunities to procrastinate. In addition, attributional thinking is responsive to corrective training (Rakes & Dunn, 2015) and has been predictive of irrational procrastination in other student populations (Cleary & Zimmerman, 2004; Dunn, Osborne, & Link, 2012a). If attributional thinking is similarly predictive of synchronous online graduate student irrational procrastination, then it may be hypothesized that corrective attributional training may decrease irrational procrastination as well, which will require further study.

Attributional Thinking

Attributional thinking lies in the reflection phase, following the performance phase of the self-regulation cycle (Zimmerman, 1990). Weiner (1972, 1974, 2000) explained learners' attributions are the causes learners ascribe to perceived outcomes of a learning event. It is important to note that the actual outcome is relatively unimportant, what is, however, important is how the learner perceives the outcome and to what the learner attributes that outcome. Attributions may arise from an internal or external locus; in other words, the individual may credit an outcome to something within their control or to something outside of their control, respectively (Weiner, 1972, 1974, 2000). Weiner divided external attributions into those related to context and to luck. An example of a context attribution is "I did poorly on my text because the teacher didn't explain the information well." An example of a luck attribution would be "I just had bad luck on this test, that's why I didn't do well." While these attributions impact learning and performance in a variety of meaningful ways, we sought to focus on attributions that are within the individual learner's control, as research indicates these attributional thinking patterns are more responsive to training (Rakes & Dunn, 2015). Thus, it was more critical to us to understand if internal attributional thinking was predictive of procrastination.

Internally focused attributions include ability and effort. An example of an ability attribution is "I did well on the test because I am good at Math." Rakes and Dunn (2015) found online graduate students reported attributing both poor academic outcomes and procrastination behavior to a feared lack of ability. For example, one student in the study reported his perceived poor writing ability resulted in less than desirable paper grades and a tendency to put paper writing off to the last minute. An example of an effort attribution is "I didn't study enough, and so I didn't do very well on this test." Rakes and Dunn (2015) also reported their sample of online graduate students frequently attributed weaker performance and increased procrastination to poor effort or "just not putting enough into the project" (p. 112).

Increased external attributional thinking decreases self-regulatory activity and increases the tendency to procrastinate (Dunn et al., 2012b; Rakes et al., 2013; Weiner, 1986). This theoretical connection to procrastination and its trainable nature makes understanding attributional thinking critical to the understanding of procrastination. Thus, we wanted to explore if attributional thinking predicted procrastination in our sample of synchronous, online graduate students, as no such research was found for this unique population.

Methods

Participants

The convenience sample used for this study consisted of 132 graduate students enrolled in a synchronous online graduate program in colleges of education at two large mid-southern universities. Students mean age was 35.6 years of age, ranging from 71 to 23 years of age. The majority of the participants were female (94%). With regard to race, participants reported as Caucasian ($n = 118$), African American ($n = 7$), Asian American ($n = 4$), Native American ($n = 2$), or other ($n = 1$). The majority of participants reported working full time while being married/living with a partner and raising a family or providing care for an elderly parent (n = 123). Four participants reported working full time and being single. Five participants reported working part-time and being single. The average student waited 6.72 years since their last degree completion to enroll in the online graduate program, ranging from 21 years since last degree to immediate enrollment after previous degree completion.

Measures

To address the research question three surveys were utilized, the Irrational Procrastination Scale (IPS), the Multidimensional-Multiattributional Causality Scales (MMCS), specifically the Ability Attribution Scale and the Effort Attribution Scale, and the Motivated Strategies for Learning Questionnaire-Revised (MSLQ-R), specifically the General Strategies for Learning Scale (GSL). Each measure is described, and subsequently, validity evidence for the factor structure of each scale with this sample is provided from the results of an Exploratory Factor Analysis (EFA). The potential number of factors possible was not constrained in order to determine if the scales emerged from the current data as expected. According to Floyd and Widaman (1995), as well as Comrey and Lee (1992), factor loadings exceeding .40 on only one factor were considered meaningful. Therefore, items that did not load substantially each respective scale (i.e., a factor loading of less than .40) were deleted from the scale. Subsequently, Cronbach's alpha is provided for each measure to support the internal consistency of each scale. Weiner, Freedheim, Graham, and Naglieri's (2003) minimum acceptability criteria of .60 was utilized to determine if each scale was reliable. To calculate the score for each scale used, the scores were summed and a mean was calculated.

IPS. The IPS measures the degree to which an individual reports irrationally putting tasks off so as "to voluntarily delay an intended course of action despite expecting to be worse off for the delay" (Steel, 2007, p. 66). The IPS consists of nine items, and it employs a five-point Likert scale (1 = "Very Seldom True of Me" to 5 = "Very Often True of Me"). Steel (2010) established convergent validity by correlating the IPS with the Pure Procrastination Scale. The resulting correlation was 0.96. Other researchers have used similar validation methods, and found the measure to be consistently high in convergent validity (Rebetez, Rochat, Gay, & Van der Linden, 2014; Rozental, Forsell, Svensson, Forsström, Andersson, & Carlbring, 2014; Steel & Ferrari, 2013; Svartdal, 2015). As previous studies have not conducted any factor analysis to verify the structure of the measure, the EFA was of particular importance for this scale. EFA results indicated two items did not load substantially onto the IPS scale (i.e., factor loadings were less than .40). Item two, "I do everything when I believe it needs to be done," had a factor loading of .36, while factor item five, "If there is something I should do, I get to it before attending to lesser tasks," had a factor loading .31. The reliability coefficient for the revised seven-item scale was .88, and thus, the scale was deemed reliable.

MMCS. The MMCS was developed to assess attributional style and goal specific locus of control for social affiliation and academic achievement (Lefcourt, 1981). The MMCS delineates two basic attributional styles: internal and external. It also distinguishes whether internal attributions are made to effort or ability, and whether external attributions are made to luck or situational context. In this study, we wanted to assess the more academically adaptive attributional patterns impact on procrastination. This was based on the premise that we wanted to examine the relationship of positive, trainable academic traits that may be addressed through evidence-based strategies in the instructional process to ultimately indicate if it may be feasible that doing so may potentially decrease procrastination. Thus, the Academic Achievement Ability Attribution and Effort Attribution Scales were utilized. Each scale consists of six items, and employed a five-point Likert scale (1 = "Strongly Disagree" to 5 = "Strongly Agree"). Higher scores on each scale indicated a higher degree of endorsement for the attributional belief (Lefcourt, et al., 1979).

Lefcourt and his colleagues (1979) first validated this measure nearly forty ago. The MMCS was originally validated on 240 undergraduate students. Lefcourt, et al.'s (1979) factor analysis confirmed the structure of the scale and the reliability of the Achievement Scale ($\alpha = .61$). In the current study, EFA results indicated that all items loaded substantially on the Ability Attribution Scale. However, item one on the Effort Attribution Scale did not load onto the related factor for this sample and was, thus, removed from further analysis (i.e., "When I receive a poor grade, I usually feel that the main reason is that I haven't studied enough for that course"). Subsequently, the internal reliability of the MMCS Achievement subscales, Ability (.71) and Effort (.69), were confirmed.

MSLQ-R. Participants completed the General Strategies for Learning scale from the revised MSLQ (Dunn et al., 2012b). Pintrich et al. (1991) developed the MSLQ from a social-cognitive perspective to determine students' self-perceived engagement in self-regulated learning strategies relative to a course in which students are currently enrolled. The MSLQ-R utilized a five-point Likert scale (1 = "Not at all true of me." to 5 = "Very true of me."). The General Strategies for Learning scale consists of five-items and was used for this study. Blind et al. (2012) addressed validity issues related to some of the original MSLQ scales and found the scale to be valid in a study of college students ($n = 355$). The General Strategies for Learning scale assessed learners' aptitude for utilizing the processes of planning, monitoring, regulating, and resource management in order to achieve learning goals. In this case, academic self-regulation was best defined as a form of learning that is guided by metacognition, partially intrinsically motivated, and strategic (Dunn et al., 2012a). Based on EFA and confirmatory factor analysis results, Blind and her colleagues (2012) determined the scale to be valid and reliable ($\alpha = .60$). The current study's EFA results support these findings, as all factor loadings exceeded .40. The measure was also deemed reliable, as Cronbach's alpha for this sample was .73.

Data Analysis

In order to examine the influence of the effort and ability attributions, as measured by the MMCS, and the influence of adaptive self-regulated learning strategies, as measured by the GSL subscale of the MSLQ-R, on the variance of irrational procrastination, as measured by the IPS, the data were analyzed with multiple linear regression. The IPS score was entered as the dependent variable and MMCS scores for Ability and Effort and the GSL scores were entered as the independent or predictor variables. The significance and the size of the coefficient of determination were examined to determine if the set of independent variables had a significant influence on

irrational procrastination. Additionally, the magnitude of impact for each independent variable was examined and interpreted.

Results

The initial regulation model included Ability Attribution, Effort Attribution, and GSL as the predictor variables for Irrational Procrastination, the outcome variable. However, the model indicated that Ability Attribution did not significantly explain a unique portion of the variance in Irrational Procrastination. Thus, Ability Attribution was removed from the linear regression model, and a second regression model was run. The refined regression analysis tested if participants' self-reported levels of Effort Attribution and GSL significantly predicted participants' self-reported IPS.

Preliminary examination of the results indicated there was no extreme multicollinearity in the data, as the variance inflation factors were all less than two. Exploratory analysis also indicated the assumptions underlying the application of multiple linear regression, independence, normality, heteroscedasticity, and linearity, were met. The means, standard deviations, and correlations for this regression model are presented in Table 1. The results of the regression indicated the two predictors explained 21.4% of the variance, $F_{(2, 129)} = 5.56$, $p < .01$ (See Table 2). Cohen's f^2 measured effect size and was interpreted as moderate at 0.27 (Cohen, 1988). Each of the remaining variables in the model uniquely and significantly contributed to the explained variance; in order of magnitude of influence they were GSL ($t = -4.48$, $p < .01$) and Effort Attribution ($t = -3.21$, $p < .01$).

Table 1

Means, Standard Deviations, and Correlations for Regression of IPS on MMCS and GSL (n = 132)

	1	2	3
1. IPS	1.00		
2. MSLQ-R: GSL	-.41	1.00	
3. MMCS: Effort	-.32	.19	1.00
Mean	18.58	16.45	21.18
Standard Deviation	5.52	3.66	3.80

Table 2

Results of Regression of IPS on MMCS and GSL

Variable	b	Beta	Partial	t
MSLQ-R: GSL	-.37	-.25	-.27	-4.48*
MMCS: Effort	-.54	-.35	-.37	-3.21*

Note. *$p < .01$, $R^2 = .214$

Discussion

Procrastination, for the purposes of this study, described the irrational delay of work that must be completed, which results in a decrease in the quality and the quantity of the product of one's efforts (Akinsola et al., 2007; Rakes & Dunn, 2010; Steel, 2007). Procrastination not only decreases goal commitment (Morford, 2008) and current course achievement (Akinsola et al., 2007); it also decreases one's commitment to life-long learning (Schouwenburg, 1995). Unfortunately, the tendency to procrastinate is resistant to direct training (Wohl et al., 2010) and is reportedly stronger in online adult learners (Cao, 2012).

However, the current findings may provide some initial insight to a potential path for addressing the problem of procrastination for graduate students enrolled in synchronous online courses. Specifically, this study's findings indicated the malleable variables of adaptive self-regulation (i.e., learning strategy use) and effort-based attributional thinking are predictive of online graduate students' tendency to procrastinate in their synchronous coursework. Specifically, we found that as participants' perceived use of learning strategies and effort attributions decreased, their perceived tendency to procrastinate increased. These findings suggest that if instructors dedicate effort to addressing learner's self-regulation and effort-based attributional thinking, they may see a decrease in student procrastination. Recommendations for practice based upon this conclusion are provided below, but first, it is important to discuss the current findings in the context of the extant, related literature.

The finding that lower effort attributions are predictive of greater procrastination in our sample aligns with research on other student populations (Cleary & Zimmerman, 2004; Dunn et al., 2012a; Rakes et al., 2013). Similarly, our research supported previous findings that reported higher levels adaptive self-regulation were predictive of lower levels of procrastination supported previous research with the same findings (Cerino, 2014; Garzón-Umerenkova et al., 2018; Wäschle et al., 2014). This finding is important because self-regulation and effort-based attribution training may increase these adaptive learner thoughts and behaviors and decrease learners' tendency to procrastinate.

It should be noted that our finding that ability attributions were not predictive of procrastination was counter to the work of Rakes and her colleagues (2013) in which ability attributions uniquely predicted a portion of procrastination in asynchronous online graduate students. Thus, the relationship of ability-based attributions and procrastination in online graduate students, synchronous and asynchronous, should be further explored. The authors in that study used a different measure of procrastination, which may have contributed to the difference in findings. A comparison of the two measures and an examination of their factor structures with the synchronous online graduate students may be another warranted avenue for future research. We will couch further recommendations for future research in relation to the limitations of the current study and to our recommendations for practice.

Limitations

This exploratory study was limited in several ways that future research may address. One limitation of this study was the use of multiple linear regression. While linear regression analysis is appropriate for exploratory research (Cohen, Cohen, West, & Aiken, 2003), this methodology does present a number of limitations that should be addressed in future studies. For example, multiple linear regression is only able to assess straight-line relationships; thus, if a curvilinear relationship exists, it may go undetected. For example, in this study, ability attributions did not

predict a unique portion of the variance in procrastination, nor did it add meaningfully to the variance explained by the group of variables. Thus, it was removed from analysis in this study. The literature provides hints that the relationship between procrastination and ability may possibly be curvilinear, which would not have been identified in this study. For example, if one perceives his or her ability to be low, then they are more likely to procrastinate (Wäschle et al., 2014). However, overconfidence in one's ability may also lead to procrastination (Kornell & Finn, 2016). Thus, it may be possible that the relationship between ability attributions and procrastination is curvilinear. Future researchers may wish to examine this through curvilinear regression analysis (Aiken, West, & Reno, 1991).

Additionally, multiple linear regression only examines the mean of the dependent variable for the sample (Lewis-Beck & Lewis-Beck, 2015). Thus, top and bottom quartile differences in the sample may go undetected. In other words, those with higher reported levels procrastination may differ from those who report lower levels of procrastination in a significant way with regard to their attributional thinking and self-regulator behaviors. As this study consisted of a relatively small sample and was exploratory in nature, the first study examining these constructs in synchronous, online graduate students, we were unable to do this. However, future researchers may wish to consider examining the specific differences between high and low procrastinators and the possible differences between the groups in the degree to which the current independent variables predict procrastination for those groups.

Additionally, the use of a convenience sample introduced bias to a study, as this group of participants self-selected to attend the two mid-southern universities included in this study. For example, the majority of these participants were representative of the common demographics of colleges of education in the United States (Bristol & Goings, 2018). Specifically, participants were primarily female and Caucasian. Thus, future researchers may wish to identify a larger pool of synchronous online graduate programs from which to randomly select participants. This work would be important in helping us understand differences that occur in diverse populations that may require attention as we design our synchronous online courses. Additionally, future researchers may wish to engage in purposeful sampling in order to include substantial numbers of male and/or minority students in order to identify any group differences with regard to these variables.

Finally, our information regarding the time demands participants experienced was limited because a multiple choice option was used to assess this. Participants were able to select from the following options:

(1) "Working full time while being married/living with a partner, raising a family, and/or providing care for an elderly parent."
(2) "Working full time while single, raising a family, and/or providing care for an elderly parent."
(3) "Working full time and single."
(4) "Working full time and married or cohabitating."
(5) "Working part-time and single."
(6) "Working part-time and married or cohabitating."
(7) "Not working and single."
(8) "Not working and married or cohabitating."

This format limited the amount of information we gathered about the demands on our participants' time. Future researchers may want to add an option to describe various demands on the learners'

time. This may provide important information about how to best serve this subset of higher education students. This may also be an important area to examine potential cultural differences between and across majority and minority learners.

Recommendations for Practice

As procrastination has detrimental effects for learning and performance (Cao, 2012; Cerezo et al., 2017; Duru & Balkis, 2017) and two malleable variables, adaptive self-regulation and attribution, were predictive of procrastination for our sample, it is imperative that future research investigate the effects of adaptive self-regulation training and attribution training on procrastination, and ultimately, on academic outcomes for synchronous online graduate students. Carefully constructed instructor feedback may be a helpful approach to increasing synchronous online students. Ambrose, Bridges, Di Pietro, Lovett, and Norman (2010) reported that targeted and timely feedback that focuses on specific ways students may grow to meet their personal learning goals enhances student self-regulation. A structured format for this type of feedback may facilitate the growth of self-regulatory skills in synchronous online graduate students; however, the effects of such structured feedback should be studied to determine if it is effective.

Rakes and Dunn (2015) provided asynchronous online graduate students with four brief online self-regulatory trainings for self-efficacy, achievement goal orientation, learning strategies, and attributional thinking. The trainings included a one-page explanation of each construct and the impact maladaptive and adaptive behaviors related to those constructs may affect students' learning and achievement. After reading the materials, students were required to reflect and journal about how they understood the variables and their impact (one paragraph), about what their strengths related to the variables (one paragraph), and about what their weaknesses related to the variables were and three concrete actions they could take to improve (two paragraphs). Results indicated that the students perceived growth in each area after the course was completed. Future researchers may wish to replicate these trainings with synchronous online students to test their effect on the respective variables, procrastination, and ultimately, student performance.

In addition to the aforementioned brief training approach to general attribution retraining, the current results indicate it may be important for future researchers to target effort attributions for synchronous online graduate students. Rakes and her colleagues (2013) found asynchronous online graduate students' effort attributions were significantly related to procrastination. Their participants reported that a primary impediment to them giving their best effort was familial and work obligations. Skibba (2009) reported that giving adult online learners flexible due dates assisted in allowing them to put forth the necessary effort to succeed and to meet non-academic demands on their time. Therefore, we recommend future researchers determine if providing due date ranges in synchronous online courses may allow students to make more adaptive attributions to effort, as the flexibility allows them to address all their priorities, and if this decreases the tendency to procrastinate.

References

Aiken, L. S., West, S. G., Reno, R. R. (1991). *Multiple regression: Testing and interpreting interactions.* Sage.

Albert, M. A., & Dahling, J. J. (2016). Learning goal orientation and locus of control interact to predict academic self-concept and academic performance in college students. *Personality and Individual Differences, 97,* 245–248.

Allen, I. E., & Seaman, J. (2013)*. Changing course: Ten years of tracking online education in the United States*. Babson Survey Research Group and Quahog Research Group. http://www.onlinelearningsurvey.com/reports/changingcourse.pdf

Akinsola, M. K., Tella, A., & Tella, A. (2007). Correlates of academic procrastination and mathematics achievement of university undergraduate students. *Eurasia Journal of Mathematics, Science & Technology Education, 3*(4), 363–370.

Ambrose, S. A., Bridges, M. W., Di Pietro, M., Lovett, M. C., & Norman, M. K. (2010). *How learning works: Seven research-based principles for smart teaching.* John Williams.

Baker, C. K., & Hjalmarson, M. (2019). Designing purposeful student interactions to advance synchronous learning experiences. *The International Journal of Web-Based Learning and Teaching Technologies, 14*(1), 1–16.

Bristol, T. J., & Goings, R. B. (2018) Exploring the boundary heightening experiences of black male teachers: Lessons for teacher education programs. *Journal of Teacher Education, 70,* 51–64.

Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies and academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education, 27*, 1–13.

Cao, L. (2012). Differences in procrastination and motivation between undergraduate and graduate students. *Journal of the Scholarship of Teaching and Learning, 12*(2), 39–64.

Cerezo, R., Esteban, M., Sánchez-Santillán, M., & Núñez, J. C. (2017). Procrastinating behavior in computer-based learning environments to predict performance: A case study in Moodle. *Frontiers in Psychology, 9.* http://digibuo.uniovi.es/dspace/bitstream/10651/45204/1/procrastinating.pdf

Cerino, E. S. (2014). Relationships between academic motivation, self-efficacy, and academic procrastination. *Journal of Psychological Research, 19,* 155–163.

Chu, A. H. C., & Choi, J. N. (2005). Rethinking procrastination: Positive effects of "active" procrastination behavior on attitudes and performance. *The Journal of Social Psychology, 145*(3), 245–264.

Cleary, T. J., & Zimmerman, B. J. (2004). Self-regulation empowerment program: A school based program to enhance self-regulated and self-motivated cycles of student learning. *Psychology in the Schools, 41*(5), 537–550.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Lawrence Erlbaum.

Comrey, A. L., & Lee, H. B. (1992). *A first course in factor analysis* (2nd ed.). Lawrence Erlbaum.

de Barba, P. D., Kennedy, G. E., & Ainley, M. D. (2016). The role of students' motivation and participation in predicting performance in a MOOC. *Journal of Computer Assisted Learning, 32,* 218–231.

Diseth, A. (2011). Self-efficacy, goal orientations and learning strategies as mediators between preceding and subsequent academic achievement. *Learning and Individual Differences, 21*(2), 191–195.

Dunn, K. E., Osborne, C., & Link, H. J. (2012a). Exploring the influence of students' attribution for success on their self-regulation in Pathophysiology. *Journal of Nursing Education*, *51*(6), 353-357.

Dunn, K. E., Lo, W., Mulvenon, S. W., & Sutcliffe, R. (2012b). Revisiting the Motivated Strategies for Learning Questionnaire: A theoretical and statistical reevaluation of the Metacognitive Self-Regulation and Effort Regulation subscales. *Educational and Psychological Measurement*, *72*, 312-331.

Duru, E., & Balkis, M. (2017). Procrastination, self-esteem, academic performance, and well-being: A moderated mediation model. *International Journal of Educational Psychology, 6,* 97–119.

Floyd, F. J., & Widaman, K. F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment*, 7, 286–299.

Garzón-Umerenkova, A., de la Fuente, J., Amate, J., Paoloni, P. V., Fadda, S., Pérez, J. F. (2018). A linear empirical model of self-regulation on flourishing, health procrastination, and achievement among university students. *Frontiers in Psychology, 9.* https://doi.org/10.3389/fpsyg.2018.00536

Greene, J. A., & Azevedo, R. (2007). Adolescents' use of self-regulatory processes and their relation to qualitative mental model shifts while using hypermedia. *Journal of Educational Computing Research, 36*(2), 125–148.

Guo, J., Marsh, H. W., Parker, P. D., Morin, A. J. S., & Dicke, T. (2017). Extending expectancy-value theory predictions of achievement and aspirations in science: Dimensional comparison processes and expectancy-by-value interactions. *Learning and Instruction, 49,* 81–91.

Honicke, T., & Broadbent, J. (2016). The influence of academic self-efficacy on academic performance: A systematic review. *Educational Research Review, 17,* 63–84.

Hood, M. (2013). Evaluation of a workshop to reduce negative perceptions of statistics in undergraduate psychology students. *Psychology Learning and Teaching, 12*(2), 115–125.

Jarvela, S., Kirschner, P. A., Panadero, E., Malmberg, J., Phielix, C., Jaspers, J.,…Jarvenoja, H. (2015). Enhancing socially shared regulation in collaborative learning groups: designing for CSCL regulation tools. *Educational Technology Research and Development, 63*(1), 125–142.

Kerr, M. S., Rynearson, K., & Kerr, M. C. (2006). Student characteristics for online learning success. *The Internet and Higher Education, 9*, 91–105.

Kitsantas, A., Steen, S., & Huie, F. (2009). The role of self-regulated strategies and goal orientation in predicting achievement of elementary school children. *International Electronic Journal of Elementary Education, 2*, 65–81.

Klingsieck, K. B., Fries, S., Horz, C. & Hofer, M. (2012). Procrastination in a distance university setting. *Distance Education, 33,* 295–310.

Labuhn, A. S., Bogeholz, S., & Hasselhorn, M. (2008). Fostering learning through stimulation of self-regulation in science lessons. *Zeitschrift Fur Padagogische Psychologie, 22*(1), 13–24.

Lai, C. L., & Hwang, G.-J. (2016). A self-regulated flipped classroom approach to improving students' learning performance in a mathematics course. *Computers and Education, 100*, 126–140.

Lefcourt, H. M. (1981*).* The construction and development of the multidimensional-multiattributional causality scales. In H. M. Lefcourt (Ed.), *Research with the locus of control construct* (Vol. 1, pp. 245–277). Academic Press.

Lewis-Beck, C., & Lewis-Beck, M. (2015). *Applied regression: An introduction* (2nd ed.)*.* Sage.

Martin, F., & Parker, M. A. (2014). Use of synchronous virtual classrooms: Why, who, and how. *Journal of Online Learning and Teaching, 10,* 192–210.

Morford, Z. H. (2008). *Procrastination and goal-setting behaviors in the college population: An exploratory study* [Unpublished master's thesis]. Georgia Institute of Technology. http://smartech.gatech.edu/dspace/bitstream/1853/21829/1/FinalThesis.pdf

Rakes, G. C., & Dunn, K. E. (2010). The impact of online graduate students' motivation and self-regulation on academic procrastination. *Journal of Interactive Online Learning, 9*(1), 78-93.

Rakes, G. C., & Dunn, K. E. (2015). Teaching online: Discovering teacher concerns. *Journal of Research on Technology in Education, 47*, 229-241.

Rakes, G. C., Dunn, K. E., & Rakes, T. A. (2013). Attribution as a predictor of procrastination in online graduate students. *Journal of Interactive Online Learning, 12*(2). Retrieved from http://www.ncolr.org/issues/jiol/v12/n3/2

Rebetez, M. M. L., Rochat, L., Gay, P., & Van der Linden, M. (2014). Validation of a French version of the Pure Procrastination Scale (PPS). *Comprehensive Psychiatry*, *55*(6), 1442–1447.

Rozental, A., Forsell, E., Svensson, A., Forsström, D., Andersson, G., & Carlbring, P. (2014). Psychometric evaluation of the Swedish version of the pure procrastination scale, the irrational procrastination scale, and the susceptibility to temptation scale in a clinical population. *BMC Psychology*, *2*(1), 54–65.

Schouwenburg, H. C. (1995). Academic procrastination: Theoretical notions, measurement, and research. In J. R. Ferrari, J. L. Johnson, & W. G. McCown (Eds.), *Procrastination and task avoidance: Theory, research, and treatment* (pp. 71–96). Plenum Press.

Senécal, C., Koestner, R., & Vallerand, R. J. (1995). Self-regulation and academic procrastination. *Journal of Social Psychology, 135*, 607–619.

Skibba, K. (2009). What faculty learn teaching adults in multiple course delivery formats. Paper presented at the Twenty-Fifth Annual Conference on Distance Teaching and Learning; August 3-7, 2009, Madison, WI.

Steel, P. (2010). Arousal, avoidant and decisional procrastinators: Do they exist? *Personality and Individual Differences, 48*, 926–934.

Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin, 133,* 65–94.

Steel, P., & Ferrari, J. (2013). Sex, education and procrastination: an epidemiological study of procrastinators' characteristics from a global sample. *European Journal of Personality*, *27*(1), 51–58.

Wäschle, K., Allgaier, A., Lachner, A., Fink, S., & Nückles, M. (2014). Procrastination and self-efficacy: Tracing vicious and virtuous circles in self-regulated learning. *Learning and Instruction, 29,* 103–114.

Weiner, B. (1974). *Achievement motivation and attribution theory.* General Learning Press.

Weiner, B. (2000). Intrapersonal and interpersonal theories of motivation from an attributional perspective. *Educational Psychology Review*, *12*(1), 1–14.

Weiner, B. (1972). *Theories of motivation: From mechanism to cognition.* Markham Publishers.

Weiner, I. B., Freedheim, D. K., Graham, J. R., & Naglieri, J. A. (Eds.). (2003). *Handbook of psychology: Assessment psychology.* Wiley.

You, J. W. (2015). Examining the effect of academic procrastination on achievement using LMS data in e-learning. *Educational Technology and Society, 18*(3), 64–74.

Zimmerman, B. J. (1998). Academic studying and the development of personal skill: A self-regulatory perspective. *Educational Psychologist, 33,* 73–86.

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). Academic Press.

Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist, 25*, 3–18.