SELF-REGULATED LEARNING IN DOCTOR OF PHYSICAL THERAPY STUDENTS

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ABSTRACT

There is a paucity of adult professional education literature, yet there are multiple theories and models from which to extrapolate information regarding learning in this population, including self-regulated learning theory and adult learning models. The first aim of this study was to explore these bodies of literature and provide a compelling argument for how these theories and models may be considered relative to each other. The second aim of this study was to provide empirical support for the theoretical framework within the professional education population, specifically for Doctor of Physical Therapy (DPT) students.

Participants included 232 DPT students from a large, research-intensive university in the mid-Atlantic region. The Self-directed Learning Readiness Survey for Nursing Education (SDLRSNE) (Fisher, King, & Tague, 2001) was administered to five cohorts of students seven times throughout the duration of the DPT program. T-tests and ANOVAs were conducted to determine cohort differences. The data were collapsed across time in order to generate longitudinal growth curve models. Results revealed that the SDLRSNE is an internally consistent tool to utilize with DPT students and that the majority of DPT students were self-regulated learners. Results from the growth curve models indicated that self-regulated learning increased across time, was discontinuous within the DPT program, and that participation in clinical education experiences coincided with the change in slope of the model that best fit the data. Additionally, results indicated that the age of a student (traditional: age 19-24 versus nontraditional: age 25+) significantly predicted Desire For Learning subscale scores.

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TABLE OF CONTENTS

PAGE

LIST OF TABLES

LIST OF FIGURES

Figures Page

CHAPTER 1

INTRODUCTION

In 1998, Smith and Pourchot introduced the concept of adult educational psychology. This concept was derived from a noticeable gap in educational psychology research and adult education practices ranging from adult basic literacy to professional education. Although more research regarding adult educational psychology has been developed since the late 1990's, most of its focus is on how college students or adults in a work setting acquire knowledge. Little research can be found in the realm of adult students in post-baccalaureate/professional education programs. Due to the lack of educational psychology research in this adult population many educators have turned to social psychology and sociology for their understanding of adult learning and its components.

As a result, this dissertation was meant to help bridge the gap between the literature on adult learners and the literature of educational psychology. More importantly, I intended to bridge the gap between adult education theory and educational psychology empirical research. Theories and models of adult learning are useful in helping to create a framework to understand adult learners; however, the lack of empirical research in the population of adult professional program students makes it difficult to develop sound, evidence-based educational decisions with this population. Moreover, the empirical research provided by educational researchers on self-regulated learning, primarily conducted with children and high school students, also helps inform

education practices but does so without consideration to the context and life circumstances of adult learners.

Ideally, this study will initiate a line of future research into the educational psychology of adult professional education students. Conceptually, self-regulated learning and self-directed learning are broad constructs. This study examined only a small slice of the construct because this specific line of research is still in its infancy and will need to continue to be developed. Adult educational psychology will help identify which students are and are not likely to be self-regulated learners, which could affect their future practice as professional, lifelong learners. This study should help define self-regulated learning, beyond simple identification, in this population, as well as clarify how self-regulated learning is similar to or different from self-directed learning. This will assist in creating a common vocabulary, which can be used in future research.

My review of the current literature and the findings from the study explored the components of self-regulated learning in the Doctor of Physical Therapy (DPT) student population. By developing a sound theoretical framework and using data from DPT students, I was able to investigate the multidimensional nature of self-regulated learning. Many professional education programs are distinct from PhD programs in that students advance in cohorts. Consequently, the data for this research were analyzed across time. By reviewing the change in self-regulated learning in physical therapy students across time I was able to gain additional insights into both the nature of DPT students as well as the nature of self-regulated learning.

By understanding the self-regulated learning of adults in professional education programs educators may be able to impact the learning of thousands of professionals

being educated towards lifelong learning goals. They may learn how to prepare and adapt curricula for these professionals to better and more quickly acquire the knowledge they need to perform successfully as well as identify their own impairments to learning. As such, the potential value of this research cannot be underestimated.

Problem Statement

Previous literature has described adult students in a professional education environment as self-directed learners. To date, this research has been conducted primarily with students in medical doctor and nursing programs. Research on other healthcare professionals, such as DPT students, is considerably more limited. Moreover, the social psychology and sociology literature in adult learning tends to describe these populations as self-directed, whereas educational psychology literature offers empirical support for the important role of self-regulated learning in this population. These discrepancies in terminology, empirical support in the literature, and the population studied lead to a need for a better understanding of students' self-regulated learning in professional education programs.

Hypothesis

Based on previous research in similar professional adult learner populations, it is likely that most DPT students can be categorized as self-directed learners as characterized by the Self-Directed Learning Readiness Scale for Nurse Education (SDLRSNE), see Appendix A. Arguably, a more significant point to consider is the construct validity of the SDLRSNE. Is the scale really measuring self-directed learning or is it measuring self-regulated learning strategies, motivation and volition? I hypothesize that the SDLRSNE is actually measuring multiple components, among which are motivation,

volition, and metacognitive strategies, which together define self-regulated learning in the adult population as these education psychology constructs are defined.

Definitions

It is vital to operationally define the constructs that are used throughout the rest of this dissertation.

Knowledge

Schraw (2006) describes three primary epistemological perspectives: positivist, post-positivist, and postmodern. Each perspective contains specific beliefs about the nature of knowledge. Positivists believe that knowledge is stable, objective, and that it can be transmitted from one individual to another. Postpostivists believe that knowledge changes slowly over time and is based on a consensual agreement about meaning with others through social interaction. Finally, postmodernists believe that knowledge is subjective and always changing. It is based on the individual's experience and is constructed via the individual's own meaning making and therefore cannot be shared with others.

Using the post-positivist perspective, Schraw (2006) further describes a taxonomy of knowledge with three generic types. The first is declarative knowledge: the facts or concepts that individuals can retrieve from their memory. In physical therapy students this would likely be information related to anatomy, specifically muscle and ligament attachments, function, innervations, etc. The second type of knowledge, procedural knowledge, is information about how to do things. These actions can range from simple to complex. For physical therapy students this may range from performing a transfer with a patient to completing an evaluation or discharge plan. Finally, Schraw (2006) describes

a third type of knowledge as self-regulatory. This is information one knows about oneself. This third category is further divided into domain *specific* self-regulatory knowledge, which is information about a certain content area or task as opposed to domain *general* self-regulatory knowledge, which is information one knows about oneself that is equally useful in any domain. For physical therapy students, an example of domain specific tasks may include whether or not the student physical therapist knows how to complete an evaluation of a patient with a particular diagnosis. An example of domain general knowledge is whether or not the student physical therapist knows the strategies they would use to find out the pertinent information related to that specific diagnosis, such as searching the database for an article (planning), retrieving the article (monitoring), reading the article (controlling), and applying the information garnered from the article and determining if it was appropriate (reaction/reflection). Domain general knowledge is also referred to as metacognitive knowledge.

Metacognitive knowledge, or domain general self-regulatory knowledge, can be broken down into two component parts: knowledge of cognition and regulation of cognition, both of which are necessary for effective learning (Schraw, 2006). Knowledge of cognition includes strategy and conditional knowledge. This refers to individuals' ability to know which strategies are appropriate for them and how and when to use them. Regulation of cognition includes multiple skills, such as planning, monitoring, and evaluating learning. For physical therapy students, metacognitive knowledge is essential during both their didactic/classroom components as well as the clinical/practical experiences

In short, knowledge is the skill and information an individual has and can retrieve regarding facts and concepts, how to perform particular skills, and how to regulate the acquisition of information and skills. This information and these skills can be shared with others and are developed through interactions with others and personal experience.

Motivation and Volition

There are many theories and models purporting to identify the true nature of motivation, but similar to knowledge, motivation is multifaceted and different theories may play various roles. Specific motivation theories are discussed later in this paper. For now, an operational definition for motivation is the *push* or force towards an action or end goal.

Volition is the deliberate directing and sustaining of one's attention to a specific task. Whereas motivation may guide an individual in a given direction, sustained volition will keep her there. Volition can allow the self-regulated learner to focus on given specific internal and external factors without exhausting their psychological resources. Volition controls compulsions and desires so that the student can complete the task (Corno, 2001).

Self-regulated Learning

Self-regulated learning is the result of the appropriate execution of the strategies and conditions discussed as knowledge of cognition as well as the planning, monitoring and evaluating involved in regulation of cognition. It is important to note the mere execution of these skills and strategies does not guarantee learning or knowledge acquisition. The strategies must be appropriately self-selected and self-examined in order to allow for learning to take place (Kuo, 2010). Self-regulated learning involves the

initial motivation of the student and the enduring volition of the student to utilize metacognitive knowledge within a given context. Self-regulated learning is the keystone to lifelong learning.

Lifelong Learning

Lifelong learning occurs throughout the developmental continuum, from infancy into late adulthood. This temporal approach to learning is often hard to capture due to the evolving nature of the individual. For the purposes of this paper, however, lifelong learning will specifically refer to the adult professional learner. The type of information to be learned can be categorized as either implicit or explicit. Implicit learning refers to the information that is inadvertently acquired simply by being an individual within a society. Explicit learning is information that the individual has overtly sought out to learn regardless of the environment. Implicit learning does not require the use of self-regulatory knowledge; explicit learning does. Lifelong learning as a goal for an adult requires the skills and strategies of self-regulated learning.

Professional Education

Professional education is more than just training. It is a nuanced education system that requires several elements: 1) professional education requires intimate knowledge of the profession or a component of the profession for which one is educating, and 2) there is a practical component to the information disseminated that is unlike customary education practices. Professional education generally includes an experiential learning component-clinical or practical experience-in a setting outside of the classroom. In such settings, student performance is often observed and evaluated by individuals who are currently practicing and not directly a part of the academy. This learning happens in

addition to theoretical and didactic components that occur within the classroom. Such dual models of teaching practices are an attempt to engage students in responsibly carrying out the care for patients and clients for which they are being prepared. It is often the practical experience, followed by reflection that aids in the students' learning.

Professional Significance

One may ask why is self-directed or self-regulated learning meaningful to professional education? In this section I will propose several suggestions, which are supported by current literature to answer this question. I will discuss how research in self-regulated learning helps inform the concepts of evidence-based education, new developmental literature, and lifelong learning.

Evidence Based Education

Current theorists, investigators and academicians alike have called for the increased use of evidence in education. Emerson and Records (2008) offer a host of reasons to support the concept of *evidence-based education*, not the least of which is related to rapid changes in information. Professionals, especially those in healthcare, need to have foundational information rooted in current evidence and practice. Without it their knowledge may be obsolete before they even get started. Much like the concept of evidence-based practice, evidence-based education serves to offer best practice ideas and suggestions. It also helps create a standard to which professionals are accountable.

Evidence-based education has been called for in physical therapy education. Jones and Sheppard (2008) investigated the frequency in which physical therapy educational methods were based in evidence. These authors claim, "historical practice influenced educational practice rather than education being based in rigorous research" (p. 9). The

authors call for a change due to the large variability in the clinical education component of most physical therapy curricula. Based on findings, Jones and Sheppard (2008) proposed a model for physical therapy evidence-based education. Utilizing this model, the authors propose, will help counteract the current deficit in the literature. Formalizing a structure to disseminate information and then evaluate its effectiveness is the basis for the scholarship of teaching and learning.

Lifelong Learning

Many professional organizations advocate for lifelong learning among their member professionals. The medicine and nursing professions acknowledge that lifelong learning is a component of professionalism (American Association of Colleges of Nursing & American Association of Medical Colleges, 2010). This is also the case in other professions, such as physical therapy and engineering (American Physical Therapy Association, 2007; National Academy of Engineering, 2010; Jiusto & DiBiasio, 2006). Lifelong learning is valued as an important characteristic of the professional in healthcare as changes are happening in every venue: technology, reimbursement, and best practice. Lifelong learning is defined by individuals' ability to regulate their own learning, recognize deficits or areas that need to be supplemented, investigating and supplementing the information, and finally, evaluating the process effectively. In order to stay current, professionals must constantly be maneuvering through this process by either reflecting on their own knowledge and learning or actively seeking out the information they are lacking.

Emerging Adulthood

As an individual is transitioning from a student in the formal academic setting to a professional in the less structured setting of the workplace, it is relevant to consider the transition from self-regulated learner to lifelong learner as well as the environment in which the individual is functioning. Arnett (2000) developed his theoretical argument for a *new* developmental stage, which he called *emerging adulthood*. Since his initial article, many researchers have investigated this topic. The general consensus of this ongoing research is that conceptually emerging adulthood is a phenomenon of the industrialized world. The typical age range discussed relative to emerging adulthood is 18-29. In light of this age range I believe it is important to consider the impact of emerging adulthood on adults involved with professional education.

According to Arnett (2007), emerging adulthood is a sociocultural phenomenon characterized by heterogeneity in activities and contexts. He argues that from birth to age 18 much of the typical individual's life is characterized by homogeneity: going to the same school, living in the same house, being surrounded by the same family, etc. Comparatively, after age 30, empirical evidence shows a return to relative homogeneity. The time period in between, however, demonstrates patterns that are the opposite of one's previous life. Five key features characterize emerging adulthood: 1) identity exploration, 2) instability (heterogeneity), 3) self-focus, 4) feeling in-between, and 5) feeling of possibility. Learning during this developmental stage becomes the responsibility of the learner, whereas previous to this stage learning was more mandated by society, not necessarily by choice (Tanner, Arnett, & Leis, 2009). This is true for individuals who are moving from the structured, formal education of high school into college and requires

even more self-regulation for those students moving from college into post-baccalaureate, professional programs.

Emerging adulthood could affect adult learning in a number of ways. Students who are living with more heterogeneity may be more resourceful to reach out to appropriate resources in order to evaluate and direct their own learning. Conversely, it could also be argued that in such a state of heterogeneity, a student may require more structure and teacher-led curriculum design in order to achieve the level of learning necessary to become a successful professional. It is difficult to say for sure which hypothesis would hold true without empirical research. What has been substantiated in research is the need to match the student's readiness for self-directed learning to the instructor's ability to facilitate or direct as necessary (Cheng et al., 2010; Merriam et al., 2007). Meeting students at their level of learning has shown to be essential for fostering the best academic and professional outcomes. Tanner et al. (2009) hypothesize that meeting the individual needs of the learner will optimize what the authors call *life-span adult learning* and has previously been called lifelong learning.

Investigating the relationship between self-regulated learning and self-directed learning within the professional education population serves an important purpose. Insight into this relationship can help foster better education models based in empirical evidence. Such evidence-based education is likely to assist in producing lifelong learners, a goal for many professional education programs. Moreover, understanding self-directed and self-regulated learning can foster a better understanding of Western society's phenomenon of emerging adulthood.

Overview of Methodology

Conceptual Framework

Self-regulated learning in adult professional students includes multiple dimensions such as motivation, volition and the metacognitive skills to direct, monitor, and assess one's own learning. One can argue that if all these components are being investigated in an individual, whether an adult or child, then the phenomenon being investigated can be termed self-regulated learning. This is true even if previously it had been called self-directed learning. The title, albeit important for conceptualizing the construct and gaining a historical reference, is only as much as its component parts.

The data for this research are secondary data from the Department of Physical Therapy at a large mid-Atlantic, high research activity university (The Carnegie Foundation for the Advancement of Teaching, 2012). Upon matriculation into the Doctor of Physical Therapy (DPT) program, first year DPT students are instructed to complete a Self-Directed Learning Readiness Scale for Nurse Education (SDLRSNE) questionnaire (Fisher, King, & Tague, 2001). The students complete this questionnaire a total of seven times throughout their DPT education (34 months).

Table 1.1

Administration Schedule of SDLRSNE

DPT Program	Summer 2	Fall	Spring	Summer 1
Year 1 (12 Months)	July (T1)			June (T2)
Year 2 (12 Months)	August (T3)		March (T4)	
Year 3 (10 Months)	August (T5)	Dec (T6)	May (T7)	

After the initial baseline measurement, the intervals between surveys vary based on clinical experiences. Students complete the survey before and after clinical experiences.

Questions are rated using a five-point scale ranging from strongly agree to strongly disagree. Each of these ratings is assigned a point value of five to one with strongly agree being five points and strongly disagree scoring one point.

Methods

To validate the use of the SDLRSNE with the DPT student population, an exploratory factor analysis was conducted using SPSS (Version 21) to determine how many factors underlie the responses to the SDLRSNE questions in the sample. Previous research has described three and four factor results (Fisher, King, & Tague, 2001, 2010; Hendry & Ginns, 2009; Smedley, 2007). As part of the preliminary analysis, the data were reviewed to determine if they meet the assumptions necessary to conduct the secondary analysis-longitudinal growth curve modeling, to address the stated research questions. A longitudinal growth curve analysis was performed to determine if there is a change in self-regulated learning over the course of the three years in the DPT curriculum, when that change may happen, and if there are particular subsets of students who are sensitive to change.

Previous research in self-regulated learning and self-directed learning has been conducted using several tools. Zimmerman and Pons (1986) developed a structured self-regulated learning interview that has been used by many researchers. Additionally, Guglielmino's Self-Directed Learning Readiness Scale is widely cited in adult learning literature. The reliability and validity of this tool, however, has also come into question. As a result, the SDLRSNE was chosen for this study. Using the SDLRSNE provided two

significant benefits to the study: 1) The SDLRSNE has been utilized within the physical therapy department for several years, generating both a breadth and depth of data to analyze; 2) The tool has been previously validated in other healthcare professional programs such as nursing and medicine, which is why it was chosen by the department initially.

Delimitations

There are several delimitations to this literature review and research that must be acknowledged. First, this literature review and research will not address the actual behaviors of self-regulated learning but rather the process as a whole. Additionally, the literature review and research primarily focus on domain *general* self-regulatory knowledge (metacognitive knowledge) and not on domain *specific* self-regulatory knowledge. Although a focus on domain *general* self-regulatory knowledge may allow for a broader interpretation of the information presented, the study does ignore the possibility that domain *specific* information may have a significant relationship to how students utilize the domain *general* self-regulatory knowledge.

Organization of Dissertation

This dissertation is organized into five chapters. The first chapter has covered a general overview of the gap in educational research in adult learners, particularly those in a post-baccalaureate professional degree program. Chapter 2 will explore this gap in an in-depth analysis of literature using the educational research construct of self-regulated learning and the adult learning construct of self-directed learning. From there an argument is presented to consider the components of the constructs as opposed to the names themselves.

Chapter 3 discusses the methods used to quantitatively analyze self-regulated learning in adults, specifically DPT students. This discussion includes detailed information regarding the sample, the instrument, and the statistical methods used to either support or refute the initial hypothesis. Chapter 4 presents the results of the statistical analysis and chapter 5 provides a discussion of results, a conclusion, as well as areas for further research.

CHAPTER 2

REVIEW OF LITERATURE

Chapter Organization

The review of the literature in this chapter was designed to comment on both adult learning and educational psychology theoretical and empirical literature. To create a foundation for understanding, the theoretical literature is reviewed first. To give life to the theory, the review of empirical research will follow. Upon completion of this review, the reader will have an in-depth appreciation for the problem as well as conceptions for future directions.

Search Strategy

I began my review by first consulting the most relevant theoretical literature. After reviewing the theoretical information I began searching databases such as Academic Search Premier, CINAHL, ERIC, Google Scholar, MEDLINE, and PsycInfo for empirical research. I used the following search terms singularly and in combination: adult learning, andragogy, healthcare, healthcare education, professional education, self-directed learning, and self-regulated learning. I also hand-searched the references in the bibliographies of the articles I found electronically. I included empirical research dated from 2000-2012, as this is information published after Zeidner, Monique Boekaerts, and Paul R. Pintrich's seminal work, *Handbook in Self-regulation* (2000). Beyond the date of publication other inclusion criteria were related to the population. I only included research articles that included populations similar in age range to most adult professional

education programs. This included college-aged students, but did not include students younger that college aged.

Theoretical

Adult Learning – Self-Directed Learning

By definition, adult learning is, "the process of adults gaining knowledge and expertise" (Knowles, Holton III, & Swanson, 2005). This definition describes adult learning as a process, but does not offer much direction regarding the many factors that have been identified in adult learning. To date, no one model or theory has been sufficient to describe all of the factors in their entirety (Merriam, Caffarella, & Baumgartner, 2007). The most commonly cited information regarding adult learning has been Malcolm Knowles' Andragogy. In fact, for many adult learning and Andragogy are synonymous. Andragogy illustrates characteristics about adult learners such that: 1) they are self-directed; 2) they have life experiences to draw from; 3) their learning is related to their societal roles; 4) they are problem-centered; 5) they are internally motivated; and 6) they need to know why they are learning the information (Knowles, Holton III, & Swanson, 2005; Merriam et al., 2007).

To understand the phenomenon of adult learning, it is necessary to review the individual characteristics set forth by Knowles et al. (2005), as well as how they inform adult learning as a whole. In order to refer to a set of characteristics or assumptions about adult learning as a theory, the assumptions must be confirmable. One must be able to repeatedly test either the theory as a whole or its component parts. In the context of adult learning, much focus has been directed towards measures of, and repeatedly testing the specific component of self-directedness. Few empirical studies involving the other

characteristics of adult learning have been conducted. This raises the question: are these other elements suggested by Knowles confirmable?

In the current adult learning literature, self-directed learning is written about in several distinct ways. One way self-directed learning is written about is related to goals. These goals can be categorized according to three basic principles: 1) the goal to improve the adult learner's ability to be self-directed; 2) the goal to facilitate transformational learning; and 3) the goal to endorse emancipatory learning and social action (Merriam et al., 2007). Self-directed learning is also described in current literature as a learning process. Knowles defined self-directed learning as: "a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (Knowles, 1975, p. 18). A third way in which self-directed learning is written about is as a personal attribute-a fixed characteristic innate to the individual.

Within Knowles' conception of adult learning, self-directed learning is the primary construct that has been empirically measured. With the variety of interpretations of the construct, the empirical data associated with the current research contains multiple instruments and outcome tools used to measure self-directed learning and its components. These valuable tools and the results from these studies are, unfortunately, often described in the literature as *poorly defined*. The lack of consistency in definition and measurability likely complicates the research possibilities for Knowles' proposed characteristics as a theory.

In addition to an individual being self-directed, Knowles identified other attributes of adult learners that have been less popular with researchers. One of the other attributes is that an adult has a "reservoir of experience" which is a source for learning (Knowles et al., 2005; Merriam et al., 2007). Anecdotally and logically this assertion would appear to hold true. It is likely that an adult will have more experiences from which to draw from and from which to associate new learning simply due to the larger quantity of time spent in existence. This concept, however, has not been empirically tested and is related to one of the most serious critiques of Andragogy: that some of these principles may apply to child-age learners as well. A child also has life experiences to draw from, albeit quantitatively fewer, and can use these experiences to inform his or her own learning. Without evidence to demonstrate how adult learners use their life experiences in a distinctly different way from the way child learners may use their experience, this assertion does not support the idea that the principles stated by Knowles are a theory. It may be testable and falsifiable but to date it has not been. It is also possible that the experiences garnered through years of life could prove to inhibit an individual's learning (Merriam et al., 2007). Knowles' Andragogy does not address these possibilities.

Further, the assumptions may also anecdotally hold true that the readiness of an adult to learn is closely related to the societal role and that an adult is more problem-centered than subject-centered in learning (Knowles et al., 2005; Merriam et al., 2007), especially when one considers the rate at which adults are returning to school to change careers. These career-changers are viewed as seeking out information and learning opportunities that they deem pertinent to their lives. Without empirical evidence to

support this, however, it is difficult to say for sure this it is true. With increasing information regarding a *new* developmental stage in western societies known as emerging adulthood (Arnett, 2007), the impact of societal role in learning may be changing. In the knowledge-based western industrialized economy the societal role of an adult is viewed in a different context than it once was.

Knowles' fifth and sixth principles (Knowles, et al., 2005; Merriam et al., 2007) are also difficult to validate without empirical support. It is difficult to know what an individual's motivators are and there are multiple motivation theories to consider when attempting to understand them. Understanding motivation becomes even more complex when one considers the number of psychosocial and environmental influences that come into play during a learning opportunity. With regard to adults needing to know why they are learning specific information, the same argument can hold true. It is possible that adults learn purely for the enjoyment of learning and require no other explanation. The principles generated by Knowles cannot account for such a possibility and further diminish the understanding of these principles as a theory, but generate a rich model for which to think about adult learning.

Given the known flaws in the theory, it may be most useful to think of Andragogy as a model. Models are generally useful to assist in understanding a theory and can help generate a mental image. After considering each of the components of an adult learner proposed by Knowles it is easy to see that the theory, because of all the factors to consider, as a whole is not testable. Similarly, many of the individual components have not yet been tested or are not testable. The exception to this is self-directedness, which has a substantial amount of research to support its significance within adult learning. For

this reason it is better to consider Andragogy and the characteristics of adult learners as a model to further explore the nuances of adult learning.

This understanding of Andragogy as a model is important because elements of the model, for example adult learning being related to societal roles, play a crucial role in distinguishing the adult professional learner from other types of learners. Upon graduation, professional students will move into their own practice at which point the information they gather and disseminate to others may have significant consequences – medical doctors, for instance, may be making life or death decisions, doctors of physical therapy may be choosing between interventions that could help or hinder the healing process for an individual. It is vital that these students are able to regulate their own learning so that they can stay informed post-graduation and make appropriate decisions based on current information. How specific societal roles relate to how an adult may regulate their own learning, as well as how previous experience and the other Knowles' principals are related to self-regulated learning are excellent areas of further investigation, but is beyond the current scope of this paper.

Pintrich (2000) described four areas of regulation for self-regulated learning: cognition, motivation, behavior, and context. Although these areas were described for self-regulated learning they can also be utilized to better organize the characteristics identified by Knowles. As described previously, adult learners are: problem-centered, intrinsically motivated, need to know why they are learning, are self-directed, draw from life experiences during learning, and their learning is related to their societal role (Knowles et al., 2005). Being problem-centered reflects the adult's cognition – that the individual can identify a problem and take cognitive steps to address the issue. The adult

learner's motivation is intrinsic and is related to the need to know why he or she is learning specific content. Adult learners' ability to direct their own learning can be evidenced by their behavior to find and utilize appropriate information and also the cognition they use to direct the learning. Finally, life experiences and societal roles are related to the context in which an adult learner is learning. Table 2.1 lays out Knowles' characteristics of adult learners within the context of Pintrich's areas of regulation during self-regulated learning.

Table 2.1

Knowles' Characteristics of Adult Learners in Pintrich's Areas of Regulation

Theorist	Cognition	Motivation	Behavior	Context
Knowles	Problem-centered, Self-Directed	Intrinsic, Need to know why they are learning	Self-Directed	Life Experiences, Societal Roles

Self-Regulated Learning

There tends to be complementary models and theories that encompass similar constructs in the educational psychology and adult learning literature. In the educational psychology literature a concept related to adults self-directed learning is self-regulated learning. Self-regulated learning has been defined previously as the result of the appropriate execution of the strategies and conditions discussed as knowledge of

cognition as well as the planning, monitoring and evaluating involved in regulation of cognition in concert with motivation and volition.

Self-regulated learning, much like self-directed learning, however, is often described as poorly defined. This is primarily because several authors have conceived of self-regulated learning in different ways, primarily as a learning strategy to set goals, monitor progress, and control motivation. (Kuo, 2010; Zimmerman, 1986) Additionally, self-regulation (beyond the specific focus on learning) has generated its own body of research, which has added to the poor understanding. Historically, there have been two models most regularly cited in the self-regulated learning literature: Zimmerman's model (1986) and Pintrich's model (1994). Table 2.2 represents the relationship of the two models to each other.

Table 2.2

Models of Self-regulated Learning

Zimmerman	Pintrich
Phase1	Phase 1
Forethought	Forethought, Planning, & Activation
	Phase 2
Phase 2	Monitoring
Performance	Phase 3
	Control
Phase 3	Phase 4
Reflection	Reflection

Zimmerman's Model

Zimmerman developed a model of self-regulated learning with the influence of Bandura's social cognitive theory. Zimmerman's model included a process of forethought, which is related to preparation to learn; performance, the actual process of directing one's attention to and monitoring one's active learning process; and reflection, which refers to the process of individuals reacting to their performance and learning (Sitzmann & Ely, 2011).

Pintrich's Model

Pintrich also developed a model of self-regulated learning that included four phases instead of three like Zimmerman's model. Phase 1 includes planning, phase 2 includes monitoring one's self, phase 3 includes control and regulation of self, based on the monitoring information attained in phase 2, and phase 4 includes reaction and reflection (Sitzmann & Ely, 2011). In Pintrich's model it is easy to see how self-regulated learning can be viewed as a process. (See Figure 2.1)

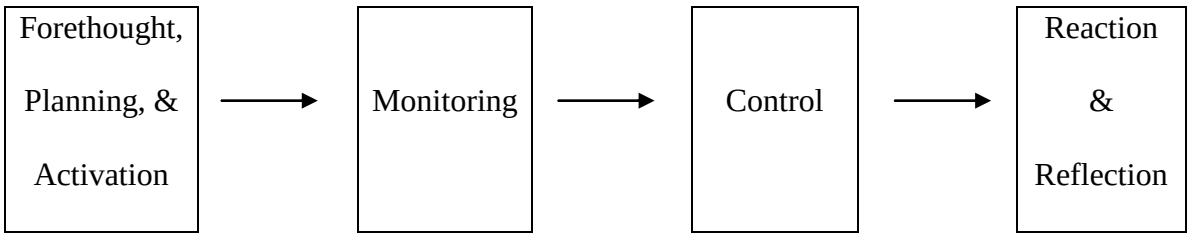

Figure 2.1 Pintrich's Model of Self-regulated Learning

Both Zimmerman and Pintrich emphasize that students who regulate their own learning are more effective because it is a purposeful experience (Wolters, 2003). One can see there is overlap between Zimmerman's and Pintrich's models and within that

overlap there is a consistent message that self-regulation occurs in several phases. Both researchers understand self-regulated learning to be a process. Keep in mind, however, that these researchers have focused their efforts on academic achievement and goals almost exclusively. There is additional overlap between self-regulation as it relates to other aspects of one's life. This research will not be covered in this paper.

A special issue of Education Psychology Review was dedicated to distinguishing or attempting to clearly define the lines between the definitions of self-regulation, self-regulated learning, and metacognition. Shunk (2008) called for future research to identify clear definitions, identify theories that are relevant to the definitions, and ensure that the assessments that are being used to gather data on the concepts are appropriately constructed. Kaplan (2008), however, offered a different approach. Instead of an emphasis on drawing clear lines between the constructs' definitions, he suggested a reframing of the constructs. Kaplan (2008) proposed that all three constructs: self-regulation, self-regulated learning, and metacognition are dimensions of a continuum of self-regulated action.

Flexibility and a fresh way of framing these constructs as suggested by Kaplan is an important consideration moving forward, specifically as self-regulated learning applies to adult learners. If we consider the previous two tables of Knowles' model of adult learning and Zimmerman's and Pintrich's models of self-regulated learning one can easily see how these tables can be super-imposed on each other to more deeply understand the relationship between the three models (See Table 2.3).

Table 2.3

Relationships Between the Models of Self-regulated and Self-directed Learning

Theorists	Zimmerman	Pintrich				
			Cognition	Motivation	Behavior	Context
Knowles	Forethought	Forethought, Planning, & Activation	Problem-centered, Self-directed	Intrinsic, Need to know why they are learning	Self-directed	Life Experiences, Societal Roles
	Performance	Monitoring				
		Control				
	Reflection	Reflection & Reaction				

Despite their different origination, sociology and social psychology for adult self-directed learning and cognitive psychology for self-regulated learning (Pilling-Comick & Garrison, 2007); there are similarities between self-directed learning and self-regulated learning. Generally speaking, both concepts address an active involvement with the learning process (Loyens, Magda, & Rikers, 2008). Learning, especially adult learning, is not a passive process. Beyond attending to the information at hand, both self-directed and self-regulated learning allow for an individual to be able to and responsible for managing both the internal and external conditions involved in the learning experience (Pilling-Cormick & Garrison, 2007). Both constructs offer emphasis of knowledge and metacognition as parts of the learning process (Pilling-Cormick & Garrison, 2007).

Despite their similarities, however, the argument does exist that the two terms, self-regulated learning and self-directed learning, should not be used synonymously.

Loyens, Magda, and Rikers (2008) claim that "self-directed learning can encompass self-regulated learning, but the opposite does not hold true" (p. 411). After thoroughly reviewing the distinctions between the constructs I have to agree with the authors (in part) that in total the two terms should not be used interchangeably. I disagree, however, that self-directed learning can encompass self-regulated learning. Based on the frameworks laid out in this paper I would argue that self-regulated learning can encompass self-directed learning in the behavior and cognition areas during the monitoring and control phase of Pintrich's model of self-regulated learning. I would propose that more important to the conversation regarding the relationship of the constructs as a whole is consideration of how the components of each construct relate to each other. The breakdown of these constructs into individual elements is imperative, especially when one considers that some research performed under the guise of *self-directed learning* is actually measuring self-*regulated learning.* Self-directed learning primarily describes the cognition and behavior of an adult in the performance (Zimmerman) or monitoring and controlling (Pintrich) phases of self-regulated learning. Oftentimes the tools being used to measure self-directed learning are in fact implicitly measuring other elements such as motivation, volition and/or context in addition to cognition and behavior. In such instances the outcomes should be described as self-regulated learning.

To be more specific, let us first consider self-directed learning. Knowles (2005) describes cognition and behaviors such as diagnosing needs, formulating goals, identifying resources, choosing and implementing strategies and evaluating outcomes as self-directed learning. These cognitions and behaviors for all intents and purposes are the

same characteristics attributed to a self-regulated learner in varying phases of the model described by Pintrich (2000). The language may be slightly altered but the basic strategies described as self-directed learning and self-regulated learning are the same strategies Knowles did not expressly include the planning and forethought and reflection as part of the self-directed learning process.

Moreover, the context in which learning is occurring is likely to impact these strategies. An individual's life experiences as well as his or her societal role are addressed by Knowles. Although children are thought to have fewer life experiences some children seem to be self-directed. If this argument is reframed such that life experiences and/or societal roles are valuable to help individuals understand how to monitor, plan, control and regulate their own learning than this is no longer an issue but rather can help explain individual differences in the ability to accomplish self-regulated learning.

When discussing adult learners' problem-centeredness, it is likely that Knowles was addressing cognition, specifically the domain specific cognition. Problem-centeredness relates the adult's current problem to the acquisition of knowledge to help inform the decision-making and further acquisition of information and skill. This domain specific information can also be considered a type of self-regulatory knowledge. It is not that Knowles' description of adult learners is inaccurate; in fact, the descriptions may be very accurate. It is that in outlining the characteristics of the adult learner Knowles addressed only the superficial nature of the adult, not the underlying principle which may be better understood with the empirical research and theory provided by the educational psychology literature.

Beyond the strategies-the skills-the individual must possess the thrill for the learning to occur-motivation. Knowles speaks directly to this point when assigning intrinsic motivation to the adult learner. In self-regulated learning literature several motivational theories have been presented. Pintrich (2000) addressed motivation using goal-orientation theory. Goal orientation theory uses two types of goals, mastery goals and performance goals, to try to understand why students engage in specific tasks. Mastery goal orientation is used to describe students who are engaged in the task to truly master the task. Performance goal orientation on the other hand describes students who are engaged in a task to demonstrate their own ability in the task. To further describe students within goal orientation motivation theory, theorists differentiate between approach and avoidance goals. Approach goals are generally considered motivations that are positive, whereas avoidance goals are generally considered motivations that are negative. These terms can that be used in combination to describe student's motivation as mastery-approach, mastery-avoid, performance-approach, or performance-avoid (Anderman & Anderman, 2010). Using goal orientation theory, Pintrich argued that motivation directed toward goals likely took place in the first phase of self-regulated learning, the phase described as forethought, planning and activation (Pintrich, 2000).

Other motivational theories such as self-efficacy, expectancy-value, interest, and self-determination, could also apply to the first phase of self-regulated learning. Self-efficacy refers to an individual's belief about his or her capabilities to complete a certain task (Anderman & Anderman, 2010; Zimmerman & Shunk, 2011, Chapter 4). If students feel self-efficacious about a task then they are likely to work harder and longer towards their goal (Zimmerman & Shunk, 2011, Chapter 4). Expectancy-value motivational

theory refers to a student's perception of how valuable a task is to the student. Within this theory there are four primary values that students assign to tasks: attainment value, intrinsic value, utility value, and cost. Attainment value is the importance to the student to perform well on the task. Intrinsic value is the pure enjoyment of doing the task. Utility value is related to the task's usefulness. Cost is the negative implication of completing the task. In this theory students must have a firm expectancy that they can complete the task and the cost must not be greater than the other values or the student is not likely to complete the task (Anderman & Anderman, 2010; Zimmerman & Shunk, 2011, Chapter 4). Intrinsic value in the expectancy-value motivation theory describes a student's genuine interest and enjoyment or satisfaction with the task. Interest describes the student's willingness to re-engage with the task. If a student is intrinsically motivated and interested in a particular task this will likely increase the time and effort spent on a task (Anderman & Anderman, 2010; Zimmerman & Shunk, 2011, Chapter 4). Self-determination Theory identifies three basic needs that humans have: the need for autonomy, the need for competence, and the need for relatedness (Anderman & Anderman, 2010). It seems plausible that adults could elicit any of these types of motivation during their self-regulated learning, not just intrinsic motivation as Knowles describes. It is the motivation that initiates the early phases of self-regulated learning.

Considering the key constructs of adult, self-directed, and self-regulated learning in relation to each other is a complicated task. My hope in reviewing these theoretical models is to create a framework with which to better understand adult learning and to more critically review both bodies of empirical research. Having reviewed the three prominent models with regard to adult, self-directed learning and self-regulated learning

it is my hope to identify missing components in current research and facilitate future research by offering for consideration new tools and a broader understanding of self-regulated learning in the adult population.

Empirical Research

In light of the models and theories described, using the terms defined previously (knowledge, self-regulated learning, volition, motivation, professional education, and lifelong learning) as a framework to understand current empirical research in professional education is useful. Potentially even more useful, though, is to critically review the tests and instruments that researchers are utilizing to produce the empirical data. In doing so, one is likely to find that key constructs are being used to measure the same thing in different disciplines, with different names. Reviewing the constructs themselves, as opposed to simply the language, becomes critical.

As stated previously, self-regulated learning is the keystone of lifelong learning. This is consistent with current research in physicians' lifelong learning. Hojat, Veloski, Nasca, Erdmann, and Gonnella (2006) investigated the reliability and validity of a tool they developed with physicians at Thomas Jefferson University. The tool, the Jefferson Scale of Physician Lifelong Learning (JSPLL), consisted of 19 items on a four-point Likert scale. The authors surveyed 721 physicians and used factor analysis with varimax rotation to analyze their results. The researchers had a response rate of 62% (N = 444 physicians). Based on their results, the authors concluded that this tool was a valid and reliable survey and that the tool was comprised of four subscales they termed: *professional learning beliefs and motivation*, *scholarly activities*, *attention to learning opportunities*, and *technical skills in seeking information*.

Hojat, Veloski, and Gonnella (2009) conducted a similar study with a much larger sample size using alumni of the Thomas Jefferson Medical College. The researchers mailed 5,349 surveys to alumna from the college from 1975 – 2000. Sixty percent responded (N = 3,195). The researchers compared the results of the survey to questions of professional accomplishments and satisfaction as well as self-reported lifelong learning practices. The results were similar to the Hojat et al.'s (2005) study but resulted in only a three-factor model, excluding the scholarly activities factor. Hojat et al. (2009) describe lifelong learning as "an attribute involving a set of self-initiated activities and information-seeking skills with sustained motivation to learn and the ability to recognize one's own learning needs" (p. 1066). These characteristics are consistent with the line of reasoning that self-regulatory skills are a requisite for lifelong learning and hence the desired attribute of a given professional. The authors concluded that all of these areas were important in that those individuals with higher lifelong learning scores also had a greater number of accomplishments, satisfaction, and lifelong learning habits. Despite the importance of self-regulatory knowledge in their conception of lifelong learning, however, the survey does not actually address any self-regulatory skills. Rather, it appears to only address motivation and volition.

The lack of attention to self-regulatory skills was also conveyed in a follow-up study by Wetzel, Mazmanian, Hojat, Kreutzer, Carrico, Carr, Veloski, and Rafiq (2010). In this study the authors adapted the original survey by Hojat, Veloski, and Gonnella (2009) to be used with medical students. The authors concluded that this was a reliable tool to measure lifelong learning orientation; however, using factor analysis, they determined that the model with the best fit for the data only addressed motivation, skills

in seeking information, and attention to learning opportunities. The skills in seeking information related specifically to searching databases and making time for learning, not to the self-regulatory strategies that occur during knowledge acquisition. Despite the researchers' best attempts at capturing lifelong learning, it appears that there is a significant component missing in that self-regulation skills are not considered. The skills and attention that Wetzel et al. (2010) use to categorize multiple items in the survey actually refer to specific behaviors, not the self-regulatory skills that are necessary for adult learners to monitor their own lifelong learning. It appears that lifelong learning in this conceptualization refers primarily to the student's motivation to continue to learn. The actual self-regulatory capacity to do so is not considered.

The empirical literature regarding self-directed learning is probably best encapsulated by Murad, Coto-Yglesias, Varkey, Prokop, and Murad's (2010) systematic review. These authors included 59 empirical studies with a population of healthcare professionals and relevant outcomes, interventions, useable data, and appropriate study design to review for their study. Based on their review, the authors concluded that self-directed learning was associated with moderate significant increases in the knowledge domain and non-significant increases in psychomotor and attitudes domains. What is unique about this study, however, is the challenge that the authors acknowledge as being the most difficult-defining self-directed learning. They report that only 8% of published literature in self-directed learning contains an explicit definition. This makes understanding and appreciating their results difficult. Without a clear understanding that what they were reviewing was guided by similar, if not the same, principles it proves challenging to say for sure that the collection of the data was appropriate. In this

systematic review the authors do not make an attempt at offering a further, more detailed explanation about the elements that the implicit or explicit definitions may have contained. The lack of definition with regard to self-directed learning is a problem. Without a clear sense of the phenomena being investigated, it is not possible to critically evaluate the phenomenon itself. Perhaps this is why many researchers have opted to investigate self-directed readiness instead of the interaction of the multiple components.

The self-directed learning readiness literature has focused on the individual's willingness and capacity to adopt self-directed learning. This incorporates all of the influences of self-directed learning without having to explicitly define what those components are. It is clear through the tools developed and validated within this body of literature that, in fact, multiple components are included (i.e. motivation, volition, self-regulation knowledge, as well as metacognitive awareness and strategies). In practice, this body of literature can be helpful because it does contain diverse elements; however, theoretically and conceptually the construct is not well defined and therefore difficult to understand.

In professional education, research has taken two distinct paths: 1) research in the academic, classroom setting and 2) research in the clinical/practical setting. There is little information regarding the overlap between the two. Moreover, it is precisely this distinction between learning environments that is a key characteristic of professional education. Salamonson, Everett, Koch, Wilson, and Davidson (2009) conducted a study of the type of learning strategies that first year nursing students used compared to first year medical students. The impetus for this research was not so much targeted at understanding learning strategies as it was to understand how nursing and medical

students may be best educated together. With that, the data provide keen insight into these two professional populations. The authors utilized a subscale of the Motivated Strategies for Learning Questionnaire that measured value, critical thinking, time and environment management, peer learning, and help seeking. In measuring these subscales, the authors have incorporated a number of elements related to self-regulated learning. They also incorporated a singular element of motivation – value. In the context of this particular study, it seems that considering these components in isolation is a valid approach; however, since most professions, including nursing and medicine, have a similar goal of educating lifelong learners the research could have been more thorough with a measure of volition. If the authors' intent was to investigate whether nursing and medical students used similar or different learning strategies it seems noteworthy that the need for such strategies is grounded in goals similar to that of self-regulated or lifelong learning.

McMillan (2010) took an approach of understanding how professional students learn by collecting self-report interviews, observations, and post-observation interviews with seven dentistry students. In her analysis of these interviews and observations, she addresses what she has termed *cognitive strategies,* which are self-regulated learning strategies of rehearsal, elaboration, and organization. She also discusses metacognitive strategies of planning, monitoring, and regulating cognition during learning. The regulation component in this study is actually best framed as volition, while the other strategies are also additional self-regulation strategies. Based on this framework, McMillan (2010) concludes that the best way to support learning in these professional students is to help them develop "strategies for understanding, learning and remembering;

ways to think about and plan for understanding, learning, and remembering; and the desire, will and confidence to tackle understanding, learning, and remembering" (p. 10). The author argues that these strategies should be taught, explicitly, to students. This argument is not contrary to the previous definition I established for metacognitive, self-regulated learning-a type of knowledge one knows about him or her. Instead, the suggestion for teaching the strategies can be viewed as making a student aware of this type of knowledge and is likely a valuable endeavor. This research is helpful in understanding several aspects of self-directed learning with regard to motivation and self-regulated strategies; yet, the research has not addressed the willingness to attend to specific information or activities-volition, which is a significant component.

From a clinical or practical perspective, learning skills in an environment other than the classroom can prove to be challenging, but must consist of the same components. Dornan, Hadfield, Brown, Boshuizen, and Scherpbier (2005) investigated whether or not medical students can learn in a self-directed manner in a clinical environment. To investigate this, the researchers used group discussions, a computer software system, and a questionnaire. The students were broken up into three groups. Groups 1 and 2 were third year students who were all from the same diabetes/endocrine rotation that had extensive training with the software program, and free technical support. Group 3 was from multiple rotations and did not have training in the software program or free technical support. The software program was designed as a *sign-up* program so that individuals could see, based on curriculum objectives and goals, what experiences others in their cohort had had and what they had accomplished (similar to an online portfolio). The conversations in group discussion were analyzed based on statements categorized

into behavior statements, learning statements, and self-direction statements. Based on the statements, the information from the questionnaire, and software system the authors concluded that self-directed learning is not applicable in a clinical environment. The major assumption of this research, however, is that the use of the software program reflected self-directed learning. At best, the software program may assist with self-regulation strategies but the researchers did not consider how the software program might influence individuals given the research design. The software program could help the students to monitor and plan their learning and thus help in self-regulation, but based on the information presented is unable to give any information regarding any metacognitive, self-regulation strategies that may or may not have helped any of the groups in their acquisition of knowledge.

Contrary to Dornan et al.'s (2005) results, Brydges, Carnahan, Safir, and Dubrowski (2009) found greater retention of information in a group of medical students with process goals when they were *self-guided* as compared to a control group also with a process goal. The objective for the students in this study was to learn wound closure (practical) skills. The researchers used a two (self-guided vs. control group) x two (process goal vs. outcome goal) research design. The self-guided group was allowed to access a training video whenever they desired. The control group was only allowed to view the parts of the video accessed by the self-guided group. The groups were further divided into groups with goal orientations (i.e. process goals or outcome goals). The students assigned process goals were able to review the appropriate process-related goals listed for them. The students assigned to the outcome goals group did the same,

reviewing only the outcome goals listed for them. The measures used to evaluate the skill were hand motion efficiency and expert ratings.

Although Brydges et al. (2009) use language slightly different from that discussed in the rest of this review (i.e. self-guided vs. self-directed or self-regulated) it is likely that they are capturing similar concepts. Students with the greatest retention of wound closure skills, the self-guided, process-goal group, who had access to the video at any time, were likely able to regulate and monitor their own learning on demand. The article is not clear as to how many times students in this group may have watched particular segments of the video, but it is clear that the opportunity at least existed for them to do so-unlike the control group. With free access to the video, the students could watch and reflect on their own understanding and skill to determine whether or not it needed to be more finely tuned, and then re-watch the video. These processes of monitoring and accessing information are key components of self-regulated learning. The goal orientation may speak to the student's motivation while any level of persistence that the students used to master the technique relates volition. The combination of all three elements speaks to the self-regulated learning for these students.

These results demonstrate conclusions that are contrary to, but also build on, Dornan et al.'s (2005) results. That is, students are not able to completely direct their own learning in the clinical or practical environment (Dornan, 2005) but with some guidance (either from professional input or a video) they are more likely to be successful in accomplishing their goals (Brydges et al., 2009). One factor that these authors consider in order to explain why this is the case is the individual student's ability to self-assess the situation and current skills (Brydges et al., 2009). The ability to progress towards

strategizing, planning, attending to, and monitoring a goal requires an accurate understanding of the current situation. Without this, moving forward with self-regulation or self-directed learning is difficult. Some authors have referred to this as the *sensemaking paradox* (Butcher & Sumner, 2011).

With the evidence discussed above, it is clear that at a minimum, professional students require at least some guidance in order to direct their own learning. Teunissen, Scheele, Scherpbier, van der Vleuten, Boor, van Luijk, and van Diemen-Steenvoorde (2007a) concluded as much when they used a grounded theory approach with data from 51 medical residents in seven focus groups to develop a model of how medical residents learn.

In the final iteration of the model, the resident's learning begins by participating in activities (clinical or practice). Moving past participation, each of the next steps, interpretation and construction of meaning, is a function of the personal learning process with both internal influences of the learning process such as the resident's attitude and emotions, and external influences on the learning process such as knowledge that can be learned in books, articles, journals, etc.

According to the model, the resident is likely to move from participation to interpretation then to personal experience and construction of meaning to finally arrive at personal knowledge, which can inform other interpretations. For example, if I were to apply this model to a physical therapy student his/her learning could begin with observing a physical therapist taking a patient through a therapeutic exercise program (Participating in Activity). The student would access their previous knowledge, likely from the didactic portion of the curriculum, to interpret what the physical therapist was

doing and try to develop rationale to support the therapeutic exercise program (Interpretation). At the level of interpretation, there can be both internal and external factors influencing the student's understanding of the therapeutic exercise. Internal factors may include the student's previous experience with the patient or physical therapist, the student's attitudes and emotions surrounding the observation, and/or the student's beliefs regarding the efficacy of the therapeutic exercise program. Additionally, there may be external factors influencing the student: knowledge from class or previous clinical experience that supports or refutes the use of particular strategies; knowledge about the anatomy involved in the exercise program; and/or knowledge regarding specific techniques that are being utilized or diagnoses that are present. All of these factors may influence the learning that is occurring during the observation activity which influences the student's personal experience of the event and the construction of its meaning. At the level that meaning is being constructed all of the same factors mentioned previously may influence the student's learning. Other factors, internal and external, may be introduced such as peer's experiences, conversations with other clinicians, or new information that is introduced, which could influence the student's learning. Once the activity is over, and the student's personal knowledge has formed the student can use this knowledge to reflect on his/her performance and influence future interpretations.

Reviewing Teunissen et al.'s (2007a) model in light of self-regulation and self-direction, what these authors refer to as the "internal parts of the learning process" can be thought of as metacognitive strategies, motivation, and volition. Moreover, this model can be considered in lieu of Dornan et al.'s (2005) and Brydges et al.'s (2009) findings regarding self-directed learning in the clinical environment. If one assumes that Dornan

et al.'s (2005) findings are robust, that medical students require support from external sources, then it is likely that the external influences in the Teunissen et al. (2007a) model are essential for student learning. Moreover, if Brydges et al.'s (2009) findings are also robust, goal setting for the learning process may be essential as an internal factor as suggested by Teunissen et al. (2007a). All in all, Brydges et al. (2009) and Dornan et al. (2005) support the existence of internal and external influences in the Teunissen et al.'s (2007a) model.

One last point to consider with Teunissen et al.'s (2007a) model is that throughout the entire learning process, the medical residents are accessing the codified knowledge they likely acquired in the classroom via texts or journals. Including this element in the model bridges the gap between the didactic, academic, classroom knowledge and the practical, clinical knowledge. This distinction is extraordinarily helpful when trying to understand the professional students' learning, since most professional education programs contain elements of each.

Teunissen et al. (2007b) conducted a follow-up study on their initial research, using three focus groups to interview physicians working with medical residents. Again, they used a grounded theory approach based on the focus group transcripts. Based on these focus groups, three basic themes emerged which are relevant to the model developed by the authors as well as to the present research.

The first theme in Teunissen et al.'s (2007b) study identified that attending physicians believe it is essential for residents to learn by participating in daily activities. For example, residents should observe evaluations and perform an evaluation themselves. The second theme from Teunissen et al.'s (2007b) study is that attending physician's

feedback regarding performance, an external factor, is important for the resident's interpretation of an event and thus construction of meaning and personal knowledge development. For example, if a resident performs a technique incorrectly or poorly, it is important for the attending physician to give that resident that input so that the student constructs an appropriate meaning from the event and does not believe falsely that he or she did it well. The third theme from Teunissen et al.'s (2007b) study focuses on how attending physicians view residents' use of their own personal knowledge. The attending physicians believe that personal knowledge typically grows and changes from simply acquiring the knowledge to consolidating the knowledge in a way that allows the resident to make adequate management decisions.

Specifically, the first two themes, the role of participation or work activities and the attending physicians' influence should be considered relative to self-regulated learning. Addressing the concern raised by Brydges et al. (2009), the ability of the individual to self-assess is a necessary precursor to self-regulation. In Teunissen et al.'s (2007a) model it is through the day-to-day activities that residents begin their learning process during their clinical education. During this learning process, physicians are most likely to affect the medical residents in the early stages by giving them feedback as a form of external influence. As a result, students can use this external influence in addition to other resources to evaluate and better understand their own abilities. They can use this information as a filter to be better able to assess their own performance relative to those around them, thus better positioning themselves for more successful internal monitoring-self-regulated learning.

White (2007) compared medical students in problem-based learning programs to their counterparts in traditional learning programs using a semi-structured interview. Based on the results of this study, White argues that self-regulated learning strategies can help pave the way from undergraduate to graduate medical education. This same rationale is used to support the idea that self-regulated learning is also essential for lifelong learning processes and can facilitate this process once students have graduated from their professional education program. In this study, medical students educated in a problem-based program demonstrated more intrinsic motivation-*for learning's sake*-during their clinical years. Their transition into medical school, however, was more difficult than it was for traditional students because they were expected to monitor, plan, and strategize their own learning.

In considering self-regulated learning in this medical student sample, White (2007) uses Zimmerman's model of forethought, performance control, and self-reflection to influence forethought. Assuming this model is valid in professional education, it is noteworthy to mention that in an individual's willingness to attend to this information, volition, is not considered. This is especially relevant in an arduous professional education program, which consistently requires students to attend to information for sustained periods of time, sometimes for critically important reasons.

As has been suggested, self-regulated learning is a multidimensional phenomenon. Ridley, Schutz, Glantz and Weinstein (2004) provide empirical evidence to support at least a two-dimensional understanding of the construct. In their research, Ridley et al. (2004) used a two (high metacognitive awareness or low metacognitive awareness) x two (goal-setting or non-goal-setting) ANCOVA design. The researchers

placed participants in the groups by first having the students complete a Self-Consciousness scale to indicate their own, general, metacognitive awareness. Then, within these groups (either high or low metacognitive awareness) the participants were either asked to set a goal for the assigned decision making activity or were not given the instructions to set a goal (the *non-goal-setting* group). The individuals in the decision-making activity with higher metacognitive awareness who were in the goal-setting group performed the best on the decision-making task, suggesting that both these components – motivation, as defined in this study by goal-setting, and metacognitive or self-regulated strategies, are dimensions that are necessary for self-regulated learning.

Similar to other authors, Ridley et al. (2004) have defined self-regulated learning as a process in which individuals' actively-metacognitively, motivationally, and behaviorally-control their own learning. Unfortunately, though, these authors were only able to include two of these three dimensions, omitting behavioral control (i.e. volition). Even without this third dimension, though, this research lays a solid foundation for the argument that self-regulated learning comprises multiple dimensions.

Outside the professional education population, researchers such as Jiusto and DiBiasio (2006) investigated self-directed learning in a population of engineering students at a four-year college. These researchers hypothesized that an experiential learning program would increase the individual's self-directed learning. The authors, utilizing a class of students who were committed to the Global Studies Program (GSP), had the students complete a self-directed learning readiness scale as a pre-test and a post-test. The students had to submit a final project, which was independently reviewed by other faculty. The reviews of final projects and change from pre-test to post-test in self-

directed learning readiness scores were compared to on-campus (control group) students using a *t*-test analysis. Based on these results, the authors concluded that experiential learning could increase self-directed learning.

As students mature and gain more experiences, it is likely that they will draw from that experience to supplement their learning. Experiential learning may pose real-world problems that the individual can hone in on to help direct his/her own learning. Jiusto and DiBiasio's (2006) study presents no information specifically geared toward self-regulated learning; however, students in this study who were a part of the sample group were already committed to the experiential learning program. Therefore, the bigger implication toward self-directed learning may be that individuals who are invested in a topic, that is that they have the will to sustain attention (volition) and it is thrilling for them (motivation), are more likely to produce better results.

In a similar population, Dynan, Cate, and Rhee (2008) compared the self-directed learning readiness difference between pre and post-tests of students in structured classrooms and unstructured classrooms using multiple regression. A structured learning environment was one where the students were asked specific questions and given specific assignments. An unstructured classroom featured open-ended questions and the students were freer to direct their own assignments. This research brought together the matching of environmental factors with the business student's self-directed learning readiness. The authors conducted a pre-test and post-test of self-directed learning readiness on a sample of 261 students. Using the pre-test scores, students with low, below-average and average readiness were placed in a structured classroom. Students with above-average and high readiness were placed in an unstructured classroom. Based on their results, the authors

concluded that there was a significant impact on the matching of students to an appropriate learning environment. This was particularly true for students in the structured environment whose mean score increased statistically significantly on the self-directed learning readiness scale.

Although Dynan, Cate, and Rhee's (2008) research gives credence to the notion that there is evidence to support environmental and contextual components as part of the self-directed learning construct, it does not provide an in-depth understanding of what was actually being measured. First, without a control group it is difficult to suggest that any changes in self-directed learning were not artificial. Without a better understanding or definition of the construct being measured, it is difficult to apply the results, although heuristically it seems logical that matching a learner's readiness to direct his or her own learning to a classroom environment which may enhance learning.

Reio and Davis (2005) investigated how age and gender might impact self-directed learning readiness. Reio and Davis surveyed 530 participants regarding self-directed learning readiness. The participants were a variety of ages, both male and female, and were from different educational environments. These authors determined that there were no statistically significant differences in the personal characteristic of self-directed learning readiness by gender, but that there were statistically significant differences by age. Using ANCOVA and controlling for ethnicity the authors concluded that young adults in this study, ages 14-20, had the least amount of self-directed learning readiness, while individuals in their 30s and 40s had the highest amount of readiness. This research is important because it demonstrates distinct age differences in self-directed learning readiness. While this is consistent with Knowles' initial conception of

Andragogy one can also contend that age may simply be a proxy for more experience in planning, monitoring and evaluating one's learning, the metacognitive strategies that are a critical component of self-regulated learning.

In a population of undergraduate students, Bail, Zhang, and Tachiyama (2008) compared under-prepared students after completing a course in self-regulated learning to similarly under-prepared students who had not participated in such a course. The under-prepared students who completed the course were matched with a comparison group based on current cumulative GPA, number of prior academic credit hours, number of transfer credits, and gender. The groups were considered well matched because there were no significant differences between groups on any of the matching criteria. Using ANCOVA methods, four semesters after the self-regulated learning course, students in the self-regulated learning course had significantly higher cumulative GPAs, had significantly higher likelihood of graduating, and significantly lower odds of F grades in semesters following the course when compared to the students who did not participate in a self-regulated learning course.

Bail, Zhang, and Tachiyama (2008) used Pintrich's definition of self-regulated learning for the purpose of operationally defining the construct in their article. Within the context of the intervention though, the self-regulated learning course, it is difficult to identify precisely what is being addressed. The article describes the self-regulated learning course as focusing on metacognitive strategies. Learning metacognitive strategies would likely be helpful for any under-prepared students; however, the authors do not address the multidimensionality of the self-regulated learning construct because they omit the behavioral and motivation influences. It seems plausible that beyond

metacognitive strategies, the students' successes could also be related to their own motivation and volition surrounding their academic experience. The self-regulated learning course may have influenced these factors; however, this was not discussed in this research as having been included in the course or having been measured as a product of the course. As a result, this evidence can only be used to address a single component, metacognitive strategies, of a multi-component construct.

In summary, it is easy to see that many investigators have taken on either self-directed learning or self-regulated learning, generally from adult learning and educational psychology perspectives, respectively. Instead of concretely defining these constructs before moving forward with the research, most authors have accepted that these constructs are poorly defined. One reason the constructs are poorly defined is because authors have generally accepted the conventional language of their discipline without further consideration to the actual make-up of the constructs, simply allowing the measures to define the construct. A second reason is that there is a lack of overlap between two very prominent and very useful bodies of literature, adult learning and educational psychology, especially as it relates to professional education.

By using the theoretical frameworks of self-directed learning and self-regulated learning and examining the current research in professional education populations it is easy to see how the constructs overlap. If one considers the principal components of metacognitive strategies, volition, and motivation and calls that self-regulated learning then it is easy to argue that some research conducted under the name of self-directed learning could just as easily be called self-regulated learning. This understanding becomes even more important moving forward as the research conducted for this

dissertation are referred to as self-regulated learning despite the fact that the tool used to measure self-regulated learning is called the Self-Directed Learning Readiness Scale for Nurse Education (SDLRSNE). The specifics of this tool are discussed in chapter 3.

CHAPTER 3

METHODS

Research Questions

The purpose of this study was to relate the self-directed learning and self-regulated learning constructs. Specifically, this study investigated the self-regulated learning of Doctor of Physical Therapy students. With this, the following questions were proposed as research questions:

(1) What is the shape of the DPT students' self-regulated learning over the course of the entire curriculum?

(2) Does participation in clinical education experiences predict the change of the shape of growth of the DPT students' self-regulated learning?

(3) Are there specific demographics that may predict the intercept or slope of self-regulated learning among DPT students?

(4) What percentage of DPT students meets the threshold for self-regulated learners?

Research Design

For this study, I used survey data that had been collected in the Department of Physical Therapy at a large, urban, public, high research activity classified institution in the mid-Atlantic region (Carnegie Foundation for the Advancement of Teaching, 2012). The Self-Directed Learning Readiness for Nurse Education (SDLRSNE) survey is administered to professional graduate DPT students seven times during the duration of the standard 34-month curriculum (see Figure 3.1).

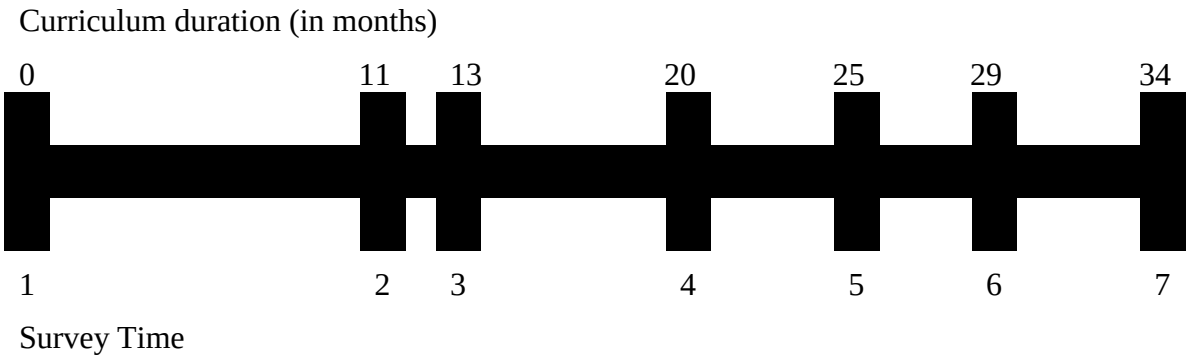

Figure 3.1 SDLRSNE Schedule and DPT Curriculum

The department began administering the survey in July 2010. The survey continues to be administered currently.

The student participants received the survey in one of three ways, either in class, via email, or accessing the survey through Blackboard™-a classroom management system. If the survey was administered during class time, the students completed the survey in a paper/pen format and the survey was returned to the administrator immediately. Via email, the students were sent the survey electronically to their school-associated email account as a word document to be completed on the computer. The student either printed the completed survey and submitted it to the instructor or emailed it back to the instructor by the due date-within one week. The third option required the student to log-in to the Blackboard™ classroom management system using his or her own username and password. The survey was posted to the appropriate Clinical Education course under *Content*. Once the student downloaded the survey the tool is completed and returned as an electronic document or printed and submitted to the course instructor.

Participants

Participants for this study were students in the DPT program who were recruited by virtue of standard procedure for the DPT program. The students were notified that the response to the survey might be used for a research study; however, completion of the survey was expected as part of the Doctor of Physical Therapy program. All students completed the initial survey; however, some students did not progress through the entire curriculum and therefore not all students completed all surveys. The students completed the survey utilizing their student identification number as opposed to their name in order to ensure anonymity within the department.

The total number of students, $N = 232$, responded to the survey at multiple initial start points for this research. This total number of students is divided into cohorts based on their year of completion of the lock-step Doctor of Physical Therapy program. The maximum number of students for any given survey is listed in Table 3.1.

Table 3.1

Maximum Number of Participants in Each Cohort

Participants	Total Possible *n*	% of Sample
Class of 2011	34	14.7
Class of 2012	42	18.1
Class of 2013	52	22.4
Class of 2014	52	22.4
Class of 2015	52	22.4

The class of 2011 (began the curriculum in 2008) completed the survey at only Time 7 (34 months) with an *n* = 34 students. The class of 2012 submitted surveys at Time 5 (25 months), *n* = 40 students; Time 6 (29 months), *n* = 42 students; and Time 7 (35 months), *n* = 42 students. The classes of 2013, 2014, and 2015 completed Time 1 (0 months) with *n* = 48 students, *n* = 49 students, and *n* = 52 students, respectively. The classes of 2013 and 2014 completed the Time 2 (11month) survey with *n* = 47 students and *n* = 50 students and the Time 3 (13 month) survey with *n* = 48 students and *n* = 50 students. The class of 2014 is the only cohort to have completed the survey at Time 5 (25 months) *n* = 48 students.

Table 3.2

Maximum Number of Surveys Collected for Each Cohort

Class of:	Time 1 (0 mos.)	Time 2 (11 mos.)	Time 3 (13 mos.)	Time 4 (20 mos.)	Time 5 (25 mos.)	Time 6 (29 mos.)	Time 7 (34 mos.)
2011							34
2012					41	42	42
2013	48	47	48	49	51	51	
2014	49	50	50				
2015	52						

It should be noted, as above, that not all students successfully completed the entire DPT curriculum and there was the potential to fall back into a later cohort in the case of dismissal and reinstatement or a leave of absence from the program. For example, class

of 2012 at Time 5 (25 months) had 41 students, but Time 6 (29 months) had 42 students. This is not meant to convey that one student did not complete Time 5 (25 month) but rather that one student was re-introduced to the curriculum at a point that allowed him/her to complete the Time 6 (29 month) survey and not Time 5 (25 months) for that cohort. The total number of students for this research was calculated by adding up the total number of students at their final testing time to date (*N*=229). Table 3.2 depicts the maximum data available for each cohort. The difference of three remaining students are students who did not advance through the program and resulted in lost data except for that collected prior to their termination.

Characteristics of the Sample

The students in this sample ranged in age from 20 – 37 years. This was representative at Time 1 (0 months) when the range was the largest with ages from 20-37 years (M_{age} = 23.17, *SD* = 2.16). At Time 2 (11 months) the range was 21-32 years (M_{age} = 24.08, *SD* = 2.02). At Time 3 (13 months), the range was 22 – 32 years (M_{age} = 24.32, *SD* = 2.02). At Time 4 (20 months) and Time 5 (25 months) the range was 23 – 33 years (M_{age} = 25.08, *SD* = 2.21) and (M_{age} = 25.40, *SD* = 2.14), respectively. The age range at Time 6 (29 months) was 23-34 years (M_{age} = 25.67, *SD* = 2.13) and at Time 7 (34 months) it was 24-35 years (M_{age} = 26.02, *SD* = 2.04). This information is presented in Table 3.3.

For this sample, students aged 20-24 years were considered traditional students. Students aged 25+ years were considered nontraditional students. At Time 1 (0 months) 84% (*N* 126) of the students were ages 20-24 years. As one would anticipate, the

percentage of students with the traditional student Status decreased as the students progressed through the program

Table 3.3

Descriptive Results for Age by Survey Time

Time	*n*	Min (Years)	Max (Years)	*Mean*	*SD*
Time 1 (0 months)	149	20	37	23.17	2.16
Time 2 (11 months)	97	21	32	24.08	2.02
Time 3 (13 months)	98	22	32	24.32	2.02
Time 4 (20 months)	48	23	33	25.08	2.21
Time 5 (25 months)	93	23	33	25.40	2.14
Time 6 (29 months)	92	23	34	25.67	2.13
Time 7 (34 months)	76	24	35	26.02	2.04

At Time 2 (11 months) the percentage of traditional students was 75.5% (n = 73), at Time 3 (13 months) the percentage was 71.7% (n = 71), and at Time 4 (20 months) the percentage was 55.1% (n = 27) of students were between the ages of 20 and 24 years. At Time 5 (25 months), the percentage of traditional students was 51.6% (n = 48). At Time 6 (29 months) the percentage declined to 34.4% (n = 32) of students who fell into the traditional student Status and at Time 7 (34 months) the percent of traditional students (age 20-24) was the lowest, at 19.7% (n = 15). The majority of the sample in this research was female, 66.4% (n = 154). This is consistent with the current demographics of the

physical therapist population and was less than the current percentage of enrolled female PT students enrolled at all institutions, 84.9% (CAPTE 2012).

Dependents

Of the total 232 survey participants, only four students responded to the demographic portion of the survey as having dependents, 1.7%. Of the participants that responded as having dependents, each indicated having 1-2 children, see Table 3.4. Although this information may be germane in recognize a student's adult status (Arnett, 1998), with such minimal data no further analysis was conducted.

Table 3.4

Descriptive Results for Gender and Number of Dependents

Demographic Variables		*n*	% of Sample
Gender			
	Male	78	33.6
	Female	154	66.4
Number of Dependents			
	0	228	98.3
	1-2	4	1.7
	>2	0	0.0

Educational Background of Students

On the demographic portion of the survey, participants were also asked to indicate their highest level of qualification (degree), as well as the highest level of qualification

for any individual in the house in which they were raised. They were then asked to indicate whom the person was that held the highest qualification relative to the participant (i.e. Mother, Stepfather, Sister, etc.). This information is presented in Table 3.5.With this information, I identified that most students participating in the survey had a bachelor's degree. At Time 1 (0 months) 96.7% (*n* = 145) of the participants had a Bachelor's degree, 1.3% (*n* = 2) had a Master's degree, and 2.0% (*n* = 3) classified themselves as others-these are likely the students who participate in the 3+3 curriculum offered to Temple undergraduates allowing them to participate in Physical Therapy graduate work for credit towards completing their Bachelor degree, therefore upon completion of Time 1 (0 months) of the survey they had not yet received a Bachelor's degree. At Time 2 (11 months) 99% (*n* = 96) had a Bachelor's degree, 1% (*n* = 1) had a Master's Degree. At Time 3 (13 months) 98% (*n* = 97) had a Bachelor's degree, 2% (*n* = 2) had a Master's Degree. At Time 4 (20 months), Time 5 (25 months), and Time 6 (29 months) all participants (100%) had a Bachelor's degree, (*n* = 49, *n* = 93, *n* = 92, respectively). At Time 7 (34 months) 98.7% (n = 75) had Bachelor's Degrees and 1.3% (*n* = 1) had Master's degrees.

With regards to the highest qualification held in the household in which they were raised, the follow statistics were generated. At Time 1 (0 months), 1.3% (*n* = 2) of the students indicated the highest qualification was a certificate, 8% (*n* = 12) indicated a diploma, 36.7% (*n* = 55) indicated a Bachelor's degree, 32.7% (*n* = 49) indicated a Master's degree, 16% (*n* = 24) indicated a Graduate degree, and 5.3% (*n* = 8) indicated other as the highest qualification. Time 2 (11 months) no one indicated a certificate, 11.3% (*n* = 11) indicated a Diploma, 39.2% (*n* = 38) indicated a Bachelor's degree,

29.9% (*n* = 29) indicated a Master's degree, 16.5% (*n* = 16) indicated a graduate degree, and 3.1% (*n* = 3) indicated other as the highest qualification. At Time 3 (13 months) 2% (*n* = 2) indicated a certificate, 9.1% (*n* = 9) indicated a Diploma, 39.4% (*n* = 39) indicated a Bachelor's degree, 35.4% (*n* = 35) indicated a Master's degree, 13.1% (*n* = 13) indicated a graduate degree, and 1% (*n* = 1) indicated other as the highest qualification. At Time 4 (20 months) no one indicated a certificate, 6.1% (*n* = 3) indicated a Diploma, 42.9% (*n* = 21) indicated a Bachelor's degree, 28.6% (*n* = 14) indicated a Master's degree, 20.4% (*n* = 10) indicated a graduate degree, and 2% (*n* = 1) indicated other as the highest qualification.

At Time 5 (25 months) 3.2% (*n* = 3) indicated a certificate, 6.5% (*n* = 6) indicated a Diploma, 40.9% (*n* = 38) indicated a Bachelor's degree, 32.3% (*n* = 30) indicated a Master's degree, 14% (*n* = 13) indicated a graduate degree, and 3.2% (*n* = 3) indicated other as the highest qualification. At Time 6 (29 months) 1.1% (*n* = 1) indicated a certificate, 6.5% (*n* = 6) indicated a Diploma, 43% (*n* = 40) indicated a Bachelor's degree, 29% (*n* = 27) indicated a Master's degree, 18.3% (*n* = 17) indicated a graduate degree, and 2.2% (*n* = 2) indicated other as the highest qualification. At Time 7 (34 months) no one indicated a certificate, 13.2% (*n* = 10) indicated a Diploma, 36.8% (*n* = 28) indicated a Bachelor's degree, 34.2% (*n* = 26) indicated a Master's degree, 11.8% (*n* = 9) indicated a graduate degree, and 3.9% (*n* = 3) indicated other as the highest qualification.

The following data were collected with regards to who held the highest qualification in the household in which the participant was raised. At Time 1 (0 months) 78.6% (*n* = 118) indicated a parent or step-parent held the degree, 20.6% (*n* = 31)

indicated a sibling or a step-sibling, 8.7% (*n* = 13) indicated that they held the highest degree in the household in which they were raised, and .7% (*n* = 1) indicated someone other than those listed held the highest qualification. At Time 2 (11 months) 72.2% (*n* = 70) indicated a parent or step-parent held the degree, 37.1% (*n* = 36) indicated a sibling or a step-sibling, and 4.1% (*n* = 4) indicated that they held the highest degree in the household in which they were raised. At Time 3 (13 months) 76% (*n* = 73) indicated a parent or step-parent held the degree, 32.9% (*n* = 32) indicated a sibling or a step-sibling, and 6.2% (*n* = 6) indicated that they held the highest degree in the household in which they were raised. At Time 4 (20 months) 75.5% (*n* = 37) indicated a parent or step-parent held the degree, 34.6% (*n* = 17) indicated a sibling or a step-sibling, and 2% (*n* = 1) indicated that they held the highest degree in the household in which they were raised. At Time 5 (25 months) 72% (*n* = 67) indicated a parent or step-parent held the degree, 34.4% (*n* = 32) indicated a sibling or a step-sibling, 9.7% (*n* = 9) indicated that they held the highest degree in the household in which they were raised, and 2.2% (*n* = 2) indicated someone other than those listed held the highest qualification. At Time 6 (29 months) 71% (*n* = 66) indicated a parent or step-parent held the degree, 37.6% (*n* = 35) indicated a sibling or a step-sibling, 4.4% (*n* = 4) indicated that they held the highest degree in the household in which they were raised, and 2.2% (*n* = 2) indicated someone other than those listed held the highest qualification. At Time 7 (34months) 60.5% (*n* = 46) indicated a parent or step-parent held the degree, 31.6% (*n* = 24) indicated a sibling or a step-sibling, 19.7% (*n* = 15) indicated that they held the highest degree in the household in which they were raised, and 6.6 % (*n* = 5) indicated someone other than those listed held the highest qualification. Based on these data, at each of the time points of the

survey, for most participants parents/step-parents held the highest qualification in the household in which the student was raised. The highest qualification that was most often held was a Bachelor's degree.

In addition to calculating percentages of participant responses and analyzing cohort differences with respect to the dependent variables, the cohorts were also compared for statistical differences with respect to the demographic data collected. These results are presented in Tables 3.6-3.11.

Testing for cohort differences in this capacity indicated that generally the cohorts were not significantly different. The demographic items related to age, gender, and highest household qualifications offered no significant differences between the cohorts. Items related to individuals' highest qualification and the individual holding the highest qualification were significantly different between cohorts at Time 1 (0 months) only; this may be attributed to the fact that there were three cohorts with available data to be analyzed as opposed to two at the other times the survey was administered.

Table 3.5

Percentages of Status, Individual Highest Qualifications, Highest Household Qualifications, and Individual Holding the Highest Qualification by Survey Time

Time 1 (0 months)	*N*	% of Sample
Status		
Traditional	125	83.9
Nontraditional	24	16.1
Individual's Highest Qualification		
Bachelor's Degree	145	96.7
Master's Degree	2	1.3
Other	3	2.0
Highest Household Qualification		
Certificate	2	1.3
Diploma	12	8
Bachelor's Degree	55	36.7
Master's Degree	49	32.7
Graduate/ PhD Degree	24	16
Other	8	5.3
Individual Holding Highest Qualification		
Parent/Step-parent	118	78.6
Sibling/Step-sibling	31	20.6
Participant	13	8.7
Other	1	.7

Table 3.5 (continued)

Time 2 (11 months)	*N*	% of Sample
Status		
Traditional	85	87.6
Nontraditional	12	12.4
Individual's Highest Qualification		
Bachelor's Degree	96	99.0
Master's Degree	1	1.0
Highest Household Qualification		
Certificate	0	0.0
Diploma	11	11.3
Bachelor's Degree	38	39.2
Master's Degree	29	29.9
Graduate/ PhD Degree	16	16.5
Other	3	3.1
Individual Holding Highest Qualification		
Parent/Step-parent	70	72.2
Sibling/Step-sibling	36	37.1
Participant	4	4.1
Time 3 (13 months)		
Status		
Traditional	86	87.8
Nontraditional	12	12.2

Table 3.5 (continued)

Time 3 (13 months)	*N*	% of Sample
Individual's Highest Qualification		
Bachelor's Degree	97	98.0
Master's Degree	2	2.0
Highest Household Qualification		
Certificate	2	2.0
Diploma	9	9.1
Bachelor's Degree	39	39.4
Master's Degree	35	35.4
Graduate/ PhD Degree	13	13.1
Other	1	1.0
Individual Holding Highest Qualification		
Parent/Step-parent	73	76.0
Sibling/Step-sibling	32	32.9
Participant	6	6.2
Time 4 (20 Months)		
Status		
Traditional	43	87.8
Nontraditional	6	12.2
Individual's Highest Qualification		
Bachelor's Degree	49	100.0

Table 3.5 (continued)

Time 4 (20 months)	*N*	% of Sample
Highest Household Qualification		
Certificate	0	0.0
Diploma	3	6.1
Bachelor's Degree	21	42.9
Master's Degree	14	28.6
Graduate/ PhD Degree	10	20.4
Other	1	2.0
Individual Holding Highest Qualification		
Parent/Step-parent	37	75.0
Sibling/Step-sibling	17	34.6
Participant	1	2.0
Time 5 (25 months)		
Status		
Traditional	65	71.4
Nontraditional	26	28.6
Individual's Highest Qualification		
Bachelor's Degree	93	100
Highest Household Qualification		
Certificate	3	3.2
Diploma	6	6.5
Bachelor's Degree	38	40.9

Table 3.5 (continued)

Time 5 (25 months)	*N*	% of Sample
Master's Degree	30	32.3
Graduate/ PhD Degree	13	14.0
Other	3	3.2
Individual Holding Highest Qualification		
Parent/Step-parent	67	72.0
Sibling/Step-sibling	32	34.4
Participant	9	9.7
Other	2	2.2
Time 6 (29 months)		
Status		
Traditional	66	71.0
Nontraditional	27	29.0
Individual's Highest Qualification		
Bachelor's Degree	92	100.0
Highest Household Qualification		
Certificate	1	1.1
Diploma	6	6.5
Bachelor's Degree	40	43.0
Master's Degree	27	29.0
Graduate/ PhD Degree	17	18.3
Other	2	2.2

Table 3.5 (continued)

Time 6 (29 months)	*N*	% of Sample
Individual Holding Highest Qualification		
Parent/Step-parent	66	71.0
Sibling/Step-sibling	35	37.6
Participant	4	4.4
Other	2	2.2
Time 7 (34 months)		
Status		
Traditional	26	34.2
Nontraditional	50	65.8
Individual's Highest Qualification		
Bachelor's Degree	75	98.7
Master's Degree	1	1.3
Graduate/ PhD Degree	0	0.0
Other	0	0.0
Highest Household Qualification		
Certificate	0	0.0
Diploma	10	13.2
Bachelor's Degree	28	36.8
Master's Degree	26	34.2
Graduate/ PhD Degree	9	11.8
Other	3	3.9

Table 3.5 (continued)

Time 7 (34 months)	*N*	% of Sample
Individual Holding Highest Qualification		
Parent/Step-parent	46	60.5
Sibling/Step-sibling	24	31.6
Participant	15	19.7
Other	5	6.6

Table 3.6

ANOVA for Age

Time	*df*	*MSE*	*F*	*p*
Time 1 (0 Months)	2, 150	6.150	.118	.889

* indicates a *p*-value <.05, ** indicates a *p*-value<.01, ***indicates a *p*-value<.001

Table 3.7

T-tests for Age

	N	*M*	*SD*	*t*	*df*	*p*
Time 2 (11 months)				1.669	95	.098
Class of 2013	47	24.28	2.262			
Class of 2014	50	23.64	1.425			
Time 3 (13 months)				1.725	97	.088
Class of 2013	49	24.53	2.209			
Class of 2014	50	23.88	1.480			
Time 4 (20 months)	—	—	—	—	—	—
Time 5 (25 months)				.411	90	.682
Class of 2012	41	25.54	2.075			
Class of 2013	51	25.35	2.171			
Time 6 (29 months)				-.065	91	.948
Class of 2012	42	25.62	1.925			
Class of 2013	51	25.65	2.189			
Time 7 (34 months)				-.110	74	.913
Class of 2011	34	25.97	2.195			
Class of 2012	42	29.02	2.018			

* indicates a *p*-value <.05, ** indicates a *p*-value<.01, ***indicates a *p*-value<.001

Table 3.8

Chi-squared for Gender

	N	*Male*	*Female*	*df*	*χ2*	*p*
Time 1 (0 months)				2	5.597	.061
Class of 2013	52	21	31			
Class of 2014	52	17	35			
Class of 2015	52	10	42			
Time 2 (11 months)				1	1.943	.163
Class of 2013	52	25	27			
Class of 2014	52	18	34			
Time 3 (13 months)				1	1.007	.316
Class of 2013	52	23	29			
Class of 2014	52	18	34			
Time 4 (20 months)	—	—	—	—	—	—
Time 5 (25 months)				1	.380	.538
Class of 2012	41	14	21			
Class of 2013	52	27	31			
Time 6 (29 months)				1	.344	.558
Class of 2012	42	14	28			
Class of 2013	51	20	31			
Time 7 (34 months)				1	2.161	.142
Class of 2011	34	17	17			
Class of 2012	42	14	28			

* indicates a *p*-value <.05, ** indicates a *p*-value<.01, ***indicates a *p*-value<.001

Table 3.9

Chi-squared for Individual Highest Qualifications

	N	*Bachelor's Degree*	*Master's Degree*	*Other*	*df*	*χ2*	*p*
Time 1 (0 months)					8	15.938	.043*
Class of 2013	52	52					
Class of 2014	52	50	1	1			
Class of 2015	52	49		3			
Time 2 (11 months)					3	1.242	.473
Class of 2013	52	52					
Class of 2014	52	51	1				
Time 3 (13 months)					3	1.242	.743
Class of 2013	52	52					
Class of 2014	52	51	1				
Time 4 (20 months)	—	—	—	—	—	—	—
Time 5 (25 months)					2	.822	.663
Class of 2012	41	40	1				
Class of 2013	52	50	1				
Time 6 (29 months)					1	1.227	.268
Class of 2012	42	41	1				
Class of 2013	51	51					
Time 7 (34 months)					3	3.859	.277
Class of 2011	34	32	2				
Class of 2012	42	42					

* indicates a *p*-value <.05, ** indicates a *p*-value<.01, ***indicates a *p*-value<.001

Table 3.10

Chi-squared for Highest Household Qualification

Class Of:	2011	2012	2013	2014	2015	*df*	*χ2*	*p*
Time 1 (0 months)			49	49	52	10	7.560	.672
Certificate			1	1	0			
Diploma			3	6	3			
Bachelor's Degree			21	18	16			
Master's Degree			12	16	21			
Doctoral Degree			8	7	9			
Other			4	1	3			
Time 2 (11 months)			49	50		6	7.747	.257
Certificate			2	0				
Diploma			6	5				
Bachelor's Degree			18	20				
Master's Degree			16	13				
Doctoral Degree			5	11				
Other			2	0				
Time 3 (13 months)			49	50		5	6.583	.254
Certificate			2	0				
Diploma			3	6				
Bachelor's Degree			22	17				
Master's Degree			18	17				
Doctoral Degree			4	9				

Table 3.10 (continued)

Class Of:	2011	2012	2013	2014	2015	*df*	$\chi 2$	*p*
Other			0	1				
Time 4 (20 months)	—	—	—	—	—	—	—	—
Time 5 (25 months)		41	51			5	7.066	.216
Certificate		3	0					
Diploma		3	3					
Bachelor's Degree		18	20					
Master's Degree		12	17					
Doctoral Degree		3	10					
Other		2	1					
Time 6 (29 months)		42	51			5	3.548	.616
Certificate		1	0					
Diploma		3	3					
Bachelor's Degree		21	19					
Master's Degree		10	17					
Doctoral Degree		6	11					
Other		1	1					
Time 7 (34 months)	34	42				4	7.650	.105
Diploma	5	5						
Bachelor's Degree	8	20						
Master's Degree	14	12						
Doctoral Degree	4	5						
Other	3	0						

* indicates a *p*-value <.05, ** indicates a *p*-value<.01, ***indicates a *p*-value<.001

Table 3.11

Chi-squared Individual Holding the Highest Qualification

	N	*Parent/ Step*	*Sibling/ Step*	*Participant*	*Other*	*df*	*χ2*	*p*
Time 1						6	13.264	.039*
Class of 2013	52	48	0	1	3			
Class of 2014	52	48	2	2	0			
Class of 2015	52	47	0	5	0			
Time 2						1	.088	.767
Class of 2013	52	46	0	6	0			
Class of 2014	52	45	0	7	0			
Time 3						2	.088	.957
Class of 2013	52	45	0	6	1			
Class of 2014	52	44	0	7	1			
Time 4	—	—	—	—	—	—	—	—
Time 5						2	.680	.712
Class of 2012	41	32	0	7	2			
Class of 2013	52	44	0	6	2			
Time 6						3	3.787	.285
Class of 2012	42	34	6	2	0			
Class of 2013	51	45	5	0	1			
Time 7						2	3.932	.140
Class of 2011	34	26	0	3	5			
Class of 2012	42	37	0	4	1			

* indicates a *p*-value <.05, ** indicates a *p*-value<.01, ***indicates a *p*-value<.001

Measures

Participants completed an untimed 46-item questionnaire that was divided into two sections: 1) six demographic questions including: age, gender, number of dependents, individually held highest degree, highest degree held of all other individuals in the household in which the participant was raised, and individual who held the highest degree; and 2) forty five-point Likert-type scale questions related to self-regulated learning. The questionnaire was entirely self-reported.

The questions related to self-directed [regulated] learning were taken from the Self-Directed Learning Readiness Scale for Nurse Education (SDLRSNE) developed by Fisher, King and Tague (2001). Fisher, King and Tague (2001) developed the Self-Directed Learning Readiness Scale for Nurse Education (SDLRSNE) using a Delphi strategy. They piloted the tool with 201 Bachelor of Nursing degree students. The survey originally had 52 items but after an initial item-total correlation analysis ten items were dropped because they were not unidimensional, meaning that they were related to other items on the survey. The items that were discarded had an item-total correlation coefficient of less than .30, leaving the researchers with 42 items on the survey. Following the initial analysis, the researchers conducted an exploratory factor analysis in which two items did not load onto any of the components (cutoff .30) and were eliminated, leaving the survey with 40 items.

In this initial research with a nursing student population, Fisher, King and Tague (2001) identified a three-factor model. The researcher's labeled the factors: *Self-Management* (13 items), *Desire For Learning* (13 items), and S*elf-Control* (15 items). The internal consistencies for each of these factors were high with Cronbach's alphas at

.924, .857, and .830 respectively. Armed with these internal consistency values, the authors concluded that the SDLRSNE was a reliable tool to use to measure self-directed learning readiness with nursing students. Since the scores in this population were normally distributed, the authors determined a threshold for nursing students to be ready for self-directed learning was ≥ a *Total Score* of 150 on the SDLRSNE. Both the Delphi technique utilized to develop the tool and item-total correlations provided evidence for content and construct validity of the tools for first year nursing students. Smedley (2007) using the same design as Fisher, King, and Tague (2001) in a nursing student population, but at a different university, also determined that the tool was reliable and valid. Smedley (2007) generated the same three factor model as Fisher, King, and Tague (2001) with Cronbach's alpha scores of .810, .780, and .844 for the three subscales: *Self-Management, Desire For Learning,* and *Self-Control*, respectively.

Hendry and Ginns (2009) also investigated the reliability and validity of the SDLRSNE. Hendry and Ginns distributed the survey to 264 Year 1 medical students during orientation. Two hundred and thirty-two students completed the survey equaling a response rate of 87.9%. Hendy and Ginns (2009) performed an exploratory factor analysis, which resulted in a four-factor model, eliminating any items that did not load on a factor at a .30 level or greater. With this cutoff, the author's eliminated two items. Two additional items were eliminated because of cross-loading, resulting in a survey of 36 items. With the components that did resolve from the factor analysis Hendry and Ginns labeled them: *Critical self-evaluation (5 items), Learning self-efficacy* (10 items), *Self-determination* (4 items), and *Effective organization for learning* (8 items). All of the factors demonstrated adequate internal consistency reliability with a Cronbach's alpha

score ranging from .72 for *Critical evaluation* and *Self-determination* to .89 for *Learning self-efficacy* and .79 for *Effective organization for learning*. Based on these results, Hendry and Ginns concluded that Fisher's SDLRSNE was a reliable tool to measure self-directed learning readiness in medical students.

In 2010, Fisher and King conducted research with first-year undergraduate nursing students using a confirmatory factor analysis instead of an exploratory factor analysis. The authors distributed the survey to 227 first year nursing students. In this study, the Cronbach's alpha for the *Total Score* was .87, demonstrating high internal consistency reliability. In order to examine the factor structure and due to a small sample size, the authors developed three one-factor models utilizing the subscales from their previous research. Based on these results, the authors determined that much of the exploratory factor analysis from 2001 held true in the nursing student population. The authors did note that eleven items were redundant leaving a survey of 29 questions. Fisher and King argue that Hendry and Ginns' (2009) findings support their results in that some of the redundant items may actually interrelate with other subscales. The research continued to support the use of the tool within medicine and nursing while suggesting the need for more research within other populations.

Data Analysis

In this study, a variety of analyses were conducted to examine the relationships among the demographic variables and the survey data. The analysis was completed in two phases. After screening the data, the preliminary phase to determine the internal consistency reliability of the SDLRSNE for DPT students was conducted using a factor analysis and calculating the internal consistency using Cronbach's alpha. Since an

important theme of this dissertation and much of the literature review focused on identifying component parts of self-directed learning and self-regulated learning: strategies, motivation, and volition, it therefore seemed particularly relevant to gather the most detailed information regarding the components or factors.

Screening for Assumptions

Prior to data analysis it was critical to ensure the accuracy of the data and to screen the data for several assumptions. These assumptions included: Normality, Independence of Observations, Homogeneity of Variance, Multicollinearity, and Linearity.

Normality

In order for most statistical analysis to be applied properly to a set of data, the data need to follow a normal distribution. In order to address this normality, I used SPSS (Version 21) to calculate the skewness and kurtosis of the variables at each time the survey was administered for each cohort; normality was reflected with symmetrical skewness and kurtosis (de Vaus, 2002). Elliott and Woodward (2007) suggested that examining the histogram, boxplot, Q-Q plot, and stem-and-leaf plot can give information regarding normality. Elliott and Woodward (2007) also suggested that a histogram in the shape of a bell curve may represent a normal distribution whereas a box plot with the median score in the center and symmetric whiskers slightly longer than the center box would also suggest normal distribution. For the screening of this data I used the histogram with a bell curve overlaid on the graph.

Independence of Observations

Because the students involved in this sample were members of several different

cohorts it is not necessary to test for Independence of Observations, as the data collected from various cohorts are inherently independent.

Homegenity of Variance

This statistical assumption is related to variance within population. The assumption is that the variance within each of the populations is equal (Huck, 2008). In order to test this assumption, I used SPSS (Version 21) to perform Levene's test. A value of greater than .05 indicates that the test is not statistically significant and that the assumption is met.

Multicollinearity

Multicollinearity describes the correlation between independent variables. If variables are significantly correlated, values of .9 or higher, this could be problematic. To detect these values I calculated bivariate correlations using SPSS (Version 21) for each of the independent variables (de Vaus, 2002).

Linearity

Linearity describes the relationship between the variables. A linear relationship would indicate that a change in one variable would affect a change in another variable at a constant rate. Since there are relatively few independent variables, to determine the relationships of the variables in this study I compared the cohort means on the SDLRSNE survey across time (de Vaus, 2002)

Outliers

In order to identify univariate outliers I used SPSS (Version 21) to calculate the standardized Z-score and reviewed the histograms as suggested previously. Z – scores three standard deviations higher or lower than the mean were considered outliers (Kline,

2011). Once outliers were identified, I went back to the original data to determine if there was an error in the coding or any explanation for the deviation from the normal. In the cases where there were outliers, they existed because students did not complete part of or the entire survey. Consequently, in given situations, the case was deleted in the person-period data file.

Missing Data

For this study, missing data were handled differently in each of the phases. In the first phase-to determine the internal consistency reliability and factor analysis-the missing data were removed pairwise in SPSS (Version 21) during calculations. For the second phase, the longitudinal growth curve analysis-the missing data were not removed and all data were included in the analysis as this statistical technique is able to handle missing data (Fan & Fan, 2010).

Factor Analysis

I conducted an exploratory factor analysis in SPSS (Version 21) to determine the factor structure of the survey for DPT students. Using varimax rotation with an exploratory principal axis factoring approach, it was clear that a three-factor solution best fit these data (see Table 3.12). 14 items, however, were omitted due to low loadings (< .4) or cross loadings-loadings on multiple factors, for example item number 56. The Eigenvalues for the Factor Analysis are presented in Table 3.13.

Although not identical to the loadings from previous research (Fisher, King, & Tague, 2001), the factors did correspond well to the suggested aforementioned subscales: *Self-Control*, *Self-Management*, and *Desire For Learning* wherein Factor 1 is consistent with *Self-management*, Factor 2 is consistent with *Desire For Learning*, and Factor 3 is

consistent with *Self-Control*[1]. Furthermore, several items that were omitted based on low factor loadings with DPT students were also omitted in previous research, for example items number 5, 44, 64, 70, and 91 (Fisher, King, & Tague, 2001). The items may need to be reviewed more in depth in future research.

[1] The subscales used in the rest of this research are based on the item loadings calculated from this research. The *Total Score* variable is calculated totaling all items.

Table 3.12

*Varimax-rotated Factor Loadings For 26 Survey Items**

Survey Item (#)	Factor 1	Factor 2	Factor 3
(9) I set strict time frames.	.546		
(12) I prefer to plan my own learning.	.642		
(16) I am systematic in my learning.	.592		
(25) I prefer to set my own learning goals.	.572		
(60) I set specific times for my study.	.685		
(63) I am self-disciplined.	.582		
(71) I am methodical.	.535		
(79) I prefer to set my own criteria on which to evaluate my performance.	.447		
(81) I can be trusted to pursue my own learning.	.426		
(87) I prefer to set my own goals.	.542		
(2) I solve problems using a plan.		.509	
(22) I need to know why.		.544	
(24) I critically evaluate new ideas.		.616	
(45) I have high personal expectations.		.610	
(46) I have high personal statndards.		.612	
(57) I enjoy a challenge.		.452	
(77) I evaluate my performance.		.511	
(29) I learn from my mistakes.			.449
(33) I am open to new ideas.			.454
(42) I am responsible.			.534

Table 3.12 (continued)

Survey Item (#)	Factor 1	Factor 2	Factor 3
(48) I am aware of my own limitations.			.516
(58) I want to learn new information.			.464
(59) I enjoy learning new information.			.514
(80) I am responsible for my own decisions/actions.			.519
(83) I can find out information for myself.			.663
(86) I like to make decisions for myself.			.487
~~(56) I have a need to learn.~~		.502	.466
~~(3) I prioritize my work.~~			
~~(5) I do not manage my time well.~~			
~~(6) I have good management skills.~~			
~~(17) I am able to focus on a problem.~~			
~~(34) When presented with a problem I cannot resolve, I will ask for assistance.~~ ~~(44) I like to evaluate what I do.~~			
(~~47) I have high beliefs in my abilities.~~			
~~(52) I am confident in my ability to search out information.~~ ~~(54) I do not enjoy studying.~~			
~~(64) I like to gather the facts before I make a decision.~~ ~~(65) I am disorganized.~~			
~~(70) I am logical.~~			
(~~91) I am not in control of my life.~~			

Table 3.13

Eigenvalues for Factor Analysis

Eigenvalues	7.392	3.348	2.931
Percentage of Total Variance	18.480	8.370	7.328
Number of Test Items	10.000	7.000	9.000

Correlations

With the findings from the factor analysis presented above, further investigation into the relationships of the subscales was necessary. Using SPSS (Version 21) the following correlations were calculated for the dependent variables. The variables were collapsed across all cohorts. Correlations nearing 1.0 would have indicated similarity in the items.

Table 3.14

Correlations Among Dependent Variables

Dependent Variables	Total Score	Self-Management	Desire For Learning	Self-Control
Total Score	—			
Self-Management	.788**	—		
Desire For Learning	.696**	.460**	—	
Self-Control	.775**	.497**	.500**	—

* indicates a *p*-value <.05, ** indicates a *p*-value<.01, ***indicates a *p*-value<.001

The correlation coefficients calculated above support the belief that the constructs represented by the dependent variables: *Total Score, Self-Management, Desire For Learning,* and *Self-Control* are not so closely related as to be considered the same construct. These findings also supported the use of the survey tool to assess self-regulated learning.

Cronbach's Alpha

With the *Total Score* and *Self-Management, Desire For Learning,* and *Self-Control* subscales listed above, I used SPSS (Version 21) to calculate the internal consistency of the survey using Cronbach's alpha. The internal consistency reliability offered insight into the appropriateness of using the survey within the DPT student population (Huck, 2008). The data from each of the survey times were analyzed to provide a range of internal consistencies for each of the variables.

Table 3.15

Cronbach's Alpha Scores by Survey Time

Dependent Variables	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7
Total Score	.852	.896	.896	.892	.892	.909	.856
Self-Management	.669	.753	.753	.721	.773	.845	.825
Desire For Learning	.583	.701	.701	.558	.550	.757	.753
Self-Control	.724	.833	.833	.811	.794	.821	.769

The *Total Score* for the SDLRSNE had good ($\alpha = .825$) to excellent ($\alpha = .909$) internal consistency reliability. The *Self-Management* subscale ranged from questionable

at Time 1 (0 months: α = .669) to good at Times 6 (29 months: α = .845). The *Desire For Learning* subscale ranged from poor internal consistency reliability at Time 5 (25 months: α = .550) to acceptable internal consistency reliability at Time 6 (29 months: α = .757). The *Self-Control* subscale demonstrated acceptable values at Time 1 (0 months: α = .724) to good internal consistency reliability at Time 2 (11 months: α = .833) and Time 3 (13 months: α = .833)

The second phase of the study included longitudinal growth curve analysis using Full-Information Maximum Likelihood to answer the specific research questions. This analysis was completed to determine if there was a change in self-regulated learning over the course of the 34 months in the DPT curriculum. Growth curve modeling generates information related to intercepts, slopes of possible subgroups as well as changes over time. Fan and Fan (2010) investigated the relationship between the number of repeated measurements and the power analysis of the study as well as the relationship of a given set of data utilizing different statistical techniques. All of their results pertain to this current research with the SDLRSNE. Fan and Fan (2010) determined that a minimum of three repeated measures was most suitable of latent growth modeling. The students who are a part of the DPT curriculum will have completed the survey seven times over the course of approximately three years (a minimum of 34 months, maximum of 46 months). Having completed the survey seven times increased the statistical power of the research. More noteworthy than the number of times the students have completed the survey was the timing of the surveys. The initial survey was completed during the first week of classes in the DPT curriculum. After this initial baseline measure the survey was administered both before and after clinical experiences. Since lifelong learning was a

goal of the DPT program and self-regulated learning was thought to be required for lifelong learning it is important to explore the shape of growth and continuity of the curve to identify when changes in self-regulated learning occurred or if it occurred within subgroups. Theoretically, most self-regulated learning changes would occur during clinical experiences, as these experiences are most likely to address the motivation and volition of the learner by offering insight into why they are learning the information. Clinical experiences would help generate problems for the students to center their learning approach and would also give them an opportunity to adopt the societal role of a physical therapist. Growth curve modeling assisted in identifying if this trend actually exists. Fan and Fan (2010) compared latent growth modeling with other common statistical tests such as *t*-test, ANOVA, and MANOVA. The authors concluded that using latent growth modeling allowed researchers to use approximately 2/3 smaller sample size to produce equal results to the previous tests mentioned. The authors concluded with a small effect size latent growth modeling was the best statistical analysis to use, offering more power to detect change than the other tests.

The analyses for these data were conducted using SPSS (Version 21) statistical software to provide descriptive information for both the sample and the variables included in the study. SPSS (Version 21) was utilized to determine the internal consistency reliability for the measures, as well as the percentage of DPT students who met the threshold of self-regulated learning, the factor analysis, and the growth curve analysis. The results of the factor analysis are presented in Chapter 4.

Research Questions 1-3

Q1. What is the shape of the DPT students' self-regulated learning over the course of the DPT program?

Q2. Does participation in clinical education experiences predict the change of the shape of growth of the DPT students' self-regulated learning?

Q3. Are there specific demographics that may predict the intercept or slope of self-regulated learning among DPT students?

In order to address these research questions thoroughly I first tested for cohort differences to see if the cohorts could be combined or if they must remain separate. I did this by using SPSS (Version 21) to perform *t*-tests and ANOVAs accordingly to determine if there are any significant differences within or between the cohorts. Results are presented in Chapter 4.

After testing for cohort effects, I screened for the sphericity assumption, specific to growth curve modeling. Sphericity implies that the variance of the differences between all pairs of measures is equal. If this assumption is not met there is likely to be an inflated Type 1 error. I tested for this assumption by performing the *F*-test (Voelkle, 2007).

After screening for the assumptions, I used SPSS (Version 21) to perform longitudinal growth curve modeling. Prior to performing these tests and analyses, I determined the fit statistics to be reviewed in order to establish whether or not the growth curve model is appropriate. Typically the following statistics are used to determine good fit: -2 Log Liklihood (-2LL), Akiake Information Criterion (AIC) and Bayesian Information Criterion (BIC). The -2LL is a deviance measure. With such a measure the actual value is not as important as the change in values with model changes. Similar to -

2LL, AIC and BIC do not have standards for good fit. AIC and BIC are parsimonious indices and as such must be considered within the context of model changes–are the values better or consistent with increasing or decreasing the complexity of the model? Generally, none of these values would be considered in isolation. It is better to review all the values collectively to interpret the model. I used the values in conjunction with the information regarding the slope and intercepts of the model to develop conclusions as to the nature of change of self-regulated learning for DPT students, if clinical education experiences predicted the change of self-regulated learning for DPT students, and if any other relationships existed that may prove enlightening.

Research Question 4

Q4. What percentage of DPT students meets the threshold for self-regulated learners?

In order to address this research question, I used the frequency function of SPSS (Version 21) to determine the mean, range, and standard deviations of *Total Scores* at each time the test was administered. Using the information from the initial phase of the study-the results of factor analysis and Cronbach's alpha-I determined that the SDLRSNE was a reliable tool to measure self-regulated learning in DPT students. I was also determined the percentage of DPT students who either met the threshold at given times throughout the curriculum in order to be considered self-regulated learners.

CHAPTER 4

RESULTS

Descriptive Results

Descriptive results for the following dependent variables: *Total Score*, and *Self-Management*, *Desire For Learning*, and *Self-Control* subscales at each time at which the survey was administered were calculated for each cohort separately. This information is presented in the Tables 4.1-4.7.

I screened for the assumption of normality during the preliminary phase of the analysis. While screening for normality, data were visually identified as outliers on histograms. An outlier was considered to be a score that was two or more standard deviations from the mean. Outliers were eliminated from the analysis by removing the affected score, not all of the data. This was in an attempt to preserve data for the growth curve analysis, which could handle missing data with full information maximum likelihood estimation.

For the class of 2011, at Time 7 (34) months there were no outliers removed. For the class of 2012, at Time 5 (25 months) for *Total Score* and *Self-Management*, one case was removed for each score. For *Desire for Learning* and *Self-Control* scores, two cases were removed for each score. At Time 6 (29 months) only one case was removed for *Self-Management*. At Time 7 (34 months) no cases were removed for the class of 2012. For the class of 2013, for all dependent variables at Time 1 (0 months) and Time 3 (13 months) five cases were removed. At Time 2 (11 months) six cases were removed for each of the dependent variables. At Time 4 (20 months) three cases were removed from

each of the dependent variables and at Time 5 (25 months) and Time 6 (29 months), one case was removed respectively. For the class of 2014 at Time 1 (0 months) three cases were identified as outliers and removed from analysis at each of the dependent variables. At Time 2 (11 months) two cases were removed from the analysis for each dependent variable and for Time 3 (13 months) two scores were removed from *Total Score*, *Self-Management*, and *Desire For Learning* analysis, while three cases were removed from *Self-Control* analysis. For the class of 2015, no cases were identified as outliers. The number of cases removed from analysis at each time point for any cohort ranged from 0% to 11% of the total possible surveys with a median of 2%. This information is presented in Tables 4.1-4.7

Changes in Mean Scores Over Time

The mean scores from the survey were reviewed over time to identify any changes or patterns. The mean scores for *Total Score*, *Self-Management*, *Desire For Learning*, and *Self-Control* subscales are reported in Table 4.8. In addition to the mean scores, the results from the cohort analysis are presented in Table 4.8 and Table 4.9. The *t*-tests and ANOVA were used to detect any difference between cohorts.

Collapsing across all cohorts, *Total Score*, after a notable increase from 164.8 at Time 1 (0 months) to 168.06 at Time 2 (11 months), there was a slight decline at Time 3 (13 months) to 167.81. After another relative increase from Time 3 (13 months) to Time 4 (20 months) 169.08 there was another slight decline to Time 5 (168.04) and from Time 5 (25 months) to Time 7 (34 months) there was continual slight increase in *Total Scores* (168.04 to 170.63).

Table 4.1

Descriptive Results For Time 1 (0 months)

Variables	*N*	*Mean*	*SD*	Skewness	Kurtosis
Class of 2013					
Total Score	48	164.44	10.874	.151	.328
Self-Management	48	37.81	4.408	-.560	2.057
Desire For Learning	48	29.71	2.790	-.667	.866
Self-Control	48	38.98	3.035	-.079	-.828
Class of 2014					
Total Score	49	166.71	10.338	-.282	.281
Self-Management	49	39.12	3.377	-.283	-.344
Desire For Learning	49	30.33	2.025	-.137	1.473
Self-Control	49	40.12	3.133	-.266	-.404
Class of 2015					
Total Score	52	163.33	12.588	-.227	-.291
Self-Management	52	37.44	4.412	-.294	-.627
Desire For Learning	52	29.37	2.642	-.327	-.614
Self-Control	52	38.98	3.196	-.121	-1.067

Table 4.2

Descriptive Results for Time 2 (11 months)

Variables	*N*	*Mean*	*SD*	Skewness	Kurtosis
Class of 2013					
Total Score	47	167.53	10.425	.729	1.102
Self-Management	47	38.72	4.137	.216	.769
Desire For Learning	47	30.49	2.145	-.288	.658
Self-Control	47	39.79	2.718	-.166	.156
Class of 2014					
Total Score	50	168.56	11.220	-.110	.405
Self-Management	50	39.06	3.695	.413	1.146
Desire For Learning	50	30.18	2.890	-.588	.264
Self-Control	50	40.46	3.092	-.413	-.384

Table 4.3

Descriptive Results for Time 3 (13 months)

Variables	*N*	*Mean*	*SD*	Skewness	Kurtosis
Class of 2013					
Total Score	48	164.50	10.910	.069	-.458
Self-Management	48	38.21	4.120	-.102	-.853
Desire For Learning	48	30.08	2.142	-.519	-.065
Self-Control	48	39.04	3.052	.198	-1.144
Class of 2014					
Total Score	50	170.98	12.515	-.309	-.703
Self-Management	50	39.68	4.405	.192	-.612
Desire For Learning	50	30.98	2.692	-.416	-.777
Self-Control	49	40.78	3.091	-.518	-.691

Table 4.4

Descriptive Results for Time 4 (20 months)

Variables	*N*	*Mean*	SD	Skewness	Kurtosis
Class of 2013					
Total Score	49	169.08	11.193	.474	-.243
Self-Management	49	39.29	3.841	.131	-.278
Desire For Learning	49	30.78	2.034	.194	-.326
Self-Control	49	39.69	3.203	.167	-1.385

Table 4.5

Descriptive Results for Time 5 (25 months)

Variables	*N*	*Mean*	*SD*	Skewness	Kurtosis
Class of 2012					
Total Score	41	163.83	12.106	-.588	-.295
Self-Management	41	38.20	4.910	-.698	-.342
Desire For Learning	40	30.98	2.304	-.273	-.657
Self-Control	40	40.73	3.210	-.824	.707
Class of 2013					
Total Score	51	171.43	11.192	.128	-.465
Self-Management	51	40.00	4.010	-.267	.624
Desire For Learning	51	31.37	2.078	.271	-.896
Self-Control	51	40.47	2.887	-.031	-1.335

Table 4.6

Descriptive Results for Time 6 (29 months)

Variables	*N*	*Mean*	*SD*	Skewness	Kurtosis
Class of 2012					
Total Score	42	164.29	12.835	-.667	.275
Self-Management	41	38.85	4.757	-.385	-.045
Desire For Learning	42	31.05	2.547	-.298	-.631
Self-Control	42	41.07	2.735	-.454	-.852
Class of 2013					
Total Score	51	171.61	12.418	.321	-1.180
Self-Management	51	40.39	4.243	-.011	-.356
Desire For Learning	51	31.04	2.607	-.200	-.833
Self-Control	51	40.25	3.446	-.100	-1.365

Table 4.7

Descriptive Results For Time 7 (34 months) Variables

Variables	*N*	*Mean*	*SD*	Skewness	Kurtosis
Class of 2011					
Total Score	34	166.88	7.023	.069	-.191
Self-Management	34	38.00	2.807	.428	-.436
Desire For Learning	34	30.29	2.140	-.152	-.758
Self-Control	34	39.82	2.208	-.337	-.939
Class of 2012					
Total Score	42	173.67	10.173	-.011	-.433
Self-Management	42	40.36	2.827	-.247	-.629
Desire For Learning	42	31.55	2.452	-.655	.342
Self-Control	42	41.90	2.676	-.478	-.915

Collapsing across all cohorts, for the Subscale *Self-Management*, the values showed a slight increase starting at Time 1 (0 months) 38.11 until Time 7 (34 months) 39.30, with a few slight declines in scores at Time 5 (25 months) and Time 7 (34 months). The subscale *Desire For Learning* maintained a slight growth pattern from Time 1 (0 months to Time 5 (25 months) at which point there was a slight decline in scores. *Self-Control* fluctuated in a similar pattern as the *Total Score* values did.

In addition to these general trends for the means, I conducted a *t*-test or ANOVA for each Time the survey was administered to determine any significant cohort differences. Generally, the cohorts were very similar in their *Total Scores* at Time 1 (0

months) and Time 2 (11 months) after which there were significant differences in their *Total Scores.* For the subscales *Self-Management* and *Desire For Learning,* there was only one instance when there were statistically significant differences between cohorts, both were at Time 7 (34 months) for *Self-Management* $t = -3.626$, $p = .001$ and *Desire For Learning* $t = -2.344$, $p = .022$ with the data from the classes of 2011 and 2012.

Collapsing across all cohorts, for *Self-Control*, the 2011 and 2012 cohorts at Time 7 (34 months), similar to *Self-Management* and *Desire For Learning,* were statistically significantly different from each other $t = -3.640$, $p = .001$. Unlike the previous two subscales, however, *Self-Control* also had a statistically significant difference at Time 3 (13 months) $t = -2.889$, $p = .007$ with the classes of 2013 and 2014.

Despite these statistical differences between cohorts, the longitudinal growth curve analysis to address the research questions continued by collapsing the data across all cohorts, as relatively few statistically significant relationships exist between cohorts compared to all of the available data. Of the statistically significant relationships, most exist at the *Total Score* level, not at the level of the subscales therefore the focus of the discussion is on the subscales *Self-Management*, *Desire For Learning,* and *Self-Control*.

Table 4.8

Mean Scores, t-tests For Cohort Differences, and Internal Consistency Reliability Values for Dependent Variables

Variables	*N*	*Mean*	*SD*	*t*	*df*	*p*	Cronbach's Alpha
Total Score							
Time 1	149	164.80	11.351	—	—	—	.852
Time 2	97	168.06	10.798	-.467	95	.642	.896
Time 3	98	167.81	12.141	-2.728	96	.008**	.896
Time 4	49	169.08	11.193	—	—	—	.892
Time 5	92	168.04	12.152	-3.123	90	.002**	.892
Time 6	93	168.30	13.063	-2.787	91	.006**	.909
Time 7	76	170.63	9.477	-3.302	74	.001**	.856
Self-Management							.
Time 1	149	38.11	4.135	—	—	—	.669
Time 2	97	38.90	3.991	-.413	95	.680	.753
Time 3	98	38.96	4.310	.1.706	96	.091	.753
Time 4	49	39.29	3.841	—	—	—	.721
Time 5	92	39.20	4.500	-1.941	90	.055	.773
Time 6	92	39.71	4.520	-1.638	90	.105	.721
Time 7	76	39.30	3.038	-3.626	74	.001**	.845
Desire For Learning							
Time 1	149	29.79	2.524	—	—	—	.583

Table 4.8 (continued)

Variables	*N*	*Mean*	*SD*	*t*	*df*	*p*	Cronbach's Alpha
Time 2	97	30.33	2.548	.596	95	.553	.701
Time 3	98	30.54	2.467	-1.820	96	.072	.701
Desire For Learning							
Time 4	49	30.78	2.034	—	—	—	.558
Time 5	91	31.20	2.177	-.864	89	.390	.550
Time 6	93	31.04	2.566	.016	91	.988	.757
Time 7	76	30.99	2.386	-2.344	74	.022*	.753
Self-Control							
Time 1	149	39.36	3.150	—	—	—	.724
Time 2	97	40.13	2.921	-1.135	95	.259	.833
Time 3	97	39.92	3.178	-2.889	95	.007**	.833
Time 4	49	39.69	3.203	—	—	—	.811
Time 5	91	40.58	3.019	.397	89	.692	.794
Time 6	93	40.62	3.155	1.246	91	.216	.821
Time 7	76	40.97	2.763	-3.640	74	.001**	.769

* indicates a *p*-value <.05, ** indicates a *p*-value<.01, ***indicates a *p*-value<.001

Table 4.9

ANOVA Results for Dependent Variables at Time 1 (0 months)

	df	*MSE*	*F*	*p*
Total Score	2, 146	128.557	1.162	.316
Self-Management	2, 146	16.804	2.311	.103
Desire For Learning	2, 146	6.293	1.891	.155
Self-Control	2, 146	9.762	2.198	.115

* indicates a *p*-value <.05, ** indicates a *p*-value<.01, ***indicates a *p*-value<.001

Research Questions

To address the first three research questions four growth curve models were developed using SPSS (Version 21). Findings from each question are addressed individually.

Q1. What is the shape of the DPT students' self-regulated learning over the course of the DPT program?

To answer this question, I first had to determine what the best model was for the data being analyzed. The results for each of the models for *Total Score* and the subscales *Self-Management*, *Desire For Learning*, and *Self-Control* can be found in Tables 4.10-4.13. The general modeling strategy was to develop models with increasing complexity from an unconditional means model to a discontinuous growth model. The first model was an unconditional means model for each of the dependent variables: *Total Score*, *Self-Management*, *Self-Control*, and *Desire For Learning*. The second model was an unconditional growth model of the dependent variables with intercepts and slopes that

were allowed to vary based on Time. The third model was an unconditional linear growth model identical to Model 2 but with an added predictor variable, in this case Status. The fourth model was a non-linear, discontinuous model. The results of these models were analyzed relative to the previous models to determine the best model for the given data.

For *Total Score*, the first, unconditional means model, was fit with the collapsed means of all of the available cohorts. With this model, the means for *Total Score* across all available cohorts increased linearly throughout the duration of the DPT curriculum. The second, unconditional growth model was developed including time in order to generate information regarding the intercept and slope of the growth of *Total Score*. With the unconditional growth model, self-regulated learning continued to grow linearly throughout the duration of the curriculum and was a slightly better fit for the data then the unconditional means model. The third model was developed to determine how the predictor variable Status would impact the model. For *Total Score,* adding the predictor variable did not improve the fit of the model as indicated by the goodness of fit indices. As a final step, the discontinuous model was developed. It had been identified previously in the analysis that the mean scores of the cohorts had a pattern of change after Time 4 (20 months). As a result, the discontinuous model was developed to detect any significant changes in the slope after Time 4 (20 months). With the discontinuous model, there was a *kink* in growth that occurred at Time 4 (20 months), which indicated a change in slope after that survey time. For *Total Score,* all three goodness of fit indices are lowest in the Discontinuous model (Model 4: -2LL = 4777.682, AIC = 4791.682, BIC = 4823.063), which indicated this model was the best fit for the data. With this information, it was

concluded that for the dependent variable *Total Score,* self-regulated learning in DPT students was discontinuous in nature.

For *Self-Management,* the models were established in the same way as for *Total Score*. The unconditional means model, was developed using the means from all available cohorts across the DPT curriculum. This information was compared to the second, unconditional means model, which included time as a variable. For *Self-Management,* the unconditional growth model was a better fit than unconditional means model per the goodness of fit indices. The third model included the predictor variable Status and was a better overall fit with two of three goodness of fit indices smaller than the then the previous two models. The discontinuous model was developed and, again, two of the three goodness of fit indices were the lowest for this model (Model 4: -2LL = 3511.4, AIC = 3525.400) while one goodness of fit index (BIC = 3555.895) had the lowest value for Model 2 (*Self-Management* + Time). With the majority of indices indicating that the more complex model was a better fit for *Self-Management*; I concluded that for the *Self-Management* subscale, learning was discontinuous for DPT students.

Desire For Learning and *Self-Control* subscales had goodness of fit indices that indicated a more linear growth pattern. For *Desire For Learning,* the unconditional growth model was a better fit than the unconditional means model. Additionally, for *Desire For Learning,* the third model (Status predictor model: -2LL = 2787.460, AIC = 2803.460) and the second model (*Desire For Learning* + Time: BIC = 2832.205) both indicated linear growth models with better fits than the discontinuous model. The discontinuous model was developed despite the significant findings for linear growth.

Similarly, for *Self-Control*, the unconditional growth model was an overall better fit than unconditional means model. The third model, with Status as a predictor variable, was developed but did not indicate a better fit for any of the indices. The discontinuous model was developed and had the best fit according to the -2LL (-2LL = 3084.911), however, the unconditional growth model indicated a best fit on the majority of indices (AIC = 3097.916, BIC = 3124.797), which suggested that *Self-Control* grows linearly throughout the DPT curriculum

The results from the growth curve models suggested that the best-fitting model for *Total Score* and *Self-Management* are both discontinuous in their shape across the 34-month duration of the DPT program. The discontinuous model that best described the growth for *Total Score* and *Self-Management* indicated a change in slope at a particular point in time. In this research, the change occurred after Time 4 (20 months). *Desire For Learning* and *Self-Control* on the other hand did not follow a similar growth pattern. These subscales grew linearly and are best described by the continuous growth models.

Q2. Does participation in clinical education experiences predict the change of the shape of growth of the DPT students' self-regulated learning?

To answer this question, the discontinuous longitudinal growth curve model must be considered with regard to the design of the curriculum. For *Total Score*, the effect of the TimeAfter variable $t = 2.343$, $p = .020$ was statistically significant. The TimeAfter variable is an additional variable created to represent changes in slope after Time 4. Since at Time 5 (25 months) the students are returning from the clinic and the Time 5 (25 months) survey data were what determined the kink at Time 4 (20 months) it can be

concluded that the experience of clinical education may predict the change of shape of growth for DPT students for *Total Score*.

Table 4.10

Longitudinal Growth Curve Models for Total Score

	Unconditional Means Model Model 1	Unconditional Growth Model Model 2	Total Score + Time + Status Model 3	Discontinuous Model 4
Fixed Effects				
Intercept	167.148	163.205	163.702	164.009
	(.675)***	(.864)***	(.954)***	(.971)***
Time		.242	.248	.165
		(.032)***	(.037)***	(.052)**
Status			-2.409	-2.384
			(2.308)	(2.315)
Status*Time			.018	-.016
			(.081)	(.082)
TimeAfter				.304
				(.129)*
Goodness of Fit				
-2LL	4836.099	4784.730	4782.973	4777.682
AIC	4842.099	4796.730	4798.973	4791.682
BIC	4855.548	4823.629	4834.838	4823.063

* indicates a *p*-value <.05, ** indicates a *p*-value<.01, ***indicates a *p*-value<.001

Table 4.11

Longitudinal Growth Curve Models for Self-Management

	Unconditional Means Model Model 1	Unconditional Growth Model Model 2	Self-Management + Time + Status Model 3	Discontinuous Model 4
Fixed Effects				
Intercept	38.778	37.750	38.048	38.127
	(.229)***	(.321)***	(.349)***	(.342)***
Time		.062	.062	.046
		(.012)	(.014)***	(.021)*
Status			-1.67	-1.698
			(.860)	(.829)*
Status*Time			.029	.023
			(.031)	(.031)
TimeAfter				.055
				(.052)
Goodness of Fit				
-2LL	3541.808	3517.006	3512.156	3511.400
AIC	3547.808	3529.006	3528.156	3525.400
BIC	3561.253	3555.895	3564.008	3556.771

* indicates a *p*-value <.05, ** indicates a *p*-value<.01, ***indicates a *p*-value<.001

Table 4.12

Longitudinal Growth Curve Models for Desire For Learning

	Unconditional Means Model Model 1	Unconditional Growth Model Model 2	Desire For Learning + Time + Status Model 3	Discontinuous Model 4
Fixed Effects				
Intercept	30.435	29.712	29.537	29.517
	(.145)***	(.194)***	(.210)***	(.204)***
Time		.045	.054	.056
		(.008)***	(.009)***	(.012)***
Status			1.11	1.148
			(.514)*	(.492)*
Status*Time			-.045	-.047
			(.019)*	(.018)**
TimeAfter				-.003
				(.029)
Goodness of Fit				
-2LL	2838.493	2793.316	2787.460	2791.152
AIC	2844.493	2805.316	2803.460	2805.152
BIC	2857.938	2832.205	2839.312	2836.523

* indicates a *p*-value <.05, ** indicates a *p*-value<.01, ***indicates a *p*-value<.001

Table 4.13

Longitudinal Growth Curve Models for Self-Control

	Unconditional Means Model Model 1	Unconditional Growth Model Model 2	Self-Control + Time + Status Model 3	Discontinuous Model 4
Fixed Effects				
Intercept	40.083	39.323	39.238	39.270
	(.176)***	(.231)***	(.254)***	(.253)***
Time		.046	.045	.038
		(.009)***	(.011)***	(.015)*
Status			.490	.483
			(.624)	(.611)
Status*Time			-.006	-.009
			(.023)	(.023)
TimeAfter				.028
				(.037)
Goodness of Fit				
-2LL	3113.014	3085.916	3085.028	3084.911
AIC	3119.014	3097.916	3101.028	3098.911
BIC	3132.455	3124.797	3136.869	3130.271

* indicates a *p*-value <.05, ** indicates a *p*-value<.01, ***indicates a *p*-value<.001

Q3. Are there specific demographics that may predict the intercept or slope of self-regulated learning among DPT students?

To answer the first two research questions, the cohorts were analyzed with total number of participants, without regard to any predictor variables. For question three, however, a predictor variable was introduced. Status was the variable that was assigned to dichotomously code age from the demographic survey. Status was coded into traditional-aged students (age 20-24 years) and nontraditional-aged students (25+ years). This variable was used to determine if Status (age of student) could predict the intercept or slope of self-regulated learning among DPT students.

Using the information presented in Tables 4.10-4.13 one can see that for the *Total Score* (Figure 4.1), *Self-Management* (Figure 4.2), and *Self-Control* subscales (Figure 4.3) Status does not predict slope or intercept of self-regulated learning in DPT students. Status does, however, significantly predict the score for *Desire For Learning* (Figure 4.4).

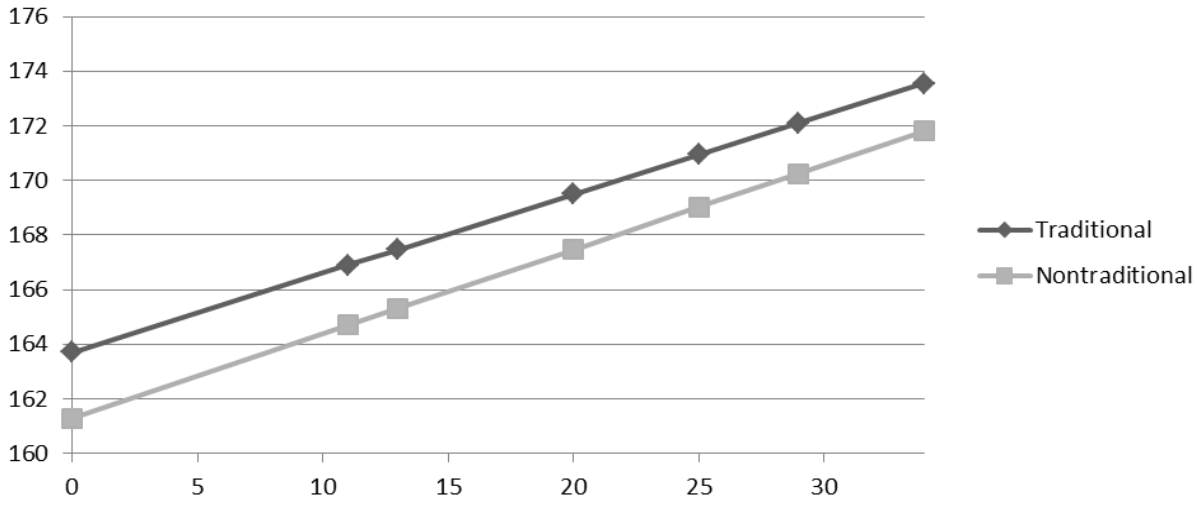

Figure 4.1Continuous Growth for Total Score

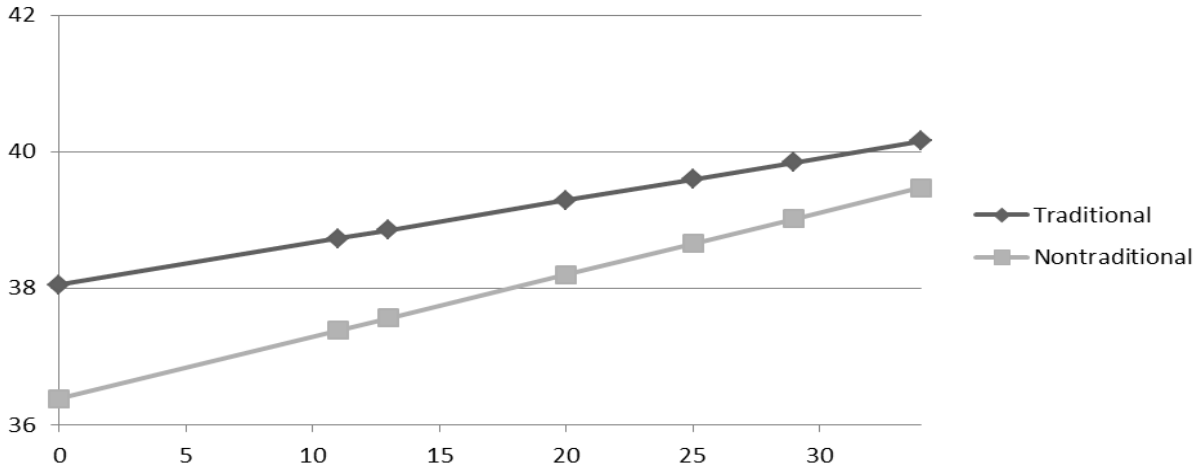

Figure 4.2 Continuous Growth for Self-Management

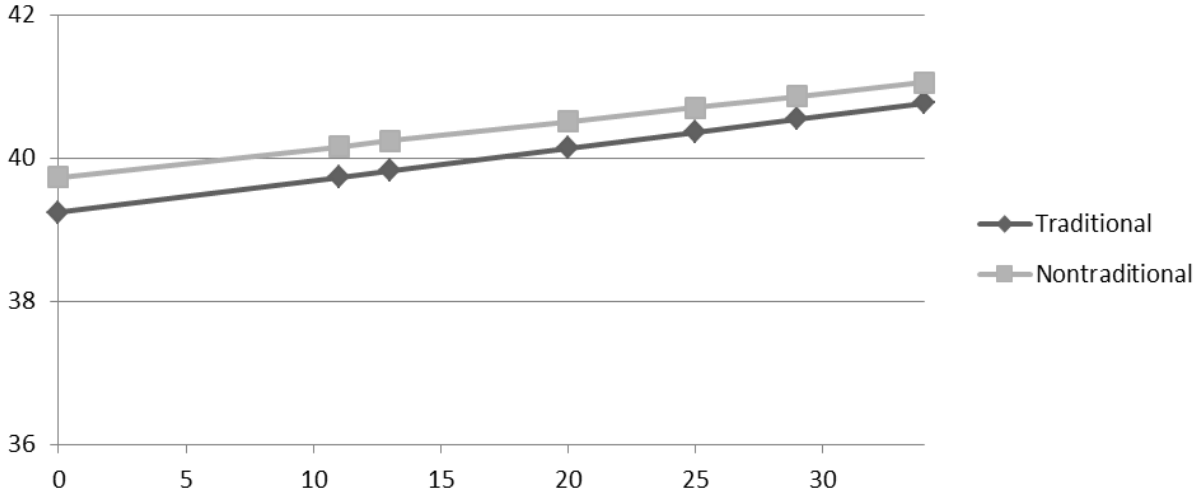

Figure 4.3 Continuous Growth for Self-Control

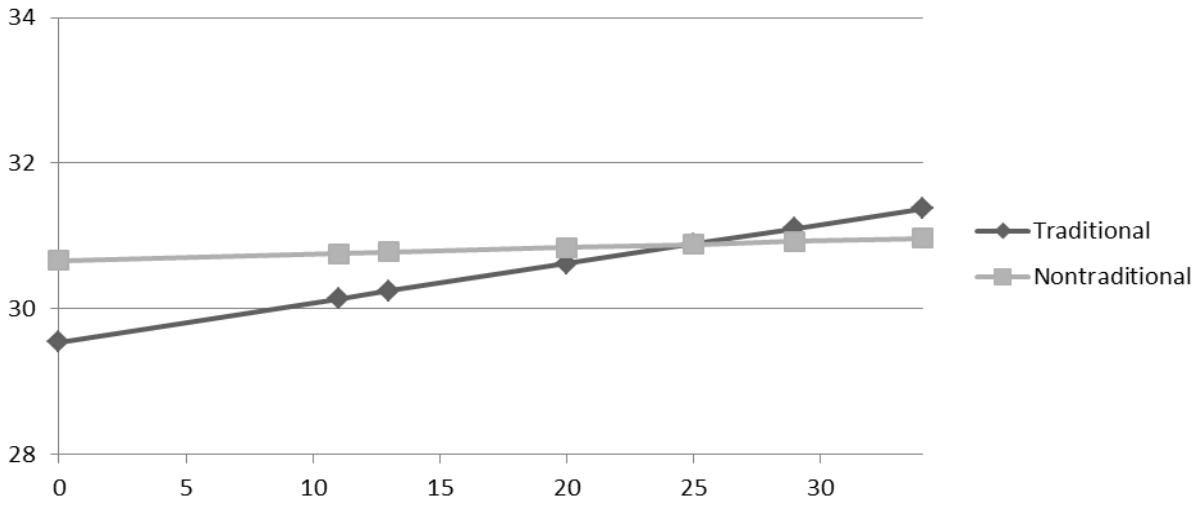

Figure 4.4 Continuous Growth for Desire For Learning

The *Desire For Learning* relationship was such that traditional students (*M* = 30.42, *SD* = 2.470) typically start lower than nontraditional students (*M* = 31.04, SD = 2.426) but the traditional students grow at a faster rate than the nontraditional students as indicated by their increased slope. The nontraditional students do not grow as fast and they grow very little across the curriculum as demonstrated by the decreased slope.

The findings indicate that Status (traditional versus nontraditional) as a function of age significantly predicts the change in slope across the curriculum. The most critical time being at Time 5 (25 months) when traditional-aged students begin to out-perform nontraditional-aged students with regards to *Desire For Learning*. For *Total Score*, *Self-Management*, and *Self-Control*, Status is not a significant predictor for the slope of these scores.

Q4. What percentage of DPT students meets the threshold for self-regulated learners?

To answer this research question a basic analysis was completed. To answer the question on its most basic level, collapsing all cohorts across time the total number of

students who scored over 150 on the *Total Score* variable of SDLRSNE was divided by the total number of students who participated in completing the survey at each time the survey was administered (see Table 4.14).

This basic analysis revealed that for any given point of the DPT program; on average 94% (range from 89.9% to 100%) of students could be considered self-regulated learners. These data also demonstrate a general trend in increasing self-regulated learning from Time 1 (0 months) to Time 7 (34 months).

Table 4.14

Percentage of DPT students with Total Scores >150

	Total Number of Students	Number of Students with Total Score >150	%
Time 1	149	134	89.9
Time 2	97	93	95.9
Time 3	98	92	93.9
Time 4	49	48	98.0
Time 5	92	86	93.5
Time 6	93	86	92.5
Time 7	76	76	100.0
Totals	654	615	94.0

CHAPTER 5

DISCUSSION

This dissertation had two primary goals. The first goal was to merge the literature between self-regulated and self-directed learning in adults, specifically for adults in professional education programs. The second goal was to conduct an empirical investigation into self-regulated learning in Doctor of Physical Therapy students. Each goal has multiple facets and the second goal required multiple analyses. The empirical investigation included validating the SDLRSNE in a *new* student population-DPT students. Previous literature has supported its use in medical and nursing student populations (Fisher, King, & Tague, 2001; Fisher & King, 2010; Hendry & Ginns, 2009; Smedly, 2007). Beyond validating the survey, the tool was critically investigated using exploratory factor analysis, which suggested a three-factor structure for the construct. The three-factor structure was utilized for the primary analysis to adddress the proposed research questions.

The specific research questions proposed were: 1) What is the shape of the DPT students' self-regulated learning over the course of the DPT program? 2) Does participation in clinical education experiences predict the change in the shape of growth of the DPT students' self-regulated learning? 3) Are there specific demographics that may predict the intercept or slope of self-regulated learning among DPT students? 4) What percentage of DPT students meets the threshold for self-regulated learners?

To address the first goal of the dissertation, several theories and models of learning were reviewed and discussed in detail. Malcolm Knowles' (Knowles, Holton III,

& Swanson, 2005; Merriam et al., 2007) model of adult learning played a major role in the review in light of the fact that most students in professional education programs are adult learners by virtue of their age. Expressly, self-directed learning (a component of Knowles' adult learning model) was reviewed relative to Zimmerman (1986) and Pintrich's (1994) theories of self-regulated learning. Most of the self-regulated learning research has been conducted with school-aged children. The intersection of these constructs is one aspect of a greater concept-adult educational psychology, initially called for by Smith and Pourchot (1998).

Using Pintrich's 4x4 model (Cognition, Behavior, Motivation, and Context x Forethought, Monitoring, Control, and Reflection) one can overlay Knowles' model of adult learning (See Table 2.3). This overlay includes the adult learner characteristics of being problem-centered and self-directed (cognition), being intrinsically motivated and needing to know why they are learning (motivation), being self-directed (behavior), and learning from life experiences and societal roles (context). Furthermore, all of Knowles' (Knowles, Holton III, & Swanson, 2005; Merriam et al., 2007) characteristics can fall during the monitoring and control phases as proposed by Pintrich (1994). It was beyond the scope of this research and dissertation to investigate the forethought, planning and activation and reflection and reaction phases that Pintrich (1994) also describes. Utilizing this framework-enhanced to more specifically include adult learners-can be a starting point for a more-developed body of literature related to adult educational psychology. This framework is supported by the empirical research conducted for this dissertation.

Generally, the results from the empirical research support my hypotheses that the SDLRSNE is a reliable tool to use with DPT students and that self-regulated learning

grows over the time that adult learners participate in a professional education program such as the Doctor of Physical Therapy program. These self-regulated learning findings are particularly meaningful in this population of students, as self-regulated learning has been identified as the keystone to lifelong learning (Hojat et al., 2005). Lifelong learning is a common outcome shared by many professional education programs. It is the key to professionals continued growth and learning following graduation. Status (traditional versus nontraditional-aged students) is a significant predictor of the Desire For Learning component of self-regulated learning as presented in this research. Participation in clinical education experiences also has a positive impact on self-regulated learning. These results are consistent with the framework presented previously. In the rest of this chapter I will discuss the results in more depth drawing connections between the results of this study to the framework laid out in the literature review. I will also include a basic summary of the information, any implications for theory, practice, and research, as well as the limitations of the study.

Analysis

The results from the factor analysis indicate that the self-regulated learning measured with this survey is supported by a three-factor structure. These findings are consistent with previous research (Fisher, King, & Tague, 2001; Fisher & King, 2010; Smedley, 2007). What may be more important than the finding of the three-factor structure though is an understanding of the tool. The Self-directed Learning Readiness Scale was designed to measure self-*directed* learning readiness. It can, though, also be considered to measure self-regulated learning. As stated earlier, the three-factor model developed by previous research has led to three subscales, which have been called *Self-*

Control, *Self-Management*, and *Desire For Learning* (Fisher, King, & Tague, 2001) for nursing students. The subscales were named based on the themes that were presented with the items loadings on each factor. Using these subscales, one can distinguish a clear relationship between Pintrich's theory of self-regulated learning and the measure. Taking the subscales at face value, *Self-Control* could be considered in the cognitive domain of the 4x4 matrix. *Self-Management* could be considered within the behavior domain and *Desire For Learning* within the motivation domain. The only domain that is not included in this pairing is Pintrich's context domain. Context, however, does not need to be paired in my perspective as it is unique to each individual experience and is related to the environment of each student-either adult or child.

Similar to these three subscales, the factor analysis conducted with the data from DPT students is also best represented by a three-factor structure. Moreover, the results of the factor analysis could easily follow the language of the previous research with the new Factor 1 being considered *Self-Management*, Factor 2 as *Desire For Learning*, and Factor3 as *Self-Control*. Although the items that load on these factors are not identical to the original loadings, the themes are still consistent and the Cronbach's alpha values are generally acceptable. With these results in mind it is important to consider the implications, that the SDLRSNE survey tool is actually well designed to measure adult self-regulated learning as portrayed by the framework presented in Chapter 2 and that this enhanced framework of adult self-regulated learning is supported by this research.

Research Questions

Q1. What is the shape of the DPT students' self-regulated learning over the course of the DPT program?

Results from multiple longitudinal growth curve models indicate that self-regulated learning in DPT students had discontinuity as represented by *Total Score* and *Self-Management*. These conclusions are based on reviewing the fit indices for each model (information presented in Tables 4.10 – 4.13), wherein each model is more complex than the previous model. *Desire For Learning* and *Self-Control* are not discontinuous.

For *Total Score* and *Self-Management* the discontinuous model was the best fit when compared to the unconditional means model, the unconditional growth model, and the dependent variable with Time and Status as a predictor variables model. The discontinuity or kink in self-regulated learning occurs between Time 4 (20 months) and Time 5 (25 months). The discontinuity indicates a statistically significant difference in slopes between the discontinuous model and the unconditional growth model after Time 4 (20 months). For *Self-Management*, the same principle applies in that the model that fits the data the best is the discontinuous model with a change in slope after Time 4 (20 months).

This discontinuous pattern can be viewed as consistent with the theoretical framework presented above. According to the framework, adult learners learn based on their contextual societal role and are cognitively problem-centered. With this, it is important to note that the change in slope of self-regulated learning occurs following the student's full time clinical education experience. With the clinical education experience come the expectations of the student to perform as a physical therapist. The implications of these expectations are discussed in more depth after addressing the second research question.

Q2. Does participation in clinical education experiences predict the change of the shape of growth of the DPT students' self-regulated learning?

To address this research question, the growth curve models need to be reviewed. Working with the understanding presented in the first research question, that the discontinuous model is the best model for this data for the *Total Score* and Self-Management variables, one can conclude that participation in clinical education experiences does predict the change of the shape of growth of self-regulated learning for DPT for these variables. One arrives at this conclusion by reviewing the discontinuous model relative to the timeline for the curriculum. For the discontinuous model, the TimeAfter variable is statistically significant. This indicates that there is a significant change in the slope in this model at Time 4 (20 months). Considering this information in light of the DPT students schedule one can see that this change occurs upon completion of clinical education experience.

As I mentioned in the first research question discussion, this is consistent with the framework presented. In clinical education, students are required to perform the actions of a physical therapist, under the guidance of a licensed physical therapist. The inclusion of clinical education in the curriculum is paramount for the development of future physical therapists. The students are no longer in a classroom with hypothetical contexts trying to regulate learning in an artificial environment. When students are in the clinic their learning is based almost entirely on problems they have encountered. They develop a new professional identity (societal role) and are responsible for regulating their own learning so as to offer the best clinical care of which they are capable. Upon returning to the classroom, having recently had these clinical education experiences, it is logical to

appreciate that self-regulated learning would increase in a significant way. The results demonstrate that the adult learning characteristics identified are a necessary component of the framework specifically for adult, professional education. These characteristics should be considered as part of an augmented framework for future adult educational psychology literature as well as implications for practice.

Q3. Are there specific demographics that may predict the intercept or slope of self-regulated learning among DPT students?

This research question is reviewed in light of the longitudinal growth curve models presented in the Chapter 4 results section of this dissertation. Upon review of all of the demographic variables collected with the survey, age was identified as a possible predictor variable. With the variability in age, however, it became clear that it was best to dichotomously recode the variable into traditional and nontraditional students. Traditional students were aged 20-24 years and nontraditional aged students were 25+ years.

Results from this study indicate that for one of the dependent variables, *Desire For Learning*, Status was a significant predictor of growth of self-regulated learning. Specifically, for *Desire For Learning*, traditional students start lower, but end higher, growing faster throughout the curriculum when compared to their nontraditional student counterparts.

These findings are also consistent with the framework presented. For *Desire For Learning*, nontraditional students demonstrated very little growth but at the initial survey time are higher than traditional students. This may be related to the fact that often time nontraditional students in a DPT program are second-career students. These are individuals who have previously been in the workforce in another capacity and have

opted to return to school in order to rejoin the work force as a physical therapist. Working under the assumption that this is the case for these participants nontraditional-aged students would be expected to have a higher *Desire For Learning* because they have chosen to leave their current work to pursue physical therapy. For traditional-aged students this may not be the case as they likely have less time in the workforce (if any) or continue straight through from undergraduate to professional education. After equal time spent in the curriculum including having experienced equal amounts of clinical education, the traditional students do catch up and even surpass their nontraditional student counterparts.

Q4. What percentage of DPT students meets the threshold for self-regulated learners?

According to the results, on average most (94%) of students are considered self-regulated learners. What is most interesting from these results is the change in percentage from Time 1 (0 months) to Time 7 (34 months). Students complete the survey during their first week of classes in the DPT program, Time 1 (0 months). By Time 7 they have completed 34 months of the DPT curriculum. Since lifelong learning is a goal in many professional education programs one would anticipate seeing some increase in score. This growth, however, is not uniform as some students grow more; some students don't grow at all; while still other students do not make it through the program even though their initial data may be included in the analysis. Students who do not make it through the program generally do not make it for several reasons: 1) either they do not make the grade (literally) or 2) they self-select out of the program for a variety of reasons.

It is apparent from these results that there is a general trend of growth from Time 1 (0 months) to Time 7 (34 months), with some fluctuation in scores. In spite of fewer

numbers of students completing the survey at each time the cohort mean scores generally increase. Is it that the students who are no longer completing the survey are either the lowest scorers (have little self-regulated learning)? Or, those students who are low initially have increased rates of growth? Or, those students with low self-regulated learning scores initially are not moving through the program or are self-selecting out of the program? It is difficult to say with certainty with this data, but it may be worth investigating the predictive capacity of the survey in conjunction with other admission standards in future research.

Implications

In the initial chapters of this dissertation I presented three areas that this research could significantly affect: lifelong learning, evidence-based education, and emerging adulthood. I will address each of these in this section.

Self-regulated learning is a critical component of lifelong learning. Beyond needing to address the construct as an outcome measure for professional education, students need to learn about self-regulated learning and its future implications as a professional. Learning the phases of self-regulated learning: forethought, monitoring, controlling, and reflection (Pintrich, 1994) may help them to become better learners in their current context and may also assist in their own professional lifelong learning development.

Evidence-based education follows the same logic as lifelong learning. If (since) evidence in current literature supports the existence and development of self-regulated learning and most program outcomes include at least one goal of educating lifelong learners, educational programs should be fostering opportunities for students to critically

assess and receive feedback from instructors regarding the student's self-regulated learning. Furthermore, this theoretically and empirically based dissertation should serve as evidence to help bridge the current gap in adult educational psychology literature.

Related to the emerging adulthood developmental phase, this research supports the notion that there is distinction in learning between traditional and nontraditional-aged students. There are many premises for why this distinction exists and consequently this is also a promising area for continued research.

This dissertation offers notable implications for the areas of theory, research and practice. With regards to theory, the enhanced framework proposed initially has been supported by empirical evidence. The framework addresses a population of students who have been overlooked in current educational psychology literature. With this framework, there is room for further discussion regarding differences and similarities between how adults and children learn as well as offering theoretical support for educational decision for professional students. Furthermore, it opens the door for increased development of theories and models related to adult educational psychology.

With regards to research, although this investigation addressed multiple specific research questions, the research questions I was left with were still greater.
The issue of measurement is most apparent in that the items composing the subscales in the factor analysis, although similar to previous research in nursing and medical populations, were not exact replicas. It may be that using the tool in a new population is revealing actual differences in the various samples or that there is something about the tool that is not measuring the constructs accurately. This is particularly interesting when considering the models of education in the various populations. During medical and

nursing clinical experiences, multiple students are paired with one instructor; whereas in physical therapy, during clinical experiences, most often one student is paired with one instructor. This is not to suggest that one way is better than the other, but that it may contribute to differences in self-regulated learning and should be investigated further. Other potential areas for future investigation include: the implications of student perceptions of the societal role; the forethought, planning, and activation of self-regulated learning in adults, the reflection and reaction component of self-regulated learning in adults, the empirical relationship between self-regulated learning and lifelong learning; and the usefulness of the SDLRSNE in predicting student outcomes.

Most noteworthy are the implications for practice, specifically physical therapy education. Recent trends to move most or all of clinical education to the end of the curriculum is antithetical to the findings presented. With focus on evidence-based practice, and in this case evidence-based education, one might be wise to consider that teacher education as well as medical education research suggests assigning practical (clinical) education earlier in the curriculum. Based on this research, an argument could be made that this type of curricular change would boost students' self-regulated learning and possibly lifelong learning as a consequence.

Limitations

As is the case with most research, there are limitations to this study that should be considered when interpreting the results. First, the student sample was a sample of convenience. All of the students came from one university and it is possible that there is a given characteristic about students who choose to attend this DPT program that lends itself to more or less self-regulated learning. Also, it is possible that students may have

answered in a more socially desirable way than they would have otherwise, if a faculty member were not administering the survey. In offering the survey multiple times, using the aggregate means to develop the growth curve model, and the large sample sizes these effects may be negligible; however, they are worth noting.

The SDLRSNE survey that was used in this study was specifically designed to measure self-directed learning readiness. It is my hope that readers have been sufficiently persuaded to adopt the survey as a tool to measure self-regulated learning but beyond measuring the most suitable construct there are additional philosophical questions one may ask regarding a survey tool used to measure the construct. These questions address the concerns of whether the survey items are interpreted and mean the same thing to different individuals let alone to the same individual at multiple time points in unique contexts. As context is a key component to Pintrich's self-regulated learning theory and is encompassed in Knowles' adult learning model, these are valid questions. Context may also include information regarding the individual's race and/or cultural experiences, which were not addressed in this study but may be considered for future research.

As a theoretical framework, Pintrich's self-regulated learning offers multiple phases and domains. As has been discussed, the first and the last phase, forethought, planning, and activation and reflection and reaction, respectively, were beyond the scope of this paper. This begs the question, if only some of the components of a theory are being tested, is the theory (in its entirety) being tested? As this dissertation is the initial step in a line of research, I would not propose that this research is all encompassing rather that this research should only be considered a first step at understanding adult professional education learners.

Finally, during the analysis it became apparent that the *Total Scores* at Time 3 (13 months) through Time 7 (34 months) were statistically different between cohorts, indicating that the respective cohort means were significantly different from each other. This was not the case for the majority of the other dependent variables however, so the analysis continued. In future projects it would be more ideal if there were no cohort differences when analyzing the information in aggregate.

Summary

An enhanced theoretical framework was presented for self-regulated learning in adults in professional education. This framework incorporated noted concepts from sociology and social psychology with Knowles' (Knowles, et al., 2005; Merriam et al., 2007) model for adult learners as well as theories from cognitive psychology and education psychology via Zimmerman's (1986) and Pintrich's (1994) self-regulated learning. Following the proposed theoretical framework research was conducted with DPT students using the SDLRSNE tool. In utilizing this tool, a case is made for the importance of analyzing results relative to the components of the survey, not merely the title or originally identified construct. With professional students SDLRSNE captures self-regulated learning and should be discussed as such.

With growth curve modeling, I was able to detect a discontinuous pattern of growth for self-regulated learning, likely related to the students' participation in clinical education. For *Desire For Learning*, Status is a significant predictor of growth in self-regulated learning and based on the internal consistency reliability coefficients it is appropriate to use the tool with DPT students. Consistent with previous research, the

survey consists of a three-factor structure. Although the items loading on these factors are not the same as previous research, the corresponding themes are.

The strengths of the dissertation include an enhanced theoretical framework for which to consider adult self-regulated learning, and more broadly a component of adult educational psychology as well as empirical evidence to support the structure of the framework. Results suggest future research should include analyzing multiple cohorts across all times and comparing these results to further explore the self-regulated learning in Doctor of Physical Therapy students. Additional research efforts can focus on developing a tool designed specifically for measure self-regulated learning in adults, investigating all the domains suggested by Printrich's model, and further inquiry into the relationship between age, Status and *Desire For Learning*. Furthermore, this current research could be enhanced by including information regarding race and education in the analysis of the data as well as following up with participants to determine the individual's understanding or meaning of the individual items presented in the survey.

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.

APPENDIX A

SELF-DIRECTED LEARNING READINESS SCALE FOR NURSE EDUCATION

TUid # _____

Section A

Demographic Data:

1. **Age in years:** _____

2. **Gender:** ☐ Male ☐ Female

3. **Dependents**: ☐ 0 ☐ 1- 2 children ☐ > 2 children

4. **Your highest qualification:**
   - ☐ Bachelor's Degree
   - ☐ Master's Degree
   - ☐ Graduate Degree (other than DPT)/PhD
   - ☐ Other _____

5. **The highest qualification of all other individuals in the household in which you were raised?**
   - ☐ Certificate
   - ☐ High School Diploma
   - ☐ Bachelor's Degree
   - ☐ Master's Degree
   - ☐ Graduate Degree/ PhD
   - ☐ Other_____

5A. **Who has the highest qualification listed in question #5?**
   - ☐ Parent/ Step-parent
   - ☐ Sibling/ Step-sibling
   - ☐ Participant completing the questionnaire
   - ☐ Other _____

SELF-DIRECTED LEARNING READINESS SCALE (for Nurses)
(Fisher, Tague, King, 2000)

The following is a bank of items perceived to reflect the attributes, skills and motivational factors required of self directed learners.

Please evaluate each item regarding **the degree the item measures a characteristic of yourself**. You are required to assess each item using a 5 point Likert scale as follows:

1 if you "strongly disagree" that the item measures a characteristic of yourself
2 if you "disagree" that the item measures a characteristic of yourself
3 if you are "unsure" if the item measures a characteristic of yourself
4 if you "agree" that the item measures a characteristic of yourself
5 if you "strongly agree" that the item measures a characteristic of yourself

(SD = strongly disagree, D = disagree, U = unsure, A = agree, SA = strongly agree)

ITEM	SD 1	D 2	U 3	A 4	SA 5
2. I solve problems using a plan	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3. I prioritise my work	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
5. I do not manage my time well	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
6. I have good management skills	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
9. I set strict time frames	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
12. I prefer to plan my own learning	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

ITEM	SD D U A SA 1 2 3 4 5
16. I am systematic in my learning	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
17. I am able to focus on a problem	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
22. I need to know why	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
24. I critically evaluate new ideas	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
25. I prefer to set my own learning goals	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
29. I learn from my mistakes	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
33. I am open to new ideas	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
34. When presented with a problem I cannot resolve, I will ask for assistance	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
42. I am responsible	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
44. I like to evaluate what I do	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
45. I have high personal expectations	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
46. I have high personal standards	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
47. I have high beliefs in my abilities	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
48. I am aware of my own limitations	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
52. I am confident in my ability to search out information	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
54. I do not enjoy studying	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐

ITEM	SD D U A SA 1 2 3 4 5
56. I have a need to learn	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
57. I enjoy a challenge	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
58. I want to learn new information	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
59. I enjoy learning new information	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
60. I set specific times for my study	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
63. I am self disciplined	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
64. I like to gather the facts before I make a decision	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
65. I am disorganised	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
70. I am logical	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
71. I am methodical	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
77. I evaluate my own performance	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
79. I prefer to set my own criteria on which to evaluate my performance	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
80. I am responsible for my own decisions/actions	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
81. I can be trusted to pursue my own learning	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
83. I can find out information for myself	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
86. I like to make decisions for myself	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐

ITEM	SD D U A SA 1 2 3 4 5
87. I prefer to set my own goals	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
91. I am not in control of my life	1 2 3 4 5 ☐ ☐ ☐ ☐ ☐

Thank you for completing this survey!