Digital Learning Readiness: A Study on the Self-Regulation and Self-Motivation of Secondary Students Enrolled in an Online Asynchronous Economics Course

A Dissertation

Presented in Partial Fulfillment of the Requirements for the

Degree of Doctorate of Philosophy

with a

Major in Education

in the

College of Graduate Studies

University of Idaho

by

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May 2015

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Authorization to Submit Dissertation

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Abstract

The purpose of this study was to investigate digital learning readiness of secondary students by analyzing their level of self-regulated learning (i.e., self-regulation and self-motivation) with their academic performance. This study focused on whether self-regulation and self-motivation are associated with academic performance of secondary students who self-select into an asynchronous online economics course. Descriptive and inferential statistical analyses were performed on data collected from the cross-sectional sample of secondary students in grades 10, 11, and 12 that were grouped according to their performance levels (high, average, and low). This procedure yielded analyses of both the contributions and predictive strength of individual variables within these two constructs. Students' perceptions of their self-efficacy, self-control, and test anxiety showed the strongest contributory and predictive strength for increased academic performance. The implications of these findings may lead educators to better prepare secondary students for digital learning by modeling and facilitating self-regulated learning in primary and secondary classrooms.

***Keywords*: self-regulated learning, self-motivation, self-efficacy self-control, secondary students, asynchronous digital learning**

Acknowledgements

I wish to acknowledge Dr. Allen Kitchel, my major professor who was so generous with his time and expertise. He spent hours reading, reflecting, prompting, and encouraging me throughout the entire process with patience and a steady hand. Thank you Dr. Paul Gathercoal, Dr. Anne Kern, and Dr. Royce Kimmons for agreeing to serve on my committee, contribute, and provide feedback.

Dedication

I dedicate this dissertation work to my family and in particular, my husband, for the many words of encouragement and unending belief in me, which helped get me through the times when I had to activate my own self-regulation and self-motivation.

I also dedicate this dissertation to the child who struggles to stay unique throughout her journey through our American school system.

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Chapter 1

Self-regulated learning (SRL) is a cyclical process that connects learner-generated thoughts, feelings, and actions with academic planning, motivation, and behavior, while striving to attain a goal (Schunk, 2000; Schunk & Ertmer, 2000). SRL's positive effect on academic performance has been a focus of study by academic researchers since the 1980's (Blumenfeld, Pintrich & Hamilton, 1986; McKeachie, Pintrich, & Lin, 1985; Schunk, 1984, Zimmerman, 1986). Academic researchers have broken the components of self-regulated learning into four phases aligned with process of learning (1) forethought/planning, (2) monitoring, (3) control, and (4) reflection/reaction (Pintrich, 2000a, 2000b, 2004). Pintrich (2000a, 2000b, 2004) identified four areas for regulation within these phases (1) cognition, (2) motivation, (3) behavior, and (4) context. Each area identified is learner-dependent reliant on the affective response and personal efficacy of the learner to the goal. Thus, the ability to achieve the desired goal is advanced or impeded based upon the learner's self-beliefs (Pintrich, 2000b; Zimmerman, 2000b).

SRL has been used in the fields of health, psychology, and social sciences by clinicians, researchers, and teachers when supporting patients and students working to achieve their goal(s) (Zimmerman, 2008). SRL has been attributed with increased academic performance in both the traditional and digital learning environments (Hung, Chou, Chen, & Own, 2009; Pintrich & DeGroot, 1990; Zimmerman, 2000). The majority of the studies on the association between SRL and academic performance were done using post-secondary students; fewer exist with adolescent students in secondary grades (U.S. Department of Education, 2010; Frank, Reich, & Humphreys, 2003). To address this lack of student age diversity, the U.S. Department of Education (2010) called on the research community to

broaden its focus to include the growing population of secondary online learners. In the autonomous learning environment of asynchronous digital learning, SRL takes on an even greater level of importance than in other, less autonomous settings found in a traditional classroom. As access to and enrollment in digital learning for secondary students increases, research to investigate SRL in secondary students becomes increasingly relevant.

Digital learning is now a common mode for course delivery in Higher Education and is becoming more commonplace and attractive for instructional delivery in primary and secondary grades across the U.S. (Watson, Pape, Murin, Gemin, & Vashaw, 2014). The ease in accessing classes online using a computer or other mobile device offers students the flexibility of arranging courses around their lives without being bound by the geography of the place they reside, making it a popular mode for learning. Public school districts across the United States, both in the primary and secondary grade levels, increasingly offer online courses as an alternative to the traditional face-to-face classroom-learning environment (Watson, et al., 2014). Online courses have typically been offered in one of two ways: *synchronous* courses (Web-based) courses facilitated by an instructor in real time, also known as *blended learning*) or *asynchronous* courses (Web-based) courses separated by time and location) (Watson, et al., 2014). The focus of this study is on asynchronous digital learning.

In 2004, Watson and colleagues (Watson, 2014) formed the Evergreen Education Group (EEG) to compile and disseminate data on the variety of ways that digital learning has evolved and changed the way students learn in our public and private, primary and secondary schools. They published their eleventh annual report in the fall of 2014. In *Keeping Pace with K-12 Digital Learning: An Annual Report on Policy and Practice,* they reported on the nation's continued growth of online and blended learning in K-12 schools (Watson, et al.,

2014). In school year (SY) 2009-2010, 74% of the 1,816,400 enrollments in online courses among K-12 school districts across the United States were in high school (iNACOL, 2013). This number did not include students enrolled in full-time digital learning (iNACOL, 2013). In SY2013-2014, almost 310,000 students in thirty states enrolled in full-time digital learning (Watson, et al., 2014). Public schools were not alone in this growing trend; private and charter schools are beginning to offer online courses to supplement the curriculum (Watson, et al., 2014). Academic and state leaders have also pushed for digital learning in K-12 grades to better prepare graduates in the use of daily technology and to compete in the modern world of trades and businesses. In response, five states have adopted a mandate that requires high school students to take at least one online course prior to graduation: Maryland, Nevada, Virginia, Arkansas, and Kentucky (Watson, et al., 2014).

The majority of enrollments for online courses are high school students seeking to supplement their course load with asynchronous courses for either early graduation or to recover credits (Watson, Murin, Vashaw, Gemin, & Rapp, 2013). Digital learning appeals to secondary students for a variety of reasons, one of which is they are allowed a flexibility they do not experience in traditional classrooms (Eccles, 1999). Others seek full-time digital learning as a means to avoid the culture found in many high schools (Watson, et al., 2013. This change in the learning environment shifts the emphasis of responsibility for learning from the teacher to the online learner. To meet the multifaceted challenges of asynchronous digital learning, effective online learners must independently engage in the learning process of goal setting, monitoring, self-control and reflection (Calcaterra, Antonietti, & Underwood, 2005; Quintana, Zhang, and Krajcik, 2005; Tsai, 2009). They are responsible for regulating their cognition, motivation, behavior, and context as they strive to achieve a self-selected or

teacher-generated goal (Calcaterra, Antonietti, & Underwood, 2005; Quintana, Zhang, & Krajcik, 2005; Tsai, 2009). Simply put, research suggests that the successful online learner is a proficient self-regulated online learner (Azevedo & Cromley, 2004; Quintana, Zhang, & Krajcik, 2005; Tsai, 2009; Winters, Greene, & Costich, 2008). In order to understand how SRL evolved from the field of health and psychology to the classroom, a brief background into its development and current understanding will be discussed in Chapter 2.

Theoretical Framework of Self-Regulated Learning

SRL is the "self-directed processes and self-beliefs that enable learners to transform their mental abilities … into an academic performance skill" (Zimmerman, 2008, p. 166). It is an "active constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (Wolters, Pintrich & Karabenick, 2003, p. 5). Although different researchers focused on different aspects of SRL, all models of SRL shared the following assumptions:

1. Learners are active, constructivist agents in their own learning process;
2. Learners have the potential to control and regulate their cognition, motivation, behavior and aspects of their environment, with the recognition that there are differences in learners, developmentally or biologically which can interfere with their efforts;
3. Learners are able to set an ideal standard for the goal they seek to attain, for example to get an "A" for a class, and this ideal standard goal is used as a reference to assess progress. (Pintrich, 2000a)

The following illustration (Figure 1) sets out the phases and areas of self-regulated learning found in most models of SRL, which will be discussed more fully in Chapter 2 (Blackwell, Trzesniewski & Dweck, 2007; Hyman, Dweck, & Cain, 1992; Margolis & McCabe, 2004; Pintrich, 2000(a), 2000(b); Scarpati, Malloy, & Fleming, 1996; Zimmerman, Bandura, & Martinez-Pons, 1992). Figure 1 also illustrates the influence student characteristics have on the learning outcomes and SRL.

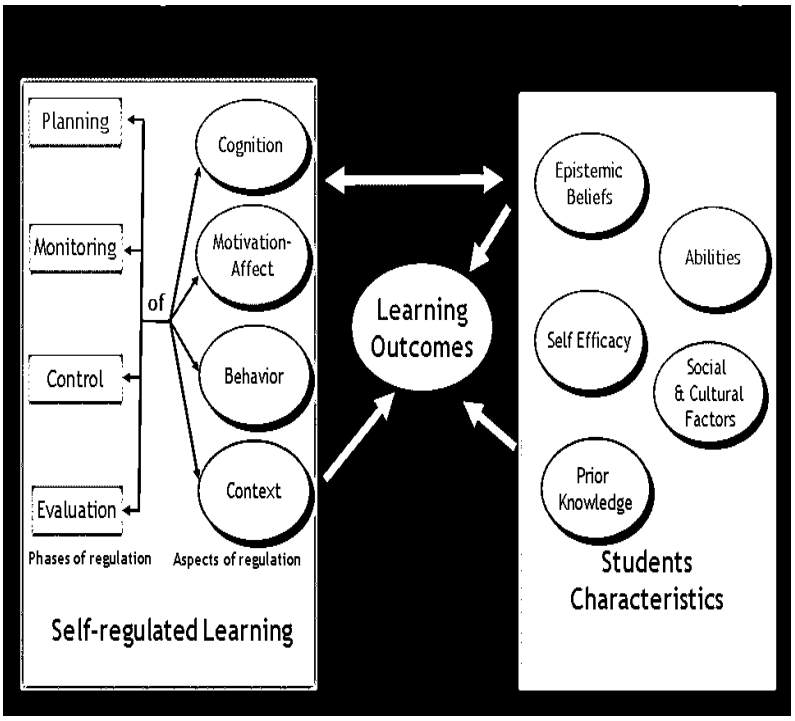

Figure 1. Theoretical framework of the study. Adapted from Kassab, Al-Shafei, Al-Mannai, Jadeed, Al Mulla, Mohyieldin, & Otoom, (2012). Retrieved from http://simec2012.net/modules/eposter/templates/blue/simec-blueVertical.php?key=TXpVNVhsNWVNVEl3WGw1ZU5URT0=

The first phase, forethought/planning, which occurs before a task begins, is considered to be the foundation for successful goal attainment (Pintrich, 2000a, 2000b, 2004; Zimmerman, 2002). During this phase, a self-regulated learner would break down the tasks s/he felt were necessary to lead to the desired ideal goal (the ideal standard goal). The self-regulated learner would select learned cognitive and behavioral strategies that would contribute to goal attainment. The learners' self-beliefs are key to developing and planning the ideal standard goal, while their personal-efficacy beliefs motivate the learners to plan and progress toward the ideal standard goal (Pintrich, 2000a, 2000b, 2004; Zimmerman, 2002)

Throughout the next two phases, (monitoring and control), self-regulated learners would engage in self-observation and monitor whether the chosen strategies were suitable to

the task or should be changed (Pintrich, 2000a, 2000b, 2004; Zimmerman, 2002). Self-observation would include an assessment of the learning environment and engagement in self-recording progress to monitor satisfactory advancement toward goal attainment (Zimmerman, 2002). This sustained self-observation requires a high level of self-control during the learning process with the willingness to initiate the necessary changes to the previously conceived plan (Zimmerman, 2002). As an example, management of effort would be monitored and could be assessed as requiring additional effort to meet satisfactorily the criteria selected for the ideal standard goal in a timely manner.

In the reflection/reaction phase, the learner would assesses whether the attained goal was satisfactorily met when compared to the ideal standard goal originally set during the first phase of the learning episode (Pintrich, 2000a, 2000b, 2004; Zimmerman, 2002). If the proficient self-regulated learner assessed the goal satisfactorily met, studies showed it would be more likely that the learner would continue activating SRL in the future because self-confidence and efficacy had been increased or maintained. On the other hand, if the proficient self-regulated learner perceived the goal was not satisfactorily met, s/he should determine the point where the plan or process broke down in order to find a solution that could be enacted in a future similar task (Pintrich, 2000a, 2000b, 2004; Zimmerman, 2002). If the self-regulated learner was ineffective, inconsistent, or a novice, research has shown self-reflection may result in perceived overall failure in the SRL process and the student would not activate SRL in the future (Pintrich, 2000a, 2000b, 2004; Zimmerman, 2002).

The catalyst to SRL is the student's own perception of self as an active agent with the ability to initiate, maintain, and control the phases and areas of SRL (Margolis & McCabe, 2004; McCombs & Marzano, 1990). The impediment to self-regulated learning then, is also

the student's perception of self as active agent. For example, if a student experiences feelings of poor self-efficacy, low interest value, motivation, or has few learning strategies, the ability to self-regulate his/her learning may be diminished (Margolis & McCabe, 2004; McCombs & Marzano, 1990). These findings are particularly relevant for this study and any study analyzing academic achievement for adolescent students in the secondary grades. Adolescence, the period between 15-17 years of age (Center for Disease Control and Prevention, 2014), has been described as the transitional period of human development when the individual develops their personal identity, a sense of self that includes self-beliefs and self-efficacy (Erickson, 1968).

The ability to self-regulate motivation and behaviors demonstrated by most post-secondary students are not generally evident in secondary students (Abar & Loken, 2010; Bandura, et al., 2003). Bandura, et al. (2003) noted that late adolescence is a difficult and emotionally exhausting transitional phase that presents an array of new challenges. The adolescent has to manage "major biological, education, and social role transitions concurrently" (Bandura, et al., 2003, p. 769). According to Eriksonian theorists, from early through late adolescence is a time when individuals are developing their self-identity, aligned with society's expectations and their own (Marcia & Josselson, 2013). Erikson (1968) wrote that during this stage of human development, adolescents struggle to find purpose and direction in their life by selecting personal roles and values. Hyman, Dweck, and Cain (1992) observed that while very young children demonstrated high self-motivation to learn in primary grades, the pursuit of mastery striving was often abandoned when transitioning to secondary grades. After experiencing academic failure, secondary students developed perceptions of low self-efficacy in their academic abilities resulting in poor self-motivational

beliefs (Hyman, Dweck, & Cain, 1992). Thus, SRL abilities in secondary students may not necessarily align with SRL abilities in post-secondary students, specifically in the areas for regulation (cognition, motivation, behavior, and context). These self-beliefs have a direct impact on whether students will initiate and maintain SRL, especially when the learning environment is particularly reliant on the learner's internal self-beliefs, such as asynchronous online course (Bandura, et al., 2003, Blumenfeld, Pintrich, & Hamilton, 1986; Zimmerman, Bandura, & Martinez-Pons, 1992).

Problem

The shift from the traditional classroom to the asynchronous digital learning environment presents many challenges for students (Azevedo & Cromley, 2004; Tsai, 2009; Winters, Greene, & Costich, 2008). The digital environment is more autonomous with fewer immediate external supports than those provided in traditional classrooms. In a traditional face-to-face secondary classroom, the adolescent student's role is often more passive and teacher-dependent than it can be in the digital learning environment. Research studies suggest students perceive they have little control over their daily schedules or classroom activities in the traditional school environment (Eccles, 1999). Primary and secondary students' daily attendance are controlled by external legislation with states' mandated compulsory attendance laws (National Center for Education Statistics, 2014). Students' self-perceptions and low levels of control over their learning environment have been shown to result in passive learning and inappropriate behaviors that impede learning and successful goal attainment (Eccles, 1999; Wang & Eccles, 2012).

In most traditional secondary classrooms, teachers control and monitor student learning through formative assessments within their instruction and can provide immediate

interventions or supports to provide students with cognitive strategies and motivational techniques to work toward a successful goal (Eccles, 1999; Weinstein, 1987). In an asynchronous digital learning environment, the online learner needs to have the ability and willingness to self-assess for understanding and select corrective interventions to progress through the learning episode. These abilities may not be fully developed in every high school student enrolled in an online course (Eccles, 1999; Yukselturk & Bulut, 2009).

It can be inferred from prior research, asynchronous digital learning is suited for confident, independent learners capable of initiating, monitoring, and controlling the four areas for regulation in Pintrich's 2004 framework of SRL. In contrast, studies on the self-regulation and characteristics of secondary students have found self-motivation, perceived cognitive efficacy, and school engagement decreased as they move through the secondary grades in the traditional classrooms (Eccles, 1999). This downward spiral affected their academic performance and even their level of interest in and value of academic performance in both the traditional and/or digital learning environments (Eccles, 1999; Eccles & Wigfield, 2002; Quintana, Zhang, and Krajcik's 2005; Yukselturk & Bulut, 2009). The difference in SRL between post-secondary (post-adolescence) and secondary students (adolescence) has a bearing on the applicability of the findings found in studies on SRL and academic performance. Teachers and researchers should consider these differences before applying findings from one population into the classroom of the other.

Asynchronous digital learning is an autonomous environment best suited to self-efficacious, motivated students, actively engaged and reflectively self-aware during their learning process; skills and abilities that are necessary for SRL (Matuga, 2009; McCombs & Marzano, 1990; Tsai, 2009;). As digital learning emerges as a viable option to traditional

classroom learning in the secondary grades, it has become critical to examine secondary students' readiness to meet the challenges in this new learning environment. A need exists to explore SRL in secondary students, and to investigate its impact on academic performance within an asynchronous digital learning environment.

Purpose

The purpose of this study was to investigate digital learning readiness of secondary students by analyzing their level of SRL (self-regulation and self-motivation) with their academic performance. Previous research has associated SRL processes with increased academic performance. This study builds upon this body of research through an examination of the processes of self-regulation and self-motivation in adolescent students who enrolled in and completed an asynchronous online course.

Research Questions

The overarching research question is how are self-regulation and self-motivation associated with academic performance of secondary students who self-select into an asynchronous online economics course? To answer this question, four sub-questions were developed and investigated.

1. Is there a significant difference among academic performance groups of students (high, average, low) based on their self-regulation scores (i.e., control, cognitive strategy use)?
2. Is there a significant difference among academic performance groups of students (high, average, low) based on their self-motivation scores (i.e., self-efficacy, intrinsic value, test anxiety)?

3. Can the scores of self-motivation (i.e., self-efficacy, intrinsic value and test anxiety) significantly predict academic performance of secondary students?
4. Can the scores of self-regulation (i.e., control, cognitive strategy use) significantly predict academic performance of secondary students?

For this study, academic performance was measured by participants' end of course scores. End-of-course scores had a possible range from one to one hundred, with ten points available for extra credit. End of course scores were based upon the overall course performance including assignments and assessments. These scores were used to divide the participants into three groups of academic performance levels, (high, average, and low).

1. High achieving students were defined as those who received a score of a 90 points or higher.
2. Average achieving students were defined as those who received a score between 75-89 points.
3. Low achieving students were defined as those who received a score below 75 points.

Hypotheses

To help answer the research questions, a series of hypotheses were tested. Each of the hypothesis statements addressed learners who completed an online economics course during the summer of 2013.

Hypotheses to Research Question 1

Null Hypothesis 1. There are no significant differences among academic performance groups of students (high, average, low) based on their self-regulation scores (control and cognitive strategy use) during the summer of 2013.

Alternative Hypothesis 1: There are significant differences among academic performance groups of students (high, average, low) based on their self-regulation scores (control and cognitive strategy use) during the summer of 2013.

Hypotheses to Research Question 2

Null Hypothesis 2. There are no significant differences among academic performance groups of students (high, average, low) based on their self-motivation scores (i.e., self-efficacy, intrinsic value, test anxiety).

Alternative Hypothesis 2: There are significant differences among academic performance groups of students (high, average, low) based on their self-motivation scores (i.e., self-efficacy, intrinsic value, test anxiety).

Hypotheses to Research Question 3

Null Hypothesis 3: The scores of self-regulation do not statistically predict academic performance of secondary students in an online economics course taken in summer of 2013.

Alternative Hypothesis 3: The scores of self-regulation do statistically predict academic performance of secondary students in an online economics course taken in summer of 2013.

Hypotheses to Research Question 4

Null Hypothesis 4: The scores of self-motivation do not statistically predict academic performance of secondary students in an online economics course taken in summer of 2013.

Alternative Hypothesis 4: The scores of self-motivation do not statistically predict academic performance of secondary students in an online economics course taken in summer of 2013.

Significance

Secondary students' access to and enrollment in digital learning has been increasing every year since 2004 (Watson, et al., 2013). Prior research shows a strong association between student activation in SRL with increased academic performance levels in both the traditional classroom and digital learning environment (Hung, et al., 2009; Pintrich & DeGroot, 1990; Zimmerman, 2000). Most of these studies have explored students enrolled in postsecondary school; relatively few studies have been conducted examining this phenomena for students in the secondary grades (U.S. Department of Education, 2010, Frank, et al., 2003). This is a particularly important distinction when inferring findings from postsecondary students to secondary students due to the characteristic differences between these two populations, emotionally, behaviorally, cognitively, and contextually. This study seeks to add to the body of research on the relationship between SRL and the academic performance of secondary students in an asynchronous digital learning environment, and its association with digital learning readiness.

Limitations

1. The study is subject to all limitations recognized in collecting data by an online survey.
2. The surveys used to collect data relied upon self-reported data that may not be consistent with other objective measures.

3. The survey return rate (n=121) was less than what is recognized as an appropriate sample size out of the population of N=433. (Krajcie & Morgan, 1970).

4. Data collected in this study reflect overall student academic performance score within an online economics course in summer of 2013 created by a state online provider aligned with the state standards, which is unique to that state.

5. The state virtual school designed the end of course survey used in this study, and reflect its specific interests in course improvement.

Delimitations

1. Findings of this study are limited to data collected from the state online provider, and do not include data from private online providers.

2. This study is delimited to sample data from a group of junior and/or senior high school students taking an online economics course in the summer of 2013 and not intended to infer results to the population of Idaho students taking online courses at other times.

3. The instrument used to assess self-regulation and self-motivation (MSLQ) was intended to be discipline specific, and not intended to cross disciplines (Wolters, Pintrich & Karabenick, 2003).

Assumptions

1. Participants responded in an honest and truthful manner to the questions in the MSLQ and EOCQ.

2. The variable constructs for self-regulation (control and cognitive strategy use) and self-motivation (self-efficacy, intrinsic value, and test anxiety) are reliable

Definition of Terms

The following list describes and defines the concepts and terms used throughout this study:

Asynchronous learning. Communication exchanges which occur in elapsed time between two or more people. Examples are email, online discussion forums, message boards, blogs, podcasts, etc. (iNACOL, 2011. p. 3)

Blended learning: Any time a student learns at least in part at a supervised traditional school environment away from home and through online delivery with some element of student control over time, place, path, and/or pace; often used synonymously with *Hybrid Learning*. (iNACOL, 2011. p. 3)

Causal attribution: Beliefs about the cause of one's errors or successes. (Zimmerman, 2002, p. 68)

Computer Assisted Instruction (CAI): The use of educational software to enhance the mastering of educational concepts or standards without the involvement of a teacher. (iNACOL, 2011. p. 4)

Cognitive strategy use: Active cognitive engagement in the tasks in terms of their use of rehearsal, elaboration, and organizational strategies. (Pintrich, 2000, p. 546)

Credit recovery: Refers to a student passing, and receiving credit for, a course that he/she previously attempted but did not succeed in earning academic credit towards graduation. (iNACOL, 2011. p 4)

Cyberschool: A full-time online school have full-time online students, and are typically responsible for ensuring students take annual state assessments. (Watson, et al., 2013 p. 9)

Digital Learning: Another term for *online learning* or *blended learning*. (iNACOL, 2011. p. 5)

Distance education: A term for any type of educational activity in which the participants are at a distance from each other; separated geographically. They may or may not be separated in time (*asynchronous vs. synchronous*). (iNACOL, 2011. p. 5)

Goal orientations: Reasons that a learner engages in the activity, in other words *why* are they engaged in this activity (Schunk, 2005)

Expected achievement*:* Analogous to expectancy goal and refers to a learner's beliefs about how well he will do on an immediate task or expectations for future goals (Eccles & Wigfield, 2002; Wigfield, 1994)

Forethought Phase: Processes and beliefs that occur before efforts to learn comprised of task analysis and self-motivation beliefs (Zimmerman, 2002, p. 67)

Full-time online program*:* Full-time online schools, also known as cyber schools and fully online schools, with students enrolled primarily (often only) in the online school. (iNACOL, 2011. p. 6)

Intrinsic interest: refers to the learner's valuing of the task skill for its own merits (Zimmerman, 2002, p. 68)

Intrinsic value: See *Intrinsic interest* (Pintrich & DeGroot, 1990, p. 35)

Internet: A vast computer network connecting users worldwide via TCP/IP protocol. (iNACOL, 2011. p. 6)

Metacognition: The awareness of and knowledge about one's own thinking. (Zimmerman, 2002, p. 65)

Multi-district program*:* An online program provided by a *state virtual school* that serve students from multiple districts. (Watson, et al., 2013. p. 9)

Online course: Any course offered over the Internet. (iNACOL, 2011. p. 7)

Online course provider: An organization that provides courses that are offered over the Internet. (iNACOL, 2011. p. 7)

Online learning (aka: *distance learning, e-learning*): is defined as courses that are delivered to the student using the Internet as a mode of course delivery. (iNACOL, 2011)

Online school: A formally constituted organization (public, private, state, charter, etc.) that offers full-time education delivered primarily over the Internet. (iNACOL, 2011. p. 7)

Perceived control (Control): General expectancies about whether goals are controlled by one's behavior or external forces: internal local of control should support self-directed action and external locus of controls should discourage action. (Zimmerman, 2000, p. 85)

Performance Phase: Involving two sub-processes: self-control and self-observation. It is the process in Zimmerman's 2002 framework of the self-regulated learner when the self-regulated learner engages in self-control, using learning and monitoring strategies and prior knowledge upon which to build new content (Zimmerman, 2002, p. 67)

***Self-control**:* The deployment of specific methods and/or strategies that were selected in the *forethought phase* (Zimmerman, 2002, p. 68)

Self-efficacy: An individual's beliefs about his or her abilities to accomplish a task; it is not concerned with the amount or quality of skills one possesses, but rather what a person believes he or she can achieve with the skills he or she possesses (Bandura, 1977)

Self-evaluation: Comparisons of self-observed performances against some standard, such as one-s prior performance, another person's performance, or an absolute standard of performance. (Zimmerman, 2002, p. 68)

Self-reflection phase: Involves two sub-processes: self-judgment and self-reaction. It is the process in Zimmerman's 2002 framework of the self-regulated learner, which occurs after the task has been completed. The self-regulated learner engages in self, task evaluation, and determines whether the process and results were satisfactory. (Zimmerman, 2002, p. 67)

Self-regulation: is defined as the "process of setting goals for oneself and engaging in behaviors and cognitive processes that lead to goal completion" (Ormrod, 2006, p. 347)

Self-regulated learner: One who can undertake "the process by which learners personally activate and sustain cognitions, affects, and behaviors that are systematically oriented toward the attainment of learning goals" (Schunk & Zimmerman, 2008, Preface)

Self-regulated learning (SRL): Actions directed at acquiring information or skill that involve agency, purpose, and self-perceptions by a learner. (Zimmerman & Martinez-Pons, 1986, p. 615)

Single- district program: An online program provided by the *state virtual school* that serves students who reside within the district, although some programs may serve a small number of students outside of the home district. (Watson, et al., 2013, p. 9)

State virtual schools: Created by legislation or by state level agency and/or administered by a state education agency, and/or funded by a state appropriation or grant for the purpose of providing digital learning opportunities across the state. (Watson, et al., 2013. Definitions)

Supplemental online programs: An online program that provides a small number of courses to students currently enrolled in a school separate from the online program. (Watson, et al., 2013, p. 5)

Synchronous learning: Digital learning in which the participants interact at the same time and in the same space. (iNACOL, 2011, p. 9)

Task analysis: Involves goal setting and strategic planning. (Zimmerman, 2002, p. 68)

Task value beliefs: Personal beliefs about the importance, utility, and relevance of the learning and/or task. (Pintrich, 2004, p. 395)

Test anxiety: Student's worry and concern about doing well on exams (An emotional response that is measured on the MSLQ instrument). (Pintrich, 2004, p. 397)

Time management: Involves making schedules for studying and allocating time for different activities. (Pintrich, 2004, p. 398)

Virtual class: A group of students assigned to the same online course. (iNACOL, 2011, p. 9)

Virtual school: See *online school*." (iNACOL, 2011, p. 9)

Web-based education: See *digital learning*. (iNACOL, 2011, p. 9)

Chapter 2: Review of Literature

A critical review of existing published research literature serves several important functions for any research study. After identifying an area of focus, the researcher engages in a review of literature in order to identify and synthesize existing related research, which ultimately provides insight into gaps that might exist within the literature base and areas of needed research. Identifying research needs allows a meaningful focus to be identified and serves as a justification for the value of the study. According to Arlene Fink (2010), literature reviews can be approached using these elements a) after choosing the area of focus, the researcher then selects a bibliographic database to search for relevant articles, books and other material, such as dissertations, (b) the research selects key words or phrases based upon the main ideas in the research questions, (c) screen articles using methodologies that help narrow the relevant material appropriate to the research question; in other words, engage in monitor quality of articles and, (d) synthesize the selected relevant material, checking for current articles into the descriptive review. This chapter reviews the literature related to secondary students' level of self-regulation and self-motivation within an asynchronous digital learning environment, and the correlation to academic performance.

One of the most studied areas in educational research are instructional designs that include learning strategies and techniques that might improve academic performance of students. To this end, educational researchers began to analyze the separate sub-processes of self-regulation that were being used by psychologists to help their patients modify maladaptive behavior for possible use in the self-regulation of learning (Casey, 2008; Zimmerman, 2008). Social-cognitive theorists developed taxonomies that divided the sub-processes of self-regulation of learning into different phases and sub-processes, and further

discovered a relationship between self-regulated learning (SRL) and student performance (Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003; McCombs & Marzano, 1990; Pintrich, 2000a; 2000b; 2004; Schunk, 1984; Zimmerman 2008; 2002, 2000). As a result of these findings, interest in SRL increased among academic scholars to better understand SRL within the academic setting (Casey, 2008; Zimmerman, 2008). Paul Pintrich and other researchers developed similar theoretical frameworks of SRL by dividing the components into phases or processes observed in students during a learning episode (1) forethought (or planning), (2) monitoring, (3) control and, (4) reflection. A learning episode was defined as a situation where a person is "invited, coached, or coaxed to display context-specific, goal-directed learning behavior" (Boekaerts & Niemivirta, 2000, p. 418). Paul Pintrich's (2000b, 2004) framework also included four areas for regulation that were associated with each phase: (1) cognition, (2) motivation, (3) behavior, and (4) context (Table 1) Using this framework, Pintrich sought to develop an instrument capable of measuring the sub-processes of SRL (Pintrich, 2000b, 2004).

Table 1

Phases and areas for Self-Regulated Learning

SRL Phases	Areas for Regulation			
	Cognition	Motivation/Affect	Behavior	Context
One: Forethought, planning, and activation	Target goal setting Prior content knowledge Metacognitive knowledge activation	Goal orientation adoption Efficacy judgments EOL judgments, perceptions of task difficulty Task value activation Interest activation	Time and effort planning Planning for self-observations of behavior	Perceptions of task Perceptions of context
Two: Monitoring	Metacognitive awareness and monitoring of cognition JOL and FOK judgments	Awareness and monitoring of motivation and affect	Awareness and monitoring of effort, time use, need for help	Monitoring changing task and context conditions
Three: Control	Selection and adaptation of cognitive strategies for learning, thinking	Selection and adaptation of strategies for managing motivation and affect	Increase/decrease effort Persist, give up Help-seeking behavior	Change or renegotiate task Change or leave context
Four: Reaction and reflection	Cognitive judgments Attributions	Affective reactions Attributions	Choice behavior	Evaluation of task Evaluation of context

Pintrich, P.R. (2000b). Phases and areas for self-regulated learning. Handbook on Self-Regulation (p. 454)

SRL was also observed to promote student autonomy, shifting the responsibility of learning from the teacher to the student (Weinstein, 1987). Learning autonomy is an important goal for all students in any learning environment, but is particularly important within the

asynchronous digital learning environment. Digital learning is considered an autonomous learning environment where students must act independently during learning episodes. SRL has been shown to increase the probability of successfully achieving learning goals in this environment (Azevedo, Moos, Greene, Winters, & Cromley, 2008; Sansone, Fraughton, Zachary, Butner & Heiner 2011; Tsai, 2009; Winters, Greene, & Costich, 2008). Many of the studies that have analyzed SRL within the digital learning environment, however, have used college students as its subject population; there have been fewer studies in this area on secondary students (Foundation for Excellence in Education, 2011). This is an important distinction for educators when applying findings from studies using post-secondary students to secondary students. These two populations are quite different in the four areas for regulation as delineated in Pintrich's (2000b) SRL framework (Table 1), specifically (1) cognition, (2) motivation, (3) behavior and, (4) context (Pajares, Johnson & Usher, 2007). For this study, these areas for regulation in secondary students enrolled in an online economics course were analyzed to determine whether SRL had a contributory and/or predictive effect on academic performance, and could infer digital learning readiness.

The following literature review seeks to support the relevance of my research study by describing (a) the emerging landscape of digital learning in K-12 grades, particularly in high schools, and (b) the historical and current research on SRL in the traditional and digital learning environments, and (c) a review of the literature on the academic, emotional, and behavioral profile of secondary students was conducted to explore the claim in previous studies that secondary students have academic challenges unique to that period of human development, adolescence (Eccles, 1999; Wang & Eccles, 2012). Through these descriptions it is believed that the concerns expressed by parents and academics that secondary students

may not possess the appropriate skills and abilities to meet the challenges specific to the asynchronous digital learning environment may be valid. Chapter 2 is organized into four main sections (a) the emergence of K-12 digital learning, (b) self-regulated learning, (c) SRL and digital learning, and (d) SRL in secondary students.

The Emergence of K-12 Digital learning

Digital learning, the more comprehensive term that is now used to describe distance, online and/or blended learning, has evolved over time to meet the needs of students, districts and policy-makers (Watson, Pape, Murin, Gemin & Vashaw, 2014). Digital learning first began in the 19th century as *correspondence courses* delivered through the mail (Casey, 2008). The Phonographic Institute in Cincinnati, OH, developed the first distance course in 1852, when it mailed instructional courses in stenography to its students using the U.S. postal service (Casey, 2008). The delivery method for distance courses evolved with technological advances during the next few decades and the institutions that created these courses broadened into the more traditional academic fields (Casey, 2008). The emergence of the Internet in the early 1990's provided academic institutions with a new tool to support distance education. In 1993, The Higher Learning Commission recognized Jones International University in Colorado as the first institute of higher learning that provided fully online instruction to its undergraduates and graduates (Casey, 2008).

The Department of Defense (DOD) was instrumental in its contribution to the development of digital learning programs. Since 1976, the U.S. Army Training Support Center (ATSC) in Virginia has been providing instructional correspondence courses to individuals interested in skills building and/or promotion within the ranks (Duncan, 2005). In 1997, working with the U.S. government's Office of Science and Technology, the DOD

launched the Advanced Distributed Learning Initiative (ADLA) that utilized technological advancements to deliver online courses (Duncan, 2005). There were three key reasons for the interest and growth of digital learning, (a) access to a course regardless of the distance between students and learning institutions, (b) the students' quest for continued learning; and most significantly, (c) the evolution of modern technology (Casey, 2008). From the modest beginnings as correspondence courses delivered through the mail, modern digital learning programs now offer individuals an alternative mode of course delivery across a vast geographical plane as well as accessing a cadre of degree options from colleges and universities (Casey, 2008). This growth is seen in institutions for higher learning, as well as K-12 schools of every kind, public, charter, and private.

A group of researchers known as the Evergreen Education Group (EEG) has collected data from educators and researchers around the United States since 2004, to publish its report on the current state of digital learning (Watson, et al., 2014). In its first published report, John Watson of the Evergreen Consulting Associates worked with two other researchers, one from the University of Denver and the other from the Colorado Department of Education, to collect data on the state of K-12 digital learning policies. The EEG collected the data through telephone interviews, literature reviews and Web-based research (Watson, Winograd, & Kalmon, 2004). At that time, the researchers collected data from 22 states based upon certain criteria, such as population density and student demographics. It was found that digital learning was growing rapidly but without clear policies and regulations in place (Watson, Winograd, & Kalmon, 2004). The National Association of State Boards of Education warned, "In the absence of firm policy guidance, the nation is rushing pell-mell toward an ad hoc system of education that exacerbates existing disparities and cannot assure a high standard of

education across new models of instruction" (Watson, Winograd & Kalmon, 2004, p. 3). In 2005, EEG collected data from 50 states and reported that most online programs were still being run without clear policies and procedures, depending instead on the individual program developers to ensure quality (Watson, Kalmon, & Passamaneck, 2005). In 2009, the EEG continued to report on the need for policymakers to develop a model of online and/or blended learning that could guide further development of this new increasingly popular learning environment (Watson, Murin, Vashaw, Gemin, & Rapp, 2010). In 2011, the EEG reported some states had passed laws to regulate policies for digital learning, primarily in response to the 2010 initiative *Digital Learning Now* (Watson, Murin, Vashaw, Gemin, & Rapp, 2011).

In 2010, Former Florida Governor Jeb Bush, founder and Chairman of the Board for the Foundation for Excellence in Education (FFEE), brought 100 leaders together from diverse backgrounds in education, government, business, technology, and philanthropy to focus on ways to reform and transform this country's public schools using technology. This assembly, the Digital Learning Council (DLC) published its ten recommendations for high quality digital learning in a report entitled *Digital Learning Now* in December of that year (Foundations for Excellence in Education, 2010). Among those recommendations were for educators to embrace the edict that "all students are digital learners" (FFEE, 2010, p. 6) who should have access to quality courses delivered online through a cadre of highly qualified service providers in order to provide a more student-centered approach to academic progress (FFEE, 2010). In its report, the DLC stated, "[d]igital learning offers the potential for students to study at their own pace and advance based upon competency and mastery of the material" (FFEE, 2010, p. 9).

The DLC (2010) criticized the K-12 public school system in the United States with charges that education had remained unchanged since the 1950's and no longer reflected the society from where they drew its students. They found that U.S. students still sat in brick and mortar school buildings, reading outdated textbooks for a "set number of hours on a set number of days based primarily on an agrarian calendar" (FFEE, 2010, p. 4). The DLC cautioned against random policy restrictions for online courses, such as limits for course enrollment or arbitrary budget constraints and challenged public schools to transform classrooms through technology and implement digital learning in grades K-12 to meet the needs of the modern student (FFEE, 2010).

The DLC was not alone in its quest for digital learning to become a common mode of course delivery throughout the K-12 schools in the United States. President Obama and his administration supported the trend of integrating technology into every classroom across the United States. The U.S. Department of Education called for a transformation in the public school system by integrating technology into K-12 classroom instruction. On November 9, 2010, Arne Duncan, the U.S. Secretary of Education, unveiled the U.S. Department of Education's plans for digital learning in the nation's K-12 schools in its report, *Transforming American Education Learning Powered by Technology.* In it, Duncan called for a "revolutionary transformation" of our schools (U.S. Department of Education, 2010, p. 1). The report included a learning model, empowered through technology, that would bring "state of the art technology into learning to enable, motivate, and inspire all students, regardless of background, languages, or disabilities to achieve" (U.S. Department of Education, 2010, p. 1).

The *Transforming American Education Learning Powered by Technology* report (2010) also suggested that core national standards be developed that incorporate modern

technology into every discipline (U.S. Dept. of Ed., 2010). At the time of the report, the movement to develop Common Core State Standards (CCSS) had already begun. The CCSS initiative was supported by state governors, educators and commissioners, and by 2013, 43 states had adopted the CCSS, which integrated modern technology throughout every grade level and within every core academic subject. The Center for Public Education National School Board Association's 2012 publication, *Searching for the Reality of Virtual Schools*, may have said it best "[t]he place of digital content in public education is therefore not a matter of debate; it is inevitable" (p. 1).

The Landscape of K-12 Digital Learning in 2014

There are several types of K-12 digital learning programs. They often vary from one district to another and from one state to another. These programs may be delivered by a single district, a group of many districts that are located near each other (a *consortium*), or by a public agency (*state virtual school)*. Digital learning can be accessed in real time with a teacher present, (*synchronously*), or time delayed with a teacher in separate locale, (*asynchronously*). High schools provide students more access to digital learning than elementary and middle schools, and it is in this environment where asynchronous digital learning is often found (Watson, et al., 2014). The diverse landscape of digital learning, course delivery, and course type is illustrated by this partial list:

- At the beginning of SY 2014-15 there were 26 states with fully online state virtual schools that served over 740,000 of the overall course enrollments; reflecting almost three quarters of students enrolled in digital learning across the U.S. (see Figure 2) (Watson, et al., 2014). State virtual schools are created and/or funded by legislation or state-level

agency and have become a vital online provider in emerging K-12 digital learning landscape (Watson, et al., 2014);

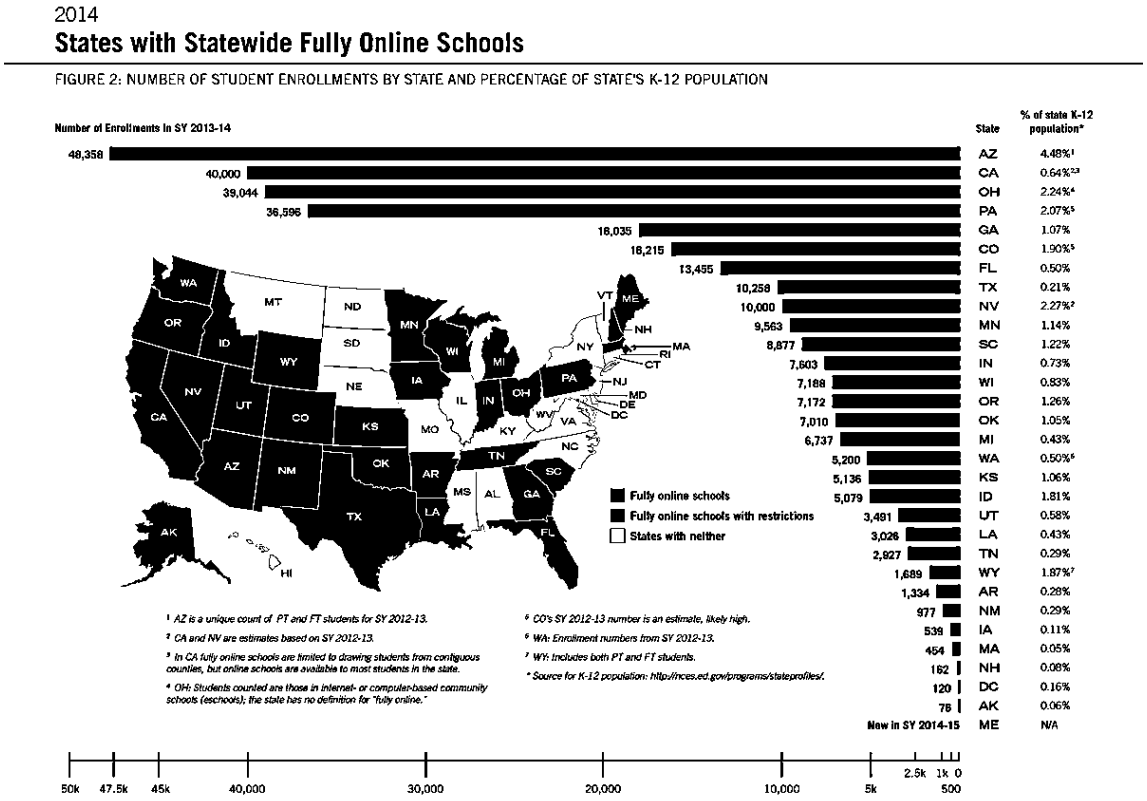

Figure 2. Number of student enrollments by state

Note: Fully online schools are defined as schools that operate without much of an onsite component, if any, that draws students from a large geographic area, with open access to enrollment. Fully online schools with restrictions are defined as schools that operate without much of an onsite component, if any, that draws students from a large geographic area, with certain statewide restrictions, e.g. enrollment cap. Adapted from *Keeping Pace 2014* (Watson, et al., 2014).

- Private and charter schools increased access to online courses as fully online schools or supplemental online courses within the daily schedule (Watson, et al., 2014). Supplemental online courses have become an integral part of the digital landscape across the United States in all school types. Supplemental online courses generally are courses available only to students within the jurisdictional district, designed and

provided either by district employees, a consortium of schools districts, or the state virtual school (Watson, et al., 2014);

- 30 states support multi-district fully online schools, with over 315,000 student enrollment, a 6.2% increase from SY2013-14 (Watson, et al., 2014). In SY2013-14, EEG reported a 13% increase in enrollment for multi-district fully online schools from SY2011. Multi-district fully online schools offered online programs delivered through a public agency, such as a state virtual school that provided students from many districts access to online programs aligned with the grade level curriculum (Watson, et al. 2013);
- Single-district online schools were a growing category allowing students within its district access to blended learning designed and provided by instructors employed by the district (Watson, et al., 2013). Blended learning combines the digital learning with traditional requirements such as mandatory physical attendance for its students during the school year. Blended learning is described as "anytime a student learns at least in part at a supervised traditional school environment away from home and through online delivery with some element of student control over time, place, path, and/or pace" (iNACOL, 2011, p. 3). Complete data regarding online programs in single districts can be difficult to track because of the lack of mandated reporting on student enrollments specific to digital learning, separate from the enrollment numbers for traditional school districts (Watson, et al., 2013);
- Eleven states provided students the option of choosing which online course provider to use to deliver its course choice programs (Watson, et al., 2014);

- A few districts created a consortium program. The Wisconsin eSchool Network, (WEN), a non-profit organization and one of the oldest and largest consortium programs in the United States partnered with nineteen other school districts in the state to create a consortium that offered access to digital learning (Watson, et al., 2013). EEG reported on at least four other states that use the consortium model (Watson, et al., 2013).

Digital Learning is a growing phenomenon, however, not all K-12 students have access to digital learning, and only 16% of the total number of K-12 students in the United States are enrolled in any of the forms of digital learning (Watson, 2014). According to Watson, et al. (2013), "[w]hether or not a student has access to high-quality online and blended learning options depends on a variety of factors, including state policy; availability of statewide, regional and local programs; whether that student is public, private, or homeschooled; and what grade levels are served by which options" (p. 7).

It is apparent that there is a transformative movement to reform the teaching platform in K-12 schools in the United States through the integration and implementation of technology as a learning tool. Legislators, administrators, and educators understand the need for this transformation given the changing landscape of the 21st century world of business, expectations in new academic core standards, and daily life. Access to asynchronous and synchronous digital learning in K-12 schools provides a gateway for meeting these expectations; however, it is important to ensure that these students are prepared to engage independently in their own learning so that they are successful in this new learning

environment. SRL provides students the skills, confidence, and strategies that promote the kind of learning autonomy that aligns with asynchronous digital learning.

The Theory of Self-Regulated Learning

A foundational goal in teaching is the transfer of responsibility for learning onto the student and away from the instructor so that the student attains the self-skills necessary to be a life-long learner and a self-sufficient, productive citizen. Researchers in the areas of health, psychology, and education found that when individuals are able to self-regulate cognitive and behavioral processes there is an increased likelihood in their ability to attain the desired goal (.Pintrich, 2000a, 2000b; Schunk, 2005; Zimmerman, 2002) The by-product of self-regulation is a self-awareness of the sequential processes in goal attainment. (Pintrich, 2000b; Zimmerman, 2008). Academic researchers looked for ways SRL contributed to student performance, and discovered a relationship between SRL and increased academic performance for students within both traditional classroom environments and digital learning programs (Pintrich, 2000a, 2000b; Schunk, 2005; Winters, Greene, & Costich, 2008; Zimmerman, 2002). Scholars found strategic instruction in self-regulation were shown to increase SRL and promote independent, self-confident learners, capable of meeting the challenges in everyday tasks, and academic expectations (Acee, T.W., 2009; Weinstein, C.E., 1987).

The History of Self-Regulated Learning

The term self-regulation originated in the 1970's, and found in personality and social psychology journals. Self-regulation referred to the proactive state one takes to solve the problems confronted in daily life, by regulating cognition and behavior purposefully to achieve goals, while reducing or removing obstacles (Leventhal, Brissette, & Leventhal,

2003). Self-regulation was viewed synonymously with self-discipline and empowerment in goal attainment, whether in athletics, health, or organization (Leventhal, Brissette, & Leventhal, 2003). Clinicians and/or therapists in areas of health and organization, for example, would provide patients with strategies in self-control, self-awareness, and self-correction to enable them to lead productive lives and/or overcome impediments to their desired goal. Although scholars held different views of self-regulation, there was an overall belief that it was a complex, multi-layered construct "highly relevant to the science of the mind and human behavior" (Boekaerts, Pintrich & Zeidner, 2000, p. 35). Self-regulation continues to be vital part of the landscape in social sciences, due in part to "efforts at maintaining a sense of individual autonomy in the face of technological changes and monopolistic, corporate conglomerates that are actually shrinking the individual's options" (Leventhal, Brissette & Leventhal, 2003, p. 42). This sense of individual autonomy elicits feelings of self-empowerment and self-efficacy, abilities shown to drive self-motivation in students toward goal attainment, in and out of the classroom environment.

Academic researchers, such as Claire Weinstein and Monique Boekaerts used the psychological strategies for self-regulation to develop learning strategies such as self-control, recording, imagery, goal setting and monitoring for individual students based upon. McKeachie, Pintrich, and Lin (1985) believed the most important goal in education was to empower students with the ability to use effective strategies to adapt and regulate cognitive and metacognitive practices that will enable them to tackle higher ordered learning goals. Therefore, in controlled environments, he and his colleagues conducted studies focused on developing a more holistic instructional program aimed at increasing autonomy in learners (Zimmerman, 2008). Pintrich and his colleagues found students demonstrated increased

learning capacity when taught explicit metacognitive and cognitive strategies during learning episodes, such as rehearsal, elaboration, and imagery (McKeachie, et al., 1985).

The researchers also observed that while students displayed SRL in laboratory situations, this skill did not appear to transition to the classroom environment. Pintrich found in studies conducted outside of the controlled laboratory environment that student use of SRL was "guided and constrained by [learners] goals and the contextual features in the environment" (Pintrich, 2000b, p. 453). He and his colleagues discovered that teaching students cognitive and metacognitive strategies alone was only part of the answer for increasing autonomy and capacity in learning; students needed to learn affective strategies to maintain self-motivation and effort within contextual features found in the learning environment. They discovered self-beliefs, behavior control, and self-motivation played key roles in determining students' use of these self-regulated learning strategies in the classroom (McKeachie, et al., 1985).

In an effort to establish a more cohesive and unified understanding of self-regulated learning, recognized scholars from diverse areas of psychology and education came together for a seven-day conference at Leiden University in The Netherlands (Boekaerts, Pintrich & Zeidner, 2000). In support of continuing this effort, scholars met at the 1986 American Education Research Association conference to explore SRL further. Some of the findings from this conference were published in a special publication entitled *Contemporary Educational Psychology* (Zimmerman, 2008). Scholars who took part in this event included foundational theorists of SRL, among who were Barry Zimmerman, Dale Schunk, Barbara McCombs, and Paul Pintrich (Zimmerman, 2008). Each of these scholars brought information specific to their area of expertise relative to SRL. Scholars mutually agreed to the general

definition of SRL as referring to "the degree to which students are metacognitively, motivationally, and behaviorally active participants in their own learning process" (Zimmerman, 1986). Academic researchers in social-cognitive theory, such as Schunk, Pintrich, and Zimmerman, believed that the effectiveness of SRL during the learning process was reliant on three interacting, cyclical factors: internal/personal, behavioral/affect, and external/context (Schunk and Ertmer, 2000). Academics divided SRL into separate sub-processes enabling focused studies, including the development of theoretical models of SRL, and different instruments to measure the sub-processes of SRL aligned with the designing scholars' interpretations and focus (Pintrich, 2000b, 2004; Winne & Hadwin, 1998; Zimmerman, 2004, 2008).

Different researchers focused on different questions for SRL engagement, why, what and how (Reeve, Ryan, Deci, & Jang, 2008). "Why" researchers sought the catalyst for student activation of SRL (i.e., was the student regulating his/her behavior based upon a personal goal (autonomous)), or a goal that was set by others (controlled) (Reeve et al., 2008)? What" researchers sought to identify the motivating factor(s) for the student's ongoing use of SRL; was it intrinsically or extrinsically motivated (Reeve et al., 2008)? "How" researchers studied the various learning strategies that were utilized during the learning episode (Reeve et al., 2008). Answers to some of these questions suggested that students who regulated their behavior based upon an intrinsically motivated, autonomous perspective demonstrated consistent use of SRL resulting in successful goal attainment, whether personally or extrinsically set (Reeve, et al., 2008)

Although different scholars focused on the different questions, most researchers agreed on the following four assumptions for SRL (Pintrich, 2000b; 2004):

- Learners are actively engaged in their own learning process, and not passive observers. They construct their own meanings, plan their own goals, and manipulate their environment to attain their goals;
- Learners have the potential to control and monitor their cognition, motivation and behavior. This assumption does not mean that all learners activate this potential, but that they have that potential;
- Learners have a standard or prototype of the ideal standard goal they wish to attain and by which they use as comparison as they work toward that goal. This monitoring results in making revisions or changes should their progress indicate possible goal deficits;
- Learners use self-regulatory practices as mediators between learner characteristics, contextual characteristics, and academic performance. In other words, there is an assumption that self-regulatory learning is linked with academic achievement and performance.

In summary, SRL was regarded as a proactive approach to learning rather than a reactive approach (Zimmerman, 2002). The proficient self-regulated learner was characterized as self-efficacious, with the ability to control personal, behavioral, and contextual factors when working toward goal attainment (Pintrich, 2000b; 2004; Zimmerman, 2002). The proficient self-regulated learner would be undaunted by difficulties or challenges within a task, and would instead engage in cognitive and metacognitive strategies to monitor and/or revise task plans to achieve the ideal standard goal (Pintrich, 2000b; Zimmerman, 2002). The important final phase in SRL was the self-reflection process. Self-reflection could motivate or

prevent continued use of SRL when faced with similar tasks in the future based upon the proficiency and confidence of the self-regulated learner (Pintrich, 2000; Zimmerman, 2002).

Development of the SRL Theoretical Framework

Educational researchers observed learners as they worked toward self-selected or teacher-generated goals in classroom and laboratory settings (Pintrich, 2000b; Winne, 1997; Zimmerman & Martinez-Pons, 1986). Researchers divided the observed elements into separate stages/phases such as goal-setting, progress monitoring, controlling internal and external impediments, and finally self-reflection (Pintrich, 2000b, 2004; Schunk, 2005; Winne & Hadwin, 1998; Zimmerman, 2002; Zimmerman & Martinez-Pons, 1986). In an effort to develop instruments to measure SRL using findings from their own research and those from others, Zimmerman (2002) and Pintrich (2000b, 2004) individually developed two separate but similar theoretical frameworks of SRL that contained interactive, cyclical phases observed during learning episodes. Pintrich's (2000b) framework contained four phases, or processes, in learning, while Zimmerman's 2002 framework contained three phases (Figure 3).

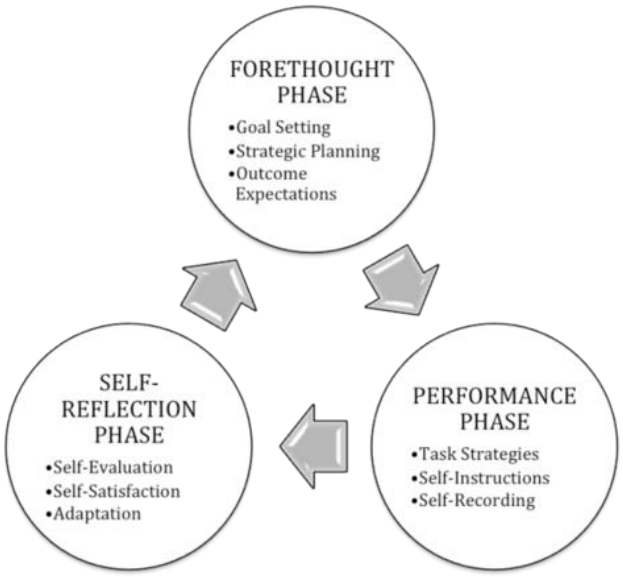

Figure 3. Phases and sub-processes of self-regulated learning. *Retrieved from: http://hstrial-jerome_gage8861.homestead.com/*

Note: This process is cyclical and not hierarchical in importance.

Zimmerman combined two of the phases in Pintrich's framework, monitoring, and control, into one phase, Performance. Even Pintrich (2004) acknowledged that data from some studies indicated many learners did not demonstrate that these two phases to be separate processes in learning. Pintrich and others saw monitoring and control as two separate processes, and continued to use these two separate phases in their studies (Pintrich & DeGroot, 1990, Schunk, 2005). It could be concluded from the researchers' own words describing the tasks involved in each of the phases set forth in their separate SRL models, that although dissimilar in appearance and terminology, perhaps when describing the phases within a learning episode the dissimilarities of the phases are slight (Zimmerman, 2002).

Paul Pintrich's (2000b) SRL framework set out four phases of the learning process: (1) Forethought/planning, (2) Monitoring, (3) Control and, (4) Reflection/reaction. Within those phases, four areas for regulation were included (1) Cognition, (2) Motivation/affect, (3)

Behavior and, (4) Context (Table 1). Both scholars agreed that after the first phase for goal setting and planning, the self-regulated learner would engage in regulating cognitive and metacognitive strategies and behavior control as they progress toward their ideal standard goal, constantly alert for any internal or external obstacles to goal attainment in order to make appropriate revisions to the initial plan. Both scholars also described the last phase as the self-reflective and reactive phase self-regulated learners use to determine the success or failure in attaining the ideal standard goal.

Pintrich (2000b) stressed that the four phases during the learning process/episode were not hierarchically structured, or necessarily required during less extrinsic learning episodes. Instead, this framework was to be used as a model to organize and further add to SRL research (Pintrich, 2000b). The phases should not be considered linearly structured either, and that the self-regulated learner could revisit any phase through self-observation and progress monitoring (Pintrich, 2000b). The three columns designated as "Areas for Regulation" (Table 1) represented the "traditional tripartite division" (p. 455) of psychological functioning (Pintrich, 2000b). These areas were dependent on the learner's self-perception of their abilities to regulate their cognition, motivation/affect, and behavior relative to the task(s) at hand (Pintrich, 2000b). The context area for regulation referred to the learner's perceived control to manipulate the environment in order to promote learning (Pintrich, 2000b).

The Phases of Self-Regulated Learning

The first phase, Forethought, referred to as the development and planning phase. In this phase, the learner would gauge prior content knowledge and known learning strategies to be applied to construct a reasonable and attainable ideal standard goal (Pintrich, 2000b, 2004; Zimmerman, 2002). It was further theorized that the selected the ideal standard goal was also

based upon the learner's perceived self-efficacy in goal attainment, and personal interest, intrinsic value to achieve the goal (Pintrich, 2000b, 2004; Zimmerman, 2002).

The Monitoring phase addressed the learner's constant and candid self-monitoring and progress monitoring during the implementation of the plan that had been developed during the first phase (Pintrich, 2000b, 2004). This deliberate monitoring allowed the learner to assess whether the plan was working or required a return to the first phase to revise the plan (Pintrich, 2000b, 2004). Monitoring included assessing whether the self-selected strategies were appropriate to the task or should be changed to meet the specific challenges in the task. It also included assessing whether the ideal standard goal selected was above or below the learner's perceived abilities and interest based upon the progress being made toward that goal (Pintrich, 2000b, 2004; Zimmerman, 2002).

The Control phase related to the learners' management, perseverance, control, and maintenance of effort during the process of goal attainment (Pintrich, 200b, 2004). One of the areas in the control of the learner would be the learning environment, which could be modified by removing obstacles and/or distractions that could impede the learning process (Pintrich & DeGroot, 1990; Zimmerman, 2002). A second area in the learner's control would be the level of motivation that was found to ebb and flow based upon possible frustrations or challenges the learner experienced during the learning episode (Pintrich, 200b, 2004. A third area under the control of the learner would be through sustained self-observation and self-control of behavior, with the willingness to candidly assess whether changes in effort or perseverance strategies should be implemented (Pintrich, 2000b, 2004; Zimmerman, 2002).

The last Reflection phase in both SRL framework referred to the learner's reaction to the goal attained and was important in the learners' sustained use of SRL for future academic

tasks. After the proficient self-regulated learner has reached his/her goal, there is a self-reflection period, a period that has an emotional reaction component (Pintrich, 2000b). The emotional reactions could range from satisfaction and happiness to shame and self-doubts. If the result were assessed as satisfactory, the proficient self-regulated learner would continue to engage in SRL for future tasks, because confidence in the process and self-efficacy had both been increased. If the proficient self-regulated learner perceived the goal was not satisfactorily met, s/he would determine the point where the plan/process broke down in order to find a solution to apply at that point in the future when confronted by a similar task. If, however, the self-regulated learner were a novice self-regulated learner, the SRL process would be assessed as an overall failure, and/or attribute the failure on external causes. There would be a high likelihood that the student would not use SRL processes and/or its strategies for future tasks (Pintrich, 2000a, 2000b, 2004; Zimmerman, 2000, 2002, 2004).

Many social-cognitive theorists agree that the phases in the SRL framework for learning are interactive and cyclical and can be initiated and revised throughout learning episodes (Bandura, A., Caprara, G.V., Barbaranelli, C., Gerbino, M., & Pastorelli, C, 2003; Pintrich, 2000b, 2004; Zimmerman, 2002). Bandura (1996) and (Zimmerman (2000) described the impact SRL dysfunctions had not only in academic settings but also in goal attainment. Zimmerman referred to this dysfunction as reactive self-regulation, stating that the learner had poor motivational beliefs, such as low interest value or perceptions of low abilities for the task (Bandura, 1996; Winne, 1997; Zimmerman, 2000). To compound these concerns, Philip Winne (1997) found students were not taught how to be self-regulating in classrooms across the United States. This omission leads to diverse abilities and/or reactive self-regulated learning in primary and secondary students (Table 2).

Table 2

Self-Regulatory Sub-processes of Novice and Proficient Learners

Self-regulatory phase	Classes of Self-Regulated Learners	
	Novice self-regulators	Proficient self-regulators
Forethought/planning	Nonspecific distal goals Performance goal orientation Low self-efficacy Disinterested	Specific hierarchical goals Learning goal orientation High self-efficacy Intrinsically interested
Control/Monitoring	Unfocused plan Self-handicapping strategies Goal self-monitoring	Focused on performance Self-instruction/imagery Process self-monitoring
Reflection	Avoid self-evaluation Ability attributions Negative self-reactions Non-adaptive	Seek self-evaluation Strategy/practice attributions Positive self-reactions Adaptive

Retrieved from https://crippen.education.ufl.edu/projects/PASS/Fall_2006/subprocesses_of_SRL.jpg

Note: Control and Monitoring Phases are merged into one phase as designed in Zimmerman's 2002 SRL framework

The Areas for Regulation

The four areas for regulation is learner specific and particularly impactful during the learning episode, which in turn affects the level of goal attainment and academic performance levels (Bandura, 1996; Winne, 1997; Zimmerman, 2000). Pintrich explicitly set out four areas for regulation he believed individual learners brought to any learning episode (1) Cognition, (2) Motivation/affect, (3) Behavior, and (4) Context (Pintrich 2000a, 2000b, 2004). He believed that each of these four areas determined the level of goal attainment and success in any learning episode (Pintrich 2000a, 2000b, 2004). *Cognition* was learner regulated through the selection and implementation of cognitive and metacognitive strategies during the learning episodes (Pintrich 2000a, 2000b, 2004). *Motivation/affect* was learner-regulated based upon

motivational beliefs, such as perceived self-efficacy, and/or interest value relative to the self-chosen or teacher-generated goal (Pintrich 2000a, 2000b, 2004). *Behavior* was learner-regulated through effort and persistence while working toward goal attainment (Pintrich 2000a, 2000b, 2004). Finally, *Context* was also viewed under the an area that could be learner-regulated; although a self-regulated learner may not have the ability to regulate/control every learning environment (i.e. a classroom in the traditional school environment), the learner could manipulate it to avoid distractions that affect learning, such as moving to a quieter space or removing outside noise.

Regulating cognitive strategy use.

Cognitive and metacognitive awareness develops as early as age three, and by age, four children have discovered that other's beliefs do not align with their own (Kuhn, 2000). During early childhood, children also begin to understand how they came to know what they know, in other words, the source of that knowledge (Kuhn, 2000). Social-cognitive theorists wrote that during the first phase of SRL, the self-regulated learner would activate cognitive and metacognitive strategies based upon prior experience with the content or from similar tasks (Pintrich, 2000a, 2000b, 2004; Zimmerman, 2000, 2002). That activation process may be deliberate or automatic, dependent upon the learner's level of self-regulation and the complexity of the task (Pintrich, 2000b). The proficient self-regulated learner would activate his/her memory through self-questions, cognitively and metacognitively, such as, "How much do I know about this topic?" "What strategies have I used in the past that could be applied here?" An example of a cognitive strategy would be a rehearsal strategy, such as repeating words and/or terms to increase memorization of important items. Metacognitive strategies could include using graphic organizers, imagery and/or paraphrasing content that would lead

the learner to better comprehension of the material. Pintrich and his colleagues recognized that knowledge of strategies was not enough for goal attainment; the self-regulated learner needed to self-select the best strategy at the best time during the plan in order to increase the likelihood of a successful goal (Pintrich 2000a, 2000b, Pintrich and DeGroot, 1990; McKeachie, Pintrich, & Lin, 1985).

J.H. Flavell set out three kinds of metacognitive knowledge: declarative, procedural, and conditional in his groundbreaking 1979 study on metamemory. Pintrich (2000b) used these findings to apply it to his SRL framework. Declarative knowledge was the "what" of understanding, activating prior knowledge to elicit all the possible learning strategies that could be applied in planning a successful goal (Pintrich, 2000b). Procedural knowledge was "how" the self-regulated learner would utilize the chosen best strategies for the plan (Pintrich, 2000b). Conditional knowledge referred to "when" the strategies would be used and "why" the strategies were chosen for that particular task (Pintrich, 2000b). The learner would also assess his/her level of interest and value for the task. Based upon the answers to these self-questions, the self-regulated learner would then design a plan and set an ideal standard goal.

Cognitive monitoring is less static than metacognitive knowledge; students know what they know (Pintrich, 2000b). Cognitive monitoring requires that learners make candid judgments when assessing their academic abilities, task value and subject comprehension in relation to the academic task (Pintrich, 2000b, 2002). As can be seen in Table 1, embedded in the cognitive area for regulation during the monitoring phase, Pintrich included findings from Nelson and Narens' 1990 framework for metamemory relative to a learner's self-judgments for a task; specifically, *judgments of learning* (JOL) and *feelings of knowing* (FOK). According

to Nelson and Narens (1990), an individual will make a judgment on his/her level of perceived learning mastery based upon these three judgments of learning.

If the learner could recall information independently, the JOK judgment is that s/he has achieved a level of mastery in that subject. If the learner cannot immediately recall the information, s/he would perceive a low level of JOK and/or FOK and would need to continue to study to attain the mastery level. In Pintrich's 2000(b) framework, the perceived EOL is embedded in the forethought phase, within the motivation area for regulation and will be addressed later in this chapter. Self-judgments of learning and knowing required high levels of self-awareness along and a willingness to act upon the result. For instance, a learner may assess their JOK as poor before they take a test, and act upon this judgment by rereading the material and/or reviewing lecture notes (Pintrich, 2000b, Zimmerman, 2000).

Regulating control.

As described in Pintrich's SRL model, cognitive control refers to the selection and adaptation of self-selected strategies for the specific task. For example, a proficient self-regulated learner may self-select strategies, such as mnemonics or other metacognitive strategies when studying for a test. Other strategies could include increasing study time, using graphic organizers, summarizing, note taking, or seeking outside support (Pintrich, 2002, Weinstein, 1987, Zimmerman, 2000, 2002). Claire Weinstein (1987) wrote that the "cognitively active student must be able to plan, execute, evaluate, and modify" (p. 591) the plan whenever s/he sees the progress derailed. The proficient self-regulated would control this derailment by changing the strategies initially selected to others more aligned with the task. Derailment could be because the student did not accurately self-assess his/her interest or prior knowledge during the planning stage, but the proficient self-regulated learner would remain

undeterred by this setback (Pintrich, 2000b, Weinstein, 1987). Instead, the proficient self-regulated learner would determine reasons for the derailment, and act upon these assessments. A proficient self-regulated learner would include help-seeking strategies into the initial plan to allow for further understanding, when necessary. Proficient self-regulated learners would understand the value in help-seeking strategies and are confident enough in themselves as learners to act upon that self-assessment (Pintrich, 2000b, Schunk, (2005).

Cognitive reaction during the Reflection Phase is comprised of two activities (a) evaluation of the goal against the ideal standard goal that had been pre-planned and (b) attribution beliefs (Pintrich, 2000b, 2002, 2004). Proficient self-regulated leaners have the confidence and are unafraid to conduct a careful, candid, and deliberate assessment of their final goal and evaluate whether this goal could be considered satisfactory or unsatisfactory (Pintrich, 2000b, 2002, 2004, Zimmerman, 2002). There are four measures for cognitive reflection/reactions by which learners evaluate personal learning (a) mastery, (b) previous performance, (c) normative, and (d) collaborative (Zimmerman, 2000, p 21). In brief, mastery evaluations refer to the individual's perception of personal growth toward a goal; performance evaluation is based upon performance, grades, and/or test scores, ranging from novice to expert; normative evaluations assess goal attainment through comparisons with others, and; collaborative evaluations describe goals with teamwork (for example evaluating team success upon winning a basketball game) (Zimmerman, 2000).

Cognitive reactions to a successful goal with any of these evaluative positions promote increased motivational beliefs, and the learner would become more self-efficacious in his/her abilities, and continue to use SRL for goal attainment (Zimmerman, Bandura, & Martinez-Pons, 1992). The attribution for goal attainment a learner embraced determines whether the

learner will continue to be self-efficacious and confident in his/her abilities despite an unsuccessful goal (Zimmerman, Bandura, & Martinez-Pons, 1992). The proficient self-regulated learner will use this activity to inform and implement corrective changes that will be required for future tasks so that a more successful goal will be attained (Zimmerman, Bandura, & Martinez-Pons, 1992). The novice self-regulated learner may blame outside influences for the unsuccessful goal, and more than likely discontinue SRL in the future, not learning from the mistakes that were made (Zimmerman, Bandura, & Martinez-Pons, 1992).

The cognition and control areas for regulation is reliant on an informed and effective self-regulated learner. However, Winne (1997) found primary and secondary students were not being taught how to regulate these sub-processes during learning episodes (Winne, 1997). Winne (1997) found that younger students had not developed the cognitive tactics nor tools that regulate control of learning through behavioral monitoring and/or metacognitive knowledge and saw instead reactive, trial and error models of learning being demonstrated by students. Reactive self-regulated learners evaluated goals based upon social comparisons instead of self-assessments. This dysfunction led novice self-regulated learners to become defensive, resulting in self-dissatisfaction, perceptions of low intelligence, and lower levels of self-efficacy and/or poor self-motivation in future learning episodes (Zimmerman, Bandura, & Martinez-Pons, 1992).

Regulating motivation.

Pintrich and other social-cognitive theorists believed that self-motivational beliefs were the most influential component in student implementation of SRL. Motivational beliefs were found to play a key role in the transfer of SRL from one discipline to others (McKeachie, et al., 1985). Regulating self-motivation and affect was a choice that a self-

regulated learner made in an attempt to achieve the ideal standard goal and/or self-selected learning goals (Boekaerts & Niemivirta, 2000; Pintrich, 2000b). Pintrich and DeGroot (1990) identified three regulating sub-processes that affected self-motivational beliefs. The expectancy belief is defined as the student's self-beliefs that she is capable of achieving the ideal standard or learning goal (i.e., self-efficacious) (Pintrich & DeGroot, 1990). The affective response is the emotional response, confidence; anxiety or fear the task elicits (Pintrich & DeGroot, 1990). The intrinsic value is conceptualized as the student's reasons to engage in the task and/or perceived by the learner as relevant or interesting (Pintrich & DeGroot, 1990). The learner's perceptions and assessments in these three areas either could positively or negatively influence his /her self-motivational beliefs, which could result in an increase or decrease of interest and/or effort relative to goal attainment.

Regulating self-efficacy.

One of the assumptions of SRL is that learners to have the potential to control and monitor their motivation, even in the face of mitigating self-beliefs and affective reaction (Pintrich, 2002; Zimmerman, 2000a). Pintrich (2000b) stated that although there had been research in the area of metacognitive awareness and monitoring, there had been little if any research in student awareness and monitoring of self-motivation. He opined, however, that it could be inferred when students try to control and monitor feelings of self-doubts through motivational strategies, such as positive self-talk, there is some awareness of decreasing levels of self-motivation (Pintrich, 2000b).

Bandura (1977) posited that "expectancy of personal efficacy" is based upon four sources, one of which is "performance accomplishments" (p. 195). Personal efficacy and academic expectancy could be either increased or decreased by the learner's assessment of

past performances in given academic tasks (Bandura, 1977). The learner will develop positive perceptions of self-efficacy with each positive goal, including positive feedback from others (Bandura, 1977). Positive perceptions of self-efficacy is key for employing SRL and will drive the self-regulated learner toward the goal in spite of difficult obstacles s/he may encounter (Zimmerman, Bandura, & Martinez-Pons, 1992). The learner's perceived self-efficacy during a learning episode was dependent upon the learner's beliefs and motives, judgments and self-reactions (Zimmerman, 2000a; Zimmerman, Bandura, & Martinez-Pons, 1992). Proficient self-regulated learners displayed high levels of self-efficacy, or confidence, in their abilities to meet academic challenges, which increased motivation to complete tasks necessary for goal attainment (Pintrich, 2000a, 2000b, Pintrich & DeGroot, 1990; Zimmerman, 2000a).

The triadic model of SRL illustrates the social-cognitive view of the interdependent roles of social, environmental, and self-influences on the learner during learning episodes (Figure 3) (Zimmerman, 1989, 2000a). SRL is an ongoing process of actions, both covert and overt, and subject to contextual changes or changes in the personal efficacy arising from the change in context (Zimmerman, 1989, 2000a). For example, a self-efficacious student within a science classroom environment may lower his/her perception of self-efficacy upon entering a math classroom. That student would be negatively affected by the math environment with feelings of anxiety and stress, and the belief that he or she were not able to regulate this affective state through cognitive or metacognitive strategies.

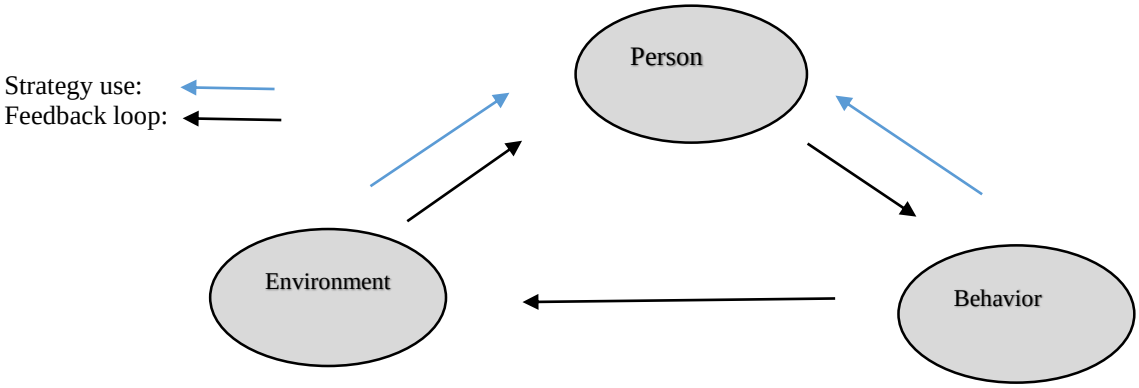

Figure 4. Triadic forms of self-regulation

Note: Triadic forms of self-regulation. Note. From "A social cognitive view of self-regulated academic learning," by B. J. Zimmerman, 1989, Journal of Educational Psychology, 81, p. 330. Copyright 1989 by the American Psychological Association. Adapted with permission. (p. 15)

The proficient self-regulated learner would make an "efficacy judgment" (p. 462) based upon the perceived difficulty level of the task, referred to as ease of learning judgment (EOL) under the motivation/affect column in the first phase of learning (Table 1) (Nelson & Narens, 1990; Pintrich, 2000b, 2004). EOL judgments would be based upon the learner's "metacognitive knowledge" of both task and self in relation to past performance (Pintrich, 2000b). Whenever there are changes in any of the triadic roles (Figure 3) the learner must adapt to the changes in order to maintain the perception of high self-efficacy and from that maintain self-motivation in goal attainment (Zimmerman, 2000a). Bandura and his colleagues stated that resiliency is required to maintain a sense of efficacy when working toward a goal in order to rise above any self-doubts or frustrations that may occur in some of the goal-related tasks (Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003).

The proficient self-regulated learner would employ strategies, such as positive self-talk during parts in the learning episode in order to control his/her emotional response to the

task (Pintrich, 2000b). During the self-reflective phase, the self-efficacious learner would analyze his/her emotional response to the end goal and determine the reasons behind his/her personal reaction/response. This period is when the learners determine attributions for the success or failure of the goal. The self-efficacious learner could candidly evaluate any problems in time management or effort exerted in order to learn from this experience for the next learning episode. However, the student with poor self-efficacy beliefs will attribute his/her failure on negative outside influences or that the task was too hard for him/her (Pintrich, 2000b). The accuracy of the students' self-reflection could determine whether the learner will be motivated to seek out challenging tasks or motivated to avoid tasks that are perceived as difficult in the future (Zimmerman, 2000a).

Regulating test anxiety.

The emotional response to a task can have a detrimental or a positive effect on motivating students to complete, or engage in, a task. Self-held beliefs in abilities and intelligence can lead a student to believe s/he is incapable of engaging in a task out of a fear of failure. Personal expectancy beliefs are effected by an individual's held beliefs in the nature of intelligence and learning, more recently termed *growth mindset* by Dweck (Blackwell, Trzesniewski & Dweck, 2007; Dweck, 2010; Dweck & Master, 2008). Dweck and her colleagues have studied the reasons why some students excel in school while others appear to lose the self-motivation to even attempt to learn since the eighties (Dweck & Leggett, 1988). Through research, an explanation for this phenomenon began to emerge as studies revealed that the students who believed intelligence was not malleable but a fixed entity, (you are either born a genius or you are not), generally lost hope in their abilities, and stopped trying (Blackwell, Trzesniewski & Dweck, 2007; Dweck, 2010; Dweck & Master, 2008).

Conversely, students who believed intelligence was malleable was observed to increase effort and continued to work through difficult tasks and persevere in the face of challenges (Blackwell, Trzesniewski & Dweck, 2007; Dweck, 2010; Dweck & Master, 2008). Students who stopped trying were posited to hold what Dweck called an entity belief of intelligence while students who exerted effort during challenges held the incremental theory of intelligence, more recently termed growth mindset (Blackwell, Trzesniewski & Dweck, 2007; Dweck, 2010; Dweck & Master, 2008). Students who held the entity theory of intelligence would demonstrate self-defeating behaviors when confronted by difficult tasks because they viewed effort as an indicator that the task was beyond their level of intelligence. However, students who held the incremental theory of intelligence would be motivated to continue to persevere and exerted increased effort because of the self-belief that increasing effort increased the likelihood of a successful goal (Blackwell, Trzesniewski & Dweck, 2007; Dweck, 2010; Dweck & Master, 2008).

These EOL judgments based upon personally held intelligence beliefs have an effect on self-motivation in that a student with a growth mindset is more likely to be motivated to engage in strategy use, metacognition, and management of effort (Dweck & Leggett, 1988; Pintrich & DeGroot, 1990). Students who believed intelligence was fixed and effort was interpreted as failure, Dweck and Leggett (1988) observed maladaptive patterns of helplessness, with tendencies to avoid tasks perceived as challenging or above their level of intelligence. Of note, Dweck and Leggett (1988) did not correlate these maladaptive patterns with student ability; in fact, they found some of the "brightest and most skilled" (p. 256) demonstrated this pattern. Instead, these patterns of behavior were correlated to the students' perceived judgments of their intelligence and abilities to learn (Blackwell, Trzesniewski &

Dweck, 2007; Dweck, 2010; Dweck & Master, 2008). Further, students who held the belief intelligence was fixed engaged in attributional biases to protect self-worth and ego (Pintrich & Schunk, 1996). For example, that student may state that s/he did not really try or that school is not that important to them when compared with other interests they value more (Pintrich, 2000b). On the other hand, students who believed in a growth mindset attributed success or failure because of their level of effort and/or intrinsic value in goal attainment (Pintrich, 2000a, 2000b). Value of the task/goal then is an important component to student engagement in SRL.

Regulating intrinsic value.

Students' perception of task value and interest determined whether they would be motivated to set a goal, plan and engage in tasks toward goal attainment (Pintrich, 2000b). If students believed that the task/goal was relevant, they were more likely to be motivated to engage in regulating their cognition and behavior through the learning episodes (Boekaerts & Niemivirta, 2000; Pintrich, 2000a, 2000b). Boekaerts and Niemivirta (2000) broke goal setting into two contexts, one that is naturally chosen by the individual and the other that is chosen by others, such as a teacher. They argued that the naturally chosen goal would be more meaningful and therefore the individual would be more likely to plan, monitor, and progress to goal attainment. However, the teacher-chosen goal tended to be attached to fragmented learning episodes that lack a clear connection to the learner (Boekaerts & Niemivirta, 2000). Students are more likely to be motivated and engaged, from goal setting and planning through goal attainment, when the context of the learning episodes coincide with their personal interests, needs, and/or expectations (Boekaerts & Niemivirta, 2000).

Regulating behavior.

In Pintrich's SRL framework (Table 1), student behavior was considered a separate area that could be regulated and monitored throughout the learning episode (Pintrich, 2000b, 2004). He adapted the triadic model of self-regulation (Figure 3) that showed behavior as a separate factor from the person, and as such could be monitored, controlled and regulated based upon self-observations by the learner (Pintrich, 2000b, Zimmerman, 2000). Pintrich (2000b) acknowledged that other models of SRL have placed behavior within the context of cognition, stating, "There may not be any behavioral planning that is not also cognitive" (p. 466). However, he referred to Gollwitzer's research on self-regulation and goal setting that found individuals could break dysfunctional behavioral responses to situations by implementing intentional strategies for behavioral control (Gollwitzer, Gawrilow, & Oettingen, 2008).

Intentional planning for behavior during the planning phase could include time management and effort planning, should there be a concern by the learner that effort may ebb and flow because of value and interest. Another form of intentional planning could include a self-reporting tool based upon behavioral observations to determine successful strategies and unsuccessful strategies in managing time and effort. The effective self-regulated learner would use this tool to become aware of behaviors that lead to successful goals and those that may impede progress, and act on this information. A result of behavioral monitoring and control could be in the example of the learner who recognized through self-observation that the time originally set aside for studying should be moved to an earlier time when the learner is more alert and focused. Effort and persistence are behaviors that are directly related to regulation and control (Pintrich, 2000b). The self-regulated learner who seeks help from

others demonstrated self-regulating behavior, according to Pintrich (2000a, 2000b, 2004). Although the reflection phase is mainly cognitive, the effective self-regulated learner would also reflect on the emotional reaction to the goal attained, and from this reaction could determine that changes should be made to increase effort or improve the management of time for the next learning episode (Pintrich, 2000a, 2000b, 2004).

Regulating context.

Pintrich included context as an area for regulation because he believed that the individual's attempt to self-regulate could be constrained by contextual features, such as outside distractions, the characteristics of the task, and/or the learning environment (Pintrich, 2000b). One of the assumptions of SRL is that the individual is able to control and monitor context to enable goal attainment. Pintrich (2000b) felt that an individual's perception of context was an important component of SRL. The contextual planning that a student would consider would be classroom rules and policies to be used as guidelines in analyzing the task. In the traditional classroom environment students recognize the conservative guidelines and hierarchical structure that promotes dependency on the teacher to plan, monitor and regulate the learning process, to provide materials for goal attainment, which are generally set by the teacher (Boekaerts & Niemivirta, 2000). The student in a traditional classroom would also expect the teacher to control time management and when appropriate, motivate them toward the teacher's conception of the ideal standard goal (Boekaerts & Niemivirta, 2000). Therefore, student's autonomous responsibilities in the traditional classroom was perceived as difficult, because of the classroom culture, and because teacher-chosen goals were perceived as outside students' interests (Boekaerts & Niemivirta, 2000). They stated that the teacher-chosen goal, in contrast to a self-desired goal, inhibit the self-regulation proTablecess in that there isn't a

clear connection between the student's needs and the achievement of the new concept and/or skill (Boekaerts & Niemivirta, 2000). Of course, there are exceptions to this generality, and more self-efficacious students do become self-regulated learners, active in the learning process, even within this environment (Boekaerts & Niemivirta, 2000; Pintrich, 2000b).

Although not directly responsible for the control of task and context, proficient self-regulated learners still employ contextual awareness not only to design a reasonable ideal standard goal specific to their personal expectation, but also to guide goal attainment (Boekaerts & Niemivirta, 2000; Pintrich, 2000b). Pintrich used the example of self-regulated learners who attempt to negotiate task requirements with the teacher, requesting more time to complete the task or fewer page requirements. In the traditional classroom environment, Pintrich (2000b) observed that students were not usually given time for reflecting on the recent learning episode. However, the self-regulated learner would independently reflect on the satisfaction or dissatisfaction in the attained goal, and the enjoyment or comfort of the classroom as it pertained to the learning episode (Pintrich, 2000b).

Research studies have demonstrated that SRL contains cognitive and behavioral strategies that correlate with increased student performance in traditional and non-traditional classroom environments. Pintrich's 2000(b) SRL framework provided the researcher ways in which to study self-regulation in learners. The four phases that are set forth are generally observed during most successful learning episodes. The three areas for regulation, cognition, motivation, and behavior, are the psychological factors that have an impact on the quality of the goal attained, based upon the level of these factors in the learner. Although context is an area that is difficult for the learner to regulate in the traditional classroom setting, contextual awareness and manipulation is in the control of the learner in the digital learning environment.

Self-Regulated Learning in Digital Learning Environment

Digital learning has been found to influence the development and use of self-regulated learning in students in higher education, but in an exhaustive literature review conducted by Matuga (2009), few such studies were found that studied SRL in students in secondary education. According to the 2014 report on digital learning, the number of high school students enrolling in digital courses are increasing across the United States (Watson, et al., 2014). It is predicted that this growth pattern will continue, especially with the legislative push being given to provide access to digital learning for all students (Foundations for Excellence in Education, 2010). School districts across the country have different options for course delivery within the digital learning environment. When a student enrolls in an online course that is delivered synchronously, the student is using the computer to access the course in a more traditional learning environment with a teacher present in real time, generally known as blended learning. When a student enrolls in an online course that is delivered asynchronously, the student is separated both geographically and timely from the course instructor. In the asynchronous environment, the student is more autonomous and therefore, more responsible for self-engagement in the course content, cognitively, motivationally, and behaviorally, the three areas for regulation in Pintrich's SRL framework.

Educational research has shown that in a digital learning environment, students needed to develop and use metacognitive and cognitive skill to obtain relevant information specific to the task or goal from the Internet and to develop and share the information with others in an effective way (Quintana, Zhang & Krajcik, 2005). The student enrolled in an online course controls the learning environment unlike the student enrolled in the traditional course setting. The online learner has more responsibility and choice in the planning and goal-setting phase

in an asynchronous learning environment (Winters, Greene, Costich, (2008). To do this effectively, the learner needs to have an understanding of the nature and demands of the task, and to self-select strategies appropriate to the task(s) self-efficacy and intrinsic value in the ideal standard goal (Quintana, Zhang, & Krajcik, 2005). Unlike the traditional classroom setting, there are no immediate external supports in an asynchronous learning environment, and the burden of task analysis and critical thinking, both considered higher levels of cognition, fall on the learner (Zimmerman, 2002). Azevedo and his associates discovered that students frequently used ineffective cognitive and metacognitive strategies within the digital learning environment (Azevedo, Moos, Greene, Winters, & Cromley, 2008).

Quintana, Zhang, and Krajcik (2005) studied the cognitive activities of K-12 students engaged in *online inquiry*, defined as an activity where students develop their own question, and use the Internet to synthesize information with the goal of answering the question. Online inquiry required cognitive and metacognitive processing, and from observations and data, a framework that described these observations was developed (Table 3) (Quintana, Zhang, & Krajcik, 2005).

Table 3

Metacognitive Challenges Novice Online Learners Face

Phase of Learning	Searching	Evaluating and Reading	Synthesizing
Phase One: Task understanding and planning	Search for the "magic" website that contains a ready-made answers Do not plan their search steps	Skims for the "right" answer without reading to understand the information No clear purpose for reading established	Directly copy from a single source rather than synthesizing an answer from multiple sources
Phase Two and Three: Monitoring and Control	Do not systematically develop "key words" for searches Spends too much time on searches at the expense of other tasks	Gets distracted when reading webpages Fail to monitor their comprehension of the material they are reading	Use few or overly simple criteria to monitor their final product
Phase Four: Reflection	Do not reflect on the search process	Do not reflect on the various criteria of the material they are reading Do not reflect on the reading strategies they could use for better comprehension	Reflect very little, if at all, on the information they are synthesizing to build their final product

Table 3: Metacognitive framework for online inquiry describing a set of problematic metacognitive behaviors that learners exhibit in different inquiry activities.

Note: This framework was adapted from Quintana, Zhang, and Krajcik, (2005). It does not include the column on "asking questions" for the purpose of this study's area of research.

Quintana, Zhang, and Krajcik (2005) observed novice online learners had difficulty regulating the learning process during the four phases of SRL. These novice learners had difficulty understanding the requirements in the task, and therefore could not develop a clear

plan to achieve the goal. Further, the novice learner did not monitor their time management and would instead stay too long on one or two websites, or become distracted (Quintana, Zhang, & Krajcik, 2005). Their framework appears to align with the phases and areas of SRL seen in the SRL framework developed by Pintrich (2000b, 2004)

Students within the digital learning environment have to maintain their self-motivation during the learning episode to be successful (Sansone, Fraughton, Zachary, Butner, & Heiner, 2011). The digital learner is provided the choice when to engage in the course, and when to disengage (Sansone, et al., 2011). Therefore, maintaining self-motivation is key to the successful digital learning goal. Matuga (2009) saw a more complicated pattern in the self-regulation component for digital learning. Self-regulation and self-motivation for high school students in an online course found that this skill was the most impacted throughout the learning episodes (Matuga, 2009). Not surprising, high-achieving students became more motivated as the course went on, while the low-achieving students lost self-motivation during that period (Matuga, 2009). The high-achieving students' confidence and self-efficacy in their ability to regulate their learning decreased as the course went on, while the low-achieving students' confidence and self-efficacy increased. Her study also brought out the fact that many of the secondary students overestimated their regulating abilities when answering the MSLQ, a common claim for studies using self-reporting instruments.

Calcaterra, Antonietti, and Underwood (2005) found that the differences in learning styles of online learners affected the way they navigated the course content. They found that the navigation pattern demonstrated in online learner aligned with cognitive and metacognitive strategies and skills (Calcaterra, Antonietti, & Underwood, 2005). Online learners described as *field dependent* are those who require structure and will be unable to

identify important from unimportant information contained with the digital learning material (Calcaterra, Antonietti, & Underwood, 2005). These online learners were observed using trial-and-error as a strategy, and became overwhelmed by multimedia tools (Calcaterra, Antonietti, & Underwood, 2005). The *field independent* online learner, in contrast, are critical thinkers who can design their own structure for the learning episode and select and use strategies that effect goal attainment (Calcaterra, Antonietti, & Underwood, 2005).

There have been pathways to incorporate SRL strategies within digital learning environments using specific software, such as *Digital IdeaKeeper, Inquiry Island* and *AutoTutor* (Azevedo, et al., 2009; Quintana, Zhang, & Krajcik, 2005; Zimmerman & Tsikalas, 2005). The software for SRL has been criticized for two reasons: (a) none of the software supported all of the SRL phases of learning, and (b) because the support was throughout the learning episode. This type of software did not provide an opportunity to for the learner to self-regulate their own cognitive processes or learning strategies (Zimmerman and Tsikalas, 2005)

In summary, although secondary students have access to digital learning, they may not be ready to meet the challenges that this environment requires, namely autonomous learning. Research has shown that generally, secondary students were found to have deficiencies in one or most of the areas of SRL and strategies in SRL are being taught (Eccles, 1999, Wang & Eccles, 2012; Zimmerman and Tsikalas, 2005). There has been a lack of research on SRL in secondary students enrolled in digital learning, and as access to digital learning in K-12 increases, and graduation requirement for digital learning in five states in place, there needs to be more studies conducted with this focus. SRL is recognized to help contribute to and predict increased academic performance, and the development of some software that support SRL

strategies for students in primary and secondary grades attempts to provide these supports. The most influential support for SRL first comes from teacher demonstration in classrooms, and if SRL is not part of the teaching model, than the secondary student will continue to use trial-and-error methods of learning with little if any reflection and digital learning readiness for those students will remain a real concern for parents and educators (Zimmerman & Tsikalas, 2005).

Self-Regulated Learning by Secondary Students.

In a 1990 study on the theory of SRL, McCombs and Marzano (1990) stressed that self is the "dynamic director or overseer of information processing: the formulator of intentions, the enactor of choices and the generator of will … to engage in skilled intellectual and behavioral activities." (p. 54). It is with that perception of self that the proficient self-regulated learner can confidently meet the challenges of the tasks embedded in the learning process to attain the ideal standard goal. Ironically, Erik Erikson, the foundational psychologist in the study of the psychosocial development of the self, described adolescence as a period of self-discovery while at the same time being pressured by the culture to conform to society's expectations, norms, and values (Woolfolk, 2013). It is during this period of human development when students transition to secondary grades, where the classroom environment becomes more focused on academic performance and competition while teacher-student relationships become strained, and more distant (Jacobs, Lanza, Osgood, Eccles & Wigfield, 2002; Marcia & Josselson, 2013; Wang & Eccles, 2012; Wigfield, Eccles, & Rodriguez, 1998). It is the period of development when the adolescent becomes keenly aware of his/her own self, separate from parents and peers, while having that identity threatened with pressures to adapt to others' expectations (Marcia & Josselson, 2013). Adolescence is a

time when students disengage with the school culture, cognitively, motivationally and behaviorally (Jacobs, et al., 2002; Marcia & Josselson, 2013; Wang & Eccles, 2012; Wigfield, Eccles, & Rodriguez, 1998). They begin to perceive their social and academic capabilities in a more realistic, and oftentimes harsher, light (Jacobs, et al., 2002; Marcia & Josselson, 2013; Wang & Eccles, 2012; Wigfield, Eccles, & Rodriguez, 1998). It is not surprising, then, that the adolescent years were rated by many as the worst times of their lives (Lowenthal, Thumher & Chriboga, 1975).

Secondary students: Regulating cognition.

One of the assumptions of SRL was that learners have the potential to control their cognition throughout the learning episode; although it was not assumed all learners would activate that control (Pintrich, 2000b, 2004). Within a natural learning episode, a goal would be self-chosen, self-initiated, and generally motivated by personal goals. In the academic environment, goals are generally teacher-generated, and oftentimes perceived by students as trivial, unimportant, and not aligned with personal goals (Boekaerts & Niemivirta, 2000). Students will pursue teacher-generated goals, but their cognitive and personal appraisals of the goal relative to their own self-beliefs, goal expectations and anxieties will enhance or impede goal attainment (Boekaerts & Niemivirta, 2000; Zimmerman, 2000).

These cognitive appraisals to the task(s) causes affective reactions to the challenges in relation to the students' well-being, if the challenges were perceived as safe or a threat to the student's perception of self and/or intellect (Boekaerts, 1996, as cited in Boekaerts & Niemivirta, 2000). Jacobs and her colleagues (2002) conducted a longitudinal study on students' personal competence beliefs as they moved from grades one through twelve. Jacobs, et al., (2002) discovered perceived cognitive assessments and competence beliefs declined

and continued to decline from middle school through high school. Wang and Eccles (2012) studied student engagement (cognitive, behavioral, and emotional) as they moved from middle through high school, and observed steady declines in intrinsic values of learning, behavioral compliance and control, and school identification, specifically from seventh through eleventh grades.

Students who do not value the task or learning goal set by the teacher, may turn the role of self-regulated learner over to the teacher, and take on a passive role in their own learning process (Boekaerts & Niemivirta, 2000). In most secondary classrooms, students perceived the teacher's role to be central in maintaining student motivation and progress toward a teacher-generated goal and assume a more passive posture of learning (Boekaerts & Niemivirta, 2000; Eccles, Wigfield, Midgley, Reuman, MacIver, & Feldlaufer, 1993). This perception is generally reinforced by the traditional secondary classrooms that are facilitated by overwhelmed teachers who must instruct to larger groups of students in more content-specific, assessment driven, domains (Eccles, et al., 1993, Jacobs, et al., 2002; Wigfield, Eccles, & Rodriguez 1998). Teacher-support is particularly important at the adolescent stage of development, but the classroom environment in secondary grades generally do not support close teacher-student relationships, for the reasons mentioned (Eccles, et al., 1993, Jacobs, et al., 2002; Wigfield, Eccles, & Rodriguez 1998). Because of this strained relationship, teachers in the secondary grades, beginning in middle school, were less likely to allow student autonomy during classroom tasks or hold the belief that their students were trustworthy, thus perpetuating decreased student engagement and/or task value in teacher-generated goals (Eccles, et al., 1993).

Adolescent students are undergoing dramatic developmental changes, cognitively, behaviorally, and contextually, when transitioning from elementary to secondary schools. By adolescence, students have the ability to think abstractly and consciously develop plans to attain goals based upon self-perceptions of efficacy, personal skills, interest, and activation of prior knowledge (Eccles, 1999). There are three influencing factors that have an effect on adolescents' self-confidence and willingness to engage in academic tasks (Eccles, 1999) One of the factors is the emergence of self-reflective thought in relation to perceptions of success and failures (Eccles, 1999). Another factor is the social development outside the home to encompass more of the world around them (Eccles, 1999). The students' engagement of social and academic comparisons and/or competition among peers in the adolescents' expanding world is the third factor (Eccles, 1999). In nurturing learning environments, these cognitive changes would be supported with strong interpersonal relationships that promoted more autonomy and trust, and could be viewed as a positive time in human development (Eccles, 1999). Unfortunately, all too often the cultural environment that surrounds the adolescent has less social support from parents, teachers and/or peers, and has been shown to have negative effects on the growing perceptions and awareness of self (Bronfenbrenner, 2005; Wang & Eccles, 2012). It may not be surprising, then, that studies have shown that as students move through the grades, students' perceptions of self-competency and efficacy decreased, particularly in struggling students (Eccles, et al., 1993, Jacobs, et al., 2002; Wang & Eccles, 2012).

Pintrich (2000b) declared that a learner could have cognitive and metacognitive skills and strategies, but if the learner perceived a threat to his/her well-being, the self-regulation process could break down. Social cognitive theorist, like Pintrich, explain that SRL is a

cyclical process involving the triadic elements of person, environment, and behavior (see Figure 4). Any change within the triadic elements, positively or negatively perceived by the learner, during a learning episode may promote or impede the leaner's motivation to activate SRL.

Secondary students: Regulating motivation.

The motivation/affect area for regulation in Pintrich's (2000b, 2004) SRL framework (Table 1) included an awareness and monitoring of motivational beliefs. According to Pintrich, (2000b, 2004) motivational beliefs were based upon (a) efficacy judgments, (b) task value and, (c) affective reactions throughout the four phases of learning. Motivational beliefs are key to activating and maintaining SRL, especially during periods of frustration, self-doubts, and/or task disengagement (Jacobs, et al., 2002; Matuga, 2009; Pintrich, 2000a, 2000b; Wang & Eccles, 2012; Zimmerman, 2000). In other words, the student's motivational beliefs at the outset of any learning episode helps to activate, or frame, the plan that is developed, and afterwards, helps to maintain a high level of effort throughout the learning episode. For example, students who held a positive goal orientation were self-motivated to plan for and achieve an ideal standard goal because they would have believed that the goal to be achieved held personal meaning to them (Matuga, 2009; Pintrich, 2000b; Zimmerman, 2009). Further, students who reported high judgments of self-efficacy and task value were motivated to selected learning strategies, monitor progress, and maintained high effort levels through the learning episodes because they believed they had the abilities to achieve the task, and because they personally valued the task's goal (Garcia & Pintrich, 1996; Pintrich & De Groot, 1990; Zimmerman & Martinez-Pons, 1990). Eccles and her colleagues discovered, however, that as students transitioned through the secondary grades, motivational beliefs

decreased across domains regardless of gender (Eccles, et al., 1993; Jacobs, et al., 2002; Wang & Eccles, 2012; Wigfield, Eccles & Rodriguez, 1998). Students' affective reactions to the goal of the learning episode are also influenced by students' goal orientation and value of the goal, as explained further in the next paragraph, but ultimately their perceptions of a successful goal would increase their self-motivation to continue to use SRL in the future (Pintrich, 1996, 2000b, 2004; Pintrich & DeGroot, 1990).

Self-motivation, then, is fueled through choices, persistence, and effort that are based upon students' goal orientation and self-competence beliefs (Wigfield, Eccles, & Rodriguez, 1998). They described three different goal orientations students demonstrated in the classroom (1) ego involved, (2) task-involved and, (3) work avoidance (Wigfield, Eccles, & Rodriguez, 1998). Students focused on how others would judge the goal were said to have an ego-involved orientation. Those students who focused on what they would learn had a task-involved orientation, and those students whose goal was to avoid working held a work avoidance orientation (Wigfield, Eccles, & Rodriguez, 1998). As can be inferred from these descriptions, goal orientation is linked to students' self-competence beliefs and influence goal expectations.

Secondary students: Regulating behavior and context.

Students begin to evaluate their own competency within different domains as early as kindergarten and first grade (Eccles, Wigfield, Harold, & Blumenfeld, 1993). Interestingly, those studies have also shown that young students tended to overestimate their abilities across domains, even when their coursework did not support that belief (Wigfield, Eccles, & Rodriguez, 1998). It was later in adolescence self-competency beliefs and goal expectations decreased, arising from the adolescents' growing self-awareness and realistic assessment of

personal strengths and weaknesses in comparisons to others within the contextual changes within the secondary classroom environments (Eccles, et al., 2002; Wigfield, Eccles, & Rodriguez, 1998).

These contextual changes have been shown to have a negative effect on secondary students' motivational and self-beliefs. The classroom environment in middle and high schools encourage comparisons to others, focusing on students' strengths and weaknesses in both social and academic areas (Eccles, 1999). At a time in development when adolescent students are becoming aware of their individuality, separate from others, the environment/culture in secondary schools promotes assessment of individual characteristics and abilities against others, thus creating a conflict between what Eccles and others term as "stage-environment fit" (Eccles, 1999, p. 554). For example, if a student is afraid to look stupid in a classroom environment that rewards academic strengths instead of effort, s/he may select a less challenging ego-involved goal motivated by the need to maintain a positive sense of self. On the other hand, if an efficacious student is in that same classroom, s/he may design a plan to reach a task-involved goal motivated by the desire to learn from the task. Upon goal attainment, these two students would react in much the same way to the goal if both felt the goal had been achieved. Alternatively, if these students did not assess the goal as satisfactory, the efficacious student would be motivated to learn from his/her mistakes to implement during the next learning episode. The less efficacious student would attribute the failure on influences outside of his/her control, and may select a work avoidance orientation for the next learning episode. Motivation is an area that can be regulated by the learner during the phases of the learning process, but it is dependent on self-efficacy judgments, task value, and

affective reaction to the perceived challenges in the task (Jacobs, et al., 2002; Matuga, 2009; Pintrich, 2000a, 2000b; Wang & Eccles, 2012; Zimmerman, 2000).

Pintrich (2000b, 2004) included behavior as one of the four areas for regulation across the phases of learning episodes because he believed overt behavior represented a separate "aspect of the person" (p. 466) that could be regulated and controlled. He supported this idea by pointing to the triadic framework in the social cognitive theory of learning (Figure 3) that showed behavior as an entity separate from environment and person. In the triadic framework, person referred to the "internal self" (p. 466) that included cognition, motivation, and affect (Pintrich, 2000b, 2004), and behavior referred to the observable behavioral strategies that promoted goal attainment, such as managing time, or self-reporting affective reactions during the learning episode. The student would monitor behavior throughout the four phases and take appropriate steps to remove obstacles that impede progress to the ideal standard goal. Proficient SRL engages in self-observation and behavior monitoring regarding persistence, effort, and coping as constructs that could be modified if the challenges of the task were harder than expected during the first phase of SRL (Pintrich, 2000b). Novice self-regulated learners were reluctant to self-report negative aspects of behavior and focus on successes since failure led to self-criticisms and poor self-efficacy (Zimmerman, 2000a, 2000b). Without candid self-assessments of behavior, the novice self-regulated learner will not notice patterns of behavior that lead to unsatisfactory goal goals (Zimmerman, 2000a, 2000b). Novice self-regulated learners who have facilitators who model behavior assessment and monitoring with immediate feedback and strategies develop SRL (Zimmerman, 2000). Unfortunately, student autonomy is rarely supported or encouraged by teachers because of the

culture and structures found in schools (Wang & Eccles, 2012; Wigfield, Eccles, & Rodriguez, 1998; Zimmerman, 2000).

Students in secondary school often find an almost hostile environment centered on discipline and teacher control, and away from self-management, choices, and decision-making (Wigfield, Eccles, & Rodriguez, 1998). The teachers in secondary schools are often encouraged to maintain traditional structures in secondary schools that lead to ability grouping, which can disrupt peer relationships and create negative school response in students (Wang & Eccles, 2012; Wigfield, Eccles, & Rodriguez, 1998). Within this type of environment, students felt they were unable to control the perceived impediments for student learning and/or goal attainment in the classroom (Wang & Eccles, 2012; Wigfield, Eccles, & Rodriguez, 1998). These feelings of inadequacy often lead to inappropriate behaviors that students choose, covertly or overtly, that protect their ego and self-competency beliefs (Eccles, 1999). Stressful academic and social environments decrease self-management and perceptions of abilities and may lead to behavioral transgressions (Bandura, 1996; Eccles, 1999). Within the school environment, these transgressions usually result in negative feedback in the form of discipline from the teachers and/or school administrators. Bandura (1996) stated that individuals would disregard negative feedback from others and will disengage, rather than regulate the inappropriate behavior as a way to protect their ego and sense of efficacy. For example, if a student acted inappropriately to avoid looking foolish or dumb because they perceived the task to be outside their abilities, and is disciplined, that student would then engage in behaviors that helped to protect his/her sense of worth by stating s/he was not interested in the task anyway, that it was unimportant or stupid. As a result, student-school disengagement and/or value is perpetuated, and this disengagement would

contribute to a breakdown of SRL (Zimmerman, 2000). As Eccles (1999) opined, if the academic and social environments promoted the development of autonomy and proximal teacher-student relationships, there would be an advantageous fit between the adolescent stage of human development and cultural development and inappropriate behaviors would decrease, and behaviors that promoted successful engagement and goal attainment in secondary schools would increase.

Summary

The emergence of digital learning in the K-12 grades, particularly in high school, is emerging and expanding across the United States. The flexibility and high level of student control have made digital learning a viable and attractive alternative to the traditional brick and mortar classroom option for high school students. The benefits of digital learning coincide with the adolescent stage of human development secondary students reach. Access and attractiveness of digital learning does not guarantee that secondary students will be successful in this environment without having the ability to self-regulate cognitively, motivationally and behaviorally.

Administrators and teachers must support students in transitioning to this more autonomous environment. One of the ways to increase student autonomy and academic performance is through modeling and facilitating SRL in the primary and secondary classrooms. Teachers can increase the students' autonomous learning by first modeling, then supporting SRL development in K-12 classrooms, framed by these four hierarchical learning steps (1) observation; (2) emulation; (3) self-control, and (4) self-regulation (Zimmerman, 2000a). White and DiBenedetto (2015) applied these steps and developed specific classroom strategies, which are not only aligned with the phases and sub-processes of SRL but also

support the goal of the common core state standards to develop students who are college and career ready. Unfortunately, studies have found few teachers explicitly teach or model SRL in the primary or secondary grades, and students are left to their own hit and miss strategies, with little encouragement to self-reflect (Wang & Eccles, 2012; Wigfield, Eccles, & Rodriguez, 1998; Zimmerman, 2000a).

There have been many studies conducted on post-secondary students taking college courses digitally to determine the relationship between SRL and academic performance, but few have analyzed SRL of secondary students taking high school online courses. As has been described, secondary students not only are challenged by their inexperience with SRL, they are also uniquely challenged by changes, physically, emotionally, and cognitively during the adolescent stage of human development. Therefore, it is important to conduct further research specifically on this population to measure the levels of SRL in secondary students who completed an asynchronous online learning course and to investigate the relationship between these SRL and their academic performance level using their end-of-course scores. From these findings, it could be inferred that if secondary students have SRL than there is an increased likelihood of a successful academic goal.

Chapter 3: Methodology

The purpose of this study was to investigate digital learning readiness of secondary students by analyzing their level of SRL (i.e., self-regulation and self-motivation) with their academic performance. The specific elements of SRL examined were consistent with and described as part of Pintrich's Framework of SRL (Table 1). This study was a cross-sectional descriptive survey design that used Pintrich and DeGroot's 1990 Motivated Strategies for Learning Questionnaire (MSLQ) as the survey instrument. End-of-course scores were also collected and compared to the MSLQ constructs. End-of-course scores had a possible range from one to one hundred, with ten points available for extra credit. In addition, the MSLQ was supplemented with an End of Course Questionnaire (EOCQ) that had been developed by the state virtual school from which the participants of the study attended.

Quantitative statistical methods were used to investigate the four research questions within this study. Hoy (2010) explained the quantitative approach as one where the investigator is interested in testing the hypotheses that were developed to explain human behavior. Quantitative research stresses control and "quantified measures of performance" that attempt to bridge empirical evidence with "mathematical expressions of relations" (Hoy, 2010, p. 1).

Population

The target population of this study was all secondary students enrolled in an asynchronous online economics course (N=433) delivered by the state sponsored virtual school during the summer of 2013. A census of the population was attempted. The process involved the school registrar sending each enrolled student an email explaining the study and inviting the student to complete the MSLQ survey. One hundred twenty-one students

volunteered to take the MSLQ; however, four of them withdrew from the course prior to completion for unknown reasons, and thus, their responses were not considered for this study. The data collected were from only those students who both responded to the MSLQ and received an end of course score upon course completion (*n*=117) (Table 4).

Table 4

Participant and District Descriptive Information SY2012-13

District or Charter Identification Number	Participants per District	District Enrollment	End of Course Score (Ave. <1)
81	1	1,456	96.0
055	1	4,282	97.0
061	3	3,346	89.0
001	39	25,440	84.0
093	1	10,834	92.0
271	1	10,173	63.0
221	2	2,256	93.5
413	1	1,452	94.0
215	2	2,309	82.5
091	9	10,499	89.9
251	1	5,059	82.0
283	2	241	75.0
414	1	1,600	93.0
003	1	5,073	71.0
084	3	3,668	77.0
350	1	4,871	86.0
321	1	5,131	83.0
136	1	774	87.0
002	15	35,939	85.5
134	1	3,362	94.0
331	1	4,016	88.0
193	2	1,184	85.0
131	5	15,776	86.0
351	1	868	77.0
171	2	1,014	92.5
137	1	1,060	92.0
025	7	12,467	99.6
291	2	801	85.0
322	1	1,530	95.0
461	1	419	68.0
411	2	8,265	73.0
139	5	7,290	84.8

Note:This table sets out the districts or charter schools from which the participants were enrolled (n=117)

Sampling Method

The total population of students enrolled in the online economics course at the time of this study was 433 (N = 433). Upon enrolling in the 9-week online economics course, every student received an email from the school's registrar requesting her/him to volunteer to take the MSLQ through a web-link provided by the registrar. Student access to the MSLQ was from June 1-16, the first few weeks at the start of the online economics course. The registrar followed up the initial request with a second reminder during the period the survey was open to students to encourage those enrolled in the class to participate in the survey. One hundred twenty one students responded to the MSLQ, but four of these respondents withdrew from the course prior to completion. Since the reasons for their withdrawal were not given, these four surveys were not used to avoid assumptions not in evidence (e.g., they withdrew because they were incapable of regulating their motivation). Krejcie and Morgan's (1970) recommended that a sample of at least 205 be selected from population size of 440; however this number is greater than the sample size for this study (*n*=117) (Krejcie & Morgan, 1970, p. 608).

Social scientists also use the approach of "*proximal similarity model*" Trochim, 2006, para. 2) to address generalizability (external validity) of a study. This approach uses the theory of "*gradient of similarity*" to generalize findings from one study to another that are contextually similar to each other, for example similar people, settings and time (Trochim, 2006, para. 2). For this study, participants self-selected into the study from a target population of high school students taking an online economics course during the summer of 2013. The course was delivered by the state virtual school to private and public school districts across six regions within the state of Idaho (Table 4). As can be seen, the participant pool represents a sampling model, albeit non-random but rather through attempts at a census, which could be

inferred to represent a broader range of high school students throughout the six regions in the state of Idaho who took an online course in the summer of 2013. Trochim (2006) wrote the best method of addressing criticisms for generalization is to conduct your study "in a variety of places, with different people …" (para. 4). . The theory of gradient of similarity refers to the concept of generalizability for the findings of a study, which looks at the similarities of the persons from the study in order to generalize the findings to similar persons, in terms of another place, time, or characteristics. (Trochim, 2005). Under this theory, the findings of this study could arguably be generalized to other high school students taking an asynchronous online course. The population data in this study was drawn from all of the six regions in the state of Idaho, from large and small school districts. Although this was a non-random selection, an attempt at a census had been made but failed. Generalizability of the findings is strengthened in accordance to the theory of gradient of similarity, although cautions as to the interpretation of the data will be addressed in Chapter 5

Dillman, Smyth, and Christian (2009) provided several guidelines that were adapted for this study, one of which was the use of providing respondents with a web link that they could access and answer electronically. Dillman, Smyth, and Christian (2009) encouraged the selection of an organization with the capability of providing the survey to respondents and the ability to protect the respondents' identification. This study used the state virtual school because it had met those criteria. The accredited state virtual school was created by state legislation in 2002 (Idaho Code Title 33 Chapter 44) and has been providing access to digital learning for the Idaho school districts. Dillman, Smyth, and Christian (2009) stressed the importance of ensuring that respondents had similar platforms so the Web-based survey that is received reflects the survey's structure that was designed. The state virtual school has

provided supplemental asynchronous online courses to more than 65,000 students in grades 7-12. Each online course is facilitated by an in-district site coordinator that the student uses to answer procedural questions, such as registration, scheduling the final exam and general concerns, etc. However, during summer semesters, there are no site coordinator available; therefore, the only support system for the online student during summer semester is the teacher-student correspondence using email, texting, or telephone

Survey Instruments

The data collection instruments consisted of the MSLQ and the EOCQ. In addition, final course percentage grades were provided by the online school. Each of these items was important for the collection of relevant and valid data points.

Motivated Strategies for Learning Questionnaire (MSLQ).

Many researchers have used the Motivated Strategies for Learning Questionnaire (MSLQ) to assess self-regulation and self-motivation since its inception (Duncan & McKeachie, 2005; Schunk, 2005; Tsai, 2009). Pintrich, Smith, Garcia, and McKeachie published a manual in 1991 for the open-domain MSLQ, an 81-item self-report survey in 1991, based upon extensive studies that had been conducted using earlier versions of the MSLQ. There were three reported waves of data collected from three institutes of higher learning in 1986, 1987, and 1988 (Pintrich, et al., 1991). Upon analysis of the data from the participants (326 students; 687 students and 758 students, respectively), Pintrich, and his colleagues revised his framework of SRL and designed the final version of the MSLQ (Pintrich, et al., 1991). The MSLQ was designed to be segmental, which could be used in whole or in part based upon the researchers' focus of study (Pintrich, et al., 1991). Pintrich deliberately kept the two constructs of SRL (self-regulation and self-motivation) separate in

his studies, based upon his information processing (IP) approach (top-down) to learning derived from the constructs found in cognitive and educational psychology (Pintrich, 2004). Pintrich (2004) broadened the IP approach to include factors of motivation, affect, and context within his framework of SRL. He and his colleague found that in addition to the cognitive and metacognitive sub-processes in in the IP approach, students needed self-motivation to regulate these sub-processes (Pintrich & DeGroot, 1990). He opined that when comparing the IP approach to learning, the "SRL approach offers a much richer description" of the constructs involved in the learning process (Pintrich, 2004, p. 386).

Pintrich, et al., (1991) used factor analysis to analyze the constructs associated with motivation, three scales were developed: self-efficacy (α=.89), intrinsic value (α=.87), and test anxiety (α=.75) to evaluate students' self-motivational beliefs. A few of the statements that were associated with internal value were "I prefer class work that is challenging so I can learn new things," and "Understanding this subject is important to me." Some samples of statements associated with self-efficacy were "Compared with other students in this class, I think I'm a good student" and "I'm certain I can understand the ideas taught to me in this course." While statements associated with test anxiety were negatively posited, "When I take a test I think about how poorly I am doing" and "I am so nervous during a test that I cannot remember facts I have learned."

Upon completion of the factor analysis on the constructs of self-regulation, two scales were developed: cognitive strategy use (α=.83) and control (α=.74) to evaluate students' self-regulation levels. Statements for cognitive strategy use involved metacognition, such as: "When studying, I copy my notes over to help me remember material" and "When I am studying a topic, I try to make everything fit together. Statements for control were constructed

in statements such as "I find that when I'm reading online material, I think of other things and become distracted" and "Even when study materials are dull and uninteresting, I keep working until I finish."

Paul Pintrich and Elisabeth DeGroot (1991) modified the 81-item self-report instrument to use in their study of SRL and academic performance with students in secondary school. They reduced the items to 56-items initially, but after further factor analyses, used only 44-items that broke the constructs of self-regulation strategies and motivational beliefs into the same five scales as established with the previous, 81-item instrument. The scales for self-regulation were control and cognitive strategy use, while the scales for motivational beliefs were self-efficacy, intrinsic value, and test anxiety. This revised MSLQ (see Appendix B) was the measurement used to collect data for this study with secondary students enrolled in an asynchronous digital learning environment.

The revised MSLQ was presented online, so some of the statements were further revised for this study to reflect the mode of course delivery. For example, question 23 from the online version was stated as follows: "When I study for a test, I try to put together the information from class and from the reading material" instead of the original statement: "When I study for a test, I try to put together the information from class and from the book." Pintrich and his colleagues allowed for such deviations as noted in the manual for the original MSLQ "[t]he fifteen different scales on the MSLQ can be used together or singly…[and] are designed to be modular…to fit the needs of the researcher or instructor" (Pintrich, Smith, Garcia, & McKeachie, 1991, p. 3).

A pilot study was conducted three months prior to this study to determine whether the language in the 44-item MSLQ was age-appropriate, clearly set out, and understandable when

given in an online environment. The twenty participants in the pilot study were eighth grade students enrolled in a traditional middle school setting. The teacher for this class was present during the sixty-minute class period, although she had instructed the students there would be no teacher-student interaction during this period. The researcher of this study was also present only to observe students' behaviors during the period they took the MSLQ online. The students sat at individual computer desks, in school's computer laboratory that is located within the school library. Upon completion of the survey, the participants had been instructed to return to their classroom.

A post-survey interview was conducted with the participants to determine age-appropriateness of language, and found that these eighth grade students reported they did not have any problems with understanding the questions. Participants' responses verified usability of this MSLQ survey for the population that was the subject of this study.

For this study, the 44-item MSLQ (Appendix B) was made available to students during June 1-16, 2013, at the beginning of the online economics course. A census approach was attempted for the purpose of obtaining survey responses from all the enrolled students in the asynchronous online course requests for participation in the study were emailed to each enrolled student from the online school's registrar. A follow-up request for participation was made prior to the survey's deadline date. The email informed them of the purpose of the study and invited them to complete the MSLQ survey. Contact procedures with the population followed guidelines recommended by Dillman (2007). The students were asked to rate their self-regulation and self-motivation on Likert-type response scales (1=Never; 2=Sometimes, 3=Often; 4=Always). The end-of-course scores were provided to the researcher by the registrar for the state virtual school at the end of the summer session. The end-of-course

scores ranged from 0-100 points acquired during the online economics course. Students also had an opportunity to receive 10 extra credit points. These scores/points were based upon students' academic performance, which included course work/projects, participation, tests, and assessments throughout the course session.

End of Course Questionnaire (EOCQ).

The End-of-Course Questionnaire (EOCQ) (Appendix C) survey was made available to all enrolled students by the registrar for the state virtual school at the end of the summer session. The End of Course Questionnaire (EOCQ) is a self-report 61-item questionnaire that was developed by the state virtual school in order to understand and use the suggestions and input from the students to improve future course delivery. The EOCQ included questions to determine (a) student demographics, (b) reasons for taking the online course, (c) their self-reflections. The EOCQ was developed by the state virtual school to provide information to improve its online course instruction. Prior to analysis, the responses were divided into the three academic performance levels, and Pintrich's Theoretical Framework of SRL (Table 1) was used as a guide to align the four open-ended questions and responses with the areas for regulation, cognition, motivation, behavior, and context. For example, EOCQ posed the question "What did you like about the online course?" was categorized under the motivation area for regulation. Further, questions dealing with the students' perceptions and reactions of the digital learning environment as a learning tool were aligned with the context area for regulation. Responses that crossed into more than one area were placed in each of the relevant area. For example, responses posed to elicit tips and recommendations to other students prior to enrolling in an online course cautioned against procrastination. These responses aligned with the behavior and context area for regulation. The responses were used only to identify

any patterns and/or provide additional information that could shine a light on the digital learning readiness of secondary students.

Data Analyses

Microsoft Excel and the Statistical Package for Social Sciences (SPSS) were used to conduct descriptive and inferential statistics. Microsoft Excel was used to organize, summarize, and describe the data collected from the MSLQ and the EOCQ. The Statistical Package for the Social Sciences (SPSS) was used to code and tabulate scores collected from the MSLQ and provide summarized values where applicable including the mean, central tendency, variance, and standard deviation. End-of-course scores had a possible range from one to one hundred, with ten points available for extra credit. End-of-course scores were used to divide the participants into three groups of academic performance levels, (high, average, and low).

1. High achieving students were defined as those who received a score of a 90 points or higher.
2. Average achieving students were defined as those who received a score between 75-89 points.
3. Low achieving students were defined as those who received a score below 75 points.

Descriptive statistics included means, standard deviations, counts, variances, and variable relationship measures using correlation statistics. Reliability analyses were conducted to determine whether the variable constructs in the MSLQ instrument were sufficiently reliable for use (see Chapter 4). Multivariate analyses of variance (MANOVA) was used to

determine if any significant differences in self-regulation and self-motivation existed between levels of academic performance. Multiple regression analyses were used to test whether or not self-regulation and self-motivation were significant predictors of the academic performance of secondary students in an online economics course taken in summer of 2013. In addition, the proportion of variance was evaluated to determine the effect size for the independent variables. Effect size is a statistic that provides researchers with a way to determine the importance in a difference or relationship in variables (Cronk, 2012). Cohen (1962) used his formula (Cohen's d) to categorize the estimated effect one variable had on another in terms of small (greater than .01 but smaller than .09); medium (greater than .10, but smaller than .25); and large (greater than .25) (Privitera, 2012). Richardson (2011) noted that researchers have begun to question the "usefulness of classical eta squared or partial eta squared" (p. 144) and suggested that "the interpretation of these measures needs to be undertaken with care" (p. 145). Richardson (2011) stated that reporting the effect size is only "the beginning of the story, not the end" (p. 145). Joyce, Weil, & Showers (1992) wrote that considering the effect size in educational research should not be the only consideration for scholars and discussed studies on pedagogical strategies that reported modest effect sizes but that had powerful, long-lasting benefits to the learner.

Null Hypotheses.

This study's overarching research question is how are self-regulation and self-motivation associated with academic performance of secondary students who self-select into an asynchronous online economics course? To answer this question, a series of hypotheses were developed, stated in the null (i.e., null hypotheses), and then statistically tested for

significance. Each of the hypothesis statements addressed learners who completed an online economics course during the summer of 2013.

Hypothesis to Research Question 1.

Null Hypothesis 1. There are no significant differences among academic performance groups of students (high, average, low) based on their self-regulation scores (i.e., control and cognitive strategy use) during the summer of 2013.

Hypothesis to Research Question 2.

Null Hypothesis 2. There are no significant differences among academic performance groups of students (high, average, low) based on their self-motivation scores (i.e., self-efficacy, intrinsic value, test anxiety) during the summer of 2013.

Hypothesis to Research Question 3.

Null Hypothesis 3: The scores of self-regulation do not significantly predict academic performance of secondary students in an online economics course taken in summer of 2013.

Hypothesis to Research Question 4.

Null Hypothesis 4: The scores of self-motivation do not significantly predict academic performance of secondary students in an online economics course taken in summer of 2013.

Prior to analyzing the four hypotheses, the data were screened for missing data and univariate outliers. The extent to which the data met appropriate statistical assumptions was examined (see Chapter 4) and generally found to be within acceptable limits. Reliability analyses were conducted on the items that were used to measure self-regulation (control and cognitive strategy use) and self-motivation (self-efficacy, intrinsic value, and test anxiety)

consistently measured the constructs as measured by the 44-item *Motivated Strategies of Learning Questionnaire* (MSLQ) (Cronk, 2012).

Hypotheses 1 and 2 were evaluated using multivariate analyses of variance (MANOVA) determine if any significant differences in self-regulation and self-motivation existed between levels of academic performance. The criterion variables for Hypothesis 1 was self-regulation (control and cognitive strategy), and the criterion variables for Hypothesis 2 was self-motivation (self-efficacy, intrinsic value, and test anxiety). The predictor variable for both hypotheses was participants' level of academic performance (high, average, and low) in an asynchronous online economics course. End-of-course scores had a possible range from one to one hundred, with ten points available for extra credit. End-of-course scores were used to divide the participants into three groups of academic performance levels, high, average, and low.

1. High achieving students were defined as those who received a score of a 90 points or higher.
2. Average achieving students were defined as those who received a score between 75-89 points.
3. Low achieving students were defined as those who received a score below 75 points.

Hypotheses 3 and 4 were evaluated using multiple regression analyses to test whether or not self-regulation and self-motivation were significantly predictive of the academic performance of secondary students in an online economics course taken in summer of 2013. Specifically, the criterion variable in both hypotheses was participants' end-of-course scores.

The predictor variables for hypothesis 3 were control and cognitive strategy (self-regulation) and the predictor variables for hypothesis 4 were self-efficacy, intrinsic value, and test anxiety (self-motivation).

Summary

This chapter has outlined the design, methodology, and procedures used for this study. Background information was provided about the MSLQ survey instrument, its development, and ability to measure self-regulation and self-motivation. The analyses procedures used to quantify the relationship that exists between these two constructs, and the sub-processes associated with them, and student academic performance level based upon student end of course score/points, were also presented. The findings from the review and analysis of the data are presented in Chapter 4.

Chapter Four: Findings

The purpose of this study was to investigate digital learning readiness of secondary students by analyzing their level of SRL (i.e., self-regulation and self-motivation) with their academic performance. The specific sub-processes of SRL examined were consistent with and are described as part of Pintrich's Framework of SRL (Table 1).

Demographic and Background Characteristics

The descriptive data contained herein represents a general description of the students who self-selected and completed an asynchronous online economics course delivered by the state virtual school during the summer of 2013. The data set represents those students from the population who participated in the end-of-course questionnaire (EOCQ) and completed the MSLQ (*n*=116). Table 4 (see previous chapter) provided a description of the geographical dispersion of these participants and the size of the school district that they were a part. They represented 32 of the state's 117 school districts from geographically dispersed locations and a wide range in school district size. Ages of the participants ranged from 15 to 18 years of age with an average age of 16.2 years (*M*=16.2). The majority (82%) of participants were female (*n*=94), and 18% were male (*n*=21). The two most reported reasons for enrolling in the online course were the students' desire to avoid a scheduling conflict, and/or a desire for early graduation. Sixty-seven of the respondents (58.2%) took the course because of scheduling conflicts such as athletics, course offerings, travel and/or they wanted more electives, etc. during their regular school day), and eighteen respondents took the course for early graduation (15.7%).

The MSLQ was used to collect data about the participants' levels of SRL (self-regulation and self-motivation), using the composite scores for self-regulation (control and

cognitive strategy use), and self-motivation (self-efficacy, intrinsic value, and test anxiety). Student performance scores were provided by the state virtual school, which had a possible range of 1-100 points, with 10 extra points available for extra credit. End-of-course scores were used as the criteria to separate the participants into three groups of academic performance levels, high, average, and low. High achieving students were defined as those who received a score of a 90 points or higher (M=94.95, n =55). Average achieving students were defined as those who received a score between 75-89 points (M=83.31, n=42). Low achieving students were defined as those who received a score below 75 points (M=67.05, n=19).

These construct scores for the sub-processes of self-regulation and self-motivation, together with the academic performance scores, were examined to understand how self-regulation and self-motivation are associated with secondary student academic performance within the online setting of this study. Table 5 reports on the mean, range, and standard deviation for these variables.

Table 5

Composite Scores of the Sub-Processes of Self-Regulation & Self-Motivation

Variable	*M*	*SD*	Skew	Kurtosis	Min	Max
Self-efficacy	3.12	0.467	-0.178	-0.708	2.11	4.00
Intrinsic Value	2.97	0.486	-0.056	-0.414	1.67	3.89
Test Anxiety	2.08	0.818	0.728	-0.308	1.00	4.00
Control	2.91	0.359	-0.341	-0.249	2.00	3.67
Cognitive Strategy	2.86	0.427	-0.198	-0.278	1.54	3.77
Academic Performance	86.41	10.393	-0.557	-0.274	60.00	108.00

Note. The range of responses on the Likert-type scale 1=Never, 2=Sometimes, 3=Often, 4=Always

Testing the Research Hypotheses

Microsoft Excel and the Statistical Package for Social Sciences (SPSS) were used to conduct descriptive and inferential statistical analysis. Microsoft Excel was used to organize, summarize, and describe the data collected from the MSLQ and the EOCQ. The participants' post-course responses to the End of Course Questionnaire (EOCQ) were used to provide additional information relative to their (a) reasons for self-selecting to take an online economics course during the summer of 2013 and (b) their self-reflections. The Statistical Package for the Social Sciences (SPSS) was used to code and tabulate scores collected from the MSLQ and provide summarized values where applicable including the mean, central tendency, variance, and standard deviation.

Descriptive statistics included standard deviations, variances, and variable relationship measures using correlation statistics. Reliability analyses were conducted on the variable constructs. Multivariate analyses of variance (MANOVA) was used to determine if any significant differences in self-regulation and self-motivation existed between levels of academic performance (high, average, and low). Multiple regression analyses were used to test whether or not self-regulation and self-motivation were significantly predictive of the

academic performance of secondary students in an online economics course taken in summer of 2013.

To help answer the research questions, a series of four hypotheses were tested (Table 6). Each of the hypothesis statements addressed secondary students who completed an online economics course during the summer of 2013.

Table 6

Variables and Statistical Tests used to Evaluate Hypotheses 1-4

Hypothesis	Criterion Variable	Predictor Variable	Test
1	Self-regulation	Academic Performance	MANOVA
2	Self-motivation	Academic Performance	MANOVA
3	Academic Performance	Self-regulation	Multiple Regression
4	Academic Performance	Self-motivation	Multiple Regression

Reliability Analysis

Prior to analyzing the four hypotheses, reliability analyses were conducted to determine if the variable constructs were sufficiently reliable, as measured by the 44-item *Motivated Strategies of Learning Questionnaire* (MSLQ) (Cronk, 2012). Reliability analysis allows one to study the properties of measurement scales and the items that compose the scales (Tabachnick & Fidell, 2007). Cronbach's alpha reliability analysis procedure calculates a reliability coefficient that ranges between zero and one. The reliability coefficient is based on the average inter-item correlation. When the reliability coefficient is close to 1.00, internal consistency is said to be very good (Cronk, 2012). Scale reliability is assumed if the coefficient is $\geq .60$ (Tabachnick & Fidell, 2007). After reverse coding several items as defined by the MSLQ manual, results from the tests found that the variable constructs for self-

regulation (control and cognitive strategy use) and self-motivation (self-efficacy, intrinsic value, and test anxiety) were sufficiently reliable (Table 7).

Table 7

Summary of Reliability Analysis

Variable	*n*	# of Survey Items	Cronbach's alpha
Control	116	9	.668
Cognitive Strategy Use	113	13	.793
Self-efficacy	113	9	.832
Intrinsic Value	116	9	.853
Test Anxiety	116	4	.864

Analysis for missing data and univariate outliers

Prior to analyzing the four hypotheses, the data were screened for missing data and univariate outliers (extreme scores in a distribution), and multicollinearity (whether there was a state of high intercorrelation (e.g., $r > \pm.90$) between the variables in self-regulation and in self-motivation and represented singularity (i.e. redundant variables) (Tabachnick & Fidell, 2007)). Missing data were investigated using frequency counts and found 14 cases that responded to all MSLQ survey items except one. Each missing response was on a separate survey item; no individual survey items was answered less often than any other items. These missing responses were replaced by series mean values (the average score of all participants for that particular survey item). This technique does not change the overall mean score for the variable construct and retains as many participants as possible (Tabachnick & Fidell, 2007).

The data were screened for univariate outliers by transforming raw scores to z-scores and comparing z-scores to a critical value of +/- 3.29, $p < .001$ (Tabachnick & Fidell, 2007). Z-scores that exceed this critical value are more than three standard deviations away from the mean and thus represent outliers. The distributions were evaluated and one case (End-of-

course score of 40 points) with a univariate outlier was found and removed from further analyses.

Analysis for multivariate outliers.

Prior to analyzing the four hypotheses, multivariate outliers were evaluated using Mahalanobis distance. Mahalanobis distances were computed for each variable and these scores were compared to a critical value from the chi-square distribution table. Mahalanobis distance for two predictor variables in self-regulation (control and cognitive strategy use) indicated a critical value of 13.82 (Hypotheses 1 and 3). The critical value for three predictor variables in self-motivation (self-efficacy, intrinsic value, and test anxiety) was 16.27 (Hypotheses 2 and 4). Results showed no cases within the distributions were found to exceed these values. Thus, for Hypotheses 1-4, 117 valid responses from participants were received and 116 were evaluated (n = 116).

Analysis of Hypothesis 1

Null Hypothesis 1 (RQ1). *There are no significant differences among academic performance groups of students (high, average, low) based on their self-regulation scores (control and cognitive strategy use during the summer of 2013).*

Prior to analyzing the Hypothesis 1, the variables of interest were further analyzed to ensure that appropriate statistical assumptions were met. This was done by analyzing for (a) normality to determine to what extent the distribution is symmetrical (skewness), (b) or to determine the extent to which a distribution departs from normal, or bell-shaped, curve (i.e. kurtosis), and (c) homoscedasticity/homogeneity of variance (Cronk, 2012; Tabachnick & Fidell, 2007; Vogt & Johnson, 2011).

Tests of normality.

Skewness and kurtosis were examined to determine if the data was within acceptable limits of the nomality assumption. Specifically, a 95% confidence interval was determined for each skewness and kurtosis value, and if the desired value of "0" was within this range then that provided evidence of a normally distributed population. The process involved comparing the calculated statistic to its standard error, and when the standard error was less than two times the statistic, the assumptions were deemed met. Thus, based on the evaluation of the z-skew coefficients no distribution exceeded the critical value. Kurtosis was also evaluated using the same method and no distributions were found to be significantly kurtotic. Therefore, since no distributions were significantly skewed or kurtotic, the criterion variables were assumed to be normally distributed (Table 8).

Table 8

Skewness and Kurtosis Statistics of the Criterion Variables for Hypotheses 1 and 3 by Academic Performance Groups

Variable	*n*	Skew	Skew *SE*	z-skew	Kurtosis	Kurtosis *SE*	z-kurtosis
Control							
High	55	-0.439	0.322	-1.364	-0.183	0.634	-0.289
Average	42	-0.275	0.365	-0.752	-0.336	0.717	-0.469
Low	19	-0.529	0.524	-1.010	0.222	1.014	0.219
Cognitive Strategy							
High	55	-0.181	0.322	-0.563	-0.573	0.634	-0.905
Average	42	-0.026	0.365	-0.071	-0.935	0.717	-1.305
Low	19	-0.680	0.524	-1.299	2.058	1.014	2.029

Homogeneity of variance.

Levene's Test of Equality of Error Variance was conducted to determine if the error variance of the criterion variable was equal across academic performance groups (high, average, and low). Results from the test indicated that the distributions of the criterion variables for Hypothesis 1 (control and cognitive strategy) did meet the assumption of homogeneity of variance (Table 9). These results suggest that the error variance of the criterion variables were equally distributed across groups.

Table 9

Summary of Levene's Tests for Hypotheses 1 and 3

Hypothesis	Criterion Variable	*F*	*df*1	*df*2	Sig.
1	Control	0.891	2	113	.413
	Cognitive Strategy	0.585	2	113	.559

Homogeneity of variance-covariance matrices.

To examine the assumption of homogeneity of variance-covariance matrices Box's M Test of Equality of Covariance Matrices was conducted. This test was chosen as appropriate to determine if the self-regulation (control and cognitive strategy) were equal across the three levels of academic performance (high, average, and low). Results from the test found the distributions of the criterion variables for Hypothesis 1 (Table 10) were equally distributed, and met the homogeneity of variance-covariance matrices assumption.

Table 10

Summary of Box's M Test of Equality of Covariance Matrices for Hypotheses 1 and 3

Hypothesis	Box's M	*F*	*df*1	*df*2	Sig.
1	3.176	0.512	6	29841.696	.800

Analysis of multicollinearity.

Prior to analyzing the hypotheses 1 and 3, the assumption of multicollinearity was tested by calculating correlations between predictor variables. Multicollinearity analysis is used to determine whether there is a state of high intercorrelation (e.g., $r > \pm.90$) between the variables in self-regulation and represent singularity (i.e. redundant variables) (Tabachnick & Fidell, 2007). Results indicated that correlations between self-regulation (control and cognitive strategy) (Table 11) did not exceed ±.90. Since, no correlational results exceeded the critical value, the presence of multicollinearity was not assumed.

Table 11

Model Summary of Correlation Analysis of Hypotheses 1 and 3

		Pearson's Coefficient	
Variable	Academic Performance	Control	Cognitive Strategy
Academic Performance	1.000	.251**	.117
Control		1.000	.709**
Cognitive Strategy			1.000

**Correlation is significant at 0.01 level (2-tailed)

Results of hypothesis 1.

Hypothesis 1 was evaluated using multivariate analyses of variance (MANOVA) to determine if any significant differences in self-regulation existed between levels of academic performance. There were two criterion variables for Hypothesis 1, self-regulation (control (9-items) and cognitive strategy (13-items). Table 12 provides the descriptive statistics of the criterion variables control (M=2.91, SD=0.259) and cognitive strategy use (M=2.96, SD=0.427) were considered separately among academic performance groups:

Table 12

Descriptive Statistics of the Criterion Variables for Hypotheses 1 and 3 by Academic Performance Groups

Variables	*n*	*M*	*SD*.	Skew	Kurtosis	Min	Max
Control							
High	55	2.97	0.331	-0.439	-0.183	2.22	3.56
Average	42	2.89	0.392	-0.275	-0.336	2.11	3.67
Low	19	2.74	0.319	-0.529	0.222	2.00	3.22
Cognitive Strategy							
High	55	2.90	0.411	-0.181	-0.573	2.08	3.77
Average	42	2.88	0.439	-0.026	-0.935	2.15	3.77
Low	19	2.70	0.432	-0.680	2.058	1.54	3.46

Using SPSS 22, multivariate analysis of variance (MANOVA) was conducted to determine if any significant differences in students' self-regulation (control and cognitive strategy use) existed between high, average, and low achievers in an online economics course taken in summer of 2013. Results from the analysis revealed that a significant difference did not exist between levels of academic performance on a model containing two sub-processes of self-regulation (control and cognitive strategy), $F(4, 224) = 1.650$, *Wilks Lambda* = 0.944, $p = .163$, *partial eta-squared* = .029. Thus, the null hypothesis was retained. The findings suggest that self-regulation is not significantly different between students performing at different levels. See Table 13 for a model summary of the MANOVA analysis of Hypothesis 1.

Table 13

Summary of Multivariate Main Effects Derived from MANOVA Analysis of Hypothesis 1

Effect	Statistic	Value	*F*	Hypothesis *df*	Error *df*	Sig.	Partial Eta Squared
Intercept	Wilks' Lambda	0.017	3203.250	2	112	< .001	.983
Academic Performance	Wilks' Lambda	0.944	1.650	4	224	.163	.029

Note. Criterion variables = Control and Cognitive Strategy Use

In addition to the multivariate analysis, examination of the individual between-subject effects revealed that none of the self-regulation sub-processes was significantly different across three levels of academic performance (high, average, and low). A model summary for the tests of between-subjects main effects is displayed in Table 14. Means plots of self-regulation sub-processes are displayed in Figures 10 and 11 in Appendix E by academic performance groups.

Table 14

Model Summary for Tests of Between-Subjects Effects for Hypothesis 1

Source	Criterion Variable	Type III *SS*	*df*	*MS*	*F*	Sig.	Partial Eta Squared
Corrected Model	Control	0.753	2	0.377	3.030	.052	.051
	Cognitive Strategy	0.567	2	0.284	1.572	.212	.027
Intercept	Control	782.655	1	782.655	6296.272	< .001	.982
	Cognitive Strategy	758.660	1	758.66	4205.696	< .001	.974
Academic Performance Groups	Control	0.753	2	0.377	3.030	.052	.051
	Cognitive Strategy	0.567	2	0.284	1.572	.212	.027
Error	Control	14.046	113	0.124			
	Cognitive Strategy	20.384	113	0.180			
Total	Control	99.377	116				
	Cognitive Strategy	967.738	116				
Corrected Total	Control	14.800	115				
	Cognitive Strategy	20.951	115				

Analysis of Hypothesis 2

Prior to analyzing the Hypothesis 2, the variables of interest were further analyzed to ensure appropriate statistical assumptions were met. This was done by analyzing for (a) normality to determine to what extent the distribution is symmetrical (skewness), (b) or to determine the extent to which a distribution departs from normal, or bell-shaped, curve (i.e.

kurtosis), and (c) homoscedasticity/homogeneity of variance (Cronk, 2012; Tabachnick & Fidell, 2007; Vogt & Johnson, 2011).

Tests of normality.

Skewness and kurtosis were examined to determine if the data was within acceptable limits of the nomality assumption. Specifically, a 95% confidence interval was determined for each skewness and kurtosis value, and if the desired value of "0" was within this range then that provided evidence of a normally distributed population. The process involved comparing the calculated statistic to its standard error, and when the standard error was less than two times the statistic, the assumptions were deemed met. Based on the evaluation only one distribution (test anxiety for high achievers: *skew* = 1.073, *z-skew* = 3.334) exceeded the critical value. Therefore, since no distributions (except for test anxiety for high achievers) were significantly skewed or kurtotic, the criterion variables were assumed to be normally distributed (Table 15). For test anxiety, a square root transformation was conducted to normalize the distribution; however, the transformed scores were not used since results from the MANOVA analysis of Hypothesis 2 were similar compared to those found using the untransformed scores. As a result, the distribution of test anxiety for one of the factor levels is recognized as marginal in terms of desired acceptable limits for meeting the normality assumption. Although the positive skewness present in high achievers' test anxiety scores is not fully satisfactory, the violation is modest and present in one level of the factor, but not in the other two.

Table 15

Skewness and Kurtosis Statistics of the Criterion Variables for Hypotheses 2 and 4 by Academic Performance Groups

Variables	*n*	Skew	Skew *SE*	z-skew	Kurtosis	Kurtosis *SE*	z-kurtosis
Self-efficacy							
High	55	-0.496	0.322	-1.541	0.295	0.634	0.466
Average	42	0.226	0.365	0.619	-0.588	0.717	-0.821
Low	19	0.352	0.524	0.671	-0.652	1.014	-0.643
Intrinsic Value							
High	55	-0.202	0.322	-0.627	-0.354	0.634	-0.559
Average	42	0.032	0.365	0.088	-0.580	0.717	-0.809
Low	19	0.432	0.524	0.825	0.414	1.014	0.409
Test Anxiety							
High	55	1.073	0.322	3.334	0.687	0.634	1.085
Average	42	0.522	0.365	1.430	-0.696	0.717	-0.971
Low	19	0.259	0.524	0.495	-0.470	1.014	-0.463

Homogeneity of variance.

Levene's Test of Equality of Error Variance was conducted to determine if the error variance of the criterion variable was equal across academic performance groups (high, average, and low). Results from the test indicated that the distributions of the criterion variables for Hypothesis 2 (self-efficacy, intrinsic value, and test anxiety) did meet the assumption of homogeneity of variance (Table 16). These results suggest that the error variance of the criterion variables were equally distributed across groups.

Table 16

Summary of Levene's Tests for Hypothesis 2

Hypothesis	Criterion Variable	*F*	*df*1	*df*2	Sig.
2	Intrinsic Value	0.967	2	113	.383
	Self-efficacy	0.553	2	113	.577
	Test Anxiety	2.110	2	113	.126

Homogeneity of variance-covariance matrices.

To examine the assumption of homogeneity of variance-covariance matrices Box's M Test of Equality of Covariance Matrices was run. This test was used to determine if self-motivation (self-efficacy, intrinsic value, and test anxiety) were equivalent across the three levels of academic performance (high, average, and low). Results from the test found that the distributions of the criterion variables for Hypothesis 2 were equal across groups (Table 17). These results suggest the sub-processes of self-motivation are equally distributed, and meet the homogeneity of variance-covariance matrices assumption.

Table 17

Summary of Box's M Test of Equality of Covariance Matrices for Hypothesis 2

Hypothesis	Box's M	*F*	*df*1	*df*2	Sig.
2	5.797	0.459	12	15021.299	.939

Analysis of multicollinearity.

Prior to analyzing the hypotheses 2 and 4, the assumption of multicollinearity was tested by calculating correlations between predictor variables. Multicollinearity analysis is used to determine whether there was a state of high intercorrelation (e.g., $r > \pm.90$) between the variables in self-motivation and represented singularity (i.e. redundant variables) (Tabachnick & Fidell, 2007). Results indicated that correlations between the sub-processes of self-motivation (self-efficacy, intrinsic value, and test anxiety) did not exceed ±.90 (see Table

18). Since, no correlational results exceeded the critical value of ±.90 (Tabachnick & Fidell, 2007), the presence of multicollinearity was not assumed.

Table 18

Model Summary of Correlation Analysis of Hypotheses 2 and 4

		Pearson's Correlation Coefficient		
Variable	Academic Performance	Self-efficacy	Intrinsic Value	Test Anxiety
Academic Performance	1.000	.492**	.022	-.337**
Self-efficacy		1.000	.491**	-.468**
Intrinsic Value			1.000	-.180
Test Anxiety				1.000

**Correlation is significant at 0.01 level (2-tailed)

Results of hypothesis 2.

***Null hypothesis 2 (RQ2*).** *There are no significant differences among academic performance groups of students (high, average, low) based on their self-motivation scores (i.e., self-efficacy, intrinsic value, test anxiety).*

Hypothesis 2 was evaluated using multivariate analyses of variance (MANOVA) to determine if any significant differences in self-regulation existed among the three levels of academic performance. Table 19 provides the descriptive statistics of the criterion variables for the sub-processes of self-motivation, specifically self-efficacy (M=3.12, SD=0.467), intrinsic value (M=2.97, SD=0.486) and test anxiety (M=2.08, SD=0.818) divided into the three academic performance groups.

Table 19

Descriptive Statistics of the Criterion Variables for Hypotheses 2 and 4 by Academic Performance Groups

Variables	*n*	*M*	*SD*	Skewness	Kurtosis	Min	Max
Self-efficacy							
High	55	3.34	0.380	-0.496	0.295	2.22	4.00
Average	42	3.01	0.460	0.226	-0.588	2.11	4.00
Low	19	2.76	0.416	0.352	-0.652	2.22	3.56
Intrinsic Value							
High	55	2.95	0.508	-0.202	-0.354	1.67	3.89
Average	42	3.04	0.453	0.032	-0.580	2.11	3.89
Low	19	2.87	0.480	0.432	0.414	2.00	3.89
Test Anxiety							
High	55	1.86	0.701	1.073	0.687	1.00	3.75
Average	42	2.23	0.889	0.522	-0.696	1.00	4.00
Low	19	2.37	0.843	0.259	-0.470	1.00	4.00

Multivariate analysis of variance (MANOVA) was conducted to determine if any significant differences in students' self-motivation (self-efficacy, intrinsic value, and test anxiety) existed between high, average and low achievers in an online economics course taken in summer of 2013. Results from the analysis revealed that a significant difference did exist between levels of academic performance on a model containing three sub-processes of self-motivation (self-efficacy, intrinsic value, and test anxiety), $F(6, 222) = 7.119$, *Wilks Lambda* = 0.703, $p < .001$, *partial eta-squared* = .161. Thus, the null hypothesis was rejected in favor of the alternative hypothesis, indicating that the sub-process of self-motivation are shown to increase academic performance. See Table 20 for a model summary of the MANOVA analysis of Hypothesis 2.

Table 20

Summary of Multivariate Main Effects Derived from MANOVA Analysis of Hypothesis 2

Effect	Statistic	Value	*F*	*H* *df*	Error *df*	Sig.	Partial Eta Squared
Intercept	Wilks' Lambda	0.012	3012.477	3	111	< .001	.988
Academic Performance	Wilks' Lambda	0.703	7.119	6	222	< .001	.161

Note. Criterion variables = Self-efficacy, Intrinsic Value, and Test Anxiety

Follow-up simple main effects test of the individual between-subject effects revealed that two of the three self-motivation sub-processes were significantly different across three levels of academic performance (high, average, and low). That is, when the criterion variables were considered separately, self-efficacy and test anxiety were found to be significantly different across academic performance groups ($p < .001$ and $p = .019$, respectively). However, no significant differences in students' intrinsic value scores were found between levels of academic performance ($p = .410$). A model summary for the tests of between-subjects main effects is displayed in Table 21.

Table 21

Model Summary for Tests of Between-Subjects Effects for Hypothesis 2

Source	Criterion Variable	Type III *SS*	*df*	*M* Square	*F*	Sig.	Partial Eta Squared
Academic Performance Group	Self-efficacy	5.479	2	2.739	15.808	< .001	.219
	Intrinsic Value	0.421	2	0.210	0.898	.410	.016
	Test Anxiety	5.200	2	2.600	4.097	.019	.068
Error	Self-efficacy	19.581	113	0.173			
	Intrinsic Value	26.475	113	0.234			
	Test Anxiety	71.720	113	0.635			
Total	Self-efficacy	1156.496	116				
	Intrinsic Value	1050.878	116				
	Test Anxiety	577.959	116				
Corrected Total	Self-efficacy	25.060	115				
	Intrinsic Value	26.895	115				
	Test Anxiety	76.921	115				

A Tukey HSD post-hoc analysis was conducted to determine which academic performance groups were significantly different (.05 level) from each other on self-motivation (self-efficacy, intrinsic value, and test anxiety). Comparing the component of s*elf-efficacy* (*M* =3.12, *SD*=0.467) among the academic performance groups, high achievers (*M* =3.34, *SD* = 0.380) scored significantly higher (p <.001) than average achievers (*M* = 3.01, *SD* = 0.460) and low achievers (*M* = 2.76, *SD* = 0.432). There was no significant difference (p = .090) found between average achievers (*M* = 3.01, *SD* = 0.460) and low achievers (*M* = 2.76, *SD* = 0.432)

Comparing the component of *Test Anxiety* (M=2.08, SD=0.818), the post-hoc analysis revealed that only one significant difference (p = .048) existed between high achievers (*M* =

1.86, *SD* = 0.701) and low achievers (*M* = 2.37, *SD* = 0.843). Students in the high academic performance group scored significantly lower on test anxiety than students in the low academic performance group. However, average achievers (*M* = 2.23, *SD* = 0.889) did not score significantly higher (*p* = .063) on test anxiety than low achievers (*M* = 2.37, *SD* = 0.843); nor was there a significant difference (*p* = .810) between average achievers (*M* = 2.23, *SD* = 0.889 and high achievers (*M* = 1.86, *SD* = 0.701).

Comparing the component of *Intrinsic Value*, there were no significant differences between high, average, and low academic achieving students. See Table 22 for a summary of the post-hoc analyses conducted for Hypothesis 2. Figures 12, 13, and 14 in Appendix E are means plots of self-motivation sub-processes are by academic performance groups.

Table 22

Summary of Tukey HSD Post-hoc Analysis for Hypothesis 2

Criterion Variable	(I)	(J)	*M* Difference (I-J)	*SE*	Sig.	95% CI Lower	95% CI Upper
Self-Efficacy	High	Average	0.327*	0.085	.001	0.125	0.530
		Low	0.571*	0.111	< .001	0.308	0.834
	Average	High	-0.327*	0.085	.001	-0.530	-.125
		Low	0.244	0.115	.090	-0.029	0.517
Intrinsic Value	High	Average	-0.085	0.099	.668	-0.321	0.151
		Low	0.088	0.129	.773	-0.218	0.394
	Average	High	0.085	0.099	.668	-0.151	0.321
		Low	0.173	0.134	.401	-0.145	0.491
Test Anxiety	High	Average.	-0.372	0.163	.063	-0.759	0.016
		Low	-0.508*	0.212	.048	-1.011	-0.004
	Average	High	0.372	0.163	.063	-0.016	0.759
		Low	-0.136	0.220	.810	-0.659	0.387

*The mean difference is significant at the .05 level

Analysis of Hypothesis 3

Hypothesis 3 was evaluated using multiple regression analyses to test whether the sub-process of self-regulation were significantly predictive of the academic performance of secondary students in an online economics course taken in summer of 2013. Specifically, the predictor variables for Hypothesis 3 were the sub-processes of self-regulation, (control, and cognitive strategy). The criterion variable was participants' academic performance in an online economics course.

Tests of normality.

Before Hypothesis 3 was assessed, basic parametric assumptions were assessed. That is, for the criterion (academic performance) and predictor variables (control, cognitive strategy), assumptions of normality (Table 8-9), linearity, homoscedasticity, and multicollinearity were tested. Multicollinearity analysis was used to determine whether there

was a state of high intercorrelation (e.g., r > ±.90) between the variables in self-regulation and represented singularity (i.e. redundant variables) (Tabachnick & Fidell, 2007). (Table 10). Linearity and homoscedasticity were examined using scatterplots and were to be within acceptable limits of the statistical assumptions. The variables were assessed for normality and no distributions were found to be significantly skewed or kurtotic (Table 7). Therefore, since no distributions were significantly skewed or kurtotic, the criterion and predictor variables were deemed to be within acceptable limits of the normality assumption.

Results of hypothesis 3.

Null Hypothesis 3 (RQ3): *The scores of self-regulation do not significantly predict academic performance of secondary students in an online economics course taken in summer of 2013.*

Using SPSS 22, a multiple regression analysis was conducted to determine if self-regulation and specifically its sub-processes (control and cognitive strategy) were significantly predictive of secondary students' academic performance in an online economics course during the summer of 2013. Results from the analysis indicated that a significant relationship did exist between students' academic performance and self-regulation (control and cognitive strategy use), $R = .266$, $R^2 = .071$, $F(2, 113) = 4.293$, $p = .016$. That is, 7.1% ($R^2 = .071$) of the variance observed in the criterion variable (academic performance) was due to the model containing two self-regulation (control and cognitive strategy use). Therefore, the null hypothesis was rejected in favor of the alternative hypothesis. Table 23 contains a model summary of the multiple regression.

Table 23

Model Summary Generated from Multiple Regression Analysis of Hypothesis 3

Source	*R*	R^2	*SE*	*F*	Sig
Omnibus Model	.266	.071	10.108	4.293	.016
	Unstandardized Coefficients		Standardized Coefficients		
	Beta	*SE*	Beta	*t*	Sig.
(Constant)	66.46	7.795		8.526	<.001
Control	9.79	3.724	0.34	2.629	.010
Cognitive Strategy	-2.97	3.130	-0.12	-0.950	.344

Note. Criterion Variable = Academic Performance

The contribution of each predictor variable, when the others are controlled for, was evaluated using the standardized Beta for each coefficient, control made the strongest, and only significant, unique contribution in explaining the criterion variable (Beta = 9.79, p = .010). There was no significant predictive relationship between cognitive strategy and academic performance (Beta = -2.97, p = .344). After re-running the linear analysis only using the significant factor (control), (Beta = 7.29, p=.006) the resulting regression model is: y = 65.23 + 7.29(control).

Analysis of Hypothesis 4

Hypothesis 4 was evaluated using multiple regression analyses to test whether or not self-motivation was significantly predictive of the academic performance of secondary students in an online economics course taken in summer of 2013. Specifically, the predictor variables for Hypothesis 4 was self-motivation (self-efficacy, intrinsic value, and test anxiety). The criterion variable was participants' academic performance in an online economics course.

Tests of normality.

Before Hypothesis 4 was assessed, basic parametric assumptions were assessed. That is, for the criterion (academic performance) and predictor variables (self-efficacy, intrinsic value, and test anxiety), assumptions of normality (Table 8-9), linearity, homoscedasticity, and multicollinearity were tested. Multicollinearity analysis was used to determine whether there was a state of high intercorrelation (e.g., $r > \pm.90$) between the variables in self-motivation and represented singularity (i.e. redundant variables) (Tabachnick & Fidell, 2007). (Table 17). Linearity and homoscedasticity were examined using scatterplots and the distributions were not found to violate the assumptions. The variables were assessed for normality and no distributions were found to be significantly skewed or kurtotic (Table 6). Therefore, since no distributions were significantly skewed or kurtotic, the criterion and predictor variables were assumed to be normally distributed.

Results of hypothesis 4.

Null hypothesis 4 (RQ4): *The scores of self-motivation do not significantly predict academic performance of secondary students in an online economics course taken in the summer of 2013.*

Using SPSS 22, a multiple regression analysis was conducted to determine if self-motivation and specifically the sub-process, self-efficacy, intrinsic value, and test anxiety) were significantly predictive of secondary students' academic performance in an online economics course taken in the summer of 2013. Results from the analysis indicated that a significant relationship did exist between students' academic performance and self-motivation (self-efficacy, intrinsic value, and test anxiety), $R = .563$, $R^2 = .317$, $F(3, 112) = 17.293$, $p < .001$. That is, 31.7% ($R^2 = .317$) of the difference observed in the criterion variable (academic

performance) was due to the model containing three self-motivating sub-processes. Thus, the null hypothesis was rejected in favor of the alternative hypothesis. Table 24 contains a model summary of the multiple regression analysis.

Table 24

Model Summary Generated from Multiple Regression Analysis of Hypothesis 4

Source	*R*	R^2	*SE*	*F*	Sig
Omnibus Model	.563	.317	8.706	17.293	< .001

	Unstandardized Coefficients		Standardized Coefficients		
	Beta	Std. Error	Beta	*t*	Sig.
(Constant)	67.52	7.922		8.523	< .001
Self-efficacy	12.80	2.227	0.58	5.747	< .001
Intrinsic Value	-6.04	1.931	-0.28	-3.129	.002
Test Anxiety	-1.51	1.126	-0.12	-1.337	.184

Note. Criterion Variable = Academic Performance

The contribution of each predictor variable, when the others are controlled for, was evaluated using the standardized Beta for each coefficient. Self-efficacy made the strongest unique contribution in explaining the criterion variable (Beta = 12.80, $p < .001$). Furthermore, after controlling for self-efficacy and test anxiety, intrinsic value made a significant unique contribution in explaining the criterion variable (Beta = -6.04, $p = .002$). A negative Beta value indicates there was a negative relationship between participants' academic performance and intrinsic value. That is, as intrinsic value scores increased, academic performance decreased. Lastly, after controlling for self-efficacy and intrinsic value, test anxiety did not make a significant unique contribution in explaining academic performance (Beta = -1.51, $p = .184$). Thus, after re-running the linear analysis using only those variables that showed significant contribution to academic performance, i.e. self-efficacy (Beta = 14.04, $p = <.001$) and intrinsic value (Beta = -6., $p < .002$) the linear equation is y = 60.689 + 14.035(self-efficacy) – 6.099(intrinsic value).

Summary of the Responses to EOCQ.

Regulating cognition.

The responses to the four open-ended questions in the EOCQ that fell under the cognition area for regulation showed participants in all of the academic performance groups generally believed they were capable of attaining their academic goal, as long as they control their behavior and motivation levels. Students responded with statements that the coursework was easy, as long as they did not procrastinate and persevered through difficult material.

Students in all three groups mentioned explicit cognitive strategies in planning and studying throughout the week, two selected responses illustrate this: "Quizzes and tests were difficult, requiring plenty of study time;" and "Make sure to plan your other activities around the course."

Regulating motivation.

One of the key reasons for self-motivation is personal goal attainment (Zimmerman, 2000b). The reasons cited by the students to take the course boiled down to two major reasons (a) early graduation and/or (b) scheduling conflicts during the regular school year that would have prevented them from taking the desired course during the next school year. Students across academic groups discussed reasons why they were motivated by the course content itself: "It was challenging enough to keep me interested in the subject," stated one student. Overall, the responses from the high achievers reported feelings of personal self-reliance and personal goal seeking, while the average and low achievers reported feelings of frustration and inability to grasp the reading material and/or test questions. Another student felt s/he had learned more about the course content in this online course than in the high school classroom, and that there was no "no busy work." Still other students complained that they "loathed and

despised" the course content, or that they simply were not "online kind of student," interestingly both of these statements were from students in the high academic group. The general sentiment, however, was that the course content was challenging and set up so they could work at their own pace, completing the course through perseverance and self-motivation. One student stated it was "hard as a diamond to focus on" but went on to achieve an 80% in the class.

Regulating behavior.

The responses to the four open-ended questions in the EOCQ that aligned with behavior revealed three recurring themes, which were identified throughout all academic performance groups: time management, help seeking, and self-observation. In all three academic group levels, students expressed concerns about managing time appropriately; warnings of "Don't procrastinate" were observed in all three academic groups. Some of the students in the low academic group level appeared to speak from their personal experiences, and students in the average and low academic group attributed their procrastination to summer/vacation time, which interfered with their studies.

Generally, the levels of help-seeking behavior was observed in all three academic group levels. Students in the average and low academic group mentioned changes they made contextually, for example finding quiet places to study, having a study buddy, and several students in these two groups wrote they had to find a *good* computer to complete their tasks. High achievers appeared comfortable and satisfied with the level and immediacy of the feedback from the online course instructor when they sought help. Students in the average and low academic groups revealed similar help-seeking behavior, but those responses indicated the online course instructors were contacting them to remind them of deadlines and/or

overdue assignments through emails, texts, and telephone calls. Another distinction between high and low achieving students was the way low-achieving students pointedly identified teacher support with exclamations of personal thanks, specifically naming the teachers in their statements, "Thanks, Mr. O, you rock!" The high and average achieving groups simply referred to the timeliness of the feedback, not to a particular teacher. Overall, students appeared to be candid observers of their own academic behavior in all three groups.

Regulating context.

As to students' perception of the context, i.e., digital learning environment, students in every performance group stated they valued the flexibility, particularly relevant for them during the summer break. Students stated they valued the fact they were able to work at their own pace and at their own time with an ability to plan around vacation time. The flexibility of work time was by far the greatest benefit" was a common sentiment among responding students. Students also stated that they were pleased that they were able to take the course outside of the classroom environment, leaving their school schedule open for other pursuits or early graduation. Admonitions were given by students across academic groups to the online providers to have even more flexibility and course control by opening all the course units at once to enable them to work ahead and autonomously pace themselves.

Summary.

This chapter presented the findings of the analysis of the data that were collected using the MSLQ and EOCQ from secondary students enrolled in an online economics course in the summer of 2013. The MSLQ is a 44-item self-report survey that was developed by Paul Pintrich and Elisabeth DeGroot (1990) to measure the levels of self-regulation and self-motivation of students in secondary grades, adopted from the original 81-item MSLQ for

post-secondary students. This survey used the sub-processes from Paul Pintrich's Theoretical Framework of SRL (2000b, 2004).

As stated in Chapter 2, the proficient self-regulated learner has been described as an active agent in his/her own learning process capable of activating, maintaining, and controlling the *self* in the areas of cognition, motivation, behavior, and context during the four phases of the learning process as described in Pintrich's (2000b, 2004) SRL framework (Table 1) (McCombs & Marzano, 1990). There have been fewer studies, however, that have analyzed digital learning readiness in secondary students using the SRL framework. This study was developed to add to the body of research into this area as digital learning emerges as a viable option to the traditional classroom-learning environment in secondary schools. The final chapter of this report will summarize the findings, present conclusions, and suggest recommendations for future studies in this area.

Chapter 5: Discussions, Conclusions and Recommendations

In the preceding chapter, the presentation, and analysis of the data collected from the two self-report surveys, the Motivated Strategies for Learning Questionnaire (MSLQ) and the End-of-Course Questionnaire (EOCQ) were reported. This chapter provides a summary of the study's relevant findings presents the major conclusions and offers recommendations for further research action.

Summary of the Study

The purpose of this study was to investigate the digital learning readiness of secondary students using the theory of self-regulated learning (SRL), by analyzing self-regulation and self-motivation of secondary students with their end-of-course scores through quantitative research. This study analyzed the data collected from secondary students enrolled in an online economics course to investigate whether the findings would corroborate prior findings in research that linked successful academic goals with SRL (Blumenfeld, Pintrich & Hamilton, 1986; Pintrich & DeGroot, 1990; Tsai, 2009; Winters, Greene & Costich, 2008; Zimmerman 2000a, 2002).

The 44-item Motivated Strategies for Learning Questionnaire, (MSLQ) for secondary students is a self-report survey created by Paul Pintrich and his colleagues to measure students' levels of self-regulation (control and cognitive strategy use) and self-motivation (self-efficacy, intrinsic value, and test anxiety) (Pintrich, et al., 1991). The 44-item MSLQ was presented online, so some of the statements were revised to reflect the mode of course delivery, question 23 from the online version used the phrase "from the reading material" as a substitute for "from the book." A pilot study was conducted and it was affirmed that

secondary students did not report any difficulties with the revised language in the MSLQ delivered online.

Participants were asked to choose the best response from a Likert-type scale (1=Never; 2=Sometimes, 3=Often; 4=Always) to determine their individual perceived levels of self-regulation and self-motivation. Scores from the MSLQ were used as quantitative data and analyzed to determine whether there was an association between SRL and academic performance, using the end-of-course scores. End-of-course scores had a possible range from one to one hundred, with ten points available for extra credit. End-of-course scores were used to divide the participants into three groups of academic performance levels (high (90 points or greater), average (between 75-80 points), and low (below 75 points).

Participants also responded to post-course survey from the state virtual school's End of Course Questionnaire (EOCQ). Responses to the EOCQ survey were used if the responders also participated in the MSLQ survey and had completed the course. Those responses included additional information relative to the participants' (a) demographics, (b) reasons for self-selecting to take an online economics course during the summer of 2013, and (c) their self-reflections. Prior to analysis, the responses were divided into the three academic performance levels, and Pintrich's Theoretical Framework of SRL (Table 1) was used as a guide to align the four open-ended questions and responses to the processes and sub-processes in that framework, particularly the areas for regulation, cognition, motivation, behavior, and context.

The participants in this study included 117 high school students who had self-selected an online economics course during the summer of 2013 (N=433). High school students across all districts in Idaho had access to this online course that was delivered through the state

virtual school. 121 participants had taken the MSLQ, but four failed to complete the course, leaving a sample set of 117 participants. One participant received an end of course score of 40, which proved to be an outlier for the data, and was removed (*n*=116)

The overarching research question is how are self-regulation and self-motivation associated with academic performance of secondary students who self-select into an asynchronous online economics course? To answer this question, four sub-questions were developed and investigated.

1. Is there a significant difference among academic performance groups of students (high, average, low) based on their self-regulation scores (i.e., control, cognitive strategy use)?
2. Is there a significant difference among academic performance groups of students (high, average, low) based on their self-motivation scores (i.e., self-efficacy, intrinsic value, test anxiety)?
3. Can the scores of self-motivation (i.e., self-efficacy, intrinsic value and test anxiety) significantly predict academic performance of secondary students?
4. Can the scores of self-regulation (i.e., control, cognitive strategy use) significantly predict academic performance of secondary students?

Discussion of the Findings

Research Question 1: Is there a significant difference among academic performance groups of students (high, average, low) based on their self-regulation scores (i.e., control, cognitive strategy use)?

The findings for research question 1 indicate no significant difference among academic performance groups based on their self-regulation scores. When the sub-processes of self-regulation (i.e. control and cognitive strategy) were considered separately, no significant differences were found among the three academic performance group. . Based upon these findings, it could be argued that the participants in the three academic groups either engaged in control and cognitive strategy use with the same level of effort and/or the same level of strategy disuse. To answer those concerns, a review of the responses to the MSLQ revealed that the most common response among all groups were "often" or "sometimes." A review of the open-ended responses suggested that the participants in this study did use cognitive and metacognitive strategies for regulating their understanding of the material and controlling their effort and levels of perseverance during study periods as posed in the questions across all of the academic performance groups.

A review of the MSLQ questions specific for control and cognitive strategy provided additional details to inform the analysis. Questions focused on control referred to perseverance in the face of frustration, and exerting extra effort when needed. Several of the questions asked whether strategies focused on controlling and monitoring progress were used by the respondent, such as pre-planning prior to initiating the learning episode, using organizing strategies to understand material, pause and review and/or self-questioning after reading the material.

Questions on cognitive strategy use were similarly phrased; for example, asking respondents whether they used specific cognitive strategies such as rehearsal, paraphrasing, and/or memory strategies to understand the reading material. Respondents overwhelmingly selected "often" or "sometimes" to these questions, so it may be that these respondents

believed they should respond in this way, a common problem with self-report surveys (Dillman, Smyth, & Christian, 2009).

Research Question 2. Is there a significant difference among academic performance groups of students (high, average, low) based on their self-motivation scores (i.e., self-efficacy, intrinsic value, test anxiety)?

The findings for research question 2 found there was a significant difference in self-motivation among the three academic performance groups. When the sub-processes of self-motivation were considered separately, no significant difference was found among the three groups based upon reported intrinsic value, but there were a significant difference among all three academic performance groups for self-efficacy, the most significant differences were between high achievers and low achievers. High achievers reported higher levels of self-efficacy than the low achievers. There was also a significant difference in test anxiety between high achievers and low achievers where high achievers had lower higher levels of test anxiety than low achievers, although there was no difference between high and average achievers.

These findings are congruent with previous research on the relationship between perceptions of self-efficacy and academic performance. Schunk and Ertmer (2000) found that students' perceptions of personal self-efficacy is key in motivating students to self-regulate their own learning process. The learners' perceived self-efficacy has also been shown to be dependent upon the self- beliefs in their abilities, judgments, and/or feelings of knowing (Zimmerman, 2000a; Zimmerman, Bandura, & Martinez-Pons, 1992). The learner's perceived self-efficacy has also been shown to either promote or impede goal attainment (Zimmerman, Bandura, & Martinez-Pons, 1992). This high level of perceived self-efficacy has been shown

to motivate students to complete the tasks in order to reach their ideal standard goal even in the face of frustration and challenges (Pintrich, 2000b; Zimmerman, 2000b). The self-efficacious self-regulated learner has been shown to be resilient in the face of self-doubts arising from academic challenges during the learning episode, and uses this resiliency to work toward goal attainment (Bandura, 1977, 1996). The learners' perceived self-efficacy has been shown to have a sustaining effect on SRL use for future like-tasks or learning episodes, particularly important in the autonomous digital learning environment. An online learner who maintained a positive attitude while interacting within the digital learning environment was more likely to achieve a successful goal (Hung, et al., 2009). In relation to this study, the responses from the high achievers reported feelings of personal self-reliance and personal goal seeking, while the average and low achievers reported feelings of frustration and inability to grasp the reading material and/or test questions.

That high achievers scored lower in test anxiety than low achievers is not surprising, since test anxiety produces a negative emotional response to tests (Pintrich, 2004). As self-efficacy increases, based upon a learner's past experiences and personal assessments of abilities in comparison to others, it stands to reason that the self-efficacious learner experiences a lower feeling of test anxiety than the less efficacious learner. In response to the open-ended questions on the EOCQ, each of the performance groups reported personal perseverance to complete the course, albeit at difference levels, motivated by their individual reasons for taking the online course during the summer of 2013. Perhaps as has been reviewed in the literature, goal orientation is important in maintaining self-motivation, and may provide a reason enrollment in digital learning is increasing in the secondary grades, particularly in high school; secondary students seek online courses that align with their personal self-

generated goals. Digital learning may offer secondary students more of a stage-environment fit in that it promotes academic autonomy and contextual control, key components found to encourage successful engagement and goal attainment, during a period of human development, adolescence, secondary students desire more independence and self-selection; elements that are not seen in the traditional classroom environment (Eccles, 1999, Wang & Eccles, 2012).

Research question 3. Can the scores of self-regulation (i.e., control, cognitive strategy use) significantly predict academic performance of secondary students?

The findings for research question 3 showed that self-regulation (control and cognitive strategy) could significantly predict academic performance in secondary students enrolled in an online course. When the sub-processes of self-regulation were considered, control was shown to be the only significant predictor of academic performance. The questions in MSLQ that addressed the sub-process of control related to maintaining behavioral control, e.g., perseverance in the face of frustration and/or exerting extra effort when needed during the learning episode. Digital learning environments have been found to encourage self-control of the learning process, a trait secondary students have rarely experienced in the traditional classroom (Eccles, 1999; Wang & Eccles, 2012; Winters, Greene, & Costich, 2008). When considering the definition of SRL, as an "active constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (p. 5), the link between control and academic performance appears expected (Wolters, Pintrich & Karabenick, 2003).

The proficient self-regulated learner exhibits self-control throughout the phases of learning, but it is particularly important as the learner activates and progresses through the designed plan for goal attainment (Pintrich, 2000a, 2000b, 2004). During these processes, the proficient self-regulated learner demonstrates self-control by initiating specific learning strategies that were selected during the planning stage, but also is willing and capable of revising any or all of the strategies or the plan itself, in accordance to the challenges experienced during the learning episode (Pintrich, 2000a, 2000b, 2004; Zimmerman, 2002). Students within this study reported they were very aware of the need to monitor time management and adjust their initial estimates when needed. The self-awareness and self-observation of the participants' responses revealed a proactive state of monitoring and control that crossed the academic group achievement exceeded expectations based upon prior studies on academic and behavioral abilities of adolescent students (Eccles, 1999; Eccles & Wigfield, 2002; Quintana, Zhang, & Krajcik's 2005; Yukselturk & Bulut, 2009). The proficient self-regulated learner is proactive in his/her own learning process by maintaining self-control through self-observation and activation; this proactive approach to learning also appears to be predictive of increased academic performance for online learners.

Research question 4. Can the scores of self-motivation (i.e., self-efficacy, intrinsic value and test anxiety) significantly predict academic performance of secondary students?

The findings for research question 4 showed self-motivation can significantly predict academic performance. When the sub-processes of self-motivation were considered, self-efficacy was the strongest significant predictor of academic performance. The findings also showed that intrinsic value made a significant unique contribution in explaining academic

performance, surprisingly, when intrinsic value increased, academic performance decreased. Test anxiety was found not to significantly predict academic performance.

These findings affirm, in part, that self-motivation is key to any learning episode, but is particularly important in the more autonomous digital learning environment (Sansone, Fraughton, Zachary, Butner, & Heiner, 2011). Pintrich and DeGroot (1990) identified three sub-processes in self-motivation (a) self-efficacy (b) the emotional response to the task (test anxiety) and, (c) intrinsic value or interest in the task. The learner's perception of self-efficacy is a component in predicting the successful attainment of academic goals (Bandura, 1977; Pintrich, 2000a, 2000b, Pintrich & DeGroot, 1990; Zimmerman, 2000a; Zimmerman, Bandura, & Martinez-Pons, 1992).

The finding of the predictive component of intrinsic value in academic performance is surprising, in part because the participants self-selected to take the online economics course for individual and personal reasons, be it early graduation and/or opening up their school schedule for the upcoming year. It would appear; therefore, that intrinsic value for goal attainment would be positively linked with academic performance. It has been found in prior research that when students believed that the task/goal was relevant, they were more likely to be motivated to engage in regulating their cognition and behavior through the learning episodes (Boekaerts & Niemivirta, 2000). The findings from this study, however, revealed that as intrinsic value increased, academic performance decreased. It could be inferred from the participants' responses related to reasons for self-selecting to take the online economics course (intrinsic value) were not attached to the course content, but rather in the personal and individual goals of each participant that helped to affect their overall goal of future academic flexibility and control.

To understand this phenomenon, a review of the questions in MSLQ for intrinsic value were reviewed. The questions, as phrased, sought responses to participants' personal interest in seeking challenging coursework, and for understanding the subject at a higher level of understanding. When considering the two main goals for self-selecting the online course were aligned with personal goals for early graduation and/or scheduling issues, it may not be surprising that the responses to the questions in the MSLQ, as phrased, resulted in this data.

Implications of Findings

The findings presented in this chapter support the SRL theory that secondary students who have the abilities of a proficient self-regulated learner, particularly in self-efficacy and control, reach a higher level of academic performance in a digital learning environment than those students without these abilities. Of particular importance is the student's self-efficacy judgments, which serves to promote motivational beliefs and drive the student to activate and maintain a plan to achieve his/her ideal standard goal. As Pintrich and other academic scholars discovered in the early years while investigating the phases and sub-processes of SRL, teaching students learning strategies is not enough to attain a successful academic goal; motivational beliefs are the catalyst for student engagement in their own learning processes (Bandura, 1977, Pintrich, 2000a, 2000b, 2002; Zimmerman, 2000a).

Secondary students need to have high levels of motivation to begin a learning process in an asynchronous online course. Secondary students need to have the ability and resiliency to regulate their level of self-efficacy to remain actively and confidently engaged during learning episodes to achieve successful goals. (Bandura, et al., 2003). If self-efficacy is a catalyst to activating the learning process, then it is important that teachers realize their role in nurturing that perception in their students. This can be done through positive feedback,

modeling, and stressing that intelligence is malleable, not fixed, which grows through exerted effort, despite difficult obstacles in the task (Bandura, 1977; Dweck, 2010; Zimmerman, Bandura, & Martinez-Pons, 1992). It is important that online instructors and others involved in the implementation of online education be aware of this need and provide the necessary emotional and academic supports to what is a diverse population of secondary students in this digital learning environment.

Unfortunately, instruction in the processes and sub-processes in the framework of self-regulated learning is generally not evident in either primary or secondary classrooms; this omission results in students activating hit-and-miss strategies for learning episodes (Wang & Eccles, 2012; Wigfield, Eccles, & Rodriguez, 1998; Zimmerman, 2000a). Eccles and other academic scholars discovered the culture of competition and comparison promoted in the secondary grades is in direct conflict with stage-environment fit for adolescent students, resulting in school disengagement and decreased academic value (Wang & Eccles, 2012; Wigfield, Eccles, & Rodriguez, 1998; Zimmerman, 2000). The social and academic culture can result in a negative sense of self, pitting the fragile, developing ego against an ingrained traditional expectation of obedience or defiance. As a result, secondary students' perceptions of self-efficacy, self-management, and decision-making abilities may suffer (Wigfield, Eccles, & Rodriguez, 1998).

White and DeBinedetto (2015) provided ways that K-12 educators can develop self-regulated learning sequentially and increase students' perception of self-efficacy by guiding them through the taxonomy of *self-regulatory competency* (White & DeBenedetto, 2015, p. 10). The four hierarchical stages (observation, emulation, self-control, and self-regulation) can begin to be taught as early as kindergarten and can continue to high school graduation in

every discipline. The teacher first models self-regulated learning to the students as s/he teaches a lesson to allow students to observe the learning process in action; for example, while editing a piece of writing, the teacher can think aloud while editing the work product (White & DeBenedetto, 2015). Through observations, the students better understand that writing does not just happen during the first attempt, that good writing involves a process of editing, revision, and re-editing. As the students attempt to emulate the processes observed, the teacher facilitates the transition through immediate feedback, reinforcement, and praise, increasing students' perceptions of self-efficacy (White & DeBenedetto, 2015). Teachers must remain continue to facilitate understanding of the processes during the third stage self-regulatory competency and provide opportunities for students to practice the processes observed and emulated to increase mastery self-efficacy (White & DeBenedetto, 2015). Finally, the teacher can assess students' attainment of self-regulatory competency when they observe students regulating their (a) strategy use (cognition); (b) self-efficacy beliefs (motivation), (c) strategies adaption and revision (behavior), and (d) learning environment (context).

A change in the academic and social culture of secondary schools would not only align more closely with the adolescent stage of human development, but would also allow for a smoother transition from primary grades to secondary grades. When self-regulated learning is modeled, taught, and encouraged, research has shown the probability of academic success is heightened. There will be a higher probability of increased academic performance of the proficient self-regulated learner enrolls in the autonomous digital learning environment.

The digital learning environment provides high school students with a flexibility and control that learners at this stage in their academic career embrace. Based upon the responses

to the open-ended questions in the EOCQ, secondary students in this study reported an overall value in the context of the learning environment that allowed a freedom, flexibility, and control of their own learning processes that stimulates personal growth that will motivate them to become life-long learners after graduation.

Recommendations for Further Research

The purpose of this study was to investigate digital learning readiness of secondary students by analyzing their level of SRL (i.e., self-regulation and self-motivation) with their academic performance. Data was collected using the Motivated Strategies in Learning Questionnaire (MSLQ) and End-of-Course Questionnaire (EOCQ) to test the four research questions relating to this goal. Through analyses of the data, significant findings were found to exist; however, there are limitations to these findings. One of the limitations is that the participants may not be representative of the population of online learners in secondary grades. An attempt at census failed; however, it could arguably be posited that the sample represented a gradients of similarity to the target population. This rather homogenous sampling, the majority white female, may not representative of the diverse population of secondary students in the United States who have enrolled in digital learning. Although it has been found that overall more females enroll in online courses in their attempt to balance their various cultural roles of mother, wife, and/or employee (Kramarae, 2003; Rickert and Sacharow, 2000; Yukselturk & Bulut, 2009). This explanation for the disproportionate enrollment of female students in the secondary grades may not be as relevant when considering the age of most high school students, but it should be further explored. Yukselturk and Bulut (2009) did conduct a study that analyzed gender differences in the variables of self-regulation and motivational beliefs within a digital learning environment and

found no significant differences between the male and female students in relation to motivational beliefs, self-regulated learning variables, and achievement. These concerns could be explored further through multiple studies specific to this population, and it is recommended that further research focused on the digital learning readiness of secondary students be conducted using a broader and more diverse sample population that would better represent the diversity seen in the public school system across the country.

Findings from prior studies have found that the MSLQ is a valid and reliable instrument that can be used to determine online learning readiness in secondary students, with some limitations. Using this instrument could provide administrators and counselors with an assessment tool prior to recommending and/or enrolling secondary students into courses within the digital learning environment. In addition to the MSLQ, it would be beneficial to include structured interviews that were aligned to the processes and sub-process of SRL to assist in further assessment of the students' digital learning readiness. In this study, the participants' responses to the open-ended EOCQ provided additional information that helped assess students' perseverance, study habits, including cognitive strategy use and behavior (e.g., help-seeking patterns). A structured interview could be developed based upon the phases and sub-process of SRL, or one could be used that has already been developed, for example as described in an article by Zimmerman and Pons' (1986).

A further area of recommended research would include analyzing the diverse needs for external support by secondary students within a digital learning environment. Of note, it appeared from the responses to the EOCQ, students in the low academic performance group pointedly acknowledged that the support and monitoring assistance provided by their instructors as instrumental in keeping them on track and completing the course. From these

responses and their end-of-course scores, it seems that struggling secondary students still need to have a perceived relationship with the instructor even within an asynchronous digital learning environment. These findings affirm studies by Jacquelynne Eccles and her colleagues on the issue of "stage-fit" for secondary students in the traditional secondary classrooms (Eccles, Wigfield, et al., 1993). Evidently, even in the digital learning environment, perhaps particularly in the digital learning environment, a personal teacher-student relationship is important to goal attainment.

Finally, it is recommended that further studies need to be conducted in this area using an experimental design in several disciplines with secondary students and the self-regulation and self-motivation constructs in SRL. An experimental study on SRL, using a control group and another group that is provided instruction in cognitive and behavioral strategies to maintain task engagement can be explicitly taught to students to determine its impact on student autonomy, school engagement, and academic success in and outside of the digital learning environment.

This study has affirmed prior research that has linked self-regulation and self-motivation in SRL with increased academic performance. It has shown that knowledge of cognitive and metacognitive is not enough to attain the ideal standard goal, that self-motivation drives the learning process forward in the face of obstacles and challenges within the task. It has shown that a high perception of self-efficacy provides a foundation for perseverance and determination in an academic setting and increases the probability of goal attainment, in other words, course completion. It has shown that secondary students personally value the benefits of digital learning in ways that move their individual goals forward, through flexibility and control of context. Finally, it has shown that students with

low academic levels of performance require external support above those students with high academic levels of performance, which should include providing supplemental guides to reduce test anxiety.

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APPENDICES

Appendix A: Motivated Strategies for Learning Questionnaire (MSLQ)

	Question	
Question 1	**Consen**t • The University of Idaho Institutional Review Board has Certified this Project as Exempt. • The purpose of this study is to determine online learning readiness in students. • You will be asked to take an online 44-item self-report questionnaire, which takes about 15 minutes. • Although there are no or minimal risks associated with the project, some people find the time to complete the project is long. • You will benefit from this project by helping us determine ways to increase student achievement in an online learning environment. • Society will benefit because it will help us provide stronger support systems to students who want to take classes online. • If you find taking the survey is creating stress or emotional difficulty, you may elect to stop taking it at any time. • All information you provide will be placed in a locked file cabinet with access only available by the faculty sponsor/PI, Dr. Allen Kitchel, and student investigator. • If you have questions about the study or interview, you can ask the investigator before taking the survey, when the survey is complete or at a time you feel is appropriate. Faculty Sponsor/PI Dr. Allen Kitchel, University of Idaho, Dept. of Education, Moscow, ID 83844-4264.Ph. 208-885-6111 Student Investigator Mary Jaglois Orr,University of Idaho, Depart.of Education, Coeur d'Alene, ID 83814, Ph. 208-667-2588. • During the course of this study, you may stop at any time with no penalty. • If you do stop your participation in the study, there will be no penalties associated with your withdrawal. All you need to say is that I no longer wish to participate. • Please indicate your agreement to participate by clicking YES below. If you do not wish to participate, please close your browser window.	
For Questions 2-45 1=Never, 2=Sometimes, 3=Often, 4=Always		**Area for Regulation**
Question 2	I prefer class work that is challenging so I can learn new things.	**IV**
Question 3	Compared with other students in this class, I expect to do well.	**SE**

Question 4	I am so nervous during a test that I cannot remember facts I have learned. REV	**TA**
Question 5	It is important for me to learning what is being taught in this class.	**IV**
Question 6	I like what I will be learning in this class.	**IV**
Question 7	I'm certain I can understand the ideas taught to me in this course.	**SE**
Question 8	I think I will be able to use what I learn in this class in other classes.	**IV**
Question 9	I expect to do very well in this class.	**SE**
Question 10	Compared with other students in this class, I think I'm a good student.	**SE**
Question 11	I often choose topics for assignments that I will learn from even if this requires more work.	**IV**
Question 12	I am sure I can do an excellent job on the problems and tasks assigned for this class.	**SE**
Question 13	I have an uneasy, upset feeling when I take a test. REV	**TA**
Question 14	I think I will receive a good grade in this class.	**SE**
Question 15	Even when I do poorly on a test I try to learn from my mistakes.	**IV**
Question 16	I think that what I will be learning in this class is useful for me to know.	**IV**
Question 17	My study skills are excellent compared with other students in this class.	**SE**
Question 18	I think that what we will be learning in this class will be interesting.	**IV**
Question 19	Compared with other students in this class I think I know a great deal about the subject.	**SE**
Question 20	I know that I will be able to learn the material for this class.	**SE**
Question 21	I worry a great deal about tests. REV	**TA**
Question 22	Understanding this subject is important to me.	**IV**
Question 23	When I take a test I think about how poorly I am doing. REV	**TA**
Question 24	When I study for a test, I try to put together the information from class and from the reading material.	**CS**
Question 25	When I do homework, I try to remember what was taught in class so I can answer the questions correctly.	**CS**
Question 26	I ask myself questions to make sure I know the material I have been studying.	**SR**
Question 27	It is hard for me to decide what the main ideas are in what I read. REV	**CS**
Question 28	When work is hard I either give up or study on the easy parts. REV	**SR**
Question 29	When I study I put important ideas into my own words.	**CS**
Question 30	I always try to understand the material even if it doesn't make sense.	**CS**
Question 31	When I study for a test I try to remember as many facts as I can.	**CS**
Question 32	When studying, I copy my notes over to help me remember material.	**CS**
Question 33	I work on practice exercises and answer end of chapter questions even when I don't have to.	**SR**

Question 34	Even when study materials are dull and uninteresting, I keep working until I finish.	**SR**
Question 35	When I study for a test I practice saying the important facts over and over to myself.	**CS**
Question 36	Before I begin studying I think about the things I will need to learn.	**SR**
Question 37	I use what I have learned from old homework assignments and the textbook to do new assignments.	**CS**
Question 38	I often find that I have been reading for class but don't know what it is all about. REV	**SR**
Question 39	I find that when I'm reading online material, I think of other things and become distracted. REV	**SR**
Question 40	When I am studying a topic, I try to make everything fit together.	**CS**
Question 41	When I'm reading I stop once in a while and go over what I have read.	**SR**
Question 42	When I read materials for a class, I say the words over and over to myself to help me remember.	**CS**
Question 43	I outline the chapters in my book to help me study.	**CS**
Question 44	I work hard to get a good grade even when I don't like a class.	**SR**
Question 45	When reading I try to connect the things I am reading about with what I already know.	**CS**

Appendix B: End of Course Questionnaire

Column	Question
Question 1	Please indicate your age:
Question 2	Please indicate your gender:
Question 3	Are you of Hispanic or Latino descent (of any race)?
Question 4	Please choose one or more races:
Question 5	Please indicate your expected grade in the course:
Question 6	On average, how many hours per week did you spend on this course, including attending classes, reading, reviewing notes, writing papers, and any other course related work?
Question 7	Please indicate your G.P.A.:
Question 8	Your expected graduation year:
Question 9	Why did you take this online course? (Choose all that apply).
Question 10	If you selected other for question #9, please explain:
Question 11	Thinking about course content, please indicate your level of agreement with each of the following statements: - I enjoyed taking this online course.
Question 12	Thinking about course content, please indicate your level of agreement with each of the following statements: - It was clear to me what I was supposed to learn from the class.
Question 13	Thinking about course content, please indicate your level of agreement with each of the following statements: - The course material was interesting to me.
Question 14	Thinking about course content, please indicate your level of agreement with each of the following statements: - I learned things that will help me in other classes or in everyday life.
Question 15	Thinking about course content, please indicate your level of agreement with each of the following statements: - The readings (web sites, articles, texts, etc.) were useful.
Question 16	Thinking about course content, please indicate your level of agreement with each of the following statements: - I found online discussion groups helpful.
Question 17	Thinking about course content, please indicate your level of agreement with each of the following statements: - The assignments were clearly related to the overall purpose of the class.
Question 18	Thinking about course content, please indicate your level of agreement with each of the following statements: - I had plenty of opportunity to practice what I learned.
Question 19	Thinking about course content, please indicate your level of agreement with each of the following statements: - The course material was too hard to read.
Question 20	Thinking about course structure, please indicate your level of agreement with each of the following statements: - Registration for the online course

	was easy.
Question 21	Thinking about course structure, please indicate your level of agreement with each of the following statements: - The interface . . . what I saw on the computer . . . was easy to use.
Question 22	Thinking about course structure, please indicate your level of agreement with each of the following statements: - My movement and navigation through the online material was easy.
Question 23	Thinking about course structure, please indicate your level of agreement with each of the following statements: - The assignments were clear; I knew what the teacher expected me to do.
Question 24	Thinking about course structure, please indicate your level of agreement with each of the following statements: - We were given enough time to complete the assignments.
Question 25	Thinking about course structure, please indicate your level of agreement with each of the following statements: - The way the class was organized worked well for me.
Question 26	Thinking about course support, please indicate your level of agreement with each of the following statements: - IDLA offers a good selection of courses students can take online.
Question 27	Thinking about course support, please indicate your level of agreement with each of the following statements: - The counselor at my school knew a lot about IDLA.
Question 28	Thinking about course support, please indicate your level of agreement with each of the following statements: - My local school gave plenty of support to help me complete the online course.
Question 29	Thinking about course support, please indicate your level of agreement with each of the following statements: - My parents encouraged me to take an online course.
Question 30	Thinking about course support, please indicate your level of agreement with each of the following statements: - There were lots of times when I needed to talk to someone about the class, to help me understand the assignments (academic support).
Question 31	Thinking about course support, please indicate your level of agreement with each of the following statements: - When I needed help with the assignments, I had easy access to academic support and I was able to get the help I needed.
Question 32	Which of the following people most helped you with understanding and completing your assignments (academic support)?
Question 33	Did you use the Academic Help Center?
Question 34	If you did use the Academic Help Center, please answer the following: - Please rate your level of satisfaction with your experience in the Academic Help Center:
Question 35	If you did not use the Academic Help Center, please indicate why. (Choose all that apply)

Question 36	During my course I had:
Question 37	When I had technical issues, the first person I contacted was:
Question 38	When I had technical issues they were most often resolved by:
Question 39	Thinking about the course instruction and your experience with your online teacher, please indicate your level of agreement with the following statements: - Overall, my teacher met my needs in this course.
Question 40	Thinking about the course instruction and your experience with your teacher, please indicate your level of agreement with the following statements: - I had positive and rewarding interactions with the online teacher.
Question 41	Thinking about the course instruction and your experience with your teacher, please indicate your level of agreement with the following statements: - The online teacher was good at moderating course discussions.
Question 42	Thinking about the course instruction and your experience with your teacher, please indicate your level of agreement with the following statements: - The online teacher was prompt with feedback on my assignments.
Question 43	Thinking about the course instruction and your experience with your teacher, please indicate your level of agreement with the following statements: - The online teacher provided helpful feedback on my assignments.
Question 44	Thinking about the course instruction and your experience with your teacher, please indicate your level of agreement with the following statements: - I felt encouraged to respectfully express myself throughout the course.
Question 45	Thinking about the course instruction and your experience with your teacher, please indicate your level of agreement with the following statements: - The teacher provided regular communication about assignments, due dates, exams and other information relevant to the course.
Question 46	Thinking about the course instruction and your experience with your teacher, please indicate your level of agreement with the following statements: - The teacher was available for extra help when needed.
Question 47	Did you have a dedicated class period at school to take your online course?
Question 48	Thinking of your overall experience with this IDLA online course, please indicate your level of agreement with the following: - If I needed another course, I would like to take another IDLA online course.
Question 49	Thinking of your overall experience with this IDLA online course, please indicate your level of agreement with the following: - I would recommend an IDLA online course to my friends.
Question 50	Thinking of your overall experience with this IDLA online course, please indicate your level of agreement with the following: - This online course was more of an intellectual challenge than other high school courses I have taken.

Question 51	Thinking of your overall experience with this IDLA online course, please indicate your level of agreement with the following: - This online course required more effort than other high school courses I have taken.
Question 52	Thinking of your overall experience with this IDLA online course, please indicate your level of agreement with the following: - The class was too easy.
Question 53	Thinking about your orientation course and your contact with IDLA administrators, please indicate your level of agreement with the following statements: - I felt prepared for my online course after taking the Orientation course.
Question 54	Thinking about your orientation course and your contact with IDLA administrators, please indicate your level of agreement with the following statements: - If I had problems during Orientation, I knew who to ask for help.
Question 55	What did you like about your online course?
Question 56	What changes would make this experience better for you?
Question 57	What difficulties did you have in completing this course?
Question 58	What advice would you give a new student taking an IDLA course?
Question 59	Do you have plans to continue your education after high school?
Question 60	Have you taken or are you currently taking any classes for college/university credit?
Question 61	Thank you for taking the time to complete this course evaluation. Please enter any additional comments you have below.

Appendix C: Scatterplots

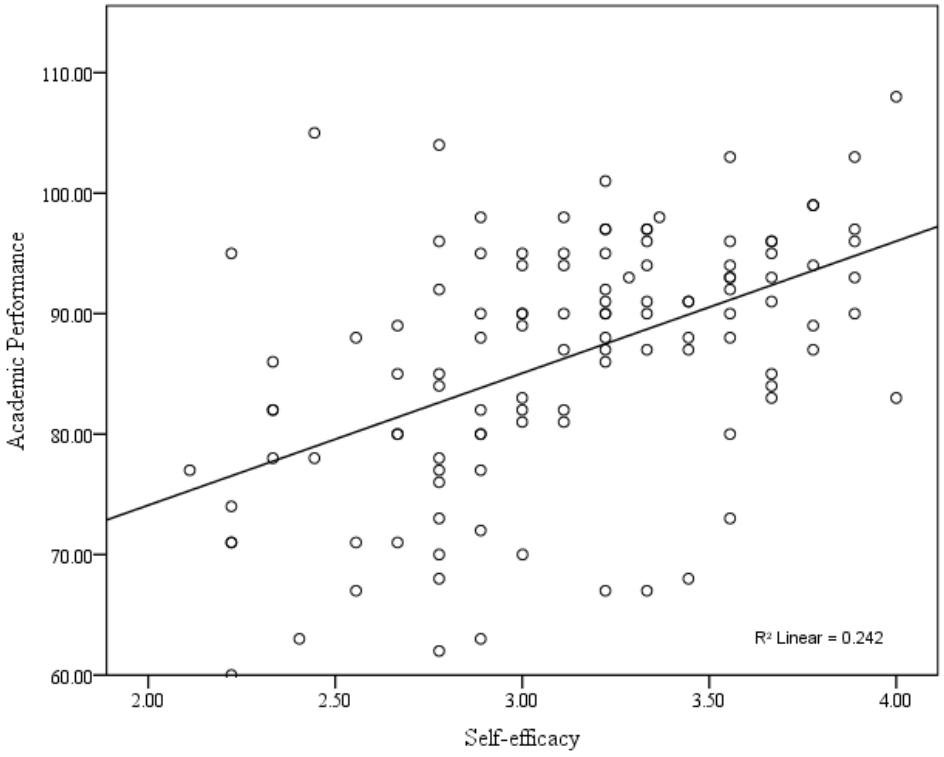

Figure 5. *Scatterplot of self-efficacy and academic performance*

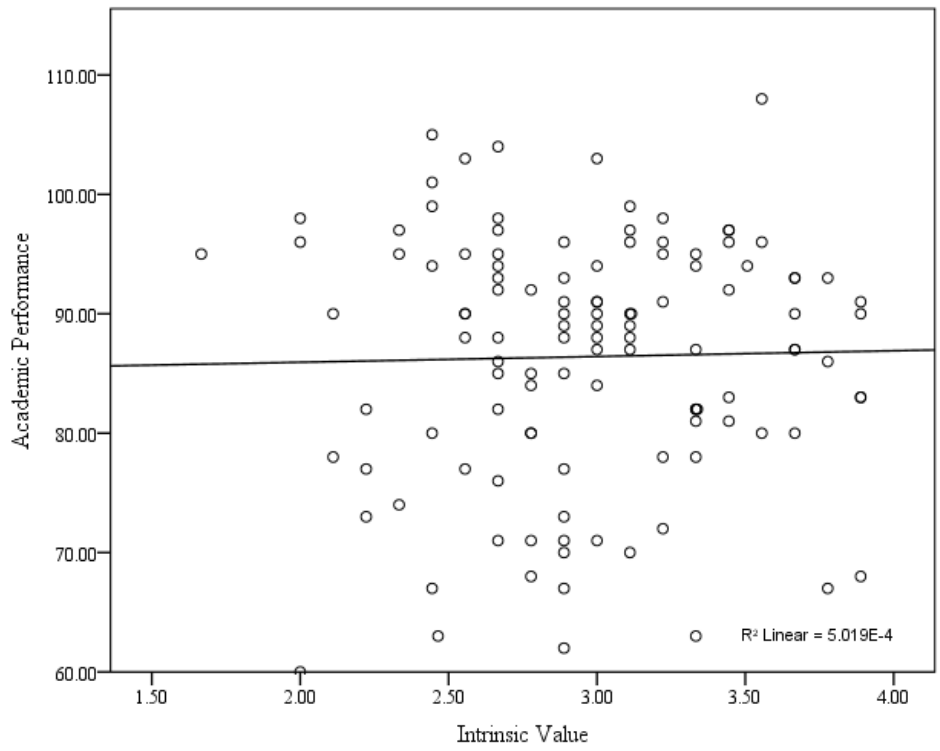

Figure 6. *Scatterplot of intrinsic values and academic performance*

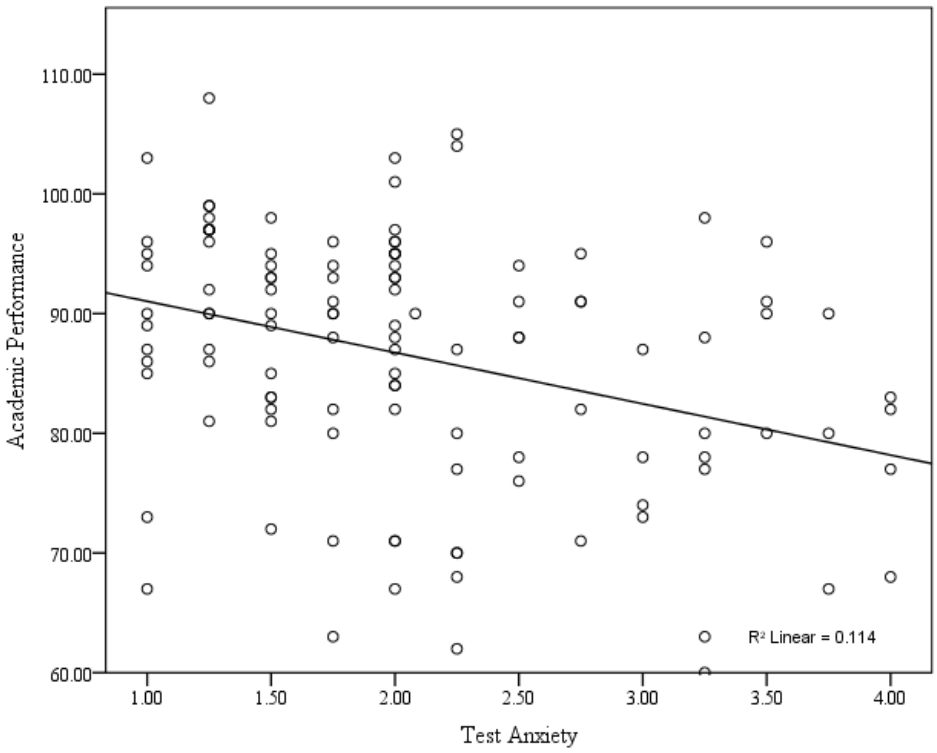

Figure 7. *Scatterplot of test anxiety and academic performance*

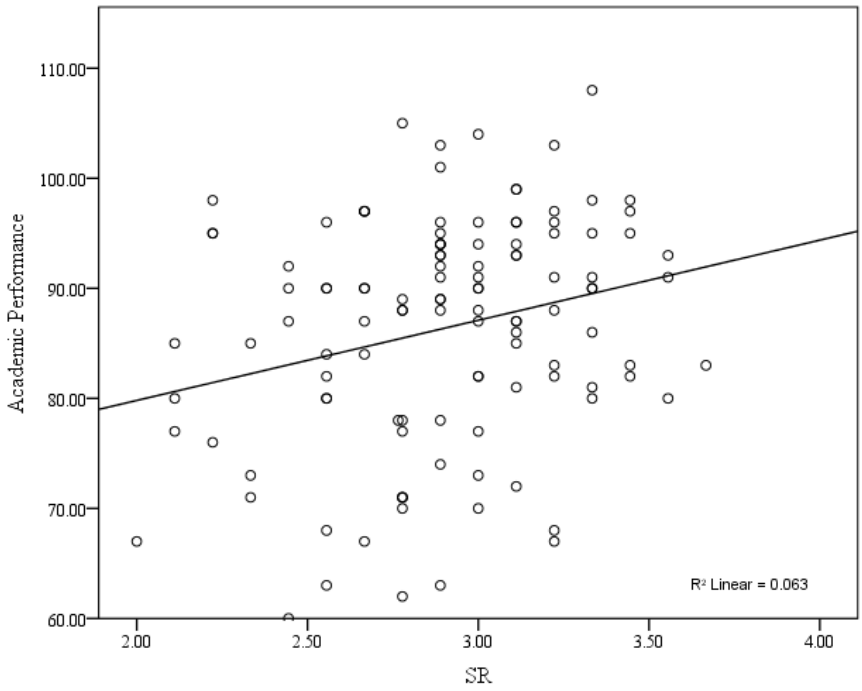

Figure 8. *Scatterplot of control and academic performance*

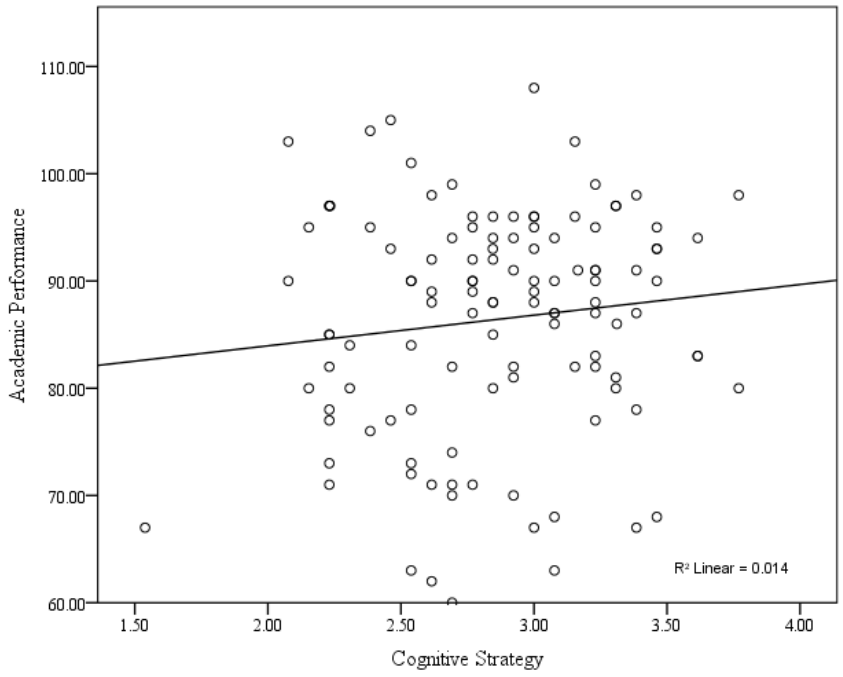

Figure 9. *Scatterplot of cognitive strategy and academic performance*

Appendix D: Means Plots

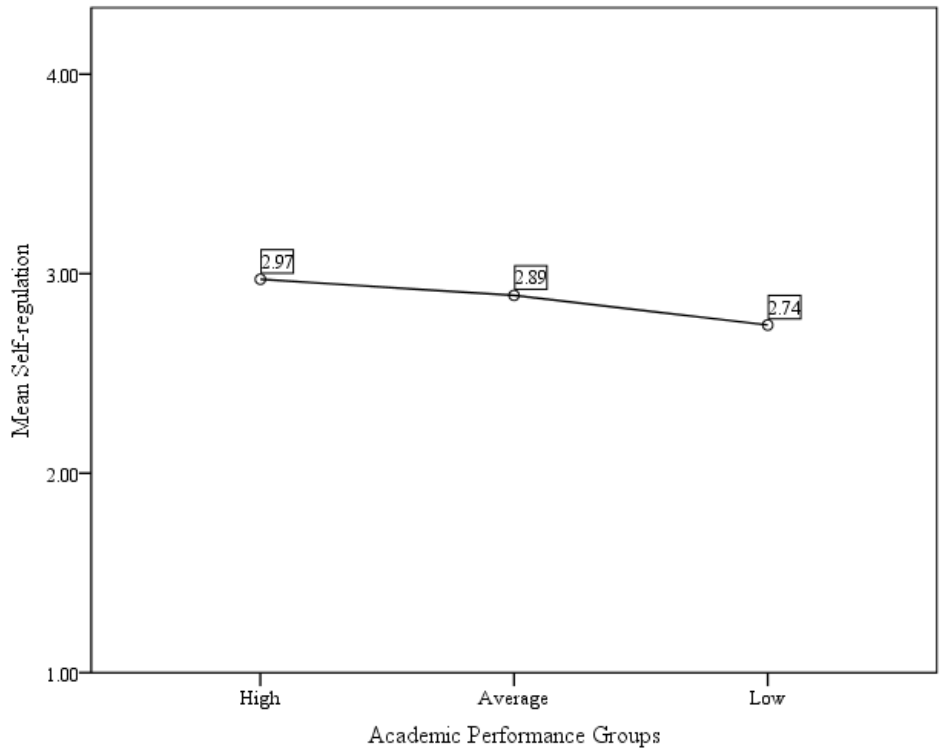

Figure 10. *Means plot of Control by academic performance groups*

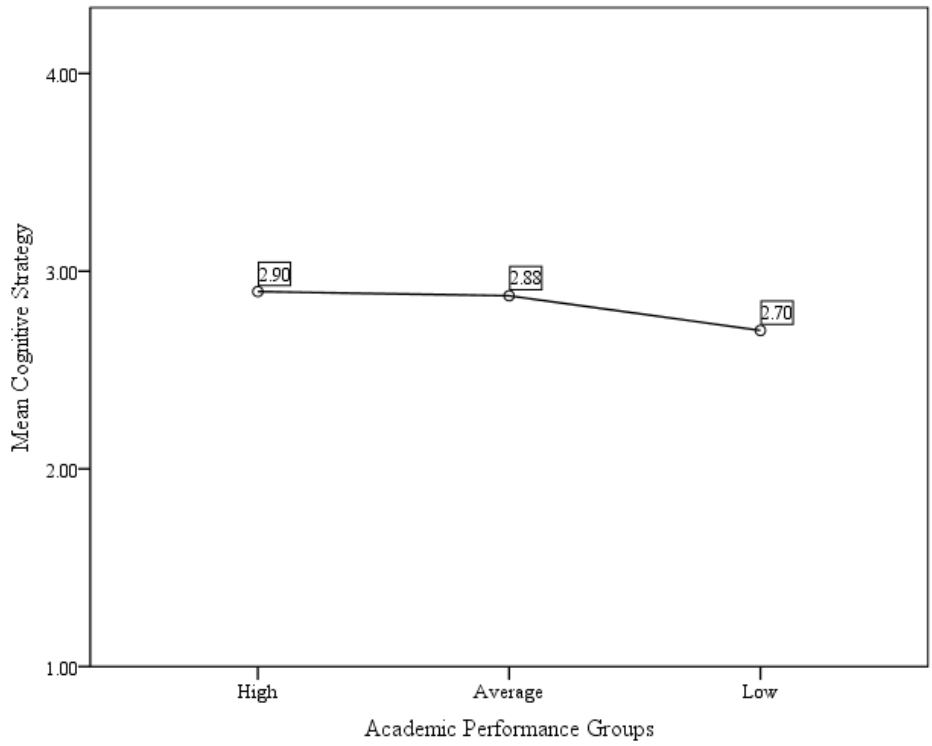

Figure 11. *Means plot of cognitive strategy by academic performance groups*

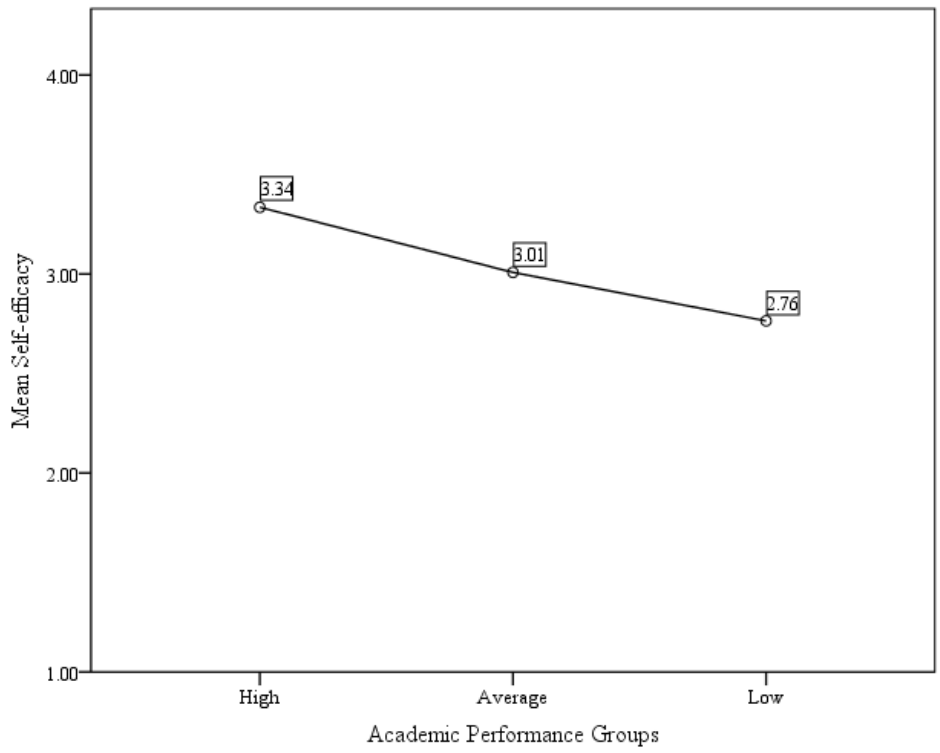

Figure 12. *Means plot of self-efficacy by academic performance groups*

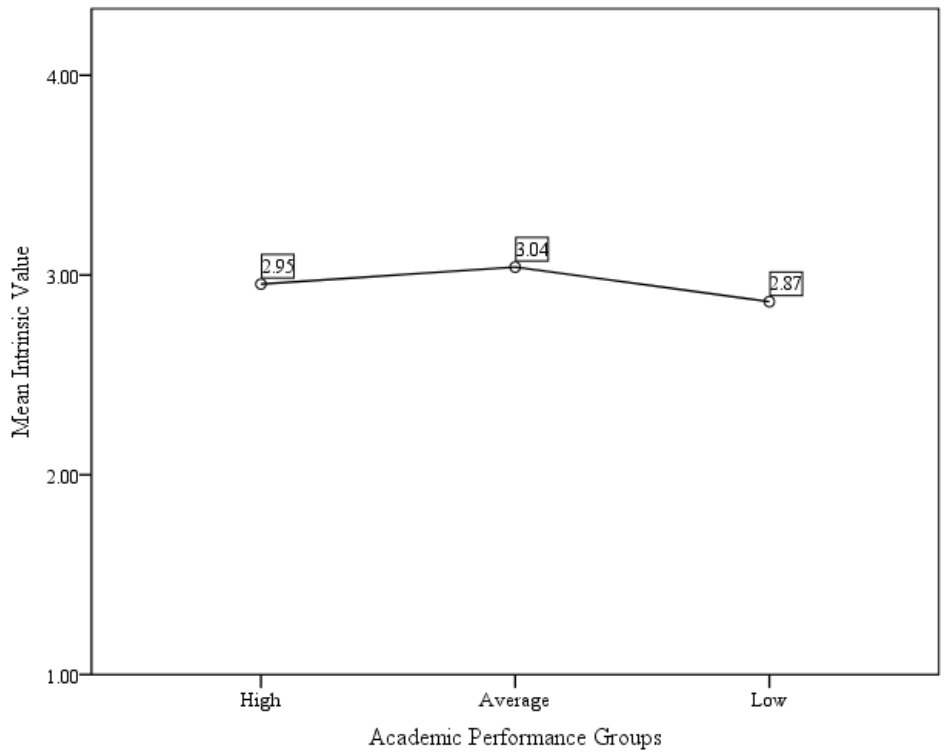

Figure 13. *Means plot of intrinsic value by academic performance groups*

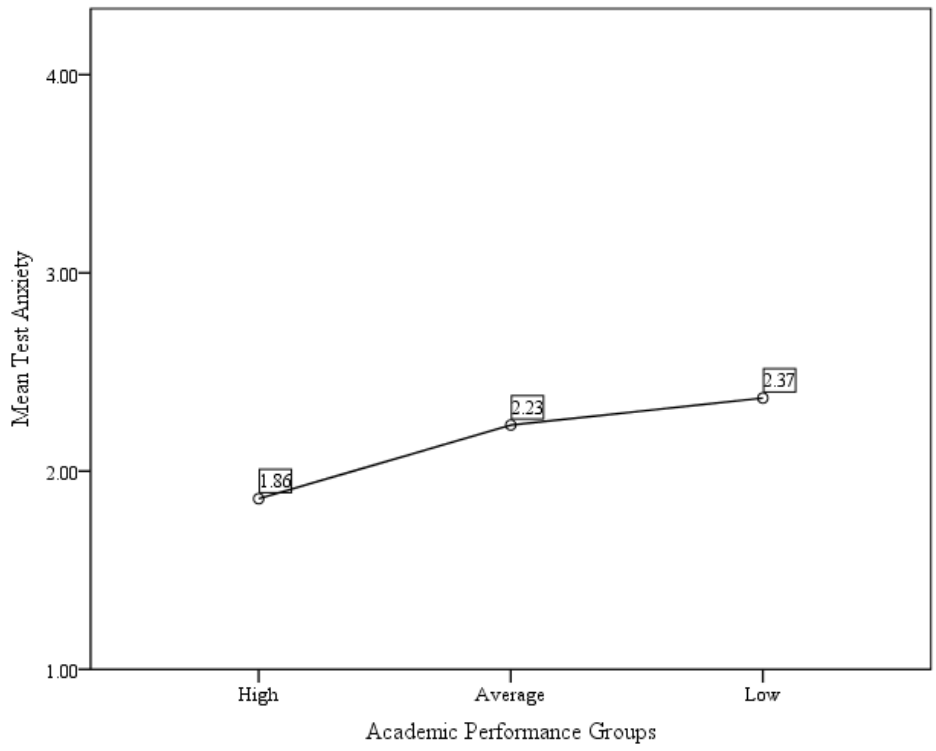

Figure 14. *Means plot of test anxiety by academic performance group*