

# Why Wait? The Influence of Academic Self-Regulation, Intrinsic Motivation, and Statistics Anxiety on Procrastination in Online Statistics

Karee Dunn

Published online: 23 March 2013  
© Springer Science+Business Media New York 2013

**Abstract** Online graduate education programs are expanding rapidly. Many of these programs require a statistics course, resulting in an increasing need for online statistics courses. The study reported here grew from experiences teaching online, graduate statistics courses. In seeking answers on how to improve this class, I discovered that research has yet to explore teaching and learning in online statistics courses. The purpose of the study was to ameliorate this gap in the literature by examining the influence of self-regulation, intrinsic motivation, and statistics anxiety on passive procrastination. The set of independent variables explained nearly thirty percent of the variance.

**Keywords** Online education · Statistics anxiety · Self-regulation · Intrinsic motivation

Fueled by the recent economic downturn, institutions of higher education are reporting an increased demand for online degree programs (Allen and Seaman 2010). At the university where this study was conducted, many of the online graduate programs in education require a statistics course. Teaching and learning in the online environment presents challenges for any course; but for statistics courses, known to be challenging and stress inducing, these challenges are magnified. One such challenge for students enrolled in statistics courses is the tendency to procrastinate. This tendency was aptly described by a well-known entrepreneur, Victor Kiam, when he noted that, “procrastination is opportunity’s assassin.”

While some research has explored the causes of this tendency in traditional class settings, no research has explored procrastination in online statistics courses. Thus, the purpose of this study was to conduct inaugural research with the quickly growing population of graduate students in education majors who are completing their statistics and research

---

**Karee Dunn** has a Ph.D. in Educational Psychology from the University of Memphis. She is currently an Assistant Professor of Educational Psychology in the Eleanor Mann School of Nursing at the University of Arkansas. Her research focuses on student motivation and learning as well as the change process associated with adoption of new innovations in education and business. Email: [kedunn@uark.edu](mailto:kedunn@uark.edu)

K. Dunn (✉)

Educational Statistics and Research Methods, College of Education and Health Professions,  
University of Arkansas, Fayetteville, AR 72701, USA  
e-mail: [kedunn@uark.edu](mailto:kedunn@uark.edu)

methods requirements online (Allen and Seaman 2010). Specifically, I examined the influence of academic self-regulation, intrinsic motivation, and statistics anxiety on the tendency of students pursuing graduate degrees in education to procrastinate in an online statistics course.

Academic procrastination is the purposeful and needless delay in completing class work that is detrimental to academic outcomes (Shaw et al. 2007). Procrastination was selected because research indicates that statistics students in face-to-face classrooms frequently procrastinate to the detriment of their learning and performance (Onwuegbuzie 2004). Academic self-regulation is the monitoring, regulation, and control of one's cognition, motivation, and behavior in order to achieve a goal (Wolters et al. 2005). Intrinsic motivation is defined as the inclination to engage in a task because the task is inherently enjoyable, a reward in itself (Ryan and Deci 2000). Research on statistics students in the traditional classroom setting has revealed that, as statistics anxiety increases, so does procrastination (Onwuegbuzie 2004). Literature that has examined this element in other traditional classroom settings indicates that self-regulation (i.e., Steel 2007) and intrinsic motivation (i.e., Klassen et al. 2007) are also significant influences on academic procrastination.

While research exists that supports the hypothesis that academic self-regulation, intrinsic motivation, and statistics anxiety separately influence academic procrastination, no research has examined the synergistic influence of these variables within any population; nor has any research been conducted to explore any of these variables in the growing population of students who are completing their statistics requirements online. It is important to begin to explore issues with this population as institutions continue to experience a growing demand for online graduate level course offerings. More importantly, students in the traditional classroom setting find statistics courses challenging (Onwuegbuzie 2004), an issue that is magnified for online graduate students who, as adult learners, face additional challenges to learning emanating from work and family obligations.

This work began with a simple instructional reflection exercise. After watching many students struggle to complete their statistics requirement online, some of them taking the class two or more times with various instructors, I began asking top performing students in an online, graduate level, introductory educational statistics and research methodology course to provide insight into what they did to succeed in class. This informal data collection resulted from emailing students and simply asking what they believed led to their personal success in a class that challenged many of their peers. A common response from these high achieving students was captured by this student's comment: "The times that I finished my online quiz a few days ahead of the deadline was so helpful from a time management standpoint. I didn't always do it, but when I did, I was more successful and more relaxed."

Often students procrastinate when preparing for any course, but it seems that statistics courses often foster even greater levels of procrastination than do other courses. Onwuegbuzie (2004) noted that procrastination is a problem in both enrollment in required statistics courses and engagement in the course work. Chu and Choi (2005) defined two types of academic procrastination—passive procrastination and active procrastination. The latter, active procrastination, is essentially a positive, proactive strategy whereas the former, passive procrastination, reflects negative behavior by which the procrastinators allow fear and indecisive behavior to paralyze them. Research indicates that passive procrastination, which was the focus of this study, negatively impacts academic performance and learning as it limits both the quality and quantity of student work (Morford 2008; Rakes and Dunn 2010).

A decrease in quality and quantity of work may be particularly debilitating in a statistics course because the obstacles to success may seem increasingly insurmountable as one falls behind. As one successful student noted about her introductory educational statistics and research methodology course,

I studied more than usual because I thought it would be more challenging than my other courses...I made sure to understand the material each week. I did not wait until right before the test to understand material. When it was time to study for the test, I just had to review what I had already learned instead of trying to learn it all for the first time.

Beyond the anecdotal evidence provided by the two students above, empirical evidence highlights the detrimental impact of passive academic procrastination. More specifically, research indicates that procrastination results in lower goal commitment, decreased achievement (Akinsola et al. 2007), and an overall decrease in long-term learning (Schouwenburg 1995).

While procrastination is a pervasive problem in the graduate student population (Onwuegbuzie 2004), the tendency to procrastinate often increases in online courses (Elvers et al. 2003). This tendency may be even greater in statistics courses and other courses that induce anxiety for many students (Onwuegbuzie 2004). Because research indicates that online statistics students experience significantly greater levels of statistics anxiety than on-campus statistics students (DeVaney 2010), the tendency to procrastinate may also be greater in online statistics students.

Because statistics courses are often the source of a great deal of stress in graduate students and because this anxiety in combination with an online course format may result in greater passive academic procrastination (Cantrell et al. 2008), the study of what influences this detrimental tendency is significant. Also, because a large number of graduate students report wanting to reduce their procrastination-related behaviors (Onwuegbuzie 2004), it is important to understand what variables impact procrastination so as to help students meet their goal of reducing this counterproductive behavior.

Furthermore, online course and degree program offerings are currently expanding at a tremendous rate with higher education institutions identifying online education as critical to long-term goals (Allen and Seaman 2010). The online learning environment can result in equivalent, if not better, academic outcomes (Bowen et al. 2012); but the online context does present unique obstacles for teaching and learning. Notably, students report that the asynchronous nature of online interactions increases their frustration and sense of isolation, which also contributes to lower levels of regulating learning through the use of learning strategies (McInnerney and Roberts 2004) and increased levels of procrastination (Elvers et al. 2003). Because most graduate degree programs in education require students to complete at least one research methods and/or statistics course (Onwuegbuzie 1997), the number of students enrolling online is increasing. As this population continues to expand, it is important that research in this fledgling area seek to understand the challenges that these online students and instructors face.

Thus, the purpose of the study reported here was to open this field of research by examining the influence of academic self-regulation, intrinsic motivation, and statistics anxiety on passive procrastination in graduate education students who were enrolled in an online introductory statistics and research methodology course. This theoretical framework and research base for this study are discussed below.

## Theoretical Framework

This study is rooted in the theoretical framework of self-determination theory as it is comprehensive and incorporates each of the constructs explored in the study. Self-determination theory is a broad framework for the study of human motivation and personality that a) defines intrinsic and extrinsic motivation, b) highlights the importance of motivation in the self-regulation of behavior, and c) explores the relationship of these constructs to social and cultural factors (Deci and Ryan 2000; Ryan and Deci 2000).

Both intrinsic motivation and academic self-regulation are associated with positive academic outcomes (Ryan and Deci 2000) and inversely related to procrastination (Rakes and Dunn 2010; Senecal et al. 1995). As one's intrinsic motivation increases, the tendency to delay work decreases (Brownlow and Reasinger 2000; Lee 2005). Conti (2000) noted that students who report lower levels of intrinsic motivation tend to dedicate less time to tasks and procrastinate more.

Additionally, Klassen et al. (2007) proposed that, whereas self-regulation requires motivation, passive procrastination reflects an absence of motivation. Other researchers have suggested that procrastination results from a failure to engage in self-regulation (e.g., Senecal et al. 1995; Steel 2007; Wolters 2003). These research findings are important because both intrinsic motivation and academic self-regulation are malleable student characteristics. For example, when working with adult learners, teachers may increase intrinsic motivation by designing course work and assignments to help students understand the personal and professional value of the material covered in class (Ryan and Deci 2000). To increase academic self-regulation, teachers need to help learners set appropriate learning goals (Zimmerman 2005). Anxiety is another learner characteristic that impacts passive procrastination and may be addressed through instructional design and practice.

Generally, anxiety is inversely related to intrinsic motivation and positively related to procrastination (Chu and Choi 2005). Statistics anxiety is a context-specific sense of trepidation that occurs as a result of encountering statistics, particularly when learning or applying statistics (Onwuegbuzie et al. 1997; Pan and Tang 2004). It is a complex phenomenon, which manifests itself in various forms such as the value students assign to statistics, test and class anxiety, and efficacy for completing statistical computations (Cruise et al. 1985). Statistics anxiety negatively impacts performance, and the level of anxiety is one of the best predictors of achievement in both graduate and undergraduate level statistics and methodology courses (Chiesi and Primi 2010). Onwuegbuzie (2004) reported that statistics anxiety is significantly related to procrastination in face-to-face classrooms. This is an important finding in light of the prevalence of an uncomfortable level of statistics anxiety in the vast majority of students (Onwuegbuzie and Wilson 2003).

Decades of research support the finding that statistics and research methodology courses engender anxiety (e.g., Hanna et al. 2008). With up to 80 % of students reporting experiences with statistics anxiety (Onwuegbuzie and Wilson 2003), students are most eager to share their negative feelings about statistics. When tasks involve high cognitive load and induce stress, as in statistics, procrastination will be a prevalent issue (Wolters 2003). Moreover graduate students, who are predominantly non-traditional learners, face a number of challenges that increase anxiety and procrastination, such as working full time, family needs, a history of bad experiences learning math, and time since their last math-based learning experience (Marchewka 2010). Thus, classes such as graduate level statistics provide the perfect mix of complex tasks and stress to foster increases in student passive procrastination. The connection between statistics anxiety and passive procrastination as well as academic success is important because teachers may utilize a number of tactics to help decrease students' statistics anxiety (Forte 1995; Onwuegbuzie et al. 1997; Onwuegbuzie et al. 2010; Wilson 1998). By addressing constructs that can help students overcome issues related to high cognitive load and stress in statistics and research methodology courses, such as statistics anxiety, academic self-regulation, and intrinsic motivation, instructors may reduce passive procrastination and consequently help students to improve their academic performance.

Although there is evidence that intrinsic motivation, academic self-regulation, and statistics anxiety are related to procrastination in face-to-face classroom environments, no research has investigated the collective influence of these variables on passive procrastination. Additionally,

none of these variables has been examined with regard to passive procrastination in online statistics students (Allen and Seaman 2010). Each variable has an impact upon learning outcomes, and issues can be addressed through thoughtful instructional design.

## The Study

### Research Question

The research question for this study was as follows. Do intrinsic motivation and academic self-regulation as measured by the Motivated Strategies for Learning Questionnaire (MSLQ) and statistics test and class anxiety as measured by the Statistical Anxiety Rating Scale (STARS) significantly influence online graduate students' passive procrastination as measured by the Procrastination Assessment Scale-Students (PASS) in their online statistics course? Based upon the existing literature, I had hypothesized that these variables would indeed significantly influence passive procrastination and that, as intrinsic motivation and academic self-regulation increased, passive academic procrastination would decrease. I also hypothesized that passive academic procrastination would increase for this sample as statistics anxiety increased.

### Participants

The participants in this study were enrolled in an online graduate level educational statistics and research methodology course at a midwestern university ( $n=101$ ). The Institutional Review Board had approved this study's protocol prior to any contact with participants. Participating professors shared the survey via email with students after the second exam and offered bonus points to students for completion. As a result the response rate was relatively high (81 %). If students did not respond to an item, they were notified and had to respond to submit the survey, resulting in no missing data.

The majority of the sample identified themselves as female (75 %) and ranged in age from 22 to 56 ( $M=33$ ). Students had varying levels of experience with enrollment in online courses with 58 % of students having taken six or more online classes, 13 % having taken three to five online courses, and 19 % having taken one to two online courses. Thirty-six percent had delayed enrollment in their required statistics course until the final semester before their expected graduation date. Thirteen percent of participants were repeating the course. Thirteen percent of the students were seeking a doctorate, 81 % a master's degree, 4 % a specialist degree (4 %), and 2 % were working towards the 30 plus hours expectation for K-12 teachers.

### Measures

*Motivated Strategies for Learning Questionnaire (MSLQ)* The MSLQ assesses intrinsic motivation and academic self-regulation (Pintrich et al. 1993). It consists of two primary scales, the Motivation Scale and Learning Strategies Scale, and 15 subscales. For the purposes of this study, the Intrinsic Goal Orientation (IGO) subscale from the Motivation scale was utilized to assess intrinsic motivation (four items); and the General Strategies for Learning (GSL) scale (five items), a modification of the MSLQ Learning Strategies subscales, was utilized to assess academic self-regulation (Dunn et al. 2012).

The IGO subscale measures students intrinsic motivation or the degree to which respondents perceive that they are engaging in an activity or task for reasons such as challenge, curiosity, and mastery (Pintrich et al. 1993). In their initial work, Pintrich and his colleagues

(1993) reported factor loadings for this scale ranging from 0.55 to 0.69 and a reliability coefficient of 0.74. In this study the reliability coefficient for the IGO was 0.73.

The GSL assessed learners' aptitude for engaging in academic self-regulation, using the processes of planning, monitoring, regulating, and resource management (Dunn et al. 2012). Dunn et al. (2012) utilized Exploratory Factor Analysis and Confirmatory Factor Analysis to extract sound factors and to confirm the data model fit, respectively. Factor loadings for the GSL ranged from 0.49 to 0.72. The reliability coefficient for the GSL was 0.73. In this study the reliability coefficient for the GSL was 0.81.

*Statistical Anxiety Rating Scale (STARS)* The STARS assessed students' statistics-related anxiety (Cruise et al. 1985; Cruise and Wilkins 1980). The 51-item survey utilizes a five-point Likert scale to assess two areas: statistics anxiety and dealing with statistics. These two parts make up the instrument's six subscales of which this research only utilized the Statistics Test and Class Anxiety (STCA, eight items). The STCA subscale measures the anxiety one experiences while in a statistics class and while taking examinations. Cruise et al. (1985) validated STARS on a sample of 1150 students and identified the aforementioned six factors. Factor loadings for items on these scales all exceeded 0.40. Internal consistency for the STCA subscale was 0.68. In this study the reliability coefficient was 0.90.

*Procrastination Assessment Scale-Students (PASS)* The PASS scale is frequently used to measure academic procrastination (Ferrari et al. 1995). It consists of six items and uses a 5-point Likert scale to measure the prevalence of procrastination. Respondents were asked to describe their behavior for specific academic tasks such as writing a term paper, studying for exams, and weekly reading assignments. PASS had originally been validated on a sample of 323 undergraduate university students. Cronbach's alpha measured the internal consistency of items for the prevalence of procrastination (0.86). For this study Cronbach's alpha for this scale was 0.83.

## Analysis

I analyzed the data using linear multiple regression with simultaneous data entry as recommended for small sample sizes (Brace et al. 2006). Prior to completing the analysis for the research question, an exploratory analysis was completed to test the assumptions underlying the application of linear multiple regression (i.e. independence, normality, homoscedasticity, and linearity). Participants responded to the MSLQ, STARS, and PASS. PASS scores were entered as the dependent variable; and GSL scores, STCA scores, and IGO scores were entered as the independent variables. The significance and size of the coefficient of determination were examined to determine if the two sets of independent variables had a significant influence on passive procrastination. Further, the magnitude of impact for each independent variable was examined and interpreted.

## Results

Multiple linear regression was used to determine whether GSL, STCA, and IGO significantly influenced PASS. The means, standard deviations, and correlations among all the variables are shown in Table 1.

The three independent variables (GSL, STCA, and IGO) were entered into the regression equation simultaneously with the dependent variable being PASS. Preliminary examination



**Table 1** Means, Standard Deviations, and Correlation for the PASS, GSL, TCA, and IGO (n=101)

	1	2	3	4	<i>M</i>	<i>SD</i>
1 PASS	1.00				15.29	5.26
2 GSL	-0.50	1.00			5.07	1.16
3 STCA	0.18	0.38	1.00		3.28	1.00
4 IGO	-0.05	0.51	-0.09	1.00	4.77	1.37

of the results indicated there was no extreme multicollinearity in the data (all variance inflation factors were less than 2). Exploratory analysis also indicated that the assumptions underlying the application of multiple linear regression (independence, normality, homoschedasticity, and linearity) were met. The regression results indicated that the set of independent variables influenced 29.1 % of the variance in passive procrastination ( $F(3, 98)=13.115; p=.001$ ). Cohen’s  $f^2$  measured effect size. The effect size was interpreted as strong at 0.41, 95 % CI [.17, 0.77] (Cohen 1988). Only GSL ( $\beta=.148$ ) had a significant unique, inverse influence on PASS ( $t=-5.91; p<.001$ ). Beta weights and partial correlations are presented in Table 2.

**Discussion**

Results supported my hypothesis that these online, graduate statistics students’ academic self-regulation, statistics anxiety, and intrinsic motivation would significantly and collectively influence their passive procrastination. Results also supported the hypothesis that, as academic self-regulation and intrinsic motivation increased, passive procrastination would decrease for this sample of students. Further, results supported the original hypothesis that, as statistics anxiety increased, passive procrastination would increase. The findings also suggest that intrinsic motivation may be a mediator variable as indicated by the bivariate and partial correlations. More specifically, the bivariate correlation of IGO and PASS was  $r_{ip}=-0.05$ ; but, when the influence of GSL and STCA were controlled for, the partial correlation for intrinsic goal orientation increased to  $r_{ip.gs}=-0.19$ .

This small increase may have been limited by sample size, and the small sample size prevents further exploration of this finding. Thus, future research should employ more advanced statistical methodology such as path analysis with a larger sample to explore the more complex model suggested by these results. Although the generalizability of these findings is limited by the convenience sampling and self-report measures employed, they have important implications for professors of online statistics courses and future researchers. These implications are discussed below.

**Increasing Academic Self-Regulation**

Academic self-regulation exerted the strongest influence on passive procrastination in this study. Fortunately, research on adult learners suggests that academic self-regulation may be

**Table 2** Results of Regression of Learner-Centered Beliefs on Teacher Efficacy While Controlling for Social Desirability (n=101)

Variable	<i>b</i>	<i>Beta</i>	<i>Partial</i>	<i>t</i>
GSL	-2.50	-0.55	-0.52	-5.91*
STCA	0.78	0.15	0.17	1.72
IGO	-0.67	-0.17	-0.19	-1.86

Note. \*  $p<.001$ .  $R^2=0.291$

increased by targeted instructional practices and curriculum development. For example, Zimmerman et al. (2009) recommended an instructional model in which teachers explicitly train students in goal setting, strategy use, and self-monitoring. To do so, statistics instructors need to make statistics-specific learning strategies and techniques part of the curriculum and assignments. Research suggests that students are more likely to master course material (Bandura 1986; Zimmerman et al. 2009) if instructors help them master the methods of learning. This heuristic may prove useful to statistics instructors. In other words, statistics professors must overcome the assumption that all graduate students come prepared to learn, much less to learn statistics. Although theorists suggest that constructs such as self-regulation are best measured at the task specific level (Bandura 1997; Pajares 1996; Pintrich and Schunk 1996), most measures of self-regulation are more global. Thus, little is known about what specific strategies best support success in statistics courses, much less online statistics courses. In light of the powerful influence of academic self-regulation on passive procrastination in statistics found in this study, future research should explore what specific strategies support effective learning in statistics and means of increasing the use of those strategies.

### Increasing Intrinsic Motivation

A relatively large body of literature describes ways of increasing intrinsic motivation. Three conditions have been identified for learners of all ages as facilitators of the highest form of motivation, i.e., intrinsic motivation: autonomy, competence, and relatedness (Ryan and Deci 2000). Research also supports that challenging learners, but not exceeding their abilities, increases intrinsic motivation (Deci and Ryan 1985). The use of rewards is not recommended for the promotion of intrinsic motivation (Cameron and Pierce 1994; Michinov et al. 2011).

With regard to autonomy, intrinsic motivation increases when students are offered options in a class (Deci and Ryan 1991; Enzle et al. 1996). Therefore, a statistics professor may wish to offer options with regard to homework assignments or a final project in order to help students follow their interests. For example, the professor could provide students with a variety of data sets related to a variety of fields for a final project.

While in general the use of rewards and rewards systems is detrimental to intrinsic motivation (Cameron and Pierce 1994; Eisenberger and Rhoades 2001), two forms of extrinsic rewards may be useful for increasing competence. First, positive feedback enhances students' sense of competence in their abilities and intrinsic motivation (Deci and Ryan 2000). Thus, statistics professors may wish to give specific feedback to students as they acquire new skills. This will be more challenging in the online class format, but no less important. Second, if rewards are tied directly to skill acquisition, they inform students that they are gaining competences and skills, which also serves to increase intrinsic motivation (Cameron and Pierce 1994). Therefore, professors may want to offer skill challenges such as online quizzes, individual activities, or group activities that coincide with a reward.

Another important way of increasing students' intrinsic motivation is the creation of a sense of belonging or relatedness (Ryan and Deci 2000). When students sense that the instructor and students are socially available, intrinsic motivation increases (Yang et al. 2006). This also presents a greater challenge in the online classroom. However, there is a body of literature that suggests ways of increasing students' sense of belonging in online courses. For example, online learning environments such as Blackboard provide opportunities for student interaction. Professors can create chat rooms, group discussion boards, or ask students to create home pages that include introductions, photographs, and other information (Bennett and Monds 2008).

An additional way to improve intrinsic motivation is presenting challenges. If tasks are too simplistic, students may experience decreases in intrinsic motivation, which may lead to



boredom. However, if a task is too difficult, students may also experience diminished intrinsic motivation. Thus, it is important that instructors seek to achieve the optimal level of challenge for student skill level in order to increase intrinsic motivation (Deci and Ryan 1985). Because many students find statistics to be very challenging, this is a critical and difficult task of which statistics instructors must be mindful. Future research should explore these and other means of increasing students' intrinsic motivation in statistics.

For example, in this study, we asked participants the following question, "Have you delayed taking this course until your last semester before graduation?" Thirty-six percent of respondents noted that they had delayed taking the course. This high percentage represents a high degree of procrastination, and it may also be indicative of the culture in colleges of education where statistics anxiety runs rampant among students and likely squashes intrinsic motivation. For graduate students who are expected to read recent research literature throughout their programs, why are they waiting until the last minute to take this required course? Perhaps the culture may lead some to believe statistics is not something they really need to be successful. Regardless, if students are helped to see the personal relevance of the course for their profession, they may experience an increase in intrinsic motivation and a decrease in statistics anxiety (Murtonen and Lehtinen 2003). Future research could explore the influence of a college culture on statistics related intrinsic motivation as well as these and other means of increasing intrinsic motivation related to statistics courses.

### Decreasing Statistics Anxiety

Although statistics anxiety is prevalent among social science majors (Onwuegbuzie and Wilson 2003), there is a variety of strategies instructors may utilize in order to diminish students' statistics anxiety. For example, several researchers have noted that the use of humor in statistics courses reduced anxiety (Forte 1995; Wilson 1998). While journal writing may decrease students' statistics anxiety (Onwuegbuzie et al. 1997), Onwuegbuzie and his colleagues (2010) recommended altering course design so as to incorporate an integrated curriculum including quantitative and qualitative methodology within a mixed methodological framework in order to decrease statistics anxiety. This body of research used on-campus statistics students, but little is known about the role anxiety plays in the growing population of online statistics students. Thus, future research should explore ways of decreasing statistics anxiety for online students. Although the predictor variables in this study explained nearly 30 % of the variance in procrastination, more research is needed to begin to understand the remaining variance in procrastination as well as other variables that influence student performance in online statistics classes.

### Limitations and Future Research

The sample of this study poses limitation, but the study entailed other limitations that suggest viable areas of future research. For example, although participants in this study were all graduate education students enrolled in the same course, at the same university, and using the same textbook, there were three separate instructors and different approaches to course design. Future research should not only continue to explore student variables that contribute to learning outcomes in online statistics, but also the influence of various facets of course design such as the use of discussion boards, quality of feedback, and frequency of feedback. This study was also limited in that it did not explore personal variables that may impact adult learner procrastination such as resource and time demands (e.g., number and

age of children, marital status, full/part time employment, and personal demands on time). Future research could explore these challenges that adult learners face. I recommend that future research also explore the influence of age, length of time since completion of last math course, previous math-based learning experiences, and quality of instruction and course design. The need for future research on online statistics teaching and learning is great. However, this study provides some initial insight into variables that impact procrastination and learning in online statistics courses.

## Conclusion

Passive procrastination is a counterproductive student behavior that research suggests may be worse in online environments for a variety of reasons (Morford 2008; Rakes and Dunn 2010). Moreover, passive procrastination is prevalent in traditional face-to-face statistics courses (Onwuegbuzie 2004). One study suggests that passive procrastination is worse in online statistics courses as compared to on campus statistics courses (DeVaney 2010). However, little is known about the role passive procrastination plays or how to reduce passive procrastination in this growing segment of higher education. Although this study presents an important early step, continuing research in this area is important as budgetary issues and increasing demands for online offerings will likely result in a continuing and increased need to offer online statistics courses.

This study took an important first look at variables that influence passive procrastination in online statistics students, laying a foundation for future research to use more complex statistical methodology to understand the more complex model suggested by the findings as well as providing implications for practice that must also be thoroughly researched. By attending to these findings and recommendations for future research, statistics professors may help facilitate better experiences with and improved achievement in statistics for online students.

## References

- Allen, I. E., & Seaman, A. (2010). *Learning on demand: Online education in the United States, 2009*. Needham, MA: The Sloan Consortium.
- 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, 363–370.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: W. H. Freeman and Company.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Bennett, C. F., & Monds, K. E. (2008). Online courses: The real challenge is “motivation. *College Teaching Methods and Styles Journal*, 4(6), 1–6.
- Bowen, W. G., Cingos, M. M., Lack, K. A., Nygren, T. I. (2012). *Interactive learning online at public universities: Evidence from randomized trials*. New York, NY: ITHAKA. Retrieved from <http://www.sr.ithaka.org/research-publications/interactive-learning-online-public-universities-evidence-randomized-trials>.
- Brace, N., Kemp, R., & Sneglar, R. (2006). *SPSS for psychologists: A guide to data analysis using SPSS for Windows* (3rd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.
- Brownlow, S., & Reasinger, R. D. (2000). Putting off until tomorrow what is better done today: Academic procrastination as a function of motivation toward college work. *Journal of Social Behavior and Personality*, 15, 15–34.
- Cameron, J., & Pierce, W. D. (1994). Reinforcement, reward, and intrinsic motivation: A meta-analysis. *Review of Educational Research*, 64, 363–423.

- Cantrell, S. W., O'Leary, P., & Ward, K. S. (2008). Strategies for success in online learning. *Nursing Clinics of North America*, 43, 547–555.
- Chiesi, F., & Primi, C. (2010). Cognitive and non-cognitive factors related to students' statistics achievement. *Statistics Education Research Journal*, 9(1), 6–26.
- 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*, 14, 245–264.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Conti, R. (2000). Competing demands and complimentary motives: Procrastination on intrinsically and extrinsically motivated summer projects. *Journal of Social Behavior and Personality*, 15, 47–59.
- Cruise, R. J., Cash, R. W., & Bolton, D. L. (1985, August). *Development and validation of an instrument to measure statistical anxiety*. Paper presented at the Annual Meeting of the American Statistical Association, Las Vegas, NV.
- Cruise, R. J., & Wilkins, E. M. (1980). *STARS: Statistical Anxiety Rating Scale*. Unpublished manuscript, Andrews University, Berrien Springs, MI.
- Deci, E. L., & Ryan, R. M. (1991). A motivational approach to self: Integration in personality. In R. A. Dienstbier (Ed.), *Nebraska symposium on motivation 1990* (Vol. 38, pp. 237–288). Lincoln, NE: University of Nebraska Press.
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York, NY: Springer.
- Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227–268.
- DeVaney, T. A. (2010). Anxiety and attitude of graduate students in on-campus vs. online statistics courses. *Journal of Statistics Education*, 18(1), 1–15.
- Dunn, K. E., Lo, W., Sutcliffe, R., & Mulvenon, S. W. (2012). 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. Retrieved from <http://epm.sagepub.com/content/early/2011/07/16/0013164411413461>.
- Eisenberger, R., & Rhoades, L. (2001). Incremental effects of reward on creativity. *Journal of Personality and Social Psychology*, 74, 704–714.
- Elvers, G. C., Polzella, D. J., & Graetz, K. (2003). Procrastination in online courses: Performance and attitudinal differences. *Teaching of Psychology*, 30(2), 159–162.
- Enzle, M., Wright, E., & Redondo, I. (1996). Cross-talk generalization of intrinsic motivation effects. *Canadian Journal of Behavioral Science*, 28(1), 19–26.
- Ferrari, J. R., Johnson, J. L., & McCown, W. G. (1995). *Procrastination and task avoidance*. New York, NY: Plenum Press.
- Forte, J. A. (1995). Teaching statistics without sadistics. *Journal of Social Work Education*, 31, 204–218.
- Hanna, D., Shevlin, M., & Dempster, M. (2008). The structure of the statistical anxiety rating scale: A confirmatory factor analysis using UK psychology students. *Personality and Individual Differences*, 45, 68–74.
- Klassen, R. M., Krawchuk, L. L., & Rajani, S. (2007). Academic procrastination of undergraduates: Low self-efficacy to self-regulate predicts higher levels of procrastination. *Contemporary Educational Psychology*, 33, 915–931.
- Lee, E. (2005). The relationship of motivation and flow experience to academic procrastination in university students. *Journal of Genetic Psychology*, 166(1), 5–14.
- Marchewka, E. (2010). Math anxiety with adult learners. *Instructional Practice in Higher Education*, 1, 19–22.
- McInerney, J. M., & Roberts, T. S. (2004). Online learning: Social interaction and the creation of a sense of community. *Educational Technology & Society*, 7(3), 73–81.
- Michinov, N., Brunot, S., Le Bohec, O., Juhel, J., & Delaval, M. (2011). Procrastination, participation, and performance in online learning environments. *Computers & Education*, 56, 243–252.
- Morford, Z. H. (2008). *Procrastination and goal-setting behaviors in the college population: An exploratory study*. Unpublished masters thesis, Georgia Institute of Technology. Retrieved from <http://smartech.gatech.edu/dspace/bitstream/1853/21829/1/FinalThesis.pdf>.
- Murtonen, M., & Lehtinen, E. (2003). Difficulties experienced by education and sociology students in quantitative methods courses. *Studies in Higher Education*, 28(2). Retrieved from <http://www.tandfonline.com/doi/abs/10.1080/0307507032000058064>.
- Onwuegbuzie, A. J. (1997). The components of statistics anxiety: A phenomenological study. *Focus on Learning Problems in Mathematics*, 19(4), 11–34.
- Onwuegbuzie, A. J. (2004). Academic procrastination and statistics anxiety. *Assessment and Evaluation in Higher Education*, 29, 3–19.

- Onwuegbuzie, A. J., DaRos, D., & Ryan, J. (1997). The components of statistics anxiety: A phenomenological study. *Focus on Learning Problems in Mathematics*, 19(4), 11–35.
- Onwuegbuzie, A. J., Leech, N. L., Murtonen, M., & Tahtinen, J. (2010). Utilizing mixed methods in teaching environments to reduce statistics anxiety. *International Journal of Multiple Research Approaches*, 4(1), 28–39.
- Onwuegbuzie, A. J., & Wilson, V. A. (2003). Statistics anxiety: Nature, etiology, antecedents, effects and treatments: A comprehensive review of the literature. *Teaching in Higher Education*, 8, 195–209.
- Pan, W., & Tang, M. (2004). Examining the effectiveness of innovative instructional methods on reducing statistics anxiety for graduate students in the social sciences. *Journal of Instructional Psychology*, 31(2), 149–159.
- Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research*, 66, 543–578.
- Pintrich, P. R., & Schunk, D. H. (1996). *Motivation in education: Theory, research, and applications*. Englewood Cliffs, NJ: Merrill.
- Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). *Educational and Psychological Measurement*, 53, 801–813.
- 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.
- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25, 54–67.
- 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). New York, NY: Plenum.
- Senecal, C., Koestner, R., & Vallerand, R. J. (1995). Self-regulation and academic procrastination. *Journal of Social Psychology*, 135, 607–619.
- Shaw, G., Watkins, T., & Olafson, L. (2007). Doing the things we do: A grounded theory of academic procrastination. *Journal of Educational Psychology*, 99(1), 12–25.
- Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin*, 133, 65–94.
- Wilson, V. A. (1998, November). *A study of reduction of anxiety in graduate students in an introductory educational research course*. Paper presented at the annual meeting of the Mid-South Educational Research Association, New Orleans, LA.
- Wolters, C. A. (2003). Understanding procrastination from a self-regulated learning perspective. *Journal of Educational Psychology*, 95, 179–187.
- Wolters, C. A., Pintrich, P. R., & Karabenick, S. A. (2005). Assessing academic self-regulated learning. In K. A. Moore & L. H. Lippmann (Eds.), *What do children need to flourish?* (pp. 251–270). New York, NY: Springer.
- Yang, C., Tsai, I., Kim, B., Cho, M., & Laffey, J. M. (2006). Exploring the relationships between students' academic motivation and social ability in online learning environments. *The Internet and Higher Education*, 9, 277–286.
- Zimmerman, B. J. (2005). Attaining self-regulation: A social cognitive perspective. In M. Boekarts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). London, England: Elsevier Academic Press.
- Zimmerman, B. J., Bonner, S., & Kovach, R. (2009). *Developing self-regulated learners: Beyond achievement to self-efficacy* (7th ed.). Washington, DC: American Psychological Association.

Copyright of Innovative Higher Education is the property of Springer Science & Business Media B.V. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.