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# Understanding Self-regulated Learning

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**ACCEPTANCE**

This dissertation, UNDERSTANDING SELF-REGULATED LEARNING, by DINA M. SCHWAM, was prepared under the direction of the candidate's Dissertation Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree, Doctor of Philosophy, in the College of Education and Human Development, Georgia State University.

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UNDERSTANDING SELF-REGULATED LEARNING

by

DINA M. SCHWAM

Under the Direction of Daphne Greenberg

ABSTRACT

Over the past few decades, self-regulated learning (SRL) has been an area of research that continues to grow in importance due to its strong relationship with academic success (Zimmerman, Bandura, & Martinez-Pons, 1992; Zimmerman & Kitsantas, 1997). Its early development arose through the metacognitive and social-cognitive literature with research geared towards a better understanding of successful learning. Over the years, confusion has grown over the conceptual definition of SRL, leading to a vast array of literature researching many of its subcomponents and processes of metacognition and motivation. Two researchers in the area of SRL, Pintrich (1999, 2000, 2004) and Zimmerman (1989, 2000, 2002), have greatly contributed to our current understanding. Through their writings, a conceptual model was developed to include multiple assumptions, phases, and domains. Studies exploring individual differences have

led to the challenging task of developing a measure of SRL. The two most popular questionnaires are the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991) and the Learning and Study Strategies Inventory (Weinstein & Palmer, 2002). With an increase in online learning, the Online Self-regulated Learning Questionnaire (OSLQ; Barnard, Lan, To, Paton, & Lai, 2009) was developed to measure SRL in the online environment.

Barnard-Brak, Lan, and Paton (2010) using the OSLQ identified five profiles of SRL and related these profiles to academic success. This current study set out to replicate the design and findings of Barnard-Brak et al. (2010) in a traditional university setting with 477 students of traditional age attending online classes. Additionally, the current study explored the possible relationship of age, level of education, online learning experience, and online comfort with the identified self-regulated learning profiles. While the current study did not find the same five profiles, four profiles were found that demonstrate that students use varying levels of the skills associated with SRL. Relationships were not found between the four profiles and academic success, age, level of education, or online experience. Level of comfort of the online environment appeared to have an impact on profile membership as did gender.

INDEX WORDS: Self-regulated learning; Metacognition; Motivation; Online learning; Individual differences; Academic success

# UNDERSTANDING SELF-REGULATED LEARNING

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**TABLE OF CONTENTS**

## LIST OF TABLES

## LIST OF FIGURES

# 1 AN IN-DEPTH LOOK AT SELF-REGULATED LEARNING

Self-regulated learning is an ongoing topic of interest among cognitive and educational psychologists. It is a concept that was born out of multiple theoretical areas of study, especially the study of metacognition and social cognitive theory. Though the core concept of self-regulated learning has remained the same, the structure or functional description has evolved over time through various insights from different theorists and areas of research. To truly understand self-regulated learning, this paper explores its early emergence into the field of psychology and how it evolved to what it is today. Due to the complexity of self-regulated learning, its relationships with metacognition, motivation and academic achievement are also discussed, along with a few of the measures that have been previously used to measure this complex construct.

## Defining Self-Regulated Learning

Decades of research have led researchers to develop the construct of self-regulated learning. While self-regulated learning has been a topic of many articles and experimental studies, the debate continues as to what truly defines self-regulated learning. In exploring the literature on this topic, it is quite clear that there are some common core elements that transcend the various perspectives which adds to the complexity of this construct. In earlier research metacognition was studied by cognitive theorists, motivation by social-cognitive theorists, and self-regulation of a variety of areas such as emotions, thoughts, and behaviors were studied by multiple theoretical orientations (Zimmerman, 2001). Throughout the 1980s, researchers from these theoretical orientations began to explore self-regulation as it relates to the academic setting, leading to

the eventual integration of the metacognition and self-regulation literature (Dinsmore, Alexander, & Loughlin, 2008; Nodoushan, 2012; Zimmerman & Martinez-Pons, 1986, 1988, 1990; Zimmerman, 1990, 2001, 2002).

One of the greatest difficulties in describing self-regulated learning is that over time there have been multiple models that were grounded in the various theoretical perspectives and how metacognition and motivation were integrated. It was during a symposium on self-regulation at the American Educational Research Association annual meeting in 1986, that an inclusive definition was developed that integrated the multiple theoretical perspectives (Zimmerman, 2008). The definition indicated that self-regulated learning is "the degree to which students are metacognitively, motivationally, and behaviorally active participants in their own learning process" (Zimmerman, 2008, p. 167). Despite the integrated definition, theorists continued to debate how self-regulated learning could be conceptually described.

Zimmerman (1990) attempted to pull the various theoretical perspectives together by identifying three common features of self-regulated learning which set the stage for its development. The first common feature is that self-regulated learners initiate the use of specific strategies such as planning, setting goals, monitoring, self-evaluating outcomes, and performance in an attempt to improve their learning. The second common feature involves the use of the *self-oriented feedback loop* whereby an individual monitors their performance and effectiveness of the chosen learning strategies and adjusts as needed. The third common feature involves the motivational processes that guide an individual in why or how they choose specific self-regulatory processes, strategies, or responses (Zimmerman, 1990; see also Cassidy, 2011).

Researchers and theorists have continued to debate about the conceptual make-up that is self-regulated learning (Alexander, 2008; Azevedo, 2009; Dinsmore, et al., 2008; Kaplan, 2008).

This paper traces some of the historical development of self-regulated learning theory, attempts to tease out the complexities of the constructs of metacognition and motivation within self-regulated learning theory, describes three examples of self-regulated learning assessments, and ends with a brief discussion of the relationship between self-regulated learning and academic achievement.

## Development of Self-Regulated Learning Theory

### Bandura's Social Cognitive Theory

Zimmerman and Pintrich are two of the most cited in the self-regulated learning literature and have contributed greatly to the study of self-regulated learning. They both contend that self-regulated learning has a foundation rooted in Bandura's Social Cognitive Theory beginning with Bandura's concept of *reciprocal determinism* (Schunk, 2001; Zimmerman, 1989). *Reciprocal determinism* is also referred to as the triadic interaction of the person, the behavior, and the environment on human functioning. While all three factors act independently, they also have an interdependent, cyclical influence on one another (Bandura, 1986; Zimmerman, 1989). In addition, three key sub-processes interact with each other in learning environments. These sub-processes are self-observation, self-judgment, and self-reaction. Self-observation involves monitoring the quantity, quality, and/or originality of self-behavior which serves as a basis to inform and motivate. Through self-judgment, an individual compares their current performance against a set standard, such as goals. This comparison can be affected by whether the standards are fixed or normative; the specificity, proximity, and the difficulty of the goal; the importance of reaching the goal; and attributions made for such outcomes. It is often through self-reaction that an individual can enhance motivation through anticipation of consequences (Schunk, 2001; Zimmerman, 2000).

**Zimmerman's Three Phases of Self-Regulated Learning**

Zimmerman introduced a conceptual model indicating that there are three phases of self-regulated learning (2002). These three phases are introduced as *forethought, performance,* and *self-reflection* with metacognition and motivation integral to the processes included at each phase. When a successful learner exhibits these three phases, a cyclical *self-reflection* phase will lead back and inform the *forethought* phase as one continues to learn.

The *forethought phase* is the phase that includes processes that lead one to act, involving task analysis and self-motivation beliefs. Task analysis refers to goal setting and strategic planning, while self-motivation involves concepts such as self-efficacy, outcome expectancies, intrinsic interest/value, learning goal orientations, etc. Goal setting and strategic planning are cognitive in nature and self-motivated beliefs have a meta-motivational component in that they involve the higher-level thinking about motivation that leads to either increased or decreased motivation to activate needed behaviors (Zimmerman, 2000, 2002; see also Cassidy, 2011; Schunk, 2001).

The *performance phase* is when the specific strategies identified during the *forethought phase* are implemented. This phase involves two major categories; self-control and self-observation behaviors (Zimmerman, 2002). Zimmerman (2002) describes self-control as when one initiates selected strategies identified initially through the *forethought phase*. Individuals who use self-control behaviors may use imagery, self-instruction, attention focusing, and task strategies. These behaviors require motivation to carry them out (Boekaerts, 1995; Pintrich, 1999; Schunk, 1995). Self-observation includes behaviors such as self-recording, self-experimentation, as well as self-monitoring. While the first two behaviors include an overt action that provides a method

of evaluating oneself during the process, self-monitoring involves a more metacognitive process of tracking one's progress during the task.

Finally, during the *self-reflective phase,* individuals respond to their performance through two major classes including self-judgment and self-reaction. During this phase, self-judgment involves self-evaluation and causal attribution. In other words, an individual will evaluate him or herself by comparing his or her performance to a set standard (such as the goals set) and attribute the cause of success or failure of meeting the set standard. The evaluation and attributed causes lead to self-reaction when an individual will determine whether he or she is satisfied with the outcome, and thereby leading him or her to adjust if needed to increase effectiveness (Zimmerman, 2002; see also Cassidy, 2011; Schunk, 2001).

**Pintrich's Conceptual Model**

Pintrich (2004) proposed a conceptual model in an effort to lead researchers to better develop a measure that will measure the fine detail and complexity of self-regulated learning. This model further expands on the three phases that Zimmerman (2002) introduced to include four general assumptions, four phases, and four domains.

**Assumptions.** Assumptions underlie the phases and domains. The first general assumption is the *active, constructive assumption.* With this assumption, it is assumed that learning is an active process and that individuals are active in their learning. The second general assumption is the *potential for control assumption,* meaning that an individual has the potential to "monitor, control, and regulate certain aspects of their own cognition, motivation, and behavior as well as some features of their environment" (Pintrich, 2004, p. 387). The third general assumption is the *goal, criterion, or standard assumption,* indicating that there is some type of standard in which an individual will compare their current performance to determine if any adjustments need

to be made in order to reach the set standard. The last general assumption is that the "self-regulatory activities are mediators between personal and contextual characteristics and actual achievement or performance" (Pintrich, 2004, p. 388).

**Phases**. The four phases are in a time ordered sequence; however, it is important to note that they can occur in any order, as well as simultaneously. The four phases include 1) forethought, planning, and activation; 2) monitoring; 3) control; and 4) reaction and reflection (Pintrich, 2004). These four phases are quite similar to the phases initially introduced by Zimmerman (2002).

**Domains.** Pintrich discusses his phases within specific domains of regulation; specifically: cognition, motivation and affect, behavior, and the context of the learning situation (Pintrich, 2004; Schunk, 2005).

***Cognition.*** Cognition, also involving metacognition, involves activation of prior knowledge, metacognitive knowledge, and goal setting during the forethought, planning, and activation phase (Phase 1). During the monitoring phase (Phase 2), metacognitive awareness and monitoring of cognition are occurring. In the control phase (Phase 3), specific cognitive and metacognitive strategies and adaptations (such as rehearsal, elaboration, organization, critical thinking, and metacognitive regulation) are selected for learning and thinking. Lastly, in the reaction and reflection phase (Phase 4), cognitive judgments, attributions, and reflections are made of the current performance measurement (Pintrich, 2004; Schunk, 2005).

***Motivation and Affect.*** When looking at the domain of Motivation and Affect, goal orientation adoptions (intrinsic and extrinsic), judgments or beliefs of ability (self-efficacy), perceptions of task value along with interest activation occur during Phase 1 (forethought, planning,

and activation). Awareness and monitoring of motivation and affect occur during Phase 2 (monitoring) by taking control with the specific strategies to be selected and adapted to manage one's motivation and affect occurring in Phase 3 (control). During Phase 4 (reaction and reflection), an individual is likely to experience affective reaction such as test anxiety, feelings of control, or ability which has a direct effect on future attributions and efficacy (Boekaerts, 1995; Pintrich, 2004; Schunk, 2005).

***Behavior.*** When considering the domain of Behavior, time and effort planning along with planning for opportunities of behavioral self-observation, are established during Phase 1. During Phase 2, an individual will then be more aware and monitor his or her effort, time, and the potential need for help. He or she will actively participate in self-observation of his or her behavior. The individual will then either increase or decrease effort and/or manage his or her time differently during Phase 3. He or she may even increase persistence or give up altogether. It is during this phase he or she will use resource management strategies and seek out help if needed. During Phase 4, the individual will reflect on one's behaviors, determining whether or not time was used efficiently or adequate effort was exerted (Pintrich, 2004; Schunk, 2005).

***Context.*** In the domain of Context beginning with Phase 1, an individual will perceive the task in relation to the context. In contrast to an individual's self-perceptions, the focus is on the environmental context. For instance, the specific features of the classroom or study environment may support or impede learning (Pintrich, 2004; Schunk, 2005). Boekaerts (2006) points out that several researchers have found that an individual's perception of the environment creates an increased level of arousal, which supports Pintrich's position on the interrelated nature of the domains. Phase 2 includes the monitoring of such task conditions to determine if they will

change or remain stable. Specific strategies on context management, such as distraction reduction in the study environment or task requirement adjustment occur during Phase 3. Lastly, Phase 4 involves the individual evaluating the demands of the task and environmental factors to determine if the task will be able to be accomplished and if any changes need to be made in terms of time and study environment (Pintrich, 2004; Schunk, 2005).

**Conclusion**

As demonstrated by Zimmerman's (2002) and Pintrich's (2004) models, it is challenging to thoroughly discuss self-regulated learning without discussing the constructs of metacognition and motivation, as these constructs are completely intertwined with one another. While some theorists tend to lean more heavily on one construct over the other, there is no denying that metacognition and motivation are central components in self-regulated learning (Boekaerts, 1995, 1996, 2006; Pintrich, 1999, 2000, 2004; Schunk, 1995, 2001, 2005, 2008; Winne, 1995, 2001, 2011; Winne & Hadwin, 1998; Wolters, 1998; Zimmerman, 1995; 2002, 2008, 2011).

## Metacognition and Self-Regulated Learning

While reviewing the integrated definition on self-regulated learning, it appears certain that metacognition is a component falling under the umbrella of self-regulated learning. However, the relationship between self-regulated learning and metacognition is not well-defined. The relationship is often dependent upon the perspective or theoretical orientation of the author, and the terms metacognition and self-regulated learning are often used synonymously as well as inconsistently (Dinsmore et al., 2008). Below, the complexity of the construct of metacognition will be described as well as how metacognition and self-regulated learning can be viewed as related.

In 1985 Flavell described metacognition "as any knowledge or cognitive activity that takes as its object, or regulates, any aspect of any cognitive enterprise" (Flavell, 1985, p. 116). The simpler definition that carried on, "cognition about cognition" (Flavell, 1985, p. 116) remains to be general enough that it allows much room for interpretation and expansion which in essence supports the way the term is used by many in the literature (Schunk, 2008). To better understand the make-up of metacognition, research in this area opened doors to additional subconcepts such as metamemory and metacomprehension, which is the evaluation of what one remembers and what one comprehends, which are both cognitive processes involved in learning (Dunlosky & Lipko, 2007; Zabrucky & Agler, 2008).

Over the years, the concept of metacognition continued to expand and evolved to include elements of control, through aspects of metacognitive regulation (Baker & Brown, 1984). This perspective moved metacognition from something that occurred to an individual at an unconscious level to something that one can control. The model of metacognition now more complex, was broken down into two components, metacognitive knowledge and metacognitive regulation. Both of these components include the process of monitoring, which is in alignment with the current definition (Schraw & Dennison, 1994; Schraw, 1998).

Schraw (1998) further defined metacognitive knowledge from Flavell's (1979) earlier model to include three components termed *declarative, procedural,* and *conditional knowledge. Declarative* knowledge expands upon Flavell's earlier description of person knowledge in that it involves knowledge of one's cognitive processes, but it also includes knowledge of strategies that influence the cognitive process. *Procedural* knowledge is the knowing about the how to carry out various strategies, and *conditional* knowledge is knowing when and why to use certain strategies (Schraw & Dennison, 1994; Schraw, 1998). The second component of metacognition,

metacognitive regulation, involves the regulating of metacognitive processes through the use of specific strategies. Therefore, one would have to first know, or be aware of his or her cognition and strategies, how to use them, and then when and why to apply them. It is after that then one would have to take action to regulate his or her cognition through a series of five aspects (Schraw & Dennison, 1994; Schraw, 1998). These five aspects include planning, information management, monitoring, debugging, and evaluation (Schraw & Dennison, 1994).

Here we begin to see some similarities in processes between self-regulated learning, and metacognition. These five aspects are similar to the structure of self-regulated learning proposed by Zimmerman (2000, 2002, 2008) and Pintrich (2004). Metacognition's aspect of planning, also as described in self-regulated learning, includes cognitively engaging to think about what is needed by setting goals and determining appropriate resources to accomplish the learning task at hand. This fits in well with the self-regulated learning's *forethought phase.* Metacognition's aspect of information management is very similar to what is called the self-regulated learning's *performance phase*, which involves the execution of chosen strategies to process information more efficiently. This includes strategies such as elaboration, summarizing, and organization. Metacognition's aspect of monitoring, also seen in the self-regulated learning's *performance phase*, is the active process of assessing one's progress and use of strategies. Debugging involves the use of strategies to make corrections to improve one's comprehension when through monitoring, errors in comprehension are found. While the term debugging has not necessarily been used in the self-regulated learning literature, this process of adjustment and self-correction through the use of monitoring is a key aspect of self-regulated learning. Lastly, metacognition's aspect of evaluation occurs at the end of the learning process to assess overall the learning and

strategy effectiveness, much like the process described in the self-regulated learning's *self-reflection phase* (Schraw & Dennison, 1994; Zimmerman, 2002).

Dinsmore et al. (2008) express that although there is an overlap in the conceptual foundations of self-regulated learning and metacognition, distinct differences between the concepts do exist. For instance, metacognition is clearly oriented from a cognitive perspective while self-regulated learning blends the cognitive orientation with the human action element of self-regulation, placing an emphasis on the role of the environment (Dinsmore, et al., 2008). In addition, metacognition can be considered domain general, while self-regulated learning includes other concepts such as self-efficacy, which is considered to be domain specific (VanderStoep & Pintrich, 2008).

## Motivation in Self-Regulated Learning

Several researchers in the field of self-regulated learning have stressed the role of motivation in self-regulation (Boekaerts, 1995; Pintrich, 2000, 2004; Schunk, 1995; VanderStoep & Pintrich, 2008; Wolters & Yu, 1996; Wolters, 1998; Zimmerman, 1995, 2011). Just as cognitive planning and implementation of cognitive strategies are essential, students must also plan and activate their motivation (Boekaerts, 1995, 1996). This involves being aware of motivational beliefs regarding values and interest as well as judgments of one's capabilities (Pintrich, 2000). As argued by researchers, a self-regulated learner must not only have the skill and awareness of needed strategies, they must also have the drive to carry out such strategies (Boekaerts, 1995, 1996; Pintrich, 1999; Schunk, 1995; VanderStoep & Pintrich, 2008; Zimmerman, 1995). Even when college students are aware of the strategies, they sometimes choose strategies that are easier than those that will increase learning (Peverly, Brobst, Graham & Shaw, 2003). Some advanced students have been shown to be more aware of areas of needed improvement, yet they

still report having difficulties in their studies (Rachal, Daigle, & Rachal, 2007), which may be due to their choosing to exhibit less effort implementing easier strategies.

Zimmerman (2011) identified that motivation plays a key role in self-regulated learning in the areas of attention, choice of task, effort, and persistence. Attention involves factors related to attending to a task, while choice of task involves factors related to what leads an individual to choose a task to engage in. Effort is the amount mental or physical exertion used to complete a task, and persistence is the amount of time spent on a difficult task.

The areas of motivation that have shown a relationship with self-regulated learning include goal orientation, interest, intrinsic motivation, task value, causal attributions, and self-efficacy (Pintrich & De Groot, 1990; Pintrich, 2000; Wolters & Yu, 1996; Wolters, 1998; Zimmerman, 2011). These areas of motivation are typically broken into two components called value and expectancy. The value component involves the goals, interest, and values of a task. Commonly studied value components are performance versus mastery goals, which are the source of the goals; intrinsic versus extrinsic motivation, which involve whether one is motivated from internal or external motivation; task value, which is how much value is placed on completing a task; and intrinsic interest, which is when the source of interest comes from within (Pintrich & De Groot, 1990).

The expectancy component includes self-efficacy and causal attributions (Pintrich & De Groot, 1990). Self-efficacy, which is an individual's assessment of one's capabilities of performing a task, has an effect on affect, effort, persistence, performance, and learning (Pintrich, 2000). Causal attributions are how one attributes his or her success or failure to a variety of

sources, ranging from internal to external. It has been found that when one can attribute an outcome to something that is changeable and that one can control, it also affects effort and persistence, and can increase self-efficacy (VanderStoep & Pintrich, 2008).

Overall, research has supported the relationship between motivation and specific aspects of motivation with the components of self-regulated learning. For example, Pintrich and De Groot (1990) found a positive relationship between self-efficacy and intrinsic value with self-regulated strategy use, cognitive engagement, and performance. As another example, in a review of multiple studies exploring goal orientations in over 3,000 college students, Pintrich (1999) found that mastery goals had a positive relationship with the use of self-regulatory strategies and class performance. Wolters (1998) explored the relationship between learning and performance goal orientation, along with intrinsic and extrinsic regulation and its effect on self-regulated learning and achievement, and found that students who reported intrinsic regulation also had a higher report of self-regulated learning strategies such as organization, elaboration, critical thinking, and metacognitive strategies. Additionally, extrinsic regulation and learning goal orientation were shown to be positively related to course grade (Wolters, 1998).

**Conclusion**

As it has been shown, it is challenging to thoroughly discuss self-regulated learning without mentioning the constructs of metacognition and motivation, due to the interrelated nature of the relationship among these constructs with self-regulated learning. Despite the differences, it is clear that metacognition is essential to self-regulated learning. Learning involves the use of cognitive processes such as perception, memory, comprehension, attention, problem-solving, and metacognition is involved in the awareness and regulation of these processes (Zabrucky & Cum-

mings, 2005). The regulation of cognition involves the monitoring of one's ability and utilization of strategies when difficulty arises during the cognitive task (Zabrucky & Cummings, 2005). Many self-regulated learning researchers have stressed that a student's ability to monitor his or her learning is of key importance to being a self-regulated learner (Dunlosky & Lipko, 2007; Isaacson & Frujita, 2006; Zimmerman, 1989). It is through monitoring and evaluation that goals and expectations can be adjusted and different strategies implemented (Isaacson & Frujita, 2006; Schraw, 1998; Zimmerman, 1989).

In terms of motivation, a student could have knowledge of essential strategies and when they are needed but still need the motivation to implement them (Boekaerts, 1995, 1996). This essential component of self-regulated learning has been studied in depth and the research uncovered points to expectancy and value components of motivation as being related to self-regulated learning. More specifically, the value component of motivation, including mastery goals, intrinsic motivation, task value, and intrinsic interest have been positively related to self-regulated learning. Self-efficacy and causal attributions, the expectancy components of motivation, are interrelated with causal attributions having an effect on self-efficacy. Both self-efficacy and causal attributions contribute to the amount of effort and persistence a student may engage in when a task is recognized as difficult, as well as overall performance and learning (Pintrich & De Groot, 1990; Pintrich, 2000; Wolters, 1998; Zimmerman, 2000, 2011).

## Measures of Self-Regulated Learning

One of the consequences of the complexity and interrelated nature of the processes involved is the challenge of measurement of self-regulated learning (Pintrich, 2004). As will be noted below, the measurements differ in their coverage of the different processes. In addition, most researchers have attempted to measure self-regulated learning through the use of self-report

questionnaires, semi-structured interviews, as well as some forms of observational qualitative measures (Cazan, 2012; Zimmerman, 2008). Self-report questionnaires have come under criticism as a measure of self-regulated learning because of the potential for response bias, as well as because there is a reliance for the responder to draw information from memory. In addition, there are times that the responder may not even be aware of the strategies that they may be using (Cazan, 2012). Despite these criticisms and the alternative measures developed, the most often used measure of self-regulated learning appears to be in the form of self-report questionnaires. This is most likely because they are convenient, easy to administer in individual and group settings, and they tend to have good convergent and predictive validity.

The college years have been targeted as one of the most important academic time periods when students need to be self-regulated in order to academically succeed (Hofer, Yu, & Pintrich, 1998; Mega, Ronconi, & DeBeni, 2014; Peverly, et al., 2003; Rachal, et al., 2007; VanderStoep & Pintrich, 2008; Wang, Shannon, & Ross, 2013; Wolters, 1998). The two self-report questionnaires that are most often referenced in the college literature are the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991) and the Learning and Study Strategies Inventory (LASSI; Weinstein & Palmer, 2002). With a trend in more college courses being delivered online, a more recent measure was developed to focus on online self-regulated learning, which is the Online Self-Regulated Learning Questionnaire (OSLQ; Barnard, Lan, To, Paton, & Lai, 2009). This next section will describe these three measures as well as the benefits and drawbacks to each one.

**Motivated Strategies for Learning Questionnaire (MSLQ)**

The MSLQ is a self-report measure that was developed from a social-cognitive view of motivation and learning strategies, with the intent to assess motivational orientations and strategy

use in college students in a college course. It was developed by Pintrich and his colleagues and its development began with the need to measure the impact of a newly developed Learning to Learn course at the University of Michigan in 1982 (Pintrich, et al., 1991; Pintrich, Smith, Garcia, & McKeachie, 1993). Following the social cognitive conceptual framework of self-regulated learning, as described by Pintrich (2004), the complexity of self-regulated learning is dynamic and greatly affected by contextual factors. This was taken into consideration during the development of the MSLQ, recognizing that one's level of self-regulated learning is not necessarily a stable trait rather it may vary from course to course (Duncan & McKeachie, 2005). Therefore, the MSLQ was developed to assess self-regulated learning at the course level, opposed to from a more generalized level (Pintrich et al., 1991).

The MSLQ is made up of 15 subscales with a total of 81 items. Each subscale can be used as an individual unit or they can be used all together so that researchers could use the MSLQ according to the needs of their research. The 15 subscales fall under two broad categories of Motivation and Learning Strategies. Under each broad category, it is further divided into components, and then into subscales (Pintrich et al., 1991, 1993).

**Motivation.** Under the category of Motivation, there are three components (Value, Expectancy, and Affective) which include a total of 31 of the 81 items.

***Value.*** The subscales that fall under the Value component include scales of Intrinsic Goal Orientation, Extrinsic Goal Orientation, and Task Value. An item example from the Intrinsic Goal Orientation subscale is "In a class like this, I prefer course material that really challenges me so I can learn new things." An item example from the Extrinsic Goal Orientation subscale is "Getting a good grade in this class is the most satisfying thing for me right now." Lastly,

an item example from the Task Value subscale is “I think I will be able to use what I learn in this course in other courses.”

***Expectancy.*** The subscales that fall under the Expectancy component include the scales of Control of Learning Beliefs and Self-efficacy for Learning and Performance. An item example from the Control of Learning Beliefs subscale is “If I try hard enough, then I will understand the course material.” An item example from the Self-efficacy for Learning and Performance subscale is “I'm confident I can understand the basic concepts taught in this course”.

***Affective***. Lastly, the Affective component includes the single subscale of Test Anxiety. An item example from this subscale is “I have an uneasy, upset feeling when I take an exam.” (Pintrich et al., 1991).

**Learning Strategies.** There are two components under the category of Learning Strategies: Cognitive and Metacognitive Strategies as well as the Resource Management Strategies.

***Cognitive and Metacognitive Strategies.*** There is a total of 31 items that make up the subscales under the Cognitive and Metacognitive Strategies component. The subscales that fall under this component include the scales of Rehearsal, Elaboration, Organization, Critical Thinking, and Metacognitive Self-Regulation. An item example from the Rehearsal subscale is “When I study for this class, I practice saying the material to myself over and over.” An item example from the Elaboration subscale is “When reading for this class, I try to relate the material to what I already know.” An item example from the Organization subscale is “I make simple charts, diagrams, or tables to help me organize course material.” An item example from the Critical Thinking subscale is “I treat the course material as a starting point and try to develop my own ideas about it.” An item example from the Metacognitive Self-Regulation subscale is “When reading for this course, I make up questions to help focus my reading.” (Pintrich et al., 1991).

***Resource Management Strategies.*** There is a total of 19 items under the Resource Management Strategies component. The subscales that fall under this component include the scales of Time and Study Environment, Effort Regulation, Peer Learning, and Help Seeking. An item example from the Time and Study Environment subscale is "I usually study in a place where I can concentrate on my course." An item example from the Effort Regulation subscale is "I work hard to do well in this class even if I don't like what we are doing." An item example from the Peer Learning subscale is "When studying for this course, I often try to explain the material to a classmate or a friend." An item example from the Help Seeking subscale is "I ask the instructor to clarify concepts I don't understand well." (Pintrich et al., 1991).

The items presented under each of the 15 subscales are statements to which the students rate their responses based on a 7-point Likert-type scale, with *1= Not at all very true of me* and *7 = Very true of me* (Pintrich et al., 1991, 1993). Statements that are negatively worded are reverse scored. The subscales are then scored individually by summing up the responses in each subscale and then calculating the average of that subscale. The measure is not normed since it is intended to be used at the class level and so the developers encourage users to develop norms at the local level, such as for a specific course or at a specific institution (Pintrich et al., 1991).

Statistical and psychometric analyses were continually conducted throughout development and refinement with initial data collected in 1986 from a sample of 326 college students, and additional samples of 687 college students and 758 college students, in 1987 and 1988 respectively. Confirmatory factor analysis shows sound factor validity. Internal consistency and reliability were found to be good with robust Cronbach's alphas ranging from .52 to .93. Relationships were found to be moderately significant between the subscales and final course grade, indicating good predictive validity (Pintrich et al., 1991).

Because of the flexibility and functionality of the MSLQ, it has been extensively used in self-regulated learning research since its initial development. Many researchers have used portions of the MSLQ or created modified versions to customize to the needs of their research questions (Bidjerano & Dai, 2007; Wang, et al., 2013). In addition, multiple versions have been created in many languages making it one of the most widely used self-regulated learning measure both nationally and internationally (Bidjerano & Dai, 2007; Daura, 2015; del Carmen Ramírez-Dorantes, Rodríguez, Bueno-Álvarez, & Echazarreta-Moreno, 2013; Jakešová, 2014; Saks, Leijen, Edovald, & Õun, 2015). Its long-standing use by reputable self-regulated learning researchers, its modular format, and good internal consistency and reliability clearly lend support of its use. Furthermore, the MSLQ has been made easily obtainable and it is non-proprietary, so it is also a cost-effective measure. The MSLQ manual with questionnaire can be found through a literary search of a research database accessible through a university library or through a traditional Internet search engine.

While there are clearly benefits to using this measure, it is also important to realize that it also has some limitations. As previously mentioned, it is course specific and therefore it is not an ideal measure intended to investigate questions that are more general in nature. Additionally, since there are no established norms, one would have to be cautious in generalizing results. Lastly, it was constructed and developed to measure self-regulated learning in a face-to-face classroom environment, which can raise some questions as to its validity and reliability in courses involving online instruction.

**Learning and Study Strategies Inventory (LASSI)**

The LASSI is also a well-known and widely used self-report measure found in self-regulated learning research. Its development also began in the early 80's in response to assess the

progress of the students enrolled in a "learning to learn" type course. It has been proposed to be used to diagnose student problems in order to target areas of needed improvement, and then used as a measurement of progress (Weinstein & Palmer, 2002). The basis of its construction is on the conceptual framework of strategic learning. It is a proprietary measure and is currently in its second edition which was published in 2002. In contrast to the MSLQ, the LASSI was developed to assess self-regulated learning from a broader standpoint. Since the LASSI was intended to measure self-regulated learning in a general sense, Weinstein and Palmer (2002) developed national norms to be included as part of the scoring. The national norms were developed initially for the first edition in 1982 and then were refined and re-tested in a new sample in 1984. In the development of the second edition, a more diverse sample was drawn to include 1092 students from 12 different institutions and from multiple geographical regions. The 12 institutions included universities, community colleges, state colleges, and technical institutions (Weinstein & Palmer, 2002).

The LASSI includes 10 scales which are divided into three components measuring the "skill, will, and self-regulation" of strategic learning (Weinstein & Palmer, 2002, p. 4). Each of the 10 scales is made of eight items, for a total of 80 items in the inventory.

**Skill component of strategic learning**. There are three scales that fall under the Skill component of strategic learning and they include Information Processing, Selecting Main Ideas, and Test Strategies. An item example from the Information Processing subscale is "To help me remember new principles we are learning in class, I practice applying them." An item example from the Selecting Main Ideas subscale is "I have difficulty identifying the important points in my reading." An item example from the Test Strategies subscale is "I have difficulty adapting my studying to different types of courses." (Weinstein & Palmer, 2002).

**Will component of strategic learning.** The Will component of strategic learning also includes three scales and they are Attitude, Anxiety, and Motivation. An item example from the Attitude subscale is "I only study the subjects I like." An item example from the Anxiety subscale is "I feel very panicky when I take an important test." An item example from the Motivation subscale is "I set goals for the grades I want in my class." (Weinstein & Palmer, 2002).

**Self-Regulation component of strategic learning.** The final component, which is the Self-Regulation component of strategic learning includes four scales and they are Concentration, Time Management, Study Aids, and Self-Testing. An item example from the Concentration subscale is "My mind wanders a lot when I study." An item example from the Time Management subscale is "I find it hard to stick to a study schedule." An item example from the Study Aids subscale is "My underlining is helpful when I review text material." An item example from the Self-Testing subscale is "I stop periodically while reading and mentally go over or review what was said." (Weinstein & Palmer, 2002).

Items on the LASSI are presented as statements that students rate on a 5-point Likert-type scale. Students respond by selecting the letter (a through e) that best meets their response with *a = Not at all typical* and *e = Very much typical*. Statements are worded both positive and negative, with negative statements scored in reverse. An item example of a positive statement is "When listening to class lectures, I am able to pick out important information". An item example of a negative statement is "I find it hard to stick to a study schedule". (Weinstein & Palmer, 2002).

There are two different forms of delivery of administration. The LASSI is available in a paper booklet format as well as in a web-based version. Both include an introduction and direc-

tions on how to complete the LASSI, the actual inventory items, and instructions on how to interpret the results. The paper booklet is easily used in class and has pressure sensitive paper so that the students' responses are transferred and translated into the corresponding number on the scoring sheet. Directions on how to score are provided in the booklet. Students are able to self-score by adding up all the numbers under each scale and then plotting the scale score on the graph to see where their score falls in comparison to the national norms. Scoring is completed automatically in the web-based version and a report with graphics is generated for the student. The administrator may elect to receive a copy of the report as well (Weinstein & Palmer, 2002).

The LASSI has gone through a rigorous process during development over two decades, testing the soundness and refinement of the scales. The 10 scales within the measure were created by identifying clusters of items through expert opinion and then further improved upon through psychometric analyses. Since response bias is a common concern of self-report questionnaires, during initial pilot testing, students were also asked to complete a measure of social desirability. During analysis, any item that correlated .5 or higher with social desirability were eliminated from the measure. Test-retest correlations were conducted over 3 to 4 week intervals resulting in good reliability, with a reliability coefficient of .88 for the measure. To test validity, the developers compared the individual scales to other tests or scales that measured comparable factors. The LASSI was then validated against measures of performance such as SAT scores and GPA, etc. The individual scale scores showed good internal consistency and reliability with Cronbach's alphas ranging from .73 to .89, with all but two scales rating greater than .80 (Weinstein & Palmer, 2002).

One of the benefits of the LASSI is that it has a strong psychometric background with almost 20 years of development and continued studies. Having two easy-to-use formats, including

a self-scoring and report generating web-based version, makes the LASSI very versatile and attractive to use. Both the paper booklet and the web-based version are available through H&H Publishing making it ready to be used once it is purchased and received from the publisher. There is no additional building or formatting needed as one may need to do with some non-proprietary measures.

As with all tests, the LASSI also has its share of limitations. While the 10 scales are independently scored and therefore can be independently analyzed as separate variables, the items and scoring system is a single unit. Therefore, a researcher would be unable to separate a scale of interest from the entire scale to meet the needs of their research question. In addition, since it is a proprietary measure, this could present a problem where funding is minimal or even non-existent. The current cost for both the paper booklet and the web-based version are the same, ranging from $3.50 to $4.00 per person, based on the total number ordered (H&H Publishing price list found at http://www.hhpublishing.com/_assessments/LASSI/prices_ordering.html).

**Online Self-Regulated Learning Questionnaire (OSLQ)**

The OSLQ is a self-report measure that was developed with the intent to measure self-regulated learning in an online or hybrid course environment (Barnard, et al., 2009). Items in the OSLQ are more focused on instruction that occurs in a more autonomous environment, such as those found in blending learning or 100% online courses (Barnard et al., 2009). The OSLQ has six subscales, which include Goal Setting, Environment Structuring, Time Management, Help Seeking, Task Strategies, and Self-evaluation. Scoring is simple with the sum of responses totaled for each subscale (L. Barnard-Brak, personal correspondence, September 18, 2015).

**Goal Setting.** An item example from the Goal Setting subscale is "I set standards for my assignments in online courses."

**Environment Structuring.** An item example from the Environment Structuring subscale is "I choose the location where I study to avoid too much distraction."

**Task Strategies.** An item example from the Task Strategies subscale is "I try to take more thorough notes for my online courses because notes are even more important for learning online than in a regular classroom."

**Time Management**. An item example from the Time Management subscale is "I try to schedule the same time every day or every week to study for my online courses, and I observe the schedule."

**Help Seeking.** An item example from the Help Seeking subscale is "I find someone who is knowledgeable in course content so that I can consult with him or her when I need help."

**Self-evaluation.** An item example from the Self-evaluation subscale is "I summarize my learning in online courses to examine my understanding of what I have learned."

Reliability and validity of the OSLQ for the online and hybrid environments were assessed through a collection of data in two separate studies. In the first study, Barnard and colleagues (2009) administered the OSLQ to a sample of 434 college students enrolled in a blended or hybrid course. Good internal consistency was demonstrated with $\alpha = .90$. Good reliability at the subscale level was found with Cronbach's alphas ranging from .89 to .90. The second study involved 204 different college students who were enrolled in an online course. Excellent internal consistency was demonstrated in the sample of online students with $\alpha = .92$. Once again, good to excellent subscale reliability was found with Cronbach's alphas ranging from .87 to .96 (Barnard et al., 2009).

The OSLQ certainly has not gone through the same level of rigorous testing that the MSLQ and the LASSI have gone through, however, initial testing is promising. With many colleges moving toward more global recruitment, many courses are shifting to 100% online. Even those courses that are not 100% online, many colleges are now involving an online component whether it is a formal hybrid course or a traditional course utilizing an online learning management system to help deliver aspects of the course. With that said, the OSLQ is a measure that has been developed specifically with this in mind and the two studies have demonstrated strong reliability and internal consistency (Barnard, et al., 2009). Another benefit to its use is that it is a more abbreviated measure with only 24 items. This is extremely beneficial if other measures are to be used to measure additional factors. Finally, accessing the OSLQ is simple as it is non-proprietary and has been published in the appendix of a journal article in Internet and Higher Education (Barnard, et al., 2009).

One of the downsides of the OSLQ is that it does not address behaviors of motivation, motivational beliefs, or regulation of motivation or affect, which have been argued and demonstrated to be an essential aspect of self-regulated learning (Boekaerts, 1996, Pintrich, 2004). In addition, since it has been designed for courses with web-based instruction, its use in a traditional lecture style course is limited.

**Conclusion**

It is quite clear that the MSLQ, the LASSI, and the OSLQ each have something unique to offer to researchers attempting to measure self-regulated learning. There is no doubt that the long-term and current use of the MSLQ and LASSI in the self-regulated learning literature supports the use of both of these measures. Both have user manuals which contain the supporting psychometric properties but each has its specific benefits. While the LASSI is more convenient

to use when purchased and has established norms; the MSLQ is free to use and modular, therefore the subscales are able to be easily used independently from the whole scale. In addition, the MSLQ covers motivation and affect differently with separate subscales for goal orientations, task value, control of learning beliefs, self-efficacy, and test anxiety. While the MSLQ and the LASSI both have been developed and used as a measure of "learning to learn" type courses, as well as have gone through rigorous testing during development, the OSLQ offers a new measure that is able to address the direction that many colleges are now taking with online learning. While the OSLQ has had less reliability testing, the results have been in the good to excellent range. In the end, all three measures have their merits. The choice of which to use depends on multiple factors such as the research questions to be answered, the population to be measured, budget, and data collection feasibility.

## Self-Regulated Learning and Academic Success

Early research leading to the development of self-regulated learning identified that there are certain behaviors and beliefs that are common among successful students (Kitsantas, Winster, & Huie, 2008; Zimmerman & Martinez-Pons, 1986, 1988 & 1990; Zimmerman, Bandura, & Martinez-Pons, 1992). Researchers have found that high-achieving students tend to report using more self-regulatory strategies than low achieving students (Zimmerman & Martinez-Pons, 1986; Schunk & Zimmerman, 1994). This early research has led to many investigations into the relationship of self-regulated learning and academic success, which produced favorable results. This strong relationship has been noted in undergraduate and graduate courses, as well as k-12 education (Pintrich, McKeachie, & Lin, 1987; Zimmerman, et al., 1992; Zimmerman & Kitsantas, 1997; Zimmerman & Martinez-Pons 1986).

Most of the previous studies focus on specific aspects of self-regulation such as strategy use, metacognition, or areas of motivational beliefs and have found a strong relationship (Bidjerano & Dai, 2007; Coutinho, 2007; Griffin, MacKewn, Moser, & VanVuren, 2012; Mega, et al., 2014; Rotgans & Schmidt, 2012; VanderStoep, Pintrich, & Fagerlin, 1996; Wang, et al., 2013). For instance, in a study investigating the relationships between the components of self-regulated learning and academic achievement, Griffin, et al. (2012) conducted a study with a sample of 45 freshmen students. They found that motivation, self-management, and self-awareness all had significantly positive correlations with academic performance, as measured by cumulative GPA. Coutinho (2007) found that in a sample of 179 undergraduate students, those with mastery goals had an increased likelihood of having better metacognition, which improved academic success as measured by GPA.

Researchers also assessed the mediating effects of self-regulated learning and motivation on the relationship between emotions and academic achievement in a study of 5,805 undergraduate students from a university in Italy (Mega, et al., 2014). Academic achievement was measured by a typical formula used in Italy which was productivity (the number of exams passed by student, divided by number of years spent in college) multiplied by GPA. Mega and colleagues (2104) found that self-regulated learning and motivation both positively predicted academic achievement and that the role of emotions was dependent upon the interaction of both self-regulated learning and motivation.

Individual difference in student performances has been an ongoing question for educational psychologists (Zimmerman, 2002). Barnard-Brak, Lan, & Paton (2010) identified five different profiles of self-regulated learning in a sample of college students enrolled in online

courses, based on the subscales of the Online Self-Regulated Learning Question (OSLQ; Barnard, Lan, To, Paton & Lai, 2009) which included goal setting, environment structuring, time management, help-seeking, task strategies, and self-evaluation. In an effort to determine if there was a relationship between the profile groups and academic achievement, the authors explored the relationship to the students' cumulative GPA. Barnard-Brak et al. (2010) found significant differences between profiles, with students who scored higher on all subscales to have a higher GPA than the students who scored lowest on all subscales. Students who scored higher on some subscales but lower on others had GPAs that fell in between the higher and lower profile groups (Barnard-Brak et al., 2010).

VanderStoep, et al. (1996) found similar individual differences, with students' beginning a course with varying levels of self-regulatory skills. Following this line of questioning, Bidjerano and Dai (2007) sought to uncover the effect of personality characteristics in a sample of 219 undergraduate students. They did so by conducting a hierarchical multiple regression in an attempt to predict academic achievement with the big five personality dimensions (Extroversion, Neuroticism, Agreeableness, Intellect, and Conscientious) as predictors and self-regulated learning strategies as mediators (metacognition, elaboration, critical thinking, organization, rehearsal, environment and time management, effort regulation, peer learning, and help seeking). The researchers discovered that self-regulated learning was important to student achievement in that the personality factors did not fully explain academic achievement. What they found was that self-regulated learning strategies mediated the relationship between two of the personality dimensions (Agreeableness and Conscientious) with the students' academic achievement levels (Bidjerano & Dai, 2007).

Many of the studies exploring the link between academic success and self-regulated learning have involved the assessment of the benefit of teaching students how to be more self-regulated in learning. Researchers have found that self-regulatory learning processes can be taught and effort has gone into developing courses to teach students how to become self-regulated learners (Hofer, et al., 1998; Zimmerman, 2002). These courses range from integrating activities that encourage the development of self-regulated learning skills into an existing curriculum through implicit or explicit instruction, to courses that are solely designed to focus on teaching students a variety of cognitive, metacognitive and motivational strategies that make up self-regulated learning (Hofer, et al., 1998; Pintrich, et al., 1987; Zeegers & Martin, 2001). The outcomes of such courses have shown to be consistent with other research that demonstrates that self-regulated learning is related to academic achievement (e.g. Bail, et al., 2008; Barnard-Brak, et al., 2010; Bidjerano & Dai, 2007; Mega, et al., 2014).

## Conclusion

Self-regulated learning is a construct that has developed over time. One of the goals of this paper was to help unravel some of the confusion between the conceptual entangling of the components of metacognition and motivation as they are related to self-regulated learning. It is also clear that measurement of self-regulated learning is complicated due the complexity of the construct, leading the type of measure to be dependent on multiple factors including the type of question to be answered.

Self-regulated learning continues to be a popular area of study as it has become recognized that academic success is heavily dependent upon the processes that make up this complex construct. The complexity of this construct leads researchers to a multitude of questions to ex-

plore and while the current literature appears to be exhaustive on the topic, many gaps still remain. While we know that individual differences exist, more research is needed to understand what contributes to these individual differences and how instruction can be best structured to increase better levels of self-regulated learning. By uncovering answers to these questions, students of all levels will be provided with more opportunities for successful learning.

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# 2 INDIVIDUAL DIFFERENCES IN SELF-REGULATED LEARNING OF COLLEGE STUDENTS ENROLLED IN ONLINE COLLEGE COURSES

## Introduction

Self-regulated learning has been an ongoing topic of interest among cognitive and educational psychologists for the past few decades. It is a multifaceted concept that has evolved out of various theoretical areas of study, especially the study of metacognition and social cognitive theory (Pintrich, 1999, 2004; Schunk, 2001, 2005; 2008; Zimmerman, 1989, 1990, 1995, 2001, 2002, 2008). Self-regulated learning has been described as a complex construct requiring one to be involved in his or her learning, through the regulation of cognition, metacognition, motivation, affect, and behavior (Boekaerts, 1995, 1996, 2006; Pintrich, 2004; Schunk, 1995; Zimmerman, 1990, 1995, 2000, 2002, 2008, 2011). Regulation of these areas is especially important for students attending college classes online, due to the requirement for self-regulation of time and environment in these types of learning environments (Barnard, Lan, To, Paton, & Lai, 2009; Cazan, 2014; Wang, Shannon, & Ross, 2013). The purpose of this study was to explore self-regulated learning in undergraduate students attending classes in an online learning environment.

### Self-Regulated Learning

Although there are many models of self-regulated learning, Zimmerman has greatly influenced the direction many models have taken. Early studies on successful learning have found that successful learners work through three phases of self-regulated learning (Zimmerman, 1990, 2000, 2002). These three phases are referred to as *forethought*, *performance*, and *self-reflection* with metacognition and motivation integral to the processes included at each phase. For instance, the *forethought phase* includes processes that will lead one to act, involving task analysis

and self-motivational beliefs. Task analysis involves goal setting and strategic planning while self-motivation includes concepts such as self-efficacy, outcome expectancies, intrinsic interest/value, and learning goal orientation. Goal setting and strategic planning are cognitive in nature and self-motivated beliefs have a metamotivational component in that they involve the higher-level thinking about motivation that leads to either increased or decreased motivation to activate needed behaviors (Cassidy 2011; Schunk, 2001; Zimmerman, 2002).

The *performance phase* is activated when specific strategies identified during the forethought phase are implemented. This phase involves two major categories; self-control and self-observation behaviors (Zimmerman, 2002). An individual who uses self-control behaviors may use imagery, self-instruction, attention focusing, and task strategies (Boekaerts, 1995; Pintrich, 1999; Schunk, 1995). Self-observation includes behaviors such as self-recording, self-experimentation, as well as self-monitoring. While self-control includes overt action that provides a method of evaluating oneself during the process, self-monitoring involves a more metacognitive process of tracking one's progress during the task. Self-control and self-observation are processes one uses in structuring an environment that is conducive to learning.

Finally, during the *self-reflective phase,* an individual responds to his or her performance, through self-judgment and self-reaction. Self-judgment involves self-evaluation and causal attribution. In other words, an individual evaluates him or herself by relating his or her performance to a set standard (such as the goals set) and then attributes the cause of success or failure of meeting the set standard. The evaluation and attributed cause influences self-reaction, when an individual determines whether he or she is self-satisfied with the outcome, directing him or her to adjust as needed (Cassidy, 2011; Schunk, 2001; Zimmerman, 2002).

**Self-Regulated Learning and Academic Achievement**

The use of self-regulated learning strategies has been positively connected to student achievement in all grade levels, including the college years (e.g., Barnard-Brak, Lan & Paton, 2010; Bail, Zhang & Tachiyama, 2008; Schunk & Zimmerman, 1994; Zimmerman & Martinez-Pons, 1986), with investigators demonstrating that high-achieving students tend to report using more self-regulatory strategies than low achieving students (Cazan, 2014; Schunk & Zimmerman, 1994; Zimmerman & Martinez-Pons, 1986). In recent years, researchers have focused on the variability of self-regulated learning and individual differences in student performance (e.g., Bidjerano & Dai, 2007; VanderStoep, Pintrich, & Fagerlin, 1996; Zimmerman, 2002), and they have found that students enter courses with varying levels of self-regulated learning skills (VanderStoep et al., 1996). This finding has inspired different researchers to investigate whether there are distinct profiles of students that can further explain the relationship between self-regulation and academic achievement. For example, using latent profile analysis, Dorrenbacher and Perels (2016) categorized students based on responses to a questionnaire about self-regulated learning strategies. Results indicated four categories of students: those with low self-regulated learning strategies and moderate motivation; those with moderate self-regulated learning strategies; those with conflicting self-regulated learning strategies and high motivation; and those with high self-regulated learning strategies. Using a univariate analysis of variance to assess the impact of profile membership on academic achievement, the authors found that students with higher levels of motivation and higher levels of self-regulated learning had higher achievement levels based on their reported current GPAs than students with lower levels of self-regulated learning and lower levels of motivation (Dorrenbaher & Perels, 2016).

**Age Differences and School Experience in Self-Regulated Learning**

One particular area that has been explored is how age and school experience effect self-regulated learning in students (e.g., Laio, Ferdenzi, & Edlin, 2012; Rachal, Daigle, & Rachal, 2007; Radovan, 2010). Early research in this area focused on school age children, finding that as children age, their level of self-regulated learning increases. Specifically, Zimmerman and Martinez-Pons (1990) found that students in 11$^{th}$ grade scored higher on measures of self-regulated learning than 8$^{th}$ graders, who scored higher on the measures of self-regulated learning than 5$^{th}$ graders. When studying self-regulated learning in a sample of international students attending college in the United States, Laio, et al. (2012) found that self-regulated learning and age predicted academic achievement theorizing that the older students may have developed self-regulated learning as a result of life balancing experiences. Likewise, Radovan (2010) explored the impact of self-regulated learning and age on successful studying in college students ages 20-49, attending school part-time, and found that age was correlated with self-regulated learning. More specifically, they found that students who were older tended to use cognitive and metacognitive learning strategies more often than younger students. Similarly, when looking at the level of education, Rachal et al. (2007) found that students across all levels (freshmen, sophomores, juniors, and seniors) struggle with learning strategies, however, freshmen tended to be less aware of their difficulties. Rachal and colleagues suggest that the reason behind the lack of awareness of their difficulties may be due to less experience with feedback from college professors. In addition, Thibodeaux, Deutsch, Kitsantas, and Winsler (2017) found that first semester freshman students spend more time on socializing and on other non-academic interests than they do on academic activities, indicating that instruction on time management and planning need to be reintroduced during the first year to aid in their self-regulated learning.

## Online Learning Environments

While most research on self-regulation is focused on students in face-to-face classes, some current research has begun to focus on the online learning experience. This trend is important as more students are beginning to enroll in online classes (Barnard, et al., 2009; Wang, et al., 2013) and success in an online learning environment requires a greater level of self-regulated learning skills compared to face-to-face learning environments (Barnard, et al., 2009; Wang, et al., 2013). In a face-to-face learning environment students are instructed when and where to attend class, and the environment is set by the instructor. In online learning environments, students must regulate when, where and how they will attend to course material (Barnard, et al., 2009; Cazan, 2014; Wang, et al., 2013).

## Measuring Self-Regulating Learning in Online Classes

To measure self-regulation in online learning classes, an online questionnaire needed to be developed. The Online Self-Regulated Learning Questionnaire (OSLQ; Barnard, et al., 2009) is a self-report measure that was developed with the intent to measure self-regulated learning that occurs in a more autonomous environment, such as blended learning/hybrid or 100% online courses (Barnard, et al., 2009). The OSLQ measures the skills that involve the various processes explained through Zimmerman's (1990, 2000, 2002) three phases of self-regulated learning (forethought, performance, and self-reflection). It has 24 items across six subscales, and each of the subscales will be briefly described below.

**Goal Setting.** This subscale includes five items which measure skills that can be found in Zimmerman's first phase of self-regulated learning (forethought), which involves planning and organizing.

**Environment structuring**. This subscale includes four items which measure skills that are used in the first phase (forethought) which involves planning the location to attend to course materials that is conducive to learning (free of distractions). It also includes skills that are used in the second phase (performance) which is the carrying out of the plan and making adjustments in the environment when the plan is no longer conducive to learning.

**Time management.** This subscale includes three items which measure skills used in the first phase (forethought) and in the second phase (performance). During the first phase, a student plans out a schedule of their time, incorporating time to attend to course material and then during the second phase the student implements the schedule.

**Help Seeking.** This subscale includes four items which measure skills used in the second phase (performance) and the third phase (self-reflection). Students who exhibit help-seeking reach out to other students and teachers to get clarification of information and to assess if they are on the right track.

**Task Strategies.** This subscale includes four items which measure skills used in all three phases. A student who reflects on his or her learning (self-reflection) may realize that there is a discrepancy in their learning and then may plan and implement a strategy to correct for the discrepancy (forethought; performance).

**Self-evaluation.** This subscale includes four items which measure skills used in all three phases. During planning and organization, the student evaluates all factors that will inform how to plan and organize how he or she will go about his or her learning (how much time is needed for the course, what the best environment to study, who are the best people to talk to for help, etc.). During the second phase, it is the active self-monitoring that informs the student if they need to re-read a passage, adjust his or her environment, ask a question, etc. Lastly, in the third

phase, it is the final review of the performance and knowledge that leads to major adjustments in goals.

**Individual Differences in Self-Regulated Learning in Online Learning Environments**

Using the OSLQ, Barnard-Brak, Lan, & Paton (2010) investigated the profiles of 279 students enrolled in one of 19 different online degree programs at a Southwestern public university. Their latent class analysis, using the six subscales of the OSLQ (Goal Setting, Environment Structuring, Time Management, Task Strategies, Help Seeking, and Self-Reflection), resulted in five different classes or profiles of self-regulated learning. When looking at the self-regulated learning profiles at the top end of the spectrum, those who scored exceptionally high on all areas of self-regulated learning were referred to as "Super Self-Regulators" and those who scored consistently above the mean on all areas of self-regulated learning were referred to as "Competent Self-Regulators". The group that fell at the other end of the spectrum was referred to as "Non-Self-Regulators" and they fell below the mean on all areas of self-regulated learning. In the middle, fell two groups who displayed reverse profiles. One group, referred to as the "Forethought-endorsing Self-Regulators" scored above the mean on Goal Setting and Environment Structuring, but below the mean on all other areas of self-regulated learning, while a second group, referred to as the "Performance/Reflection endorsing Self-Regulators" scored slightly above the mean on the self-regulated learning areas of Time Management, Task Strategies, Help Seeking, and Self-evaluation but below the mean on Goal Setting and Environment Structuring.

In a second study, Barnard-Brak et al. (2010) explored the relationships between academic achievement and students' self-regulated learning profiles by collecting the participants' official cumulative GPAs. The five self-regulated learning profiles from the first study were replicated in this second study which included 197 different students, enrolled through the same

process, and from the same population. Results indicated that the "Super Self-Regulator" group and the "Competent Self-Regulator" group maintained the highest mean GPA and the "Non-Self-Regulator" group maintained the lowest mean GPA. The "Performance/Reflection-endorsing Self-Regulator" group and the "Forethought-endorsing Self-Regulator" group, once again, fell in the middle, with the latter group maintaining a mean GPA slightly higher than the mean GPA of the "Performance/Reflection-endorsing Self-Regulator" group. The results of this study support the idea that levels of self-regulated learning vary among individuals and that the level of self-regulated learning is related to academic achievement in online courses.

In another study, Cazan (2014) attempted to identify self-regulated learning profiles in Romania, in a small sample of college students enrolled in online courses and how their profiles related to academic achievement. Using a Romanian version of the OSLQ, 80 students completed the measure at the end of the semester. When looking at the six subscales of the OSLQ, the subscales of goal setting and environment structuring showed a significant prediction of academic achievement. Cazan (2014) identified two clusters of students: those who had "efficient self-regulated learning strategies" and those who had "inefficient self-regulated learning strategies", with the first cluster of students showing a higher level on all subscales than in the second cluster. Academic achievement was also found to be higher for students in the "efficient self-regulated learning strategies" cluster than in the "inefficient self-regulated learning strategies" cluster (Cazan, 2014).

Since online learning is a relatively new phenomenon, when looking at students who are enrolled in online classes, in addition to individual differences in self-regulated learning strategies, it is also important to look at individual differences in experience and comfort with online

learning. For example, Wang and colleagues (2013) found that undergraduate and graduate students used "more effective" learning strategies when they had a higher experience level with online learning. They also found that this then led to increased motivation, increased course satisfaction, and increased technology self-efficacy. In terms of comfort, Barnard, Paton, and Lan (2008) found that online college students who perceived their online environment to be supportive and comfortable, also engaged in higher rates of self-regulated learning, which led to a higher GPA.

**Current Study**

The current study sought to further our understanding of student profiles of self-regulating strategies in online classes. Specifically, this investigation attempted to replicate the study by Barnard-Brak et al. (2010), while attending to some gaps. Barnard-Brak and colleagues' study (2010) involved students enrolled in an online degree program and therefore all classes attended were most likely online. The average number of online courses previously attended was 9.5, which indicates that their participants had much experience in an autonomous course format. It is yet to be determined whether students with less experience in online courses would display a similar relationship between their experience or comfort in online classes and their self-regulated profiles.

In addition, the mean age of both of Barnard-Brak and colleagues' study samples was higher than the mean age that is found in a traditional university setting. In the first study sample their mean age was 34, and in the second study sample the mean age was 38. Furthermore, we do not know if Barnard-Brak et al.'s sample was made up of undergraduate students (freshmen, sophomores, juniors, or seniors), masters or doctoral level graduate students, or some combina-

tion of the above. Laio and colleagues (2012) found that self-regulated learning and age predicted academic achievement in a sample of international students attending college in the United States, proposing that self-regulated learning might develop secondarily through balancing multiple responsibilities as an adult student. Keeping this in mind, it is possible that the education and experience of students in Barnard-Brak et al.'s study (2010) contributed to higher levels of self-regulated learning, as the two self-regulated learning group profiles that were above the mean on all areas of self-regulated learning ("Super Self-Regulators" and the "Competent Self-Regulators") made up almost 60% of the sample. Thus, their results may not be generalizable to undergraduate students attending online classes in a traditional university program.

The current study investigated the relationship between self-regulation profiles and academic achievement in undergraduate students enrolled in online courses, at a public university in a southeastern city in the United Sates. Additionally, an exploration of the potential effects of online course experience, comfort level, age, and level of education on the membership of the self-regulated learning profiles was conducted. Following Barnard-Brak et al.'s approach (2010), latent profile analysis was used in this study to investigate whether their participants' self-regulated learning profiles would be replicated in a traditional undergraduate population and if these self-regulated learning profiles would be related to student achievement. Latent profile analysis is identified as an ideal approach to cluster individuals on a categorical latent variable according to the relationships between a set of observed variables. By identifying self-regulated learning profiles of traditional college students attending online classes at a traditional university, insight would be provided on whether students are prepared for online learning experiences, and whether interventional programs are needed to teach students to be more self-regulated. Specific research questions to be answered include:

1. Can the five self-regulated learning profiles identified by Barnard-Brak et al. (2010) be replicated when assessing self-regulated learning in a sample of undergraduate students from a traditional university setting, enrolled in an online course?

The self-regulated learning profiles identified through latent class analysis in the current study were hypothesized to be similar to those profiles identified in the previous study, however, it was anticipated that the percentage of students falling within each profile group would vary. While Barnard-Brak et al. (2010) found that the "Super Self-Regulators" and the "Competent Self-Regulators" maintained close to 60% of the group membership, it was hypothesized that the initial profiles developed in the current study would show a greater percentage of students in the middle. This is based on the prior research that supports the great variation in levels of self-regulated learning in college students (Bidjerano & Dai, 2007; Dorrenbacher & Perels, 2016; Vanderstoep et al., 1996).

2. What is the relationship between the identified self-regulated learning profiles and student achievement, as measured by self-reported GPA?

It was hypothesized that self-regulated learning profiles would be significantly related to student achievement. Specifically, it was anticipated that the students who fell into a profile group which demonstrated scores above the mean on all areas of self-regulated learning would have a significantly higher mean self-reported GPA than the mean self-reported GPA of those who fell into a profile group which demonstrated scores below the mean on all areas of self-regulated learning. This hypothesis is based on the previous research that demonstrated a relationship between academic achievement and self-regulated learning (Bail, et al., 2008; Barnard-Brak, et al., 2010; Cazan, 2014; Dorrenbacher & Perels, 2016)

3. What are the relationships between demographic factors such as age, education level, previous online experience and online comfort level with the identified self-regulated learning profiles?

Age, level of education, number of previous online courses, and comfort level in online courses were analyzed in terms of their relationship with the self-regulated learning profile membership. It was anticipated that age and educational level would have a significant relationship with self-regulated learning profile membership. Specifically, it was anticipated that those students enrolled in the course who are of non-traditional age or are in an advanced level of education (juniors and seniors) would fall into a higher self-regulated learning profile. This hypothesis was based not only on theoretical explanations by Laio and colleagues (2012) but by their finding that self-regulated learning and age predicted academic achievement. In addition, as reported by Wang and colleagues (2013), it was expected that those students with a higher level of comfort and experience in taking online courses would also fall into a profile group exhibiting a higher level of self-regulated learning.

## Methods

### Participants

All participants were recruited from an urban university located in the southeastern region of the United States. Students were recruited from a pool of 842 undergraduate students enrolled in approximately 32 online sections of six different courses (see Appendix A for a list of courses) offered through the College of Education and Human Development during the 2016-2017 school year. Out of the 842 students, a total of 477 students volunteered to be part of the study and completed the online survey.

## Measures

A single online questionnaire was created for all participants to access and complete. This questionnaire combined the demographic questions and questions about self-regulated learning.

**Demographics.** For descriptive purposes, participants were asked to indicate their gender, race/ethnicity, and current degree programs. To collect information related to the research questions of this study, participants were asked to indicate their date of birth, levels of education, number of previously completed online courses, and comfort levels in using an online learning platform. In addition, student achievement was measured by asking students to report their cumulative GPAs. Bidjerano and Dai (2007) have reported that cumulative GPAs are a reasonably consistent measure of academic achievement. Studies have indicated that the relationships between self-report GPAs and actual GPAs have been relatively strong with reported correlations ranging from .70 to.90 (Cassady, 2001). See Appendix B for demographic questions included in the online questionnaire.

**Self-regulated Learning**. Self-regulated learning was measured by using the OSLQ (Barnard, et al., 2009). The OSLQ is a self-report measure that was developed with the intent to measure self-regulated learning in an online or hybrid course environment. The OSLQ was developed through an exploratory factor analysis of 86-items and then later confirmed through confirmatory factor analysis, for a final measure consisting of 24 items (Barnard, et al., 2008; Barnard et al., 2009). The measure has six subscales, which include Environment Structuring, Goal Setting, Time Management, Help Seeking, Task Strategies, and Self-evaluation. Respondents rate statements using a 5-point Likert-type scale, with *"5"* indicating *strongly agree* and *"1"* indicating "*strongly disagree*". In comparison to other measures of self-regulated learning, items

in the OSLQ are more focused on instruction that occurs in a more autonomous environment, such as those found in blending learning or 100% online courses. An example of an item is "I set goals to help manage my study time for my online course" (Barnard et al., 2009). Scoring involves summing the total scores for each subscale (L. Barnard-Brak, personal correspondence, September 18, 2015).

Confirmatory factor analysis of the OSLQ assessed reliability and validity in both online and hybrid environments through a collection of data in two separate studies (Barnard et al., 2009). In the first study, the investigators administered the OSLQ to a sample of 434 college students enrolled in a blended or hybrid course. Good internal consistency for the whole scale was demonstrated with $\alpha = .90$. Good reliability at the subscale level was found with Cronbach's alphas ranging from .89 to .90. In the second study, investigators examined 204 different college students who were enrolled in an online course. Excellent internal consistency was demonstrated in the sample of online students with $\alpha = .92$. Once again, good to excellent subscale reliability was found with Cronbach's alphas ranging from .87 to .96 (Barnard et al., 2009). Results of the two confirmatory factor analyses revealed that a second-order factor model described inter-item structure, supporting the use of six subscale scores given that they were good indicators of a higher-order construct, Online Self-Regulated Learning**.**

**Procedure**

Course instructors for the various online sections of courses offered through the College of Education and Human Development were contacted for permission to recruit students enrolled in their classes in the summer, fall, and spring semesters, and a total of 13 instructors agreed (See Appendix A for a listing of the courses in which the recruited students were enrolled). In the beginning of the semester, students were provided by their instructor, through the learning platform

used for online courses by the University, an explanation of the nature of the study and an invitation to participate. All information provided to the class from the instructor was verbiage approved by the IRB and was standard across all classes (see Appendix C for a copy of the approved verbiage).

Instructors provided students with a link so that interested participants could access the informed consent, the demographic questions, and the OSLQ. The link allowed participants to complete the survey anonymously. Upon clicking on the link, students were first presented with the informed consent (See Appendix D). After reading the consent, students selected either "Yes, I agree to participate in the research study" or "No, I do not wish to participate". If a student selected that they wanted to participate, they were then advanced to the next screen and presented with the demographic questions and the OLSQ items. Participants received class credit and those who did not wish to participate had the option to complete an alternate assignment of equal difficulty and length in order to receive the same class credit option without participating in the research. If a student selected that they did not want to participate, they were advanced to a slide that thanked them for their consideration with a link and instructions on how to obtain the alternate assignment. The same alternate assignment was provided to students in all classes.

Due to the potential for students to participate in more than one class, in a post-assessment of the database, surveys of those who participated more than once were eliminated to ensure that each participant completed only one survey. When duplicative surveys were identified, the initial completed survey was retained and all others were removed from the database to avoid including responses that may have been biased to previous exposure to the survey questions.

## Analysis

**Descriptive Analysis**. Descriptive analysis was completed in SPSS on all variables of interest, including all demographic variables and the six subscales of the OSLQ (Environment Structuring, Goal Setting, Time Management, Help Seeking, Task Strategies, and Self-evaluation) as observed continuous variables.

**Latent Profile Analyses.** Following the analyses of Barnard-Brak et al. (2010), the subscale scores from the OSLQ for the current study were calculated and then analyzed through latent profile analysis, a multivariate modeling procedure using Mplus 7.0 (Muthén & Muthén). Latent profile analysis is a type of structural equation modeling that can be used to classify individuals based on their observed interrelation of response patterns onto a latent variable. Conceptually similar to cluster analysis, latent profile analysis classifies individuals who are more similar within the profiles, defined by level (position on the level of continuum – low, middle, and high), by shape (the pattern of peaks and valleys across multiple scores under investigation), and by dispersion (variance around each observed scores) (Konold, Glutting, McDemott, Kush, & Watkins, 1999). The current study provided the opportunity to explore the individual differences in students based on their observed responses on the subscales of the OSLQ (Goal Setting, Environment Structuring, Time Management, Help Seeking, Task Strategies, and Self-evaluation).

# Results

## Descriptive Analyses

**Demographics.** The results of the descriptive analyses of the data collected in the demographic survey can be found in Table 1. Over 82% of the students were female and over 54% were African American. The mean age of the sample was 24 years, ($SD$ = 7.28), ranging in age from 18 to 67 years. While the student sample was recruited from undergraduate classes, 6.1%

reported that they were post-baccalaureate or enrolled in a graduate program. The remainder of the sample included mostly undergraduate seniors (44%), followed by undergraduate juniors (31.4%). In terms of GPA, the mean self-reported cumulative GPA for the sample was 3.06 (*SD* = .527), ranging from 1.59 to 4.24. The participants reported a mean number of 3.58 previous online classes and the majority felt comfortable using the online learning platform.

**OSLQ.** Prior to running the latent profile analysis to develop the self-regulated learning profiles, reliability statistics were run on all six OSLQ subscales. Cronbach's alpha for all subscales ranged .78 to .89 which indicates good reliability, however, this was lower than the previously reported Cronbach's alpha values by Barnard-Brak, et al. (2010) which was .85 to .92. The breakdown of the internal consistencies for each subscale can be found in Table 2.

As seen in Table 2, overall scores on the OSLQ were quite variable. The overall mean score for the total OSLQ was 87.98 (*SD* = 16.83). Interestingly, many students scored near or at ceiling on three of the scales. Specifically, 41.5% scored near or at ceiling (23-25) on the Goal Setting subscale, with a mean score of 20.81, *SD* = 3.99 and 37.9% scored at ceiling (20) on the Environmental Structuring subscale, with a mean score of 17.13, *SD* = 3.11. Scores on the Time Management subscale were more diffused over the top end of the scale, with 84.2% scoring above the mid-point to ceiling (9 to 15). The mean score for this subscale was 11.18, *SD* = 2.76. On the other hand, many students reported lower ratings for the three other scales. Specifically, only 9.2% hit ceiling on the Task Strategy Use subscale, only 7.3% hit ceiling on the Help-Seeking subscale, and only 9% hit ceiling on the Self-evaluation subscale. While the scores on these subscales were slightly skewed, the means still fell more in the middle with scores more evenly dispersed and a larger number of scores clustered around the middle. For example, with a possible ceiling score of 20, the means for the other subscales were as follows: Help Seeking was

12.43, *SD* = 4.03; Task Strategy Use was 13.54, *SD* = 3.84; Self-evaluation was 12.75, *SD* = 3.87.

**Research Question 1**

Can the five self-regulated learning profiles identified by Barnard-Brak et al. (2010) be replicated when assessing self-regulated learning in a sample of undergraduate students from a traditional university setting, enrolled in an online course?

To answer the first research question if the five self-regulated learning profiles identified by Barnard-Brak et al. (2010) can be replicated when assessing self-regulated learning in our sample of undergraduate, using latent profile analyses, models were run including 1, 2, 3, 4, 5, and 6 classes to determine the best model. The following statistics were used to assess model fit: the Log likelihood (Logl); the Akaike Information Criterion (AIC); the Bayesian Criterion (BIC); the Lo-Mendel-Rubin Likelihood Ratio Test (LMR); the Parametric Bootstrap Likelihood Ratio Test between class (BLRT); and entropy. Models were compared on the Logl, AIC, and BIC in search for the lowest value to assess for goodness of fit, with lower values signifying better fit. The LMR and the BLRT were used to determine significance of the model. The entropy values for each model indicates the quality of the model with values closer to 1.0 being of better accuracy of classification (Berlin, Williams, & Parra, 2013).

Model fit indices were evaluated for best fit (see Table 3). The results proved to be interesting but somewhat inconclusive as 3 models appeared to fit the data. While the BLRT values were significant across all models ($p < .001$), the LMR values were significant only for models 2, 4, and 6. This indicates that the 2-class model was significantly a better fit than the 1-class model ($p < .01$), the 4-class model was a significantly better fit than the 3-class model ($p < .01$), and the 6-class model was a significantly better fit than the 5-class model ($p < .05$). While the

AIC and BIC were lower for the 6-class model, the 4-class and the 2-class model had a higher significance when comparing its difference from the preceding models. To further evaluate and determine the best model, the entropy values were then evaluated. The entropy value measures how well the groups are defined, with a value closer to 1 showing greater delineation. When looking at the entropy values, the 4-class model had the highest entropy value at .86, while the 2-class model and the 6-class model had lower entropy values, .79 and .81 respectively.

The next step in determining which model would be the best was to evaluate the profiles of each model to determine its' meaningfulness by assessing the make-up of each class in each model. When looking at the 2-class model, 205 students (43%) were categorized in class 1 and 271 students (57%) were categorized in class 2. The two classes succinctly establish that a little more than half of the students are better at self-regulated learning than other students in online classes. However, reflecting back to the entropy value of .79 suggests that this division of classes are not as clearly defined as we would like them to be and therefore may not explain the sample fully. While the 6-class model had a higher entropy value (.81) than the 2-class model and the division of the groups were more interesting, it did not add more meaningfulness. It was decided that the 4-class model would be accepted as the better model based on the higher entropy value, statistical significance, and meaningfulness of the groups.

The 4-class model, divided the students representing varying levels of high and low scores. In this model, the group classification was clearer, with an entropy value of .86, showing two groups (classes 1 & 3) scoring below the mean on all measures of self-regulated learning, and two groups (classes 2 & 4) scoring above the mean on all measures of self-regulated learning. Class one included 20 students (4.2%) with mean total OSLQ score of 46.45 (*SD* = 9.28), 59 students (12.4%) were categorized in class 2 with a mean total OSLQ score of 114.50 (*SD* =

5.43), approximately 173 students (36.3%) were categorized in class 3 with a mean total OSLQ score of 75.16, and 225 students (47.2%) were categorized into class 4 with a mean total OSLQ score of 94.44 (*SD* = 6.35).

Similar to Barnard-Brak and colleagues (2010), to facilitate comparison across the profiles, all OSLQ scores were transformed into z-scores and graphed according to class (see Figure 1). The difference between classes 1 & 3 is that class 1 scored greater than 1 standard deviation beneath the mean on all subscales, while class 3 scored less than 1 standard deviation below the mean on all subscales of self-regulated learning. Likewise, the difference between class 2 and class 4 is that class 4 scored less than 1 standard deviation above the mean on all measures of self-regulated learning, while those in class 2 scored close to 1 standard deviation above the mean on goal setting, environment setting, and time management and above 1 standard deviation above the mean on task strategy use, help-seeking, and self-evaluation. Therefore class 1 was labeled non-self-regulated learners, class 2 was labeled as sufficient self-regulated learners, class 3 was labeled as borderline non-self-regulated learners, and class 4 was labeled emerging self-regulated learners (see Table 4 for details on this 4-class model).

To assess the significance of the 4-class model, a multi-variate analysis (MANOVA) assessing class on the six OSLQ subscales was conducted. Box's M test reveal that the assumption of the homogeneity of variance was violated, so Pillai's Trace test of multivariate analysis was used because it is more robust to departures from assumptions (Tabachnick & Fidell, 1989). The test revealed that the four classes were significantly different from one another, $F = 38.773(18, 1377)$, $p < .001$. The partial $\eta^2$ was .336, which means that approximately 34% of the multivariate variance of the OSLQ subscales is associated with the class membership. Test of Between-Subject tests also proved to be significant, after adjusting for Type 1 error $p < .001$ (see Table 5

for Between-Subject values). Pairwise comparisons were also completed using Bonferroni to control for Type 1 error. All comparisons were significantly different from one another, $p < .001$.

As an additional step, an analysis of variance (ANOVA) was conducted to assess the four classes by the OSLQ Total Scores. Levene's Test of Equality of Error Variances was not significant and so the assumption of equal error variances was not violated. Tests of Between-Subject of effects for class was significant at $F = 879.29(3, 462)$, $p < .001$, partial $\eta^2 = .851$. Pairwise comparisons were done between the classes, adjusting for type I error using Bonferroni, and all were significant at $p < .001$.

It was hypothesized that the profiles identified in the current study would be similar to the profiles identified by Barnard-Brak et al., however, it was anticipated that the percentage of students falling within each profile group would vary. This hypothesis was partially met. While we identified four profiles and Barnard-Brak et al. identified five profiles, they were similar in that two groups in both studies scored above the mean on self-regulated learning skills. The difference in the groups that we identified was that two groups scored below the mean with one group scoring just below the mean and the other scoring way below the mean. In the groups identified by Barnard-Brak and colleagues, only one group scored below the mean with the other two groups showing a mixture of strengths and weaknesses in the self-regulated learning skills. We anticipated that we would see this same mixture of strengths and weaknesses in our study, but this was not the case. Our hypothesis that the current study would show a greater percentage of students in the middle was supported with approximately 84% falling just above the mean or just below the mean.

**Research Question 2**

What is the relationship between the identified self-regulated learning profiles and student achievement, as measured by self-reported GPA?

To answer the second question and explore the relationship between the self-regulated learning profiles and student achievement, an ANOVA was run using the 4-class model. Self-reported cumulative college GPA was entered as the dependent variable while Class (the profile membership) was entered as the independent variable. Our hypothesis that the self-regulated learning profiles would be significantly related to student achievement was not supported. The results were inconclusive with no significance obtained when looking at the relationship between profile membership and academic achievement, measured by self-reported cumulative college GPA. The differences in the mean self-reported GPA for each profile (class) were very slight with the mean self-reported GPAs for class 1 = 3.09 (*SD* = .525), class 2 = 3.00 (*SD* = .513), class 3 = 3.08 (*SD* = .541), class 4 = 3.05 (*SD* = .523). An additional ANOVA was then run assessing the relationship between total OSLQ score and self-reported GPA which also proved to be not significant.

**Research Question 3**

What are the relationships between demographic factors such as age, education level, previous online experience and online comfort level with the identified self-regulated learning profiles?

To answer the third question, which explores the relationship between the identified self-regulated learning profiles with demographic factors such as age, education level, previous online experience and online comfort level a combination of Chi-Square tests for categorical data (education level) and an MANOVA for continuous data (age, previous online experience, online

comfort level) were run. It was hypothesized that age and educational level would have a significant relationship with self-regulated learning profile membership, expecting those students enrolled in the course who are of non-traditional age or are in an advanced level of education (juniors and seniors) would fall into a higher self-regulated learning profile. In addition, it was expected that those students with a higher level of comfort and experience in taking online courses would also fall into a profile group exhibiting a higher level of self-regulated learning. These hypotheses were partially supported by the results.

When looking at the Chi-Square test for education level, since five cells (25%) had an expected count less than 5, the Likelihood Ratio was used in lieu of the Pearson's Chi-Square statistic. The Likelihood Ratio value was not significant at 12.396 (12), $p = .414$. Next, an MANOVA assessing the relationship between age, number of previous online classes completed, and online comfort level (measured on a 5-point Likert-type scale) with the four classes was conducted. Once again, Box's M test was significant, revealing that the assumption of the homogeneity of variance was violated, so Pillai's Trace test of multivariate analysis was used. The test revealed a significant difference, $F = 2.021(9, 1395)$, $p < .05$. The partial $\eta^2$ was only .013, which means that only 1% of the multivariate variance of the age, number of prior online classes, and online comfort level is associated with the class membership. As seen in Table 6, the test of Between-Subject of effects for age and class, as well online experience was not significant, however the Between-Subject of effects for online comfort and class was significant, $F = 4.41$ (3, 465), $p < .01$, with a small effect size partial $\eta^2 = .028$. Pairwise comparisons were done between the classes for online comfort while adjusting for type I error using Bonferroni. Only comparisons between classes 1 and 2, as well as between classes 1 and 4 were significant at $p <$

.01 and $p < .05$ respectively. Classes 1 and 3 showed a lower level of online comfort and classes 2 and 4 showed a higher level of online comfort (See Table 7).

To explore potential other additional relationships with class membership, the other categorical variables collected (Gender and Race) were also evaluated via a Chi-Squared analysis. There was no significant relationship between race and class membership, however, there was a significant relationship between gender and class membership. The Chi-Squared Test for gender and class membership met all assumptions and only had one cell (12.5%) with an expected count less than 5 so the Pearson Chi-Square statistic was used. The relationship between gender and class membership was significant with a value of $\chi^2 (3) = 16.31$, $p. < .001$. When looking at the crosstabs the actual number of males were greater than expected in classes 1 and 3, while the actual number of females were greater than expected in classes 2 and 4. This indicates that females reported higher use of self-regulated learning skills in relation to the males. As noted in Table 8, while there were far more females than males in the sample, the percentage of males and females in each class are in alignment with this idea.

## Discussion

Years of research on self-regulated learning has uncovered an understanding of how successful college students learn in face-to-face learning environments (Bail, et al., 2008; Pintrich, McKeachie, & Lin, 1987; Pintrich, Smith, Garcia, & McKeachie, 1993). Recent researchers have sought to further understand the complexities of self-regulated learning and how this relates to individual differences in a variety of learning contexts. As Pintrich (2004) points out in his conceptual model of self-regulated learning, the regulation of the learning environment plays an important role in a student's learning. In a traditional classroom environment, the environment is

pre-determined for the student, such as time, location, atmosphere, etc. However, with more opportunities for online courses in higher education, students are required to be more self-regulated in their learning as it requires more planning and regulation of time and the environment, plus personal interactions are not always built into the online instruction, and therefore more effort to seek out help from peers and teachers is needed.

In the advent of online learning, there have been many degree programs developed that are offered solely online, thereby a student may never have to step onto a college campus. These types of programs often appeal to non-traditional age students who must balance work, family, and school. Barnard-Brak and colleagues (2010), sampled students from an online program, living in approximately 136 different zip codes, and were defined as students "representative of those enrolling in distant education courses across the nation" (p. 64). As reported earlier, the mean age of the students in their two studies were 34 and 38, with an average number of previously taken online course 9.52 and 10.21 respectively. The profiles identified by Barnard-Brak and colleagues showed that the majority of students in the program were exhibiting self-regulated learning skills with only an average of 20.5% of the students in their two samples of college students falling below the mean in their reported use of self-regulated learning skills. The current study sought to see if the 5-class solution identified by Barnard-Brak et al. could be replicated in a sample of students from a traditional university, enrolled in online classes.

**Can the five self-regulated learning profiles identified by Barnard-Brak et al. (2010) be replicated when assessing self-regulated learning in a sample of undergraduate students from a traditional university setting, enrolled in an online course?**

It was hypothesized that the identified self-regulated learning profiles in the current study would be similar to those profiles identified in the previous study. While we did not replicate a

5-class solution, we did identify a 4-class solution that demonstrated groups with varying levels of self-regulated learning skills. Barnard-Brak et al. (2010) found two groups that had scores that fell above the mean on all measures of self-regulated learning skills (termed self-regulators and super-self-regulators), while the current study also identified two groups that fell above the mean on all measures of self-regulated learning skills (termed sufficient self-regulated learners and emerging self-regulated learners). The difference between the current and the previous study, in relation to the two groups, is that the previous study groups scored higher in relation to the mean on the six self-regulated learning skills than the current study. Barnard-Brak and colleagues also identified a group that fell below the mean on all measures of self-regulated learning skills (termed non-self-regulators), while the current study identified two groups falling below the mean on all measures of self-regulated learning skills (termed non-self-regulated learners and borderline non-self-regulated learners).

The combined percentage of students in these two groups falling below the mean on self-regulated learning skills in the current study equate to 40.3% in comparison to the average of 20.5% of students identified by Barnard-Brak and colleagues as non-self-regulators. It was also hypothesized that the current study would show a greater percentage of students in the middle. This, in essence, was supported but in a slightly different way than initially expected. Barnard-Brak et al. identified two groups that scored above the mean on some skills but below the mean on others, in contrast the current study identified two groups that scored close to the mean whether it was above or below on all of the skills (emerging self-regulated learners and borderline non-self-regulated learners).

**What is the relationship between the identified self-regulated learning profiles and student achievement, as measured by self-reported GPA?**

Previous studies have found a strong relationship between self-regulated learning and academic achievement (Bail, et al., 2008; Schunk & Zimmerman, 1994; Zimmerman & Martinez-Pons, 1986). Barnard-Brak et al. (2010), found that their identified profiles differed significantly in terms of GPA with the two groups scoring above the mean on self-regulated learning skills having the highest mean GPA. It was hypothesized that self-regulated learning profiles identified in the current study would also be significantly related to students' self-reported GPA. This hypothesis was not supported with the four groups differing from each other minimally in terms of self-reported GPA. In evaluating the differences between the groups in the current study, this non-significant result could potentially be due to the fact that while all four groups were significantly different from one another, in actuality only 4.2% were truly non-self-regulated learners, scoring one to two standard deviations below the mean. This may have been the result of an over-identification of the class number and potentially unstable solution.

In addition, cumulative self-reported GPA was used as the measure of academic success, while students' official GPA was collected by Barnard-Brak et al., (2010). While self-reported GPAs have been reported to have a strong relationship with official GPAs (Cassady, 2001), it is possible that the GPAs self-reported by this sample may have not been fully accurate. Interestingly, the overall mean self-reported GPA was lower for the current study than the lowest reported mean GPA for the non-self-regulated learners reported by Barnard-Brak et al. Since this study involved students who also attended traditional classes (and therefore their cumulative self-reported GPA reflected a majority of face-to-face classes), and online learning requires greater levels of self-regulated learning skills to be successful (Barnard, et al., 2009; Wang, et al., 2013),

it is possible that in this study, students' self-reported cumulative GPA as an indicator of academic success may not have been the ideal metric to analyze. Furthermore, the majority of the students in this study were juniors and seniors, and different results may have been obtained had the study included more freshman and sophomores, when considering that age and strategy use has been shown as a predictor of academic achievement, along with that older students tend to use more cognitive and metacognitive strategies (Laio et al., 2012; Radovan, 2010).

**What are the relationships between demographic factors such as age, education level, previous online experience and online comfort level with the identified self-regulated learning profiles?**

This study tried to address gaps in Barnard-Brak et al.'s (2010) study in regard to how age, education level, comfort level, and previous online experience may impact self-regulated learning in online classes. Our hypotheses that age and educational level would have a significant relationship with self-regulated learning profile membership were not supported. This is inconsistent with previous findings by Laio and colleagues (2012) who found that self-regulated learning and age predicted academic achievement. One reason that age, in our study, was not related to the self-regulated learning profiles may have been due to the fact that while our sample's age range was large, 77.9% of the sample were between the ages of 19-25, with fewer than 1% spanning the ages of 35-67. Likewise, when looking at the education level of our sample, only 18.2% were freshmen or sophomores, with the majority of students in the sample in their junior or senior year of college. A more diverse sample, with more students who are older as well as more students who are freshmen and sophomores, would be needed to avoid the restriction of range due to the clustering around specific age groups and levels of education.

The hypotheses that students with experience in taking online courses would fall into a profile group exhibiting a higher level of self-regulated learning, was also not supported. However, this may be due to the fact that the mean number of online classes taken by the students in the sample was only 3.58, with nearly half of the students having only taken zero to two previous online courses.

While the experience in taking online courses was not supported, the level of online comfort did show a relationship. Specifically, the level of online comfort found in the groups (classes 1 and 3) that fell below the mean on reported self-regulated learning skills (Non-Self-regulated Learners and Borderline Non-Self-regulated Learners) were reportedly the least comfortable in using the online platform for learning. Alternatively, those in the groups (classes 2 and 4) that fell above the mean on reported self-regulated learning skills (Sufficient Self-regulated Learners and Emerging Self-regulated Learners) were reportedly more comfortable using the online platform for learning, with the Non-Self-regulated Learners (class 1) having the lowest level of comfort and the Sufficient Self-regulated learners (class 2) having the highest level of comfort.

As an added investigation, gender differences between classes were explored. The current sample had an overwhelmingly larger number of females than males, however, despite this imbalance the Chi-Squared Test for gender and class membership met all assumptions with a significant result, indicating that the females in the sample reported higher use of self-regulated learning skills in relation to the males.

**Limitations and Further Research.** There were multiple limitations of the current study and therefore the results should be interpreted with caution. Overall, due to the small percentage of students falling in the non-self-regulated learning profile group, the 4-class model

may lack stability as a solution in defining the profiles of students attending a traditional university and therefore further research needs to be conducted with this population. In addition, certain aspects, such as age and education level, were clustered restricting the range for proper analysis. For instance, while student ages ranged from 18 to 67, the majority of students fell in the traditional age range with very few non-traditional students, and therefore proper comparison of younger students to older students was unable to be conducted. Likewise, with most students in the sample declared as juniors and seniors, there were not enough students who were freshmen or sophomores to successfully compare the impact of the level of education. Also, as a traditional university, most classes are offered in a face to face format and therefore the overall experience level in online classes for this population is low. The mean number of online classes taken by the students in the sample was only 3.58, with nearly half of the students having only taken zero to two previous online courses. While this may also explain why overall three of the four classes did not display high levels of self-regulated learning skills, to truly assess the impact of experience in online classes, it is necessary to have more students with more experience to make an adequate comparison.

The lack of relationship between the profile groups and academic achievement was surprising, and while cumulative GPA has been used in previous studies on self-regulated learning and academic achievement (Barnard-Brak, et al., 2010; Bidjerano & Dai, 2007), it may not have been the best measure for the current study. In previous research, students' cumulative GPA best represented the type of learning they were receiving whether it was in face to face traditional format or in an online program. In this study, the majority of students' prior grades most likely reflected grades from face to face classes in which certain aspects of the learning may have been regulated for them. This in itself jeopardizes the accuracy investigating the relationship between

this sample's cumulative self-reported GPA and performance in online classes. Also, since self-regulated learning is domain specific, other variables such as interest level would be an important variable to consider. Finally, when looking at the actual profiles identified in the current study only 4.2% fell into class 1. This may have been the result of an over-identification of the class number and potentially unstable solution, so the comparison between the classes and self-reported GPA may have been flawed in that respect.

In order to best understand the individual differences in students' self-regulated learning in online courses, future research will need to continue to look into age, education level, and online experience. To assure an adequate comparison, researchers should attempt to recruit students with and without online experience when comparing online class experience within profiles of self-regulated learning. Likewise, studies to assess the impact of age and level of education on self-regulated profiles should ideally include a more balanced range of ages, including traditional and non-traditional college ages as well a more balanced range of freshmen, sophomores, juniors, and seniors. Also, to measure academic success in traditional students attending online classes in a traditional university environment, other measures that will isolate the measurement of success in the online class should be obtained, such as the end of course grade. Lastly, because of class 1 being such a small class and therefore potentially an unstable solution, future research is needed to test the stability of the number of classes defined in a traditional university population.

Although not part of the original research focus, as an added investigation, gender differences between classes were explored. The current sample had an overwhelmingly larger number of females than males, however, despite this imbalance the Chi-Squared Test for gender and class membership met all assumptions with a significant result, indicating that the females in the

sample reported higher use of self-regulated learning skills in relation to the males. Therefore, future research should aim for a balance of gender, so that this relationship can be more vigorously explored. Previous research in this area has found that females in fifth, eighth, and eleventh grade are more apt to use self-monitoring, goal setting, planning and structure their study environment than boys (Zimmerman and Martinez-Pons, 1990). Research exploring gender differences in self-regulated learning of college students found more variable results, with females having a tendency to overreport the use of some skills such as metacognition, time management, and organization, but have also found no statistical difference between males and females in regards to other skills such as help-seeking and critical thinking (Bidjerano, 2005).

**Implications.** While the findings of the current study were not completely in alignment with the expectations, they are nevertheless important. The main finding is that the four profiles identified supported the notion that there are individual differences in self-regulated learning, and that not all students are good at self-regulated learning. This information at the most basic level informs us that students attending online classes at a traditional university need support or instruction in becoming self-regulated learners. Research has supported that classes of this nature, such as a "learning to learn" class, are instrumental to students who are struggling and are very effective (Bail, et al., 2008; Hofer, Yu, & Pintrich, 1998; Pintrich, et al., 1987). Students may not realize whether they have the knowledge or skills needed to be successful in an online course and may sometimes take online courses out of convenience, only setting themselves up for failure if they do not possess the self-regulated learning skills needed. Perhaps universities or colleges can build in an online pre-assessment or provide an introduction to self-regulated learning for online learners, which could be beneficial to those who would fall in the emerging self-regulated learner category, which was the largest group in the current study.

Another important implication of this study is the idea that students who are less comfortable with the online learning platform may not use self-regulated learning skills as much as students who are more comfortable with the online platform. It is possible the discomfort they feel hinders the learning process as the student must learn the platform in addition to the content of the course. Perhaps efforts to be self-regulated in their learning of the material are pushed aside in attempts to learn to navigate the environment. A remedy to this situation may include required tutorials of the learning platform, to ensure that all students enter online courses with high levels of comfort. More research is needed in this area to better understand the intricacies that online comfort may include, such as confidence in one's technical ability to work in the online environment, and feeling of support in the online environment as it is related to the skills of self-regulated learning. Addressing these issues in future studies will further aid in the understanding of the role that individual differences play in the relationship between self-regulated learning and academic achievement.

## Tables and Figures

Table 1

*Descriptive Analyses from Demographic Questionnaire*

| Characteristics | | Mean or % (n) | *SD* | Range |
|---|---|---|---|---|
| Age (years) | | 24.22 (472) | 7.28 | 18 to 67 |
| Number of previous online classes | | 3.58 (477) | 3.96 | 0 to 30 |
| Cumulative Self-Reported GPA | | 3.06 (473) | .527 | 1.59 to 4.24 |
| Gender | Females | 82.4 (393) | | |
| | Males | 17.6% (84) | | |
| Race | African American | 54% (253) | | |
| | White | 21.4% (102) | | |
| | Asian | 10.7% (51) | | |
| | Multi-racial | 7.5% (36) | | |
| | Hispanic | 4.4% (21) | | |
| | Other | 2.9% (14) | | |
| Comfort Level Using Online Learning Platform | Not comfortable | 2.5% (12) | | |
| | Somewhat comfortable | 18% (86) | | |
| | Comfortable | 28.9% (138) | | |
| | Very comfortable | 22.4% (107) | | |
| | Extremely comfortable | 28.1% (234) | | |
| Level of Education | Undergraduate Seniors | 44% (211) | | |
| | Undergraduate Juniors | 31.4% (150) | | |
| | Undergraduate Sophomores | 15.1% (72) | | |
| | Undergraduate Freshman | 3.1% (15) | | |
| | Post-baccalaureate/ Graduate program | 6.1% (29) | | |

*Note.* The total number of students and % may not correspond to the sample size due to missing information.

Table 2

*Descriptive Analyses of the OSLQ*

| Variable | Mean | *SD* | Min/Max Score Possible Range* | Cronbach's Alpha** |
|---|---|---|---|---|
| Goal Setting subscale | 20.81 | 3.99 | 5 to 25 | .860 |
| Environment Structuring subscale | 17.13 | 3.11 | 4 to 20 | .885 |
| Time Management subscale | 11.18 | 2.76 | 3 to 15 | .797 |
| Help Seeking subscale | 12.43 | 4.03 | 4 to 20 | .781 |
| Task Strategy Use subscale | 13.54 | 3.84 | 4 to 20 | .815 |
| Self-evaluation subscale | 12.75 | 3.87 | 4 to 20 | .825 |
| Total OSLQ | 87.98 | 16.83 | 26 to 120 | .934 |

*Note*. *Each subscale ranged from 3-5 items per subscale, with a possible score per item 1 through 5. Min score would be 1 x #of items and max score would be 5 x # of items. To make the score more meaningful to the reader, the Min/Max Score Possible Ranges were included in the Table above. ** All Corrected Item-Total Correlations were >.40, so all items were retained

Table 3.

*Fit Indices for Latent Profile Analyses of Self-Regulated Learning Skills in College Students*

| Fit Statistics | Class 1 | **Class 2** | Class 3 | **Class 4** | Class 5 | **Class 6** |
|---|---|---|---|---|---|---|
| Log L | -7661.159 | **-7285.93** | -7132.179 | **-7017.089** | -6975.303 | **-6928.491** |
| AIC | 15346.319 | **14609.86** | 14316.357 | **14100.179** | 14030.605 | **13950.983** |
| BIC | 15396.329 | **14689.05** | 14424.713 | **14237.707** | 14197.306 | **14146.856** |
| LMR | | **0.0022** | 0.3498 | **0.0036** | 0.4224 | **0.0496** |
| BLRT | | **0.0000** | 0.000 | **0.000** | 0.0000 | **0.0000** |
| Entropy | | **0.791** | 0.839 | **0.856** | 0.813 | **0.810** |

*Note.* Log L = Log Likelihood; AIC = Akaike Information Criteria; BIC = Bayesian Information Criteria; LMR = Lo-Mendell-Rubin test; BLRT = Bootstrap Likelihood Ration Test. Bolded models are solutions that were shown to be significant

Table 4

*Means and Standard Deviations: Total OSLQ and OSLQ subscales for the 4-Class LPA Solution*

| | **Latent Class Profiles** | | | | |
|---|---|---|---|---|---|
| **Factor** | Class 1 | Class 2 | Class 3 | Class 4 | Overall |
| GS | 14.05 (5.00) | 24.29(1.45) | 18.75 (3.66) | 22.08 (2.98) | 20.81 (4.00) |
| ES | 10.25 (4.03) | 19.60 (1.17) | 15.70 (2.60) | 18.18 (2.25) | 17.13 (3.11) |
| TM | 4.7 (1.59) | 14.05 (1.57) | 9.35 (1.83) | 12.41 (1.97) | 11.18 (2.77) |
| TS | 5.7(1.72) | 18.93 (1.63) | 11.21 (2.70) | 14.63 (2.53) | 13.55 (3.85) |
| HS | 6.20 (2.38) | 18.29 (2.49) | 9.89 (2.69) | 13.53 (2.8.) | 12.50 (4.02) |
| SE | 5.55 (1.61) | 19.33 (1.26) | 10.26 (2.24) | 13.60 (2.31) | 12.76 (3.85) |
| Total OSLQ | 46.45 (9.28) | 114.50 (5.43) | 75.16 (6.70) | 94.44 (6.35) | 87.92 (16.83) |

*Note*. Latent Classes include: Class 1 = Non-Self-Regulated Learners; Class 2 = Sufficient Self-Regulated Learner; Class 3 = Borderline Non-Self-Regulated Learners; Class 4 = Emerging Self-Regulated Learners Factors include: GS = Goal Setting; ES = Environment Structuring; TM = Time Management; HS = Help-Seeking; SE = Self-Evaluation.

Table 5

*MANOVA Tests of Between-Subjects Effects: OSLQ Subscales by Class*

| Subscales | *F (df)* | *p* | $\eta_p^2$ |
|---|---|---|---|
| Goal Setting | 86.7 (3) | .000 | .360 |
| Environment Structuring | 110.9 (3) | .000 | .419 |
| Time Management | 223.0(3) | .000 | .592 |
| Task Strategy Use | 251.5 (3) | .000 | .620 |
| Help Seeking | 187.9 (3) | .000 | .550 |
| Self-Evaluation | 340.8 (3) | .000 | .689 |

Table 6

*MANOVA Tests of Between-Subjects Effects: Age, Online Experience, and Online Comfort by Class*

| Variable | *F (df)* | *p* | $\eta_p^2$ |
|---|---|---|---|
| Age | 1.307 (3) | .271 | .008 |
| Online Experience | .719 (3) | .541 | .005 |
| Online Comfort | 4.409(3) | .005 | .028 |

Table 7

*Means and Standard Deviations: Online Comfort Level by Class*

| Class | Mean (n) | *SD* |
|---|---|---|
| 1: Non-Self-Regulated Learners | 2.80 (20) | 1.44 |
| 2: Sufficient Self-Regulated Learners | 3.80 (59) | 1.23 |
| 3 Borderline Non-Self-Regulated Learners | 3.50 (173) | 1.14 |
| 4: Emerging Self-Regulated Learners | 3.62 (224) | 1.08 |
| Total | 3.56 (470) | 1.15 |

*Note:* Online Comfort was measured on a Likert-type scale of 1 to 5, with 1= Not at all Comfortable and 5= Very Comfortable.

Table 8

*Crosstab Counts from Chi-Square Analysis: Gender by Class*

| **Class** | Male (n= 84) | | Female (n=393) | |
|---|---|---|---|---|
| | Count (%) | Expected | Count (%) | Expected |
| 1 | 7 (8.3) | 3.5 | 13 (3.3) | 16.5 |
| 2 | 36 (42.9) | 42.9 | 204 (51.9) | 197.7 |
| 3 | 37(44.0) | 26.1 | 111 (28.2) | 121.9 |
| 4 | 4(4.8) | 12.2 | 65 (16.5) | 56.8 |

*Note*. Class 1 = Non-Self-Regulated Learners; Class 2 = Sufficient Self-Regulated Learner; Class 3 = Borderline Non-Self-Regulated Learners; Class 4 = Emerging Self-Regulated Learners

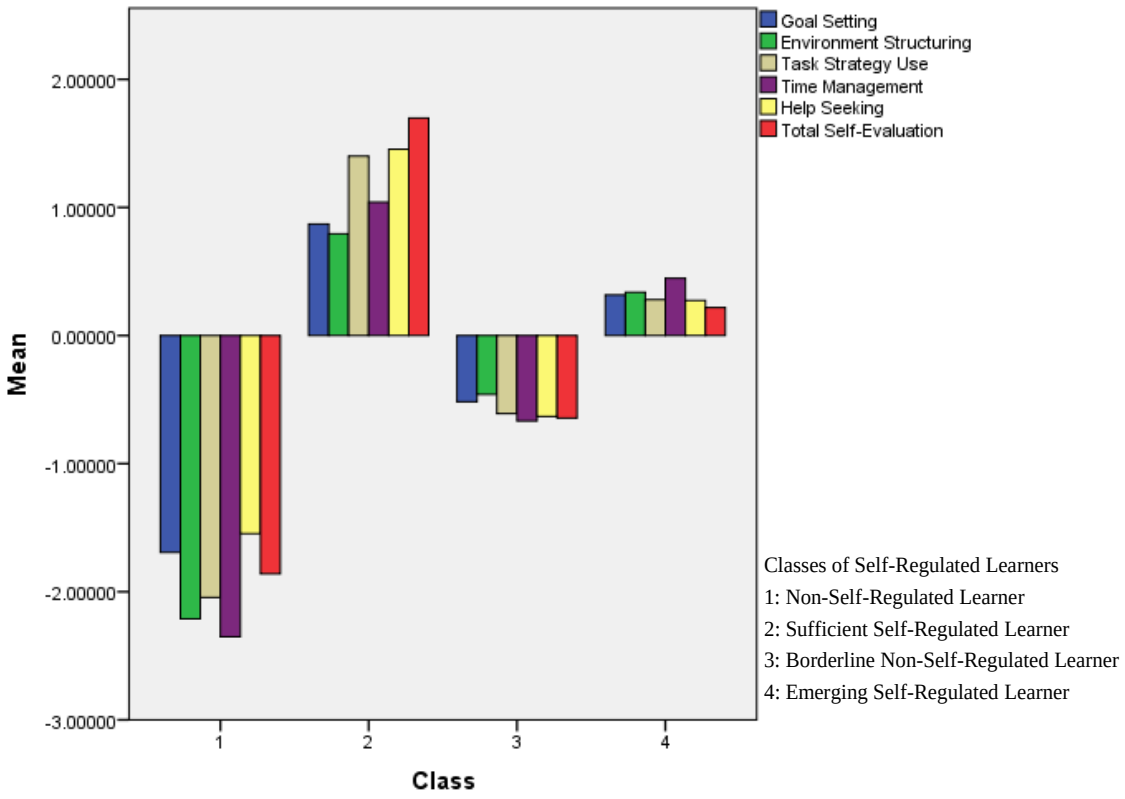


Figure 1. *Graphed Z-scores of the OSLQ subscales according to Class for 4-Class solution.*

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# APPENDICES

## Appendix A

### List of Online Courses that Participants were Enrolled in at Georgia State University

| Course # | Course Name |
|---|---|
| EDUC 2030 | Exploring Teaching and Learning |
| EPY 2050 | Human Growth & Development |
| EPY 2040 | Science of Learning |
| EPY 3010 | Memory and Cognition (Real World) |
| EPY 4360 | Learning/Develop Adolescence |
| EPY 4960 | Cognition and Culture |

# Appendix B

## Demographic Questions

1. Select your gender
- ☐ Male
- ☐ Female

2. What is your date of birth? (mm/dd/yyyy)

3. What is your race/ethnicity? (select all that apply)
- ☐ White
- ☐ African American
- ☐ Hispanic
- ☐ Asian
- ☐ Native American
- ☐ Pacific Islander
- ☐ Other (please specify) _____

4. What is your current degree program?

5. What is your current level of education?
- ☐ Freshman
- ☐ Sophomore
- ☐ Junior
- ☐ Senior
- ☐ Other (Please Specify) _____

6. What is your current cumulative GPA?

7. What is the number of online courses you have previously completed?

8. What is your comfort level using an online learning platform for this course?
- ☐ 1 = Not at all comfortable
- ☐ 2 = Somewhat comfortable
- ☐ 3 = Comfortable
- ☐ 4 = Very comfortable
- ☐ 5 = Extremely comfortable

# Appendix C

## IRB Approved Language

**Syllabus Verbiage:**

**Research Experience Opportunity:** You are invited to participate in a research study because you are currently enrolled in an online course. The purpose of this study is to understand how different people learn and attend to class in an online setting. To participate, you will complete a brief online survey about learning and studying in an online course during the first few weeks of class. Through completing the survey you may even learn more about how you attend to online learning. Participation from beginning to end will require about 15-20 minutes of your time. You will earn class credit in the course by participating. Should you choose not to participate in the research study but will still like to earn class credit, you will be given an opportunity to complete an essay question during the same time frame in order to earn the same amount of credit. This research is being conducted in online courses offered at Georgia State University by Dr. Daphne Greenberg and Dina M. Schwam.

In order to participate in this class credit opportunity, you will need to click on the link that will be provided to you. The link will bring you to the consent form and then you can either continue with the questionnaire or receive instructions on how to receive the alternative assignment.

**iCollege/Brightspace Newsfeed Verbiage:**

### Research Experience Opportunity

You are invited to participate in a research study being conducted at Georgia State University because you are enrolled in an online course. The purpose of this study is to understand how different people learn and attend to class in an online setting. To participate, you will complete a brief online survey about learning and studying in an online course during the first few weeks of class. You may learn more about how you learn and study through completing the survey. Participation will require about 15-20 minutes of your time. You will earn class credit in the course by participating. Should you choose not to participate in the research study but will still like to earn class credit, you will be given an opportunity to complete an essay question during the same time frame in order to earn the same amount of credit.

In order to participate in this class credit opportunity, you will need to click on the link that you receive via email. The link will bring you to the consent form and then you can either continue with the questionnaire or receive instructions on how to receive the alternative assignment. If you have any questions about this research study you may contact the study investigators, Dr. Daphne Greenberg at dgreenberg@gsu.edu or Dina M. Schwam at dschwam1@gsu.edu.

**Email Verbiage with Link to Survey**

**Research Experience Opportunity**

You are invited to participate in a research study being conducted at Georgia State University because you are enrolled in an online course. The purpose of this study is to understand how different people learn and attend to class in an online setting. To participate, you will complete a brief online survey about learning and studying in an online course during the first few weeks of class. Through completing the survey you may even learn more about how you learn and study. Participation will require about 15-20 minutes of your time. You will earn class credit in the course by participating. Should you choose not to participate in the research study but will still like to earn class credit, you will be given an opportunity to complete an essay question during the same time frame in order to earn the same amount of credit.

To participate in this class credit opportunity, you will need to click on the following link:

*Email Link to Survey*

This link will bring you to the consent form and then you can either continue with the questionnaire or receive instructions on how to receive the alternative assignment.

If you have any questions about this research study you may contact the study investigators, Dr. Daphne Greenberg at dgreenberg@gsu.edu, or Dina M. Schwam at dschwam1@gsu.edu.

# Appendix D

## IRB Approved Informed Consent Form

Georgia State University
Department of Educational Psychology, Special Education, and Communication Disorders
Informed Consent

Title: Self-regulated Learning and Students' Academic Achievement in Online Courses
Principal Investigator: Daphne Greenberg, PhD
Student Principal Investigator: Dina M. Schwam, MS

I. Purpose: The purpose of this study is to understand how different people learn and attend to class in an online setting. You are invited to participate in this research study because you are an undergraduate student attending an online course at a traditional university. Approximately 500 participants will be recruited for this study from online classes at Georgia State University. Participation will require 15-20 minutes of your time. You will be asked to complete an online survey one time during the first few weeks of class.

II. Procedures: If you decide to participate after reading this consent form, you will click "Yes" and continue to the next section to begin the survey. By clicking "Yes", you are giving your consent to participate in the study. At the end of the survey, you will be asked to email Dina M. Schwam (dschwam1@gsu.edu) to confirm that you have completed the questionnaire and to receive class credit. If you click "No" and do not choose to complete the survey, you will email Dina M. Schwam (dschwam1@gsu.edu) to request the alternate assignment for class credit. The questionnaire is on a secure web-based platform in Qualtrics, an official Georgia State vendor. The questionnaire is an online form that will first ask you some questions regarding very basic personal information such as your date of birth, gender, race, year in school, current GPA, comfort-level taking online classes, etc. and then ask you to rate statements regarding your study habits and beliefs about learning. You will be asked to complete this survey once during the first few weeks of class. It will take approximately 15 minutes to complete the questionnaire.

III. Risks: In this study, you will not have any more risks than you would in a normal day of life. No one will use the information in any way that could cause problems for you.

IV. Benefits: Participation in this study may benefit you personally. You may benefit by increased knowledge regarding your study habits and beliefs about learning. Overall, we hope to gain information about undergraduate students study habits and beliefs about learning when participating in an online course.

V. Compensation: You will receive class extra credit for participating in this study. If you choose not to participate, you may complete an assignment of equal difficulty and length for the same extra credit instead of participating in the research. The alternative assignment will be one of two short essay questions.

VI. Voluntary Participation and Withdrawal: Participation in research is voluntary. You do not have to participate in this study. Your participation or non-participation in this study will not affect your relationship with your teacher. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip questions or stop participating at any time. Whatever you decide, you will not lose any benefits to which you are otherwise entitled.

VII. Confidentiality: We will keep your records private to the extent allowed by law. No identifiable private information, photographing, video, or audio tape recording will be sought in the research questionnaire. Your name will be provided to your instructor for the sole purpose of confirming participation in one of the activities for extra credit; no research data will be included. Dr. Daphne Greenberg and Dina M. Schwam will have access to the information you provide. Information may also be shared with those who make sure the study is done correctly (GSU Institutional Review Board, the Office for Human Research Protection (OHRP). The information you provide will be stored on a secure web-based platform and on firewall protected and password protected computers. We will use a study number rather than your name on study records. All responses will be treated as confidential, and in no case will responses from individual participants be identified. The information from the questionnaire will be kept confidential and stored by Qualtrics, a vendor used by Georgia State University. Qualtrics uses encryption (also known as HTTPS) for all transmitted data. Researchers will practice sound security practices by using strong account passwords and restricting access to their accounts to authorized persons. Be aware that data sent over the Internet may not be secure. Data files of findings will be stored for two years in a data encrypted database on a secured firewall-protected computer. Any identifying information will be stored separately from the data, in a separate encrypted database on a firewall-protected computer to protect privacy and will be deleted once the study has been completed. Your name and other facts that might point to you will not appear when we present this study or publish its results. The findings will be summarized and reported in group form; you will not be identified personally.

VIII. Contact Persons: Contact Dr. Daphne Greenberg at dgreenberg@gsu.edu or 404-413-8040, or Dina M. Schwam at dschwam1@gsu.edu or 404-384-3118 if you have questions, concerns, or complaints about this study. You can also call if you think you have been harmed by the study. Call Susan Vogtner in the Georgia State University Office of Research Integrity at 404-413-3513 or svogtner1@gsu.edu if you want to talk to someone who is not part of the study team. You can talk about questions, concerns, offer input, obtain information, or suggestions about the study. You can also call Susan Vogtner if you have questions or concerns about your rights in this study.

IX. Copy of Consent Form to Participant: You can print a copy of this statement for your records. If you are willing to volunteer for this research, please click "Yes" and complete the questionnaire. If you choose not to participate in the questionnaire, you may request the alternative assignment for class credit by emailing Dina M. Schwam at dschwam1@gsu.edu.

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APPROVAL DATE: 04/06/2017
IRB EXPIRATION DATE: 06/04/2017 3
Version Date: 3/29/2017