

SELF-DIRECTED LEARNING READINESS AMONG PREDENTAL STUDENTS AT  
FLORIDA ATLANTIC UNIVERSITY

by

Fahad Algahtani

A Dissertation Submitted to the Faculty of

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In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

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This dissertation was prepared under the direction of the candidate's dissertation advisor, Dr. Valerie Bryan, Department of Educational Leadership and Research Methodology, and has been approved by all members of the supervisory committee. It was submitted to the faculty of the College of Education and was accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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## ABSTRACT

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Dental school is a four-year, rigorous educational endeavor packed with difficulties and challenges predental students have not experienced during their undergraduate studies. In addition, dental schools demand developing new coping and learning skills to meet the requirements of a student-centered, fast-paced curriculum. In response to these challenges, it is essential to understand and embrace self-directed learning (SDL) skills and attitudes required for predental students to thrive and succeed during their dental journey (Premkumar et al., 2014). Furthermore, SDL is essential in assisting dental students in filtering the information they need to fulfill their learning needs (Siddiqui et al., 2021).

This quantitative cross-sectional descriptive study used an online survey designed by Qualtrics<sup>XM</sup> to evaluate self-directed learning readiness (SDLR) level among predental students at Florida Atlantic University (FAU) and whether their SDLR level would differ based on age, sex, race/ethnicity, college/major, and year of study. A convenience sample

of 155 FAU pre dental students completed Fisher et al.'s (2001) 40-item *Self-Directed Learning Readiness Scale for Nursing Education (SDLRSNE)* and seven demographic questions. Descriptive and inferential statistics were conducted to analyze and answer the six research questions and corresponding hypotheses.

The results showed a positive attitude of FAU pre dental students toward SDL as total SDLR scores ranged from 119 to 179, with a mean of 151.33. Moreover, there was a statistically significant difference in SDLR level among participants based on age, race, and year of study. Contrastingly, there was no statistically significant difference in SDLR level among participants based on sex, ethnicity, and academic major. The college variable was not investigated as all participants were enrolled in the Charles E. Schmidt College of Science.

Recommendations for future research include a more diverse and larger sample of pre dental and graduate students. In addition, future qualitative research and longitudinal studies may be beneficial. It was also recommended to develop an instrument that could evaluate the actual SDLR among the pre dental student rather than their perception. Finally, implications for practice were identified for FAU pre dental students, educators, prehealth advisors, and dental schools.

## DEDICATION

This dissertation is dedicated to my wife and soulmate, Meaad Algahtani, for standing strongly by my side throughout this journey. You have been a constant source of love, support, and encouragement during the challenges of life and postgraduate studies. To my precious kids, Yosif and Norah. You have made me stronger, happier, and better than I could have ever imagined. Finally, this dissertation is dedicated to my parents, Saeed and Norah Algahtani, who have always loved me unconditionally and supported me with my education to achieve my goals. I couldn't have made it without all your support and encouragement.

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## CHAPTER 1. INTRODUCTION

Over the years, educators have guided students in their early education concerning what, how, and why to learn (Merriam, 2002). Later, this responsibility of learning shifts from educators to learners, especially in adult education settings (Manning, 2007). Educational institutions and workplace settings strongly stress the value of self-directed learning (SDL) as a substantial skill in today's labor market (Bergamin et al., 2019; Murane & Levy, 1996). Similarly, improving the learners' ability to engage in SDL is one of the most critical tasks for educators (Taylor, 1995). Some scholars claim that SDL is the most common method used by adult learners to learn (Anderson & Brockett, 2008; Merriam & Bierema, 2014). Accordingly, the concept of SDL has become a trend of great significance in contemporary adult education (Pilling-Cormick, 1994). Likewise, SDL has been recommended in health professions education programs as the methodology of choice for successful training and lifelong learning (Murad & Varkey, 2008; Simon & Aschenbrener, 2005). As adult learners and healthcare students, dental students also fit under the health professions education umbrella.

SDL is generally defined as any learning style or method in which learners are solely responsible for designing, conducting, and assessing their learning projects (Knowles, 1975; Merriam et al., 2007). The *International Society for Self-Directed Learning* describes SDL as “an intentional learning process that is created and evaluated by the learner” (Ponton et al., 2020, para. 4). Self-directed learning readiness (SDLR) describes the extent to which a learner owns the abilities, attitudes, and personal qualities

required for self-direction (Wiley, 1983). Readiness for the SDL approach entails self-discipline, self-reflection, self-evaluation, autonomy, organization, communication, and constructive feedback acceptance (Merriam, 2002).

SDL and lifelong learning are closely related (Tekkol & Demirel, 2018). Some scholars claim that SDL is a basic requirement for lifelong learning (Greveson & Spencer, 2005), while others emphasize that the two are inseparably linked (Candy, 1990). Self-direction transforms individuals from passive to active learners in learning and prepares them to be profound, lifelong learners (Spencer & Jordan, 1999). The literature shows that individuals with high SDL levels are considered active learners possessing powerful passions for learning, critical thinking and problem-solving skills, and the ability to participate in and control their learning independently (Brockett & Hiemstra, 1991; Candy, 1991; Gibbons, 2002; Guglielmino & Guglielmino, 1991; Knowles, 1975; Merriam & Caffarella, 1991). Additionally, SDL has a powerful positive influence on academic performance (Khiat, 2017; Kim, 2017).

Modern learner-centered dental curricula pose a significant shift from the traditional teacher-centered environment that is less effective in engaging and motivating students to acquire the required knowledge and skills (Schwerdt & Wuppermann, 2011). In contrast, learner-centered dental curricula seek to improve dental students' autonomy, decision-making, and critical thinking skills to help them be successful and competent in managing and treating of oral and dental diseases and understand the connection between oral and overall health (Pyle, 2012). This shift in engagement challenges students to assume a more direct role in their future practice early in their dental training.



Dental school is a four-year, rigorous educational endeavor packed with difficulties and challenges that pre-dental students have not experienced during their undergraduate studies. The dental school demands learners develop new coping and learning skills to meet the requirements of a student-centered, fast-paced curriculum; thus, SDL is essential in assisting dental students in filtering the information they need to fulfill their learning needs (Siddiqui et al., 2021). A dental student who is not a self-starter and self-motivated may be unable to keep up the pace required in this academic endeavor.

During the first two years of dental school, students focus on learning the fundamental biological sciences and dental-oriented sciences such as oral anatomy and oral pathology. In addition, dental students also practice numerous psychomotor dental skills and procedures on simulated manikin heads and dental models to enhance their hand-eye coordination and sharpen their manual skills to prepare them to perform similar dental operations in real-world clinical settings. The last two years of dental school are devoted to direct patient care and surgical training in clinical settings under supervision. In addition, dental students learn to care for chronically sick patients, special needs individuals, elderly patients, and children, to ensure that they are prepared to care for a diverse range of people of various wellness levels and age groups. Besides, dental students engage in theoretical learning and activities designed based on SDL, such as *problem-based learning (PBL)*, *team-based learning (TBL)*, and *flipped classrooms* (Bhat et al., 2021).

After graduation from dental school, dental students become dental professionals who provide their patients and communities with oral health services essential for mental

and physical well-being (Mertz, 2016). Therefore, dental students and professionals must be lifelong learners to deliver the best, most efficient, and up-to-date patient care and dental treatments due to the constantly evolving nature of dental knowledge, protocols, and standards of care (Arooj et al., 2021).

In acknowledgment of SDL as an essential requirement for dental students, the American Dental Education Association Commission on Change and Innovation in Dental Education (ADEA CCI) listed SDL and lifelong learning as one of its main goals (Hendricson et al., 2006). Furthermore, SDL has been recognized by the Faculty of General Dental Practice of the Royal College of Surgeons of England as one of the essential education strategies in developing continuing education programs (Siddiqui et al., 2021). Although SDL is not explicitly stated in dental education as a method of instruction, most dental colleges design their curricula to foster SDL in their dental students (Premkumar et al., 2014).

### **Florida Atlantic University (FAU)**

FAU is a public four-year research university located southeast of the state of Florida in the city of Boca Raton, with five additional campuses located in Dania Beach, Davie, Fort Lauderdale, Jupiter, and Fort Pierce (Florida Atlantic University, 2022a). Since it was founded in 1961, FAU has grown enormously to become one of the largest enrollment universities in the state, serving more than 30,000 students and offering more than 170 programs in various fields within its ten colleges (Florida Atlantic University, 2022a). FAU is accredited by the Southern Association of Colleges and Schools (SACS) and has earned national recognition for student outcomes (Florida Atlantic University, 2022b). In 2022, FAU advanced to 132nd from 140th as one of the best public

universities, which marks the most significant rise among all public universities in Florida (Florida Atlantic University, 2022d).

FAU values and actively promotes diversity and inclusion through several initiative programs, such as the Center for Inclusion, Diversity Education, and Advocacy, to support students from diverse demographic backgrounds. In 2021, FAU received the Higher Education Excellence in Diversity Award and ranked 27th as the nation's most racially and culturally diverse university (Florida Atlantic University, 2022e). In addition, FAU is proud to be the most ethnically and racially diverse public university in Florida, designated as a Hispanic-Serving Institution (Florida Atlantic University, 2022c).

### **Statement of the Problem**

The admissions process for dental school is highly competitive and getting more challenging every year. According to American Dental Education Association (2022), the number of pre dental students in 2020 who applied to dental schools across the United States was 10,965, and only 6,257 were accepted for admission, equating to 57.1% of applicants enrolled. While in 2021, only 53.8% of dental school applicants were accepted and enrolled in dental schools across the United States (American Dental Education Association, 2022a). In addition, the predictive value of dental school admission criteria tends to vary with time, as they can change drastically by year and between classes, making it challenging to define uniform admission criteria (Curtis et al., 2007; Sandow et al., 2002).

Pre dental students admitted to dental school to pursue a dental degree (DDS or DMD) encounter several challenges during their dental school journey. The challenges begin as pre dental students are expected to have outstanding academic credentials and the

criteria required for dental school admissions, such as college grade point average (GPA) and Dental Admission Test (DAT) score (Curtis et al., 2007). Besides, some dental schools use additional admissions criteria, such as college average academic load and psychomotor assessment through wax or chalk carving (Chamberlain et al., 2005). The ideal candidate for dental school will have a cumulative GPA of 3.5 and a score of 20 or higher for the Dental Admission Test (DAT) (Dental School Digest, 2021).

Once admitted to dental school, the scope of the challenges pre dental students face expands beyond intellectual challenges to also include acquiring technical skills and abilities. In response to these challenges, it is essential to understand, promote, and embrace SDL skills and attitudes required for pre dental students to thrive and succeed as adult dental students during their dental journey (Premkumar et al., 2014). In addition to the dental school admission criteria serving as predictors and indicators of academic performance, intelligence, and cognitive skills, the literature reveals that SDL tends to be associated with academic performance and is considered an essential factor in predicting academic achievement (Cazan & Schiopca, 2014; Chou & Chen, 2008; Hsu & Shiue, 2005; Long, 1991; Oducado, 2021; Premkumar et al., 2014; Ryan, 1993; Salamonson et al., 2009; Siddiqui et al., 2021; Stewart, 2007). Additionally, some researchers argued that self-directed learners have higher levels of self-efficacy (Cazan & Schiopca, 2014; Oliveira & Simões, 2006; Stockdale & Brockett, 2011). Consequently, under the umbrella of cognitive abilities, pre dental students should demonstrate readiness toward the SDL approach to navigate through the dental school journey (Siddiqui et al., 2021).

In today's increasingly diverse and multicultural society, pre dental students come from different racial, ethnic, and educational backgrounds that may influence their

readiness to actively participate in SDL activities to differing extents. Additionally, SDL is not suitable for all students, as some of them may feel anxious or frustrated (Dyck, 1986; Yuan et al., 2012). According to Dyck (1986), students' responses to the SDL approach are frequently marked by extreme anxiety and frustration as they were not prepared for this level of independence based on their prior experience in the andragogical approach. Furthermore, students who prefer traditional teacher-centered teaching methods will resent and oppose the SDL as they find working under self-imposed structures and deadlines extremely difficult (Dyck, 1986). Yuan et al. (2012) stated that it is significant to acknowledge that promoting SDL has inconsistent outcomes and might lead to anxiety in some learners. Yuan et al. (2012) found that students with low readiness levels for the SDL approach frequently experience increased anxiety when engaged in SDL activities and prefer teacher-centered instruction.

Moreover, other research studies reported negative attitudes of students toward SDL and low readiness for the SDL approach among the participants (Alharbi, 2018; AlRadini et al., 2022; Balamurugan & Kumar, 2015; Ballad et al., 2022; Richardson, 1988). All these issues have continually sparked discussions among dental faculty members about whether pre-dental students possess the ability to undertake the responsibilities involved in SDL. Are they prepared for the transition to a pure learner-centered, fast-paced environment? Would they be ready and use the times as intended if they engaged in a scheduled self-study time or SDL activities and modules instead of traditional teacher-centered didactic methods?

The research literature has emphasized the importance of assessing student readiness for the SDL instructional strategy to facilitate and promote SDL for students

(Fisher et al., 2001; Klunklin et al., 2010). Therefore, assessing SDLR among pre dental students will reveal their strengths and weaknesses, contributing to better educational planning and designing the most appropriate curriculum and teaching strategies to improve and promote SDL skills in pre dental students (AlRadini et al., 2022). However, there is an immense lack of research measuring SDLR among pre dental students compared to the literature on this subject in other disciplines, such as medical (AlRadini et al., 2022; Premkumar et al., 2018; Soliman & Al-Shaikh, 2015), dental (Arooj et al., 2021; Ganji et al., 2022; Premkumar et al., 2014; Siddiqui et al., 2021), pharmacy (Behar-Horenstein et al., 2018; Deyo et al., 2011; Toth et al., 2021), and nursing students (El-Gilany & Abusaad, 2013; Said et al., 2015; Yuan et al., 2012). Thus, this research study was designed to address this research gap.

### **Purpose of the Study**

The purpose of this study was to evaluate SDLR levels among pre dental students at FAU. Also, the study aimed to examine whether their SDLR level would differ based on selected demographic variables, including age, sex, ethnicity/race, college/major, and year of study.

### **Research Questions & Hypotheses**

The study addressed the following questions and corresponding hypotheses:

RQ1: What is the level of SDLR among pre dental students at FAU?

Hypothesis 1: Pre dental students at FAU would have SDL scores of readiness for the SDL approach, in which a total score  $>150$ , with a maximum of 200, implies a high level of SDLR, while a total score  $\leq 150$  represents a low level of SDLR (Fisher et al., 2001).

RQ2: Does the level of SDLR among pre dental students at FAU differ by age?

Hypothesis 2: There will be a significant difference in the level of SDLR among pre dental students at FAU based on age.

RQ3: Does the level of SDLR among pre dental students at FAU differ by sex?

Hypothesis 3: There will be a significant difference in the level of SDLR among pre dental students at FAU based on sex.

RQ4: Does the level of SDLR among pre dental students at FAU differ by ethnicity/race?

Hypothesis 4: There will be a significant difference in the level of SDLR among pre dental students at FAU based on ethnicity/race.

RQ5: Does the level of SDLR among pre dental students at FAU differ by college/major?

Hypothesis 5: There will be a significant difference in the level of SDLR among pre dental students at FAU based on college/major.

RQ6: Does the level of SDLR for pre dental students at FAU differ by year of study?

Hypothesis 6: There will be a significant difference in the level of SDLR among pre dental students at FAU based on the year of study.

### **Significance of the Study**

SDL is a key skill and embedded part of modern dental education, particularly in the *Problem-Based Learning (PBL)* and *Team-Based Learning (TBL)* dental curriculum (Bassir et al., 2014; Haley et al., 2020). Thus, identifying the readiness of pre dental students to effectively direct themselves in the learning process will increase their self-assurance in their own ability and potential to learn in different settings during dental school (Murad et al., 2010).

Improving SDL is a difficult task for educators and learners (Alharbi, 2018). Therefore, this study sought to provide FAU educators, particularly pre-health advisors,

with information about the extent of SDLR among pre dental students at FAU who are interested in applying for dental schools. In addition, the present study was intended to present insight into the roles of age, sex, ethnicity/race, college/major, and year of study in pre dental students' readiness for the SDL approach.

Finally, the current study provides implications for practice for FAU educators and pre-health advisors in their work with pre dental students. To illustrate, pre-health advisors can raise awareness and bring pre dental students' attention to the role of SDL within dental education perseverance and success. Also, FAU educators can minimize the use of lecturing, embrace interactive learning, and develop more SDL modules and activities to promote and improve SDL skills in their students. This practice of enhanced engagement may create a more conducive educational environment for pre dental students to foster student-centered learning strategies and continuously improve pre dental students' readiness for SDL instructional methods.

As mentioned earlier, a plethora of research is available concerning the readiness of dental students toward the SDL method (Arooj et al., 2021; Ganji et al., 2022; Premkumar et al., 2014; Siddiqui et al., 2021); however, little evidence is available among pre dental students. Furthermore, the relationship, if any, between pre dental students' SDLR and demographic variables, including age, sex, race/ethnicity, undergraduate major, and year of study, has not been examined. Such research might enable dental educators and researchers to acknowledge the value of assessing SDLR for pre dental students entering the dental profession. In addition, this study could be a starting point and provide the basis for additional SDLR research in the context of pre dental students, given that SDL is a prerequisite for lifelong learning (O'Shea, 2003;



Salmond & Echevarria, 2017) required for dental students and dentists to keep up to date with the latest dental advancements and treatments modalities (Siddiqui et al., 2021).

## **Limitations and Delimitations**

### **Limitations**

This study was limited in several ways. First, non-probability voluntary sampling was used in this study, which could have increased the likelihood of sample bias. As the term indicates, this type of bias arises because of who volunteers for the study within the selected population (Agresti & Finlay, 2009). While in the probability random sampling method, each subject within a selected population has an equal chance to be included in the study sample (Fuller, 2011). Second, this study used a self-reported measuring instrument. Unfortunately, self-reported survey tools measuring perception are subjected to “over-reporting of admirable attitudes and behaviors and under-reporting those that are not socially respected” (Krosnick, 1999, p. 545). As a result, participants may not feel motivated to provide honest and accurate self-representative answers. Furthermore, the results obtained from the survey were based on each participant’s interpretation of the questions included in the survey, and their answers may have been influenced by their mental, physical, and emotional state while completing the survey (Paulhus & Vazire, 2007). Finally, the participants’ perceptions of the SDL nature may differ. This discrepancy may be due to the differences in each participant’s previous learning and working experiences that might influence how the participants perceive and practice SDL.

## **Delimitations**

The study's sample criteria drove the delimitations of this research study. Based on the purpose of this study, the participants in the current study were pre-dental students at FAU who were members of the FAU Predental Association. Findings may change if the sample were expanded beyond FAU to include other universities and pre-dental societies comprised of differing populations (e.g., age, gender, nationality, prior exposure to the field, etc.). Therefore, the results cannot be generalized to either other universities or pre-dental societies. However, FAU Predental Association was selected due to data availability and accessibility.

## **Definition of Terms**

*Predental students* — Students taking the necessary prerequisites to apply for dental school to prepare them for a career in dentistry.

*Self-directed learning (SDL)* — A process in which individuals are solely responsible for designing, conducting, and assessing their learning experiences and outcomes (Knowles, 1975; Merriam et al., 2007).

*Self-directed learning readiness (SDLR)* — The extent to which the learner has the abilities, attitudes, and characteristics essential to engage in the SDL process (Wiley, 1983).

*Dental degree (DDS or DMD)* — DDS and DMD are the acronyms of the dental degrees dental students earn after finishing dental school. DDS means Doctor of Dental Surgery, while DMD means Doctor of Medicine in Dentistry. Universities determine which dental degree they award. However, dentists with either DDS or DMD degrees

have the same curriculum requirements and clinical training (American Dental Association, 2021a).

*Dental Admission Test (DAT®)* — A prometric computerized test that measures general academic knowledge, understanding of scientific information, and perceptual skill to provide dental schools with a means to evaluate dental applicants' potential for success (American Dental Association, 2021b).

*Self-efficacy* — Refers to learners' beliefs of their own abilities to design and perform the tasks necessary to achieve desired learning objectives (Bandura, 1986).

*Andragogy* — “The art and science of helping adults learn” (Knowles, 1980, p. 43).

*Cognitive skills* — Known as hard skills and are defined as general mental abilities involving abstract thinking, reasoning, attention, planning, problem-solving, comprehension of complex ideas, and learning from experience (Smelser & Baltes, 2001)

*Psychomotor assessment* — A dental school admission test to determine the dental applicant's coordination, precision, agility, and reaction time abilities.

*Problem-Based Learning (PBL)* — A student-centered educational strategy that uses complex, real-world scenarios to improve student understanding of concepts and principles rather than a traditional lecture using direct presentation.

*Team-Based Learning (TBL)* — A collaborative learning approach allows a small group of learners to work through problems following a structured process to enhance the quality of their learning and engagement.

*Flipped classrooms* — An instructional method and a form of blended learning where students are introduced to content at home before class, freeing class time for discussion and activities.

### **Outline of the Study**

This research study comprises five chapters. Chapter One covered the introduction to the present study, involving the statement of problem, purpose, significance, and research questions and corresponding hypotheses. It also addressed the limitations and delimitations of the current study, definitions of terms, and the outline of this research study. Chapter Two includes the literature review on SDL and SDLR. Topics included SDL definitions, history, models, SDL in dental education, and the SDLR scale. Chapter Three covers the research methodology, including the study design, variables, demographics, population, sample size, instrumentation, data collection, and data analysis plan for each of the six research questions. Chapter Four discusses the data analyses and the results of each of the six research questions. Additionally, it provides an overview of the sample and the demographic characteristics of the participants. Chapter Five summarizes and discusses the major findings to reach relevant conclusions, recommendations for future research concerning SDLR in the context of pre dental students, and implications for practice.

## CHAPTER 2. LITERATURE REVIEW

This chapter presents a summary of the research and literature on self-directed learning (SDL) and self-directed learning readiness (SDLR). Since there is a lack of a universal definition of SDL (Caffarella, 2000), the first topic covered provides various definitions of SDL within adult education. The second topic covered highlights the history of SDL and how multiple perspectives were adopted to further define emerging SDL theories and concepts. The third topic covered discusses various models of SDL that different scholars have proposed (Brockett & Hiemstra, 1991; Candy, 1991; Garrison, 1997; Grow, 1991; Long, 1989; Oswald, 2003) to better understand SDL and foster the use of SDL in diverse educational settings. The fourth topic covered highlights the SDL approach as the method of choice in dental education (Premkumar et al., 2014) and its advantages in improving dental students' independence, motivation, and life-long learning (O'Shea, 2003). The chapter also discussed the various teaching strategies used to promote SDL skills and attitudes in dental students, including *problem-based learning (PBL)*, *team-based learning (TBL)*, and *flipped classrooms* (Bhat et al., 2021). Finally, the last topic covers SDLR definitions and scales to evaluate the abilities, attitudes, and characteristics that describe readiness toward the SDL approach.

### **Self-Directed Learning (SDL) Definitions**

As a significant domain of research in the adult education field, SDL has been defined as a process (Knowles, 1975); learner's characteristics (Brockett & Hiemstra, 1991; Garrison, 1997); personal qualities (Kirwan et al., 2010); and a lifestyle of many

adult learners (Brockett & Hiemstra, 1991). Likewise, scholars have described SDL within adult education using a variety of terms, including *autonomous learning*, *self-education*, *self-planned learning*, *auto-didacticism*, *lifelong learning*, and *independent study* (Hiemstra, 2013). However, all the descriptions and terms have a shared focus on the learner's self-imposed responsibility during the learning process.

Early SDL research conducted by two adult education experts, Tough (1971) and Knowles (1975), had a ripple effect on several educational contexts (Conner et al., 2009). First, the idea of adult learning projects started when Alan Tough reviewed Houle's (1961) detailed transcribed interview data of research on learners' motivations. Tough (1967) asserted that adults are motivated to learn as they need to communicate with others. In addition, Tough (1971) argued that the predominant method of adult learning is self-directed or self-planning. Nevertheless, his research was criticized because he ignored individual differences that might affect levels of motivation.

Taking into consideration these criticisms of his study, Tough (1971) continued to pursue his scientific exploration of SDL and eventually suggested an operationalized definition of SDL. Tough (1971) defined SDL as a deliberate effort that stems from personal motivation to acquire knowledge, improve a skill, or make a change, with a total of seven hours minimum investment. Tough's (1971) research implicitly introduced the concept of SDL, and it launched SDL as a practical framework for several instructional methods in which educators are facilitators and learners themselves implement the strategies. As a result, SDL became a substantial topic in the literature concerning adult education literature (Brockett et al., 2000).

Following Tough's (1967, 1971) initial work on SDL, Knowles (1975) authored one of SDL's most widely cited and detailed definitions 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. (p. 18)

Knowles' (1975) definition highlighted several significant factors necessary for effective SDL: the learners should be capable of identifying their learning objectives, needs, and relevant resources; the learners should reflect on their learning during the learning process to evaluate if they have achieved their learning objectives; and, the educator should be in the background during this whole process as a supportive learning facilitator, encouraging the learners and assisting them in creating a need for learning.

In addition to Tough (1971) and Knowles (1975), Guglielmino (1977) was an early notable SDL contributor and theorist. Guglielmino (1977) outlined significant qualities that contribute to SDL, including students' openness to learning abilities; ardent desire for learning, initiation, and independence; willingness to take responsibility; ability to be self-confident and self-disciplined; use their creativity; looking to the future; and using essential learning and problem-solving skills. Anchored in Knowles' (1975) definition of SDL, Guglielmino and Guglielmino (2001) defined SDL as:

a process in which the learner is responsible for identifying what is to be learned, when it is to be learned and how it is to be learned. The learner

is also responsible for evaluating not only if the learning occurs but if it is relevant to the objective. (p. 37)

Kasworm (1983) described SDL as “a set of generic, finite behaviors; as a belief system reflecting and evolving from a process of self-initiated learning activity; or as an ideal state of the mature self-actualized learner” (p. 3). Brookfield (1984) stated that SDL definitions emphasizing independence are common, yet expressed concern that most SDL definitions did not consider external stimuli. Brockett and Hiemstra (1991) further contended that SDL is related to the educational strategy’s external characteristics and learners’ internal characteristics, in which learners are responsible for their learning. Brockett and Hiemstra (1991) assert that the learner’s perception of SDL is dynamic and anticipated to change with time. Hiemstra and Brockett (2012) explained that their terminology evolved from self-direction within learning – which highlights the learning process – to SDL, stressing that many researchers preferred the SDL phrase. Gibbons (2002) more recently defined SDL as any improvement in knowledge, abilities, achievements, or personal development that learners choose and accomplish by themselves at any time, regardless of the approach and circumstances. Regan (2003) described SDL as a concept interchangeable with pedagogical approaches such as independent learning, lifelong learning, and self-managed learning; however, he did not offer a definition for SDL.

Referring to Knowles’ (1975) definition of SDL, some scholars have described SDL as a learning process where the learner bears responsibility and works independently during the learning process (Williamson, 2007). At the same time, other researchers have perceived SDL as a process of decision-making for the depth and extent of their own



learning (Hendry & Ginns, 2009). Recently, many researchers and practitioners considered SDL as learning activities that occur at the learner's behest and require self-monitoring and self-management, reflecting that learners are managers and responsible for their own learning (Dehnad et al., 2014).

For the current study, SDL is defined as having both process and personal characteristics. SDL is a process in which learners identify learning goals, engage in the learning process, and assess their learning (Grow, 1991; Knowles, 1975). SDL as personal characteristics of learners who engage in SDL, including self-management, desire for learning, and self-control (Brockett & Hiemstra, 1991; Fisher et al., 2001; Garrison, 1997; Hiemstra & Brockett, 2012).

### **SDL History**

The self-direction approach in the learning process among adults has a very long history. Since the classical era, SDL has had a significant part in the works of numerous Greek philosophers, such as Aristotle, Plato, and Socrates, as well as different notable figures in history, including Alexander the Great, Descartes, and Caesar (Hiemstra, 1994). Likewise, many prominent figures, such as Isaac Newton, Benjamin Franklin, and Abraham Lincoln, would not have succeeded or made changes in the era of modern technology without self-direction in education (Bergamin et al., 2019).

Since SDL has become a significant domain of research within adult education over the past five decades (Merriam et al., 2007), there has been a growing body of research on SDL that mainly generated descriptive work in the beginning before shifting to quantitative research (Brockett & Hiemstra, 1991; Fisher et al., 2001; Guglielmino,

1977; Oddi, 1986; Stockdale, 2003), with some qualitative research conducted later (Blowers, 1993; Brockett, 1991; Gibbons et al., 1980; Spear & Mocker, 1984).

Houle's (1961) work played a central role in bringing the concept of SDL to the foreground of adult education. Although Houle (1961) is not generally acknowledged as the primary contributor to the field of SDL, Houle (1961) had a great impact on SDL through (a) Houle's (1961) book *The Inquiring Mind* and (b) the research of his former students Tough (1967) and Knowles (1975). In addition, Hiemstra (1994) contended that Houle's (1961) study is considered the foundation stone of SDL research. Houle (1961) collected data on learners' motivations through interviews with 22 active adult students and classified them into three groups based on how they perceived the purpose and importance of learning: (a) goal-oriented, (b) activity-oriented, and (c) learning-oriented.

As mentioned earlier, Knowles' (1980) SDL research and the increasing popularity of the term *andragogy* have established the formalized outline of SDL in the United States of America, mainly in his 1975 publication *Self-directed Learning: A Guide for Learners and Teachers*. Furthermore, Hiemstra (1994) contended that Knowles's (1975, 1980) research offered the basic definitions and assumptions that directed subsequent SDL research. Following the publication of Knowles' book (1975), Guglielmino successfully finished her Ph.D. in 1977 and developed *the Self-Directed Learning Readiness Scale (SDLRS)*. Now, the *SDLRS* is used as a beneficial tool for measuring SDLR or for contrasting SDL characteristics with other learning features (Guglielmino, 2008).

In the 1970s, SDL research expanded, and it was noted that multiple perspectives, from psychological to motivational, sociological to pedagogical, were adopted to further

define emerging SDL theories and concepts. Still, it appears that there was unanimous agreement among scholars on SDL's theoretical foundations. SDL was developed mainly from psychological constructs, emphasizing cognitive and metacognitive conceptualizations and roles (Pilling-Cormick & Garrison, 2013).

During the last decade, there has been a significant change tending toward motivational and management domains as a novel way of defining SDL (Fisher et al., 2001; Garrison, 1997; Oswald, 2003). Nowadays, there is an explosion of information, and some knowledge or skills may have a short life span, making them outdated and useless (Tekkol & Demirel, 2018). Thus, SDL has become a core concept and effective instructional method for adult education (Loeng, 2020; Periya & Sebihi, 2017).

Meanwhile, beyond the context of adult education, the notion of SDL – concerning its development, occurrences, and barriers – has expanded to various other disciplines, such as human resources development (Ellinger, 2004), engineering (Litzinger et al., 2005), medicine (Hill et al., 2020), dentistry (Premkumar et al., 2014), pharmacy (Lull et al., 2015), and nursing (Alharbi, 2018).

### **SDL Models**

Various models have been presented to understand SDL better and foster the use of SDL in diverse educational settings. In the following section, I discuss some of the most significant and prominent SDL models during the last three decades. Although this is not a comprehensive list of SDL models, I presented selected SDL models that are most pertinent to the present study.

### **Long's (1989) SDL Instructional Model**

Although most SDL models focus on adult learners, Long's (1989) SDL model leans more toward younger learners. The model outlined three dimensions of SDL, including sociological (autonomous task management), pedagogical (application in educational settings), and psychological (cognitive). Long (1989) argued that much of the discussion around SDL had ignored the psychological variable that focuses on the learners' willingness to keep control of the learning process actively. Long (1989) emphasized that the learning process can be described as an SDL condition when the psychological factor exceeds the pedagogical factor.

### **Candy's (1991) SDL model**

It was the first SDL model to consider that SDL will likely change in different contexts. Candy (1991) stated that the notion of independence concerning SDL had limited its conceptualization and revealed imbalances when applying SDL in different content areas. Candy (1991) outlined that SDL, as a comprehensive concept, encompasses dimensions of process and product (outcome). The process includes (a) student control (i.e., the amount of control within formal educational settings) and (b) *autodidaxy* (i.e., the amount of control within non-formal learning environments). In contrast, the product (outcome) involves (a) personal autonomy (i.e., learner's attributes such as independence and freedom of selection and logical reflection) and (b) self-management (i.e., willingness and ability to implement the learning process).

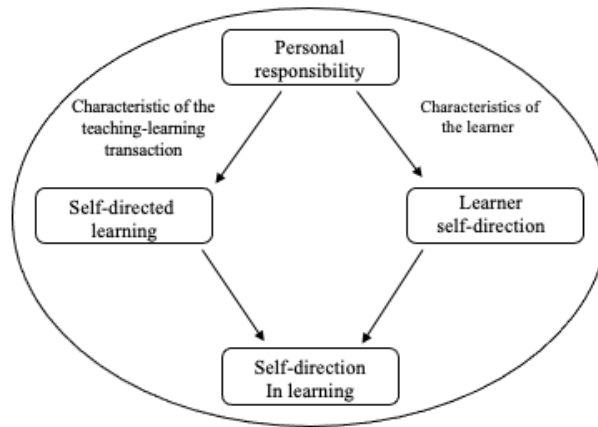
### **Brockett and Hiemstra's (1991) Personal Responsibility Orientation Model**

The Personal Responsibility Orientation (PRO) model represents SDL as both a process and a goal. As a process, learners are responsible for their own learning as well as

control over the entire learning process. While as a goal, SDL focuses on learners' willingness and tendencies to take responsibility for their own learning. In describing their PRO model, Brockett and Hiemstra (1991) emphasized that personal responsibility was the main essence in guiding the SDL process, and the oval frame embraced the factors signifying that SDL takes place in a social setting (Figure 1).

**Figure 1**

*Personal Responsibility Orientation (PRO) Model*



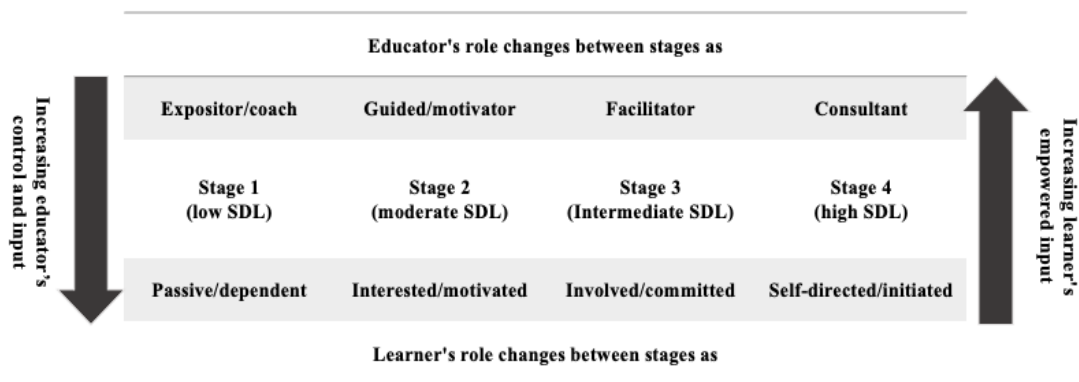
Nevertheless, Hiemstra and Brockett (2012) argue that the personal responsibility dimension has overshadowed the social context of SDL emphasized by their PRO model causing many scholars to misuse or misinterpret the PRO model. Accordingly, Hiemstra and Brockett (2012) revised and updated the PRO model to be labeled the *Person-Process-Context (PPC)* model. The most significant aspect of the PPC model is the incorporation of the PRO's three fundamental components: "the person or learner, the teaching-learning transaction or process, and the social context" (Hiemstra & Brockett, 2012, p. 157), with a strong emphasis on the effect of the sociocultural aspect in SDL process.

## Grow's (1991) Staged Self-Directed Learning Model

Based on Hersey and Blanchard's (1982) *Situational Leadership Model* in business management, Grow (1991) developed the *Staged Self-Directed Learning (SSDL)* model to illustrate SDL's dynamism. The core concept of this model is that the student's ability to be self-directed in learning is situational, and progression can loop between stages, meaning that the style of teaching must match the student's ability and motivation at the time of learning (Figure 2).

**Figure 2**

*Grow's Changing Roles of Educators and Learners*



Not all learners have the same interest and ability to direct their own learning in all instructional settings (Tennant, 1992). Accordingly, Grow's (1991) SSDL model represents a learner's transition, as part of the instructional process, from a purely dependent learner to a fully self-directed one and demonstrates the educators' roles through proposed teaching methods that fit the appropriate learners' SDL stage.

## Garrison's (1997) SDL Model

Based on a collaborative constructivist perspective, Garrison (1997) developed his SDL theoretical model that incorporates three overlapping domains: (a) self-monitoring

(cognitive responsibility), (b) self-management (task control), and (c) motivations (starting of the SDL process). Garrison (1997) argued that each dimension of his model was addressed independently; however, they are closely related in practice. Similar to Candy (1991) and Brockett and Hiemstra (1991), Garrison (1997) regarded SDL as a process and personal attribute and acknowledged the role of context. Additionally, Garrison (1997) emphasized that learner control means not only independence but also the collaboration with other learners in the given context.

### **Oswald's (2003) SDL Model**

All the previous models have contributed to a better understanding and application of SDL. Nevertheless, Oswald (2003) introduced a more comprehensive perspective of SDL. Oswald's (2003) comprehensive model includes three dimensions: (a) learning situation, (b) learners' attributes, and (c) components of learning. In the first dimension, the learning situation includes three factors, namely:

1. Opportunity (facilitator's commitment to promoting SDL).
2. Support (facilitator's willingness to support the learners with guidance and resources to direct their own learning).
3. Collaboration (peer support for each other promotes SDL among learners).

The second dimension, learners' attributes, involves (1) content skill, (2) SDL skill, and (3) willingness. Oswald (2003) contended that learners' skill level in a particular context would greatly influence their capability to manage their learning in that context. Besides, learners would be more ready to take responsibility for their learning if they have acquired previous knowledge or skills in a particular context. Oswald's (2003) last dimension, the components of learning, embraces:

1. Cognitive skills concerning critical self-reflection of the learning process and its outcomes.
2. Motivational factors include self-efficacy and desire, notwithstanding the environmental factors that attract the learner's attention.
3. The context encompasses peers, resources, materials, and other external elements within the instructional setting over which the learners have control.

According to Oswald (2003), for effective and successful SDL, the learners must take responsibility for all elements discussed above. Additionally, SDL is not an isolated practice but rather a method to discover personal meaning in the learning and its outcomes with other individuals' assistance (Oswald, 2003).

### **SDL in Dental Education**

Before the 18th century, dental education was based on the apprenticeship approach as self-taught and self-proclaimed competencies. However, in the early 18th century, dental training through apprenticeship was replaced by long periods of formal dental education and recognized competencies (Field, 1995). In 1840, formal dental education started in the United States when Baltimore College of Dental Surgery opened as the world's first dental school (American Dental Education Association, 2022b). In addition, the world's largest and oldest national dental organization, the American Dental Association (ADA), was established in 1859 to represent the dental profession and promote oral health in the community (American Dental Association, 2022).

Both change and continuity characterize the history of dental education (Field, 1995). As dental science and practice have evolved, dental education has become more sophisticated in content and teaching approaches (Field, 1995). In addition, dental



education has undergone several changes due to modifying social determinants of health, massive growth in dental technologies, and sharp increases in oral and dental health care (Bhat et al., 2021). As a result, the previous twenty years of dental education have seen a new accentuation on the necessity for dental students to become familiar with self-direction, problem-solving, critical thinking, and seeking several strategies necessary for the dental practice in today's modern society (Pyle et al., 2006). Moreover, due to the continuous advancements in dentistry, dental professionals must be self-directed learners to constantly improve their dental knowledge and skills to be competent to face the ever-changing dental environment and deal with diverse scenarios (Premkumar et al., 2014).

SDL has numerous advantages in dental education, including improved independence, self-confidence, motivation, and arrangement for long-lasting learning (O'Shea, 2003). Furthermore, the shortened life expectancy of important information and the expanded complexity of the dental profession make SDL vital for dental students to maintain their knowledge and skills through constant learning and searching for information throughout their careers (Soliman & Al-Shaikh, 2015). Consequently, SDL has been recommended by many scholars for successful and efficient training of medical and dental students, residents, physicians, nurses, and other health-related professions (Murad et al., 2010; Simon & Aschenbrener, 2005). Besides, SDL is considered the most effective method to keep dental professionals updated and informed about the latest advances and research in dentistry (Murad & Varkey, 2008). In today's modern dental curricula, there is a massive shift toward student-centered teaching methods involving competency-based learning and active learning strategies (Bohaty et al., 2016). The SDL approach is practiced in dental education through various educational techniques,

including *problem-based learning (PBL)*, *team-based learning (TBL)*, and *flipped classrooms*, to link theoretical training with real-life dental practices (Joshi et al., 2022).

*PBL* is one of the most common teaching approaches adopted in dental education in response to the limitations of traditional teaching methods (Alrahlah, 2016). *SDL* is an integral part of *PBL* to help dental students in this process (Nerali et al., 2016). *PBL* follows the research of Barrows and Tamblyn (1980), in which they defined it as “the learning which results from the process of working toward the understanding of, or resolution of a problem” (Barrows & Tamblyn, 1980, p. 18). *PBL* practice involves presenting a case-based problem or scenario to a small group of students to brainstorm, discuss, and identify proper solutions; at the same time, the educator acts as a facilitator guiding and encouraging the students during this process (Atta & Alghamdi, 2018).

*PBL* was developed as a pedagogical strategy in 1968 in the School of Medicine at McMaster University in Canada to bridge the gap between theory and practice, as students had trouble applying their medical knowledge to clinical environments (Neufeld & Barrows, 1974). Subsequently, *PBL* spread worldwide and was adopted as an innovative approach in various domains of health professions education, including nursing, pharmacy, and dentistry (Polyzois et al., 2010). In the early 1990s, The Faculty of Odontology at Malmö University in Sweden was the first dental school to introduce *PBL* as a learning approach (Jacob, 2011). In 1995, *PBL* was promoted in North America by the the Institute of Medicine (US) Committee on the Future of Dental Education, which highly recommended a reevaluation of current dental curricula (Field, 1995).

*PBL* has been introduced in dental education because many dental students could not see the connection between the materials of the first year, such as anatomy and

biochemistry, and their profession as dentists (Irgananda et al., 2018). One of the primary goals of *PBL* is to promote SDL and improve problem-solving and critical thinking skills among dental students to assist them in selecting and using relevant learning resources (Murad & Varkey, 2008; Word, 2003). In addition, the valuable skills learned through *PBL* experience, including improved SDL, communication, delegation, teamwork, and appropriate use of relevant dental literature and research to resolve clinical dilemmas, are vital for dental students in their dental profession after graduation (Onyon, 2012). A study was conducted on 5th-year dental students to compare the *PBL* method with traditional lecture-based learning (Moreno López et al., 2009). Compared to the group that only received lectures, the *PBL* group received superior grades and devoted more time to the group projects and literature analyses. Another study concluded that dental students in a *PBL* curriculum outperformed their peers in a traditional lecture-based curriculum on the United States National Dental Boards Exam (NDBE) Part I (Fincham & Shuler, 2001).

*Team Based Learning (TBL)* has recently gained popularity worldwide as an innovative method of active learning in various education contexts, including health professions education (Bhat et al., 2021; Joshi et al., 2022). *TBL* was initially developed in the late 1970s by Professor Larry Michaelsen at Oklahoma University in the United States of America (Michaelsen et al., 2004). *TBL* is defined as an educational approach that emphasizes active learning in small groups of five to seven students allowing them to apply conceptual knowledge through a series of modules that require solo effort, teamwork, and prompt feedback (Parmelee et al., 2012). Compared to *PBL*, where one educator runs each small group, *TBL* has the advantage of small group learning without

the need for large numbers of educators (Dolmans et al., 2015). *TBL* practice includes prior preparation that requires SDL, as well as individual and team readiness assurance tests, problem-solving activities, and anonymous peer feedback and evaluation (Burgess et al., 2020).

In 2001, health science educators were funded by the United States government to integrate new educational methods, and *TBL* was selected as one of the innovative teaching strategies (Abdelkhalek et al., 2010; Matos et al., 2019). *TBL* is an effective and practical approach in health professions education, including dental education, to help students engage deeply with the content and know how to apply it in real-world scenarios (Abdelkhalek et al., 2010; Livingston et al., 2014; Takeuchi et al., 2015). *TBL* creates an engaging, motivating, and cooperative environment that values collective production increasing the desire for learning (Matos et al., 2019). Literature shows health professions students have positive perceptions regarding *TBL* (Abdelkhalek et al., 2010; Addo-Atuah, 2011; Clark et al., 2008). Similarly, in dental education, the *TBL* approach contributed to better academic performance and higher satisfaction among dental students compared to traditional lectures-based learning (Haj-Ali & Quran, 2013; Kumar & Gadbury-Amyot, 2012; Pileggi & O'Neill, 2008; Shetty et al., 2015; Takeuchi et al., 2015).

A more recent active learning approach is the *flipped classroom* which has received significant attention and has become widely used in various educational contexts, including higher education (O'Flaherty & Phillips, 2015), computer science (Giannakos et al., 2014), and engineering (Karabulut-Ilgu et al., 2018). The concept was originally developed in the United States when Sams and Bergmann (2010) posted a video on YouTube entitled "*The Flipped Classroom.*" This student-centered interactive

strategy changes how core content is delivered. The educator prerecords the lectures and publishes them online for students to learn independently, devoting the time in class for learning activities and discussion (Sams & Bergmann, 2012). This approach requires students to have a great deal of responsibility to prepare enough in advance to have a fundamental understanding of the subject that helps them participate well in class discussions and activities (Sams & Bergmann, 2012).

Recently, the *flipped classroom* has been widely spread as a new paradigm in health professions education (Hew & Lo, 2018), including medicine (Phillips & Wiesbauer, 2022), nursing (Njie-Carr et al., 2017), and dentistry (Bhat et al., 2021). The literature regarding students' perceptions of flipped classrooms in health professions education indicates higher academic achievement, greater student satisfaction, better engagement, increased motivation to learn, and more interest in the subject matter (Chen et al., 2018; Chowdhury et al., 2019; Hew & Lo, 2018; Ramnanan & Pound, 2017). In dental education, *the flipped classroom* is an interactive and collaborative approach that offers several advantages to dental students, including better academic performance, more autonomy, and greater control over their learning as the content acquisition is self-guided and self-paced (Bohaty et al., 2016; Chutinan et al., 2018; Park & Howell, 2015; Shapiro et al., 2014; Vanka et al., 2019).

### **Self-Directed Learning Readiness (SDLR)**

SDLR examines the extent to which a self-directed learner possesses personal control and recognizes the freedom connected with learning what is considered significant by the learner (Fisher et al., 2001). According to Wiley (1983), SDLR describes the extent to which learners possess the required abilities, attitudes, and

characteristics to participate effectively in the SDL process. Several assumptions regarding SDLR are implicitly incorporated in the previous definitions. First, adults are intrinsically self-directed, meaning that SDL operates along a continuum and varies by individual. Second, SDL requires competencies that can be developed to some degree, and the best method to learn independent conduct is to act independently. Third, independent learning ability in one context could be applied to various contexts (Candy, 1991; Guglielmino, 1989). However, caution must be given to the third assumption as it would be possible that a learner with a high SDLR level in a particular situation may not have the same level of readiness in a different, unknown, or new setting (Fisher et al., 2001).

The previous statement concerning the third assumption does not suggest that transferring several personality characteristics and skills to a different context would not be possible. Instead, as mentioned earlier, for learners to be self-directed in a particular context, they must possess prior knowledge and skills in that context. In other words, an individual with a high SDLR in algebra may not have the same level of SDLR in science. Accordingly, it is essential to evaluate SDLR in a particular context (Fisher et al., 2001).

As mentioned earlier, SDLR is deemed individualized and representative along a continuum. Consequently, the *Staged Self-Directed Learning (SSDL)* model was designed to enable differences among learners ingrained in the SDLR continuum (Grow, 1991; Tennant, 1992). Grow (1991) stressed that learners progress over levels of SDL growth, and the educators, instructors, or teachers contribute to supporting or impeding that progression. Furthermore, the quantity and quality of educators' guidance and directions should not be the same among learners since SDL readiness is individualized.

When a learner struggles with independent learning assignments, it is necessary to utilize a more pedagogical approach (Fisher et al., 2001). The literature revealed that when students with low SDLR levels are subjected to an SDL activity, they will demonstrate high anxiety levels, similar to students with high SDLR levels in a teacher-centered environment (Fisher et al., 2001; Grow, 1991; Wiley, 1983).

### **Self-Directed Learning Readiness Scale (SDLRS)**

Guglielmino (1977) designed the *Self-Directed Learning Readiness Scale (SDLRS)*, and it has become one of the most widely used instruments to assess the characteristics and the complexities that describe the readiness for participation in SDL (Guglielmino, 1977; Merriam & Bierema, 2014; Merriam et al., 2007). The scale is also used to examine the relationship between variables related to personality and self-direction. Guglielmino's (1977) *SDLRS* is also called the *Learning Preference Assessment (LPA)* to prevent possible respondent bias based on the name SDL. Guglielmino's (1977) *SDLRS* includes 58 items with a 5-point Likert response scale ranging from "almost always true" to "almost never true," with both positively and negatively phrased questions. It is used to evaluate learners' insights about the skills and attitudes connected with SDL. The scale was designed around eight significant elements that take into account both attitudes and personalities directly related to SDL. It is necessary to take into consideration that the SDLR scores can be variable, which implies that the performance of an individual can be changed and enhanced by experience and training. However, a higher SDL readiness score is linked with better performance on assignments requiring creativity and problem-solving skills (Dyner et al., 2008).

Guglielmino's (1977) *SDLRS* has been translated into multiple languages and used in several countries worldwide (Smedley, 2007). Holt (2011) evaluated 20 research studies that utilized Guglielmino's (1977) *SDLRS* and concluded that SDLR strongly correlates with several variables, including age, gender, and undergraduate major. The studies show improvement of SDLR over time, and SDLR is substantially connected to participants' educational level (Holt, 2011). Moreover, Sawatsky (2017) systematically reviewed various instruments to measure SDLR among health professions students. The authors found that out of 121 studies, Guglielmino's (1977) *SDLRS* was used in 40 studies, making it the most widely used scale for evaluating SDLR in health professions education. However, several arguments have surfaced regarding the application, cost, and construct validity of Guglielmino's (1977) *SDLRS* (Field, 1991; Straka & Hinz, 1996). Other scholars have raised issues concerning the reliability of *SDLRS* when applied to various classes and racial groups (Long & Agyekum, 1983; Straka, 1995).

In response to these concerns, Fisher et al. (2001) proposed a re-designed SDLR instrument known as the *Self-Directed Learning Readiness scale for Nursing Education (SDLRSNE)*. This re-designed instrument was developed in two stages. First, to evaluate the construct and content validity of items reflecting the SDLR, Fisher et al. (2001) utilized the Reactive Delphi method through an expert panel consisting of 11 nursing professionals experienced in teaching and research in the SDL domain to achieve consensus among them concerning the essential elements for SDL. The panel experts were requested to rate each item's relevancy using a Likert scale individually and independently.



In the second stage, *SDLRSNE* was evaluated and demonstrated reliability in a study of 201 undergraduate nursing students, in which Cronbach's alpha values for the overall scale ( $n= 40$ ), self-management subscale ( $n= 13$ ), desire for learning subscale ( $n= 12$ ), and self-control subscale ( $n= 15$ ) were 0.924, 0.857, 0.847 and 0.830 respectively (Fisher et al., 2001). Fisher and King (2010) reassessed *SDLRSNE* by conducting a confirmatory factor analysis to verify its validity and reliability. The researchers found that 11 items displayed some redundancy. Nevertheless, because of the small sample size, the researchers proposed using the current 40-item *SDLRSNE* until additional studies investigate the relations among the items across factors in various contexts (Fisher & King, 2010).

Fisher et al.'s. (2001) *SDLRSNE* was selected as the assessment tool in this research study to evaluate SDLR among FAU pre dental students for several reasons. First, *SDLRSNE*'s 40 items, representing the self-management, desire for learning, and self-control, were designed based on Garrison's (1997) SDL Model and evaluated using the Delphi technique and confirmatory factor analysis (Fisher et al., 2001; Fisher & King, 2010). Second, the *SDLRSNE* can serve as a cost-efficient educational and research instrument to diagnose learners' abilities and personality characteristics required for the SDL approach in health professions education (Fisher et al., 2001). Finally, the *SDLRSNE* has established reliability and construct validity in several research studies that evaluated SDLR among health professions students, including nursing (El Seesy et al., 2017, 2017; El-Gilany & Abusaad, 2013; Fisher et al., 2001; Smedley, 2007), pharmacy (Deyo et al., 2011), medicine (AlRadini et al., 2022; Salih et al., 2016; Soliman & Al-

Shaikh, 2015), and dentistry (Arooj et al., 2021; Nadi & Sadjadian, 2011; Siddiqui et al., 2021).

### **Chapter Summary**

This chapter covered the literature and research studies related to the following topics that are pertinent to the current study: various definitions of SDL within adult education, SDL history and the various perspectives adopted to define further emerging SDL theories and concepts, several models of SDL proposed by different scholars, SDL and the teaching strategies used in dental education to promote SDL in dental students, and SDLR definitions and scales to assess the characteristics required for the SDL approach. In the following chapter, I discuss the methodology used in this research study, including the research design, dependent and independent variables, demographic information, target population, sample size, instrumentation, and data analysis plan for each research question.

## CHAPTER 3. METHODOLOGY

This exploratory, descriptive study sought to evaluate the self-directed learning readiness (SDLR) level of predoctoral students at Florida Atlantic University. Also, the study investigated whether the level of SDLR would differ based on selected demographic variables, including age, sex, ethnicity/race, college/major, and year of study. This chapter discusses the current study's research methodology, which involves the research design, variables, demographic information, target population, sample size, instrumentation, data collection, and data analysis for each of the six research questions.

### **Research Design**

A research design is a scheme that serves as a conceptual framework guiding the research study process, involving analyzing, interpreting, and reporting data (Creswell & Clark, 2017). It contributes to maintaining rigor and reducing errors that could compromise the validity and findings of the research study (Gray et al., 2013). A non-experimental methodology was applied to the current study. Non-experimental research does not involve the manipulation of an independent variable or randomly assigning participants to groups or conditions (O'Dwyer & Bernard, 2013). Accordingly, the present study employed a quantitative cross-sectional survey-based research design. Quantitative research design typically helps researchers better understand phenomena in their natural occurrence (Gray et al., 2016). The quantitative method uses a sample to represent a target population and measurable variables to test objective theories (Huck, 2008).

A survey design was used in the present study to determine the SDLR scale profile of the participating FAU predoctoral students to investigate whether their SDLR mean score was statistically different from Fisher et al.'s (2001) mean score of 150.55, which indicates readiness for the SDL approach. Likewise, the present study used a survey to examine the differences between the outcome variable involving SDLR scores and the subject variables, including age, sex, ethnicity/race, college/major, and year of study. A survey study provides a numeric and quantitative description of population attributes, behaviors, opinions, and beliefs by examining a sample representing that population (Fowler, 2002). In addition, a survey method collects quantitative data for statistical analyses to examine correlations and differences, draw conclusions, and generalize the results (Cohen et al., 2018).

The research tool for data collection utilized in the present study was a self-administered online questionnaire designed by Qualtrics<sup>XM</sup>. Online survey research has many advantages, including cost and time effectiveness, rapid data entry, quick turnaround, broad distribution, ease of administration remotely, and a better way of reminding non-respondents (Creswell & Creswell, 2017; Dillman et al., 2014). The online questionnaire used was Fisher et al.'s (2001) *Self-Directed Learning Readiness Scale for Nursing Education (SDLRSNE)*. Additionally, the online questionnaire included seven demographic questions concerning age, sex, ethnicity/race, college/major, and year of study.

## Variables

### Dependent variable

The dependent variable in the present study was the SDLR scores among the study participants obtained from Fisher et al.'s (2001) *SDLRSNE*.

### Independent variables

The independent variables in the present study were the participants' age, sex, ethnicity/race, college/major, and year of study. The rationale for selecting these variables was based on the literature that considered these variables as influencing factors that play a significant role in developing readiness for the SDL approach. For example, Smedley (2007) proposed that readiness for the SDL could be considered a maturational process that increases with age. In addition, studies showed differences in readiness for the SDL between males and females (Balamurugan & Kumar, 2015; Kerr et al., 2020; Slater et al., 2017).

Other studies reported a relationship between SDLR and ethnicity/race (Reio, 2004; Smith et al., 2013). Scholars reported a significant difference in SDLR levels based on the type of college and academic majors. Other scholars argued that SDLR level improves across years of study (Alharbi, 2018; Alkorashy & Assi, 2017; Kocaman et al., 2009; Örs, 2018; Prabjane & Inthachot, 2013; Turunen et al., 1997; Yuan et al., 2012).

Descriptive statistics were used to summarize and organize the characteristics of the data set to create a sample profile for the participants. In contrast, inferential statistics were conducted to test significant associations and differences within the data set based on the independent variables mentioned earlier to draw inferences and conclusions about the sample.

## Demographics

The participants' demographic characteristics were collected to better describe the sample and to compare and understand how they influence their SDLR. Accordingly, the online survey used in this research included a demographic questionnaire to provide insights into participants' age, sex, ethnicity/race, college/ major, and year of study (Table 1).

**Table 1**

*Levels of Measurements of the independent Variables*

Variable	Level
Age (continuous)	Participants were requested to report their age in years
Sex (nominal)	Female Male
Ethnicity (nominal)	Hispanic, Latin, or of Spanish origin Non-Hispanic, Latin, or of Spanish origin
Race (nominal)	American Indian and Alaska Native Asian Blacks or African American Native Hawaiians and other Pacific Islanders White
College/Major (nominal)	A dropdown list including FAU colleges and majors
Year of study (nominal)	Freshman (0-29 credits) Sophomore (30-59 credits) Junior (60-89 credits) Senior (90 credits or more)

## Population and Sample Size

The present study's target population was FAU pre dental students. For the purpose of this study, FAU pre dental students are defined as students enrolled in an undergraduate science program who intend to apply for admission to dental school. I

reached the participants through the FAU Predental Association, one of FAU's pre-health professions student organizations. FAU Predental Association aims to educate FAU predental students about the requirements and application process for dental school admission. The FAU Predental Association has 498 members of different ages, ethnic and racial backgrounds, undergraduate majors, and years of study. All members of the FAU Predental Association were cordially invited via email to participate in this research study to promote a good response rate (Appendix A). The sample inclusion criteria stipulated that the participant must be 18 years or older and a predental student at FAU who intends to apply for dental school.

A power analysis was used to determine the required sample size and increase the data's chances of attaining statistical significance (Lipsey et al., 1987). The G\*Power 3.1 program was used to conduct an a-priori power analysis using a medium effect size of 0.25, an alpha of 0.05, and a power of 0.80 (Cohen, 1992). As a result, it was determined that the required sample size for this study is 180 FAU predental students.

Of the 498 FAU predental students invited to participate, 209 prospective participants started the online survey. Of these 209 respondents, 87 participants completed a few survey items, which led to the exclusion of these cases. However, only 155 FAU predental students completed all the survey items, resulting in a 31.12% response rate. Consequently, this study used a non-probability convenience sample of 155 FAU predental students. Unlike probability sampling, not all population members have an equal chance to participate in a study using convenience sampling (Creswell, 2009). Although convenience sampling creates opportunities for sampling bias, it is

frequently and widely used in educational research as it is inexpensive, uses volunteers, and considers the population at hand (Jager et al., 2017; Mills & Gay, 2019).

### **Instrumentation**

This research study used a structured questionnaire consisting of a demographic questionnaire and Fisher et al.'s (2001) *SDLRSNE*. The combination of the demographic questionnaire and Fisher et al.'s (2001) *SDLRSNE* resulted in a 47-item online survey. The estimated time to complete all survey items was 10 minutes. The survey started with a cover letter involving written consent without a signature (Appendix B).

#### **Part I: Demographic Questionnaire**

This questionnaire identified the independent variables, including age, sex, ethnicity/race, college/major, and year of study (Appendix C). The demographic questionnaire delivered a context for the collected data from the survey to understand the participants' background characteristics better and analyze their data.

#### **Part II: Fisher et al.'s (2001) *SDLRSNE***

As mentioned earlier in Chapter 2, the *SDLRSNE* was first designed and tested by Fisher et al. (2001). *SDLRSNE* consists of a questionnaire including 40 items with a five-point Likert scale ranging from “strongly disagree” to “strongly agree.” (Fisher et al., 2001). The *SDLRSNE* encompasses three dimensions: (a) self-management, (b) desire for learning, and (c) self-control (Appendix D). The self-management dimension includes 13 items, and the greatest score that can be achieved from this dimension is 65. Twelve elements represent the desire for learning dimension, and the highest score attainable from this dimension is 60. The last dimension involves 15 items related to self-control characteristics, and the maximum score for this dimension is 75. According to Fisher et



al. (2001), a total SDLR score exceeding 150 indicates high SDLR levels, while less than or equal to 150 suggests low SDLR levels.

### **Data Collection**

This research study involved human subjects as survey participants. Accordingly, permission from the Human Subjects Institutional Review Board (IRB) at FAU was obtained before collecting data. A copy of the IRB letter can be found in Appendix E. In addition, I contacted FAU Pre-Health Professions Office, and permission was granted to reach and contact FAU Predental Association to survey their members. Upon receiving all required approvals for conducting this research study, I contacted the FAU Predental Association's president to request assistance in distributing the survey to all association members.

On January 24, 2022, the survey link, including the consent letter and the questionnaire, was sent to all participants via email. Then, a reminder email was sent twice a month throughout the data collection period to remind nonrespondents and get more responses. In addition, I used a recruitment flyer to catch the attention of FAU predental students to participate in this research study (Appendix F). The flyer was posted in the College of Science and general classrooms at FAU. The flyer included a QR code that can be scanned and read quickly by a smartphone or any other digital device to give the participant easy access to the survey. The flyer also included the research study title and purpose, inclusion criteria, and contact information for any further information or queries.

Social media has grown in popularity as an effective recruitment tool for research (Gelinias et al., 2017). Consequently, the survey link and the recruitment flyer were

posted on the FAU Predental Association's social media platforms, including WhatsApp, Instagram, and Linktree. In addition, I found that WhatsApp was the preferred method for FAU Predental Association to communicate with its members; therefore, I joined the association's WhatsApp group and posted the survey link and recruitment flyer every week throughout the data collection period. To promote additional participation in this research study and obtain more responses from FAU predental students, I attended one of the FAU Predental Association's general body meetings. I talked with the members about the study and its purpose, stressed the confidentiality and anonymity of participants' information, and addressed any questions or concerns related to their involvement.

Participation was anonymous and voluntary. The participants had the option to withdraw from the study. No known risks were associated with participation in this research study. Participants received no direct benefits from participating in this research study. However, by participating and completing the online questionnaire, participants had the opportunity to know their current level of readiness for the SDL approach at the end of the survey.

Data were collected electronically via Qualtrics<sup>XM</sup>. The online questionnaire began with a cover letter that served as informed consent. By clicking on the "I agree to participate in this research study" option at the end of the consent letter, the participants were taken to the questionnaire to start answering the questions. However, invitees could click the "I do not agree to participate in this research study" option, refuse to participate, and exit Qualtrics<sup>XM</sup>. The online questionnaire was structured so the participants would need no more than 10 minutes to complete all survey items. No personally identifiable information was gathered. Demographic information were gathered for comparison

purposes, including age, sex, ethnicity/race, college/major, and year of study. However, no guarantee of complete anonymity could be granted due to the medium used by this second party – Qualtrics<sup>XM</sup>.

Consistent with FAU IRB policy, I took several measures to maintain the respondents' confidentiality and anonymity. First, I used the anonymous link feature in Qualtrics<sup>XM</sup> for survey links to prevent them from being tracked or used to identify participants. Moreover, the anonymize responses feature was enabled to stop Qualtrics<sup>XM</sup> from recording participants' IP Addresses, location data, and contact information. The survey expired on May 6, 2022. The information collected from participants was saved in aggregate form only. I was the only one with access to the data stored securely in a password-protected computer for three years and then destroyed.

### **Data Analysis**

First, raw data was exported from Qualtrics<sup>XM</sup> as an XLSX file to Microsoft Excel<sup>®</sup> to organize and visually present the collected data. Next, I used numbers to represent all nominal data. Finally, after cleaning the data, the collected data were imported from the Excel spreadsheet into the Statistical Package for the Social Sciences (IBM SPSS<sup>©</sup>) version 28 for statistical analysis.

First, the internal consistency reliability of Fisher et al.'s (2001) *SDLRSNE* used in this research study was tested using Cronbach's alpha. Reliability of a scale, ranging from 0 to 1, represents the consistency of the results delivered in a study, ensuring that the several items measuring the same general construct produce consistent scores (McBride, 2016). A minimum acceptable alpha coefficient for a valid, reliable scale is .60 - .70. Nevertheless, an alpha coefficient closer to .90 is preferable (Aron et al., 2005).

Consequently, Cronbach's alpha coefficient for the overall scale and its three subscales were investigated to check if the results were consistent with reliability reports from previous research studies that used Fisher et al.'s (2001) *SDLRSNE*.

Descriptive analyses, including measures of central tendency, measures of variability, and frequency distribution, were used to describe the sample from the collected data based on the independent variables in this research study: age, sex, ethnicity/race, college/ major, and year of study.

Below are the six research questions that guided the present study and a description of how each of the six research questions was analyzed.

RQ1: What is the level of Self-Directed Learning Readiness (SDLR) among predoctoral students at FAU?

The SDLR scores were used to identify the level of readiness for the SDL approach among FAU predoctoral students. First, SDLR scores were described using means, standard deviations, range, minimum, and maximum. Then, a one-sample t-test was performed to analyze whether the SDLR mean score of the participating FAU predoctoral students was statistically different from Fisher et al.'s (2001) mean score of 150.55, which indicates readiness for the SDL approach.

RQ2: Does the level of SDLR among predoctoral students at FAU vary by age?

A simple linear regression was performed to analyze the direct association between SDLR level and age.

RQ3: Does the level of SDLR among predoctoral students at FAU vary by sex?

An independent samples t-test conducted used to determine if there was a significant difference between SDLR level and sex.

RQ4: Does the level of SDLR among pre dental students at FAU vary by ethnicity/race?

A two-way ANOVA was carried out to investigate the effect of ethnicity and race on the level of SDLR, followed by Tukey's Honest Significant Difference (HSD) test to identify where the significant differences existed.

RQ5: Does the level of SDLR among pre dental students at FAU vary by college/major?

A one-way ANOVA was conducted to determine if there was a significant difference between the SDLR level and the variable of major.

RQ6: Does the level of SDLR for pre dental students at FAU differ by year of study?

A one-way ANOVA was carried out to determine if there was a significant difference between the SDLR level and the year of study, followed by Tukey's HSD test to identify where the significant differences existed.

The level of statistical significance ( $p$  value) set for the present study was a  $p$  value less than 0.05 ( $p < .05$ ). The  $P$  stands for probability and measures how likely an observed outcome is due to chance, considering the null hypothesis is true (Fisher, 1992).

### **Chapter Summary**

This chapter covered the research methodology used in the present study. This non-experimental research study employed a quantitative cross-sectional descriptive design using an online survey designed by Qualtrics<sup>XM</sup>. The dependent variable in this research study was the total score of the SDLR among pre dental students at FAU, while the independent variables were age, sex, ethnicity/race, college/major, and the year of study. The target population was FAU pre dental students, and I reached the participant through FAU Pre dental Association, supervised by FAU Pre-Health Professions Office.

Following IRB approval and FAU Pre-Health Professions Office permission, data collection began on January 24 and ended on May 6, 2022.

A convenience sample of 155 FAU predoctoral students was collected. Participants completed Fisher et al.'s (2001) *SDLRSNE* ( $n = 40$ ) and a demographic questionnaire ( $n = 7$ ). Descriptive and inferential statistics were conducted to describe and analyze the data set. In the following chapter, I present the data analyses and results for the six research questions.

## CHAPTER 4. RESULTS

This research study aimed to assess the readiness level for the self-directed learning (SDL) approach among FAU predoctoral students. Also, the study investigated whether their self-directed learning readiness (SDLR) level would differ based on predetermined demographics, including age, sex, ethnicity/race, college/major, and year of study. The sample inclusion criteria stipulated that the participant should be 18 years or older and a predoctoral student at FAU. This research study utilized a convenience sample composed of one hundred fifty-five ( $n = 155$ ) FAU predoctoral students who completed the demographic questions and the *SDLRSNE* scale. Data collection took place in the Spring term of 2022, from January 10 to May 6, 2022.

Data were tabulated using Microsoft Excel<sup>®</sup>, nominal variables were coded using numbers for the purpose of statistics, and then data were transferred to IBM SPSS Statistics, version 28.0. Research questions and hypotheses were answered and tested using descriptive and inferential statistics. This chapter provides an overview of the sample, the participants' demographic characteristics, the *Self-Directed Learning Readiness Scale for Nursing Education (SDLRSNE)* reliability (Fisher et al., 2001), and the results for each research question.

### **Overview of the Sample**

As mentioned earlier, FAU Predoctoral Association has 498 members from various ethnicity, race, academic majors, and years of study. Therefore, all association members were cordially invited to participate in this research study. However, of the potential 498,

209 respondents clicked the “I agree to participate in this research study” button in the Qualtrics<sup>XM</sup>. Of these 209, only 87 invitees filled out a few questionnaire items; therefore, their responses were excluded. Only 155 FAU predoctoral students completed all the survey items, resulting in a 31.12% response rate.

### Demographic Characteristics of the Participants

The age of the participating FAU predoctoral students ranged from 18 to 31, with a mean age of  $M = 21.58$  and a standard deviation of  $SD = 2.57$  (Table 2).

**Table 2**

*Descriptive Statistics by Age*

<i>n</i>	Range	Min	Max	<i>M</i>	<i>SD</i>
155	13	18	31	21.85	2.57

Of the 155 participants, eighty-four (54.19%) were female, and seventy-one (45.81%) were male. Seventy-five (48.39%) were of Hispanic, Latin, or Spanish origin, while eighty (51.61%) were not of Hispanic, Latin, or Spanish origin. Seventeen (10.97%) participants self-identified as Asian, forty-three (27.74%) participants self-identified as Black or African American, and ninety-five (61.29%) participants self-identified as White. Neither American Indian or Alaska Native, nor Native Hawaiian or Other Pacific Islander was reported.

All participants were enrolled in the Charles E. Schmidt College of Science ( $n = 155$ ), and no other colleges were reported. Regarding their current (or anticipated) major, fifty-six (36.13%) participants reported biology, thirty-four (21.94%) participants reported chemistry and biochemistry, thirty-four (21.94%) participants reported health science, and thirty-one (20%) participants reported neuroscience and behavior. In



reporting their current year of study, twenty-three (14.84%) participants were freshmen, forty-one (26.45%) participants were sophomores, thirty-eight (24.52%) participants were juniors, and fifty-three (34.19%) participants were seniors. Numbers and percentages of the participating FAU predoctoral students are summarized in Table 3.

**Table 3**

*Descriptive Statistics by Sex, Ethnicity, Race, Major, Year of Study*

Variable	<i>n</i>	%
Sex		
Female	84	54.19%
Male	71	45.81%
Ethnicity		
Hispanic, Latin, or Spanish origin	75	48.39%
Non-Hispanic, Latin, or of Spanish origin	80	51.61%
Race		
Asian	17	10.97%
Black or African American	43	27.74%
White	95	61.29%
Major		
Biology	56	36.13%
Chemistry and biochemistry	34	21.94%
Health science	34	21.94%
Neuroscience and behavior	31	20%
Year of study		
Freshman	23	14.84%
Sophomore	41	26.45%
Junior	38	24.52%
Senior	53	34.19%

*N* = 155

### **Fisher et al.'s (2001) SDLRSNE Reliability**

Internal consistency reliability of the *SDLRSNE* was tested using Cronbach's alpha. Results indicated that the alpha coefficient for the total items ( $n = 40$ ) was 0.89. Moreover, the reliability of each subscale was investigated. The results revealed that the alpha coefficient for self-management with 13 items was .62, the desire for learning with 12 items was .79, and the self-control with 15 items was .82 (Table 4).

**Table 4***Cronbach's Alphas for SDLRSNE and its Subscales*

Item	<i>n</i>	Cronbach's alpha
Total items	40	.89
Self-management	13	.62
Desire for learning	12	.79
Self-control	15	.82

According to Smedley (2007), a Cronbach alpha of 0.6 or more supports the presence of distinguished subscales in the *SDLRSNE*. Also, these alpha coefficients are within the acceptable range of Cronbach's alpha reported in previous studies that used *SDLRSNE* (Balamurugan & Kumar, 2015; El Seesy et al., 2017; El-Gilany & Abusaad, 2013; Fasce et al., 2011; Fisher et al., 2001; Smedley, 2007).

#### **Analysis of Research Questions and Hypotheses**

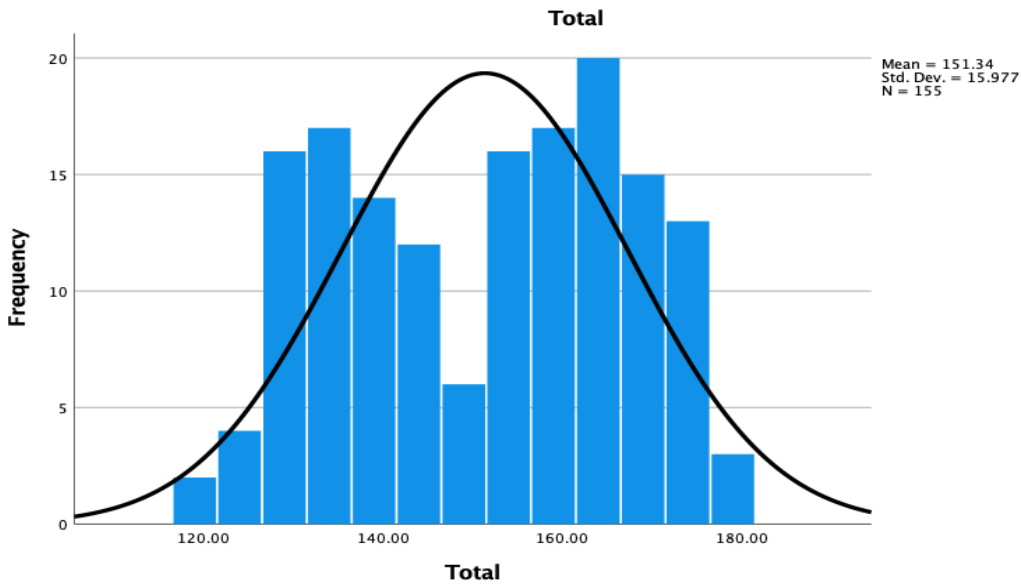
RQ1: What is the level of Self-Directed Learning Readiness (SDLR) among predoctoral students at FAU?

Hypothesis 1: Predoctoral students at FAU would have SDL readiness scores for the SDL approach, in which a total score  $> 150$ , with a maximum of 200, implies a high SDLR level, while a total score  $\leq 150$  represents a low SDLR level (Fisher et al., 2001). To answer RQ1, the SDLR scores and descriptive statistics were used to describe the SDLR scale profile of the participating FAU predoctoral students. Additionally, a one-sample t-test was conducted to compare the mean SDLR score of the participants against Fisher et al.'s (2001) mean score ( $M = 150.55$ ).

The results show that the participating FAU predoctoral students had a distribution of SDLR total scores from 119 to 179 ( $M = 151.33$ ,  $SD = 15.97$ ) (Figure 3).

**Figure 3**

*FAU Predental Students Total SDLR Scores Distribution*



The mean SDLR score among the participating FAU Predental Students ( $M = 151.33$ ) is consistent with Fisher et al.'s (2001) mean score ( $M = 150.55$ ), indicating high readiness for the SDL approach. In addition, out of 155 participants, 88 (56.77%) had high SDLR levels, as they scored higher than 150. The mean age among those 88 participants was 22.86. Forty-five (51.1%) participants were male. Forty-five (51.1%) participants were not of Hispanic, Latin, or Spanish origin. Sixty-four (72.7%) participants self-identified as White. Thirty-six (40.9%) participants reported biology major. Fifty-one (58%) participants were seniors.

The mean scores for the *SDLRSNE* subscales were as follows: self-management = 45.63 ( $SD = 4.32$ ), desire for learning = 46.39 ( $SD = 5.51$ ), and self-control = 58.30 ( $SD = 6.81$ ). Accordingly, predental students at FAU have SDL scores of readiness for the SDL approach. Descriptive statistics of the total *SDLRSNE* and its subscales are summarized in Table 5.

**Table 5***Descriptive Statistics of SDLRSNE and its Subscales Scores*

Item	<i>M</i>	<i>SD</i>	Range	Min	Max
Total Scale	151.33	15.97	60	119	179
Self-management	45.63	4.32	20	36	56
Desire for learning	46.39	5.51	23	35	58
Self-control	58.30	6.81	30	43	73

Furthermore, the results of the one-sample t-test indicate that the mean value of SDLR ( $M = 151.33$ ,  $SD = 15.97$ ) was not significantly different than Fisher et al.'s (2001) mean;  $t(154) = .612$ ,  $p = .541$  (Table 6).

**Table 6***One-Sample T-Test for SDLR Score*

Variable	<i>t</i>	<i>df</i>	Sig.	<i>MD</i>	95% Confidence Interval	
					Lower	upper
SDLR score	.612	154	.541	.785	-1.7497	3.3206

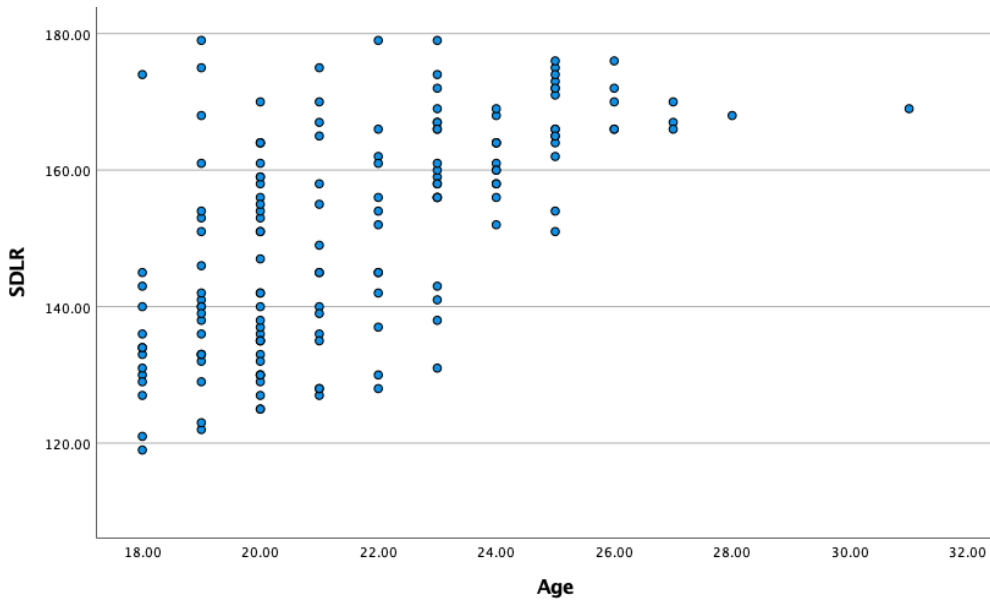
Test Value = 150.55

RQ2: Does the level of SDLR among predoctoral students at FAU vary by age?

Hypothesis 2: There will be a significant difference in the level of SDLR among predoctoral students at FAU based on age. To test this hypothesis, a simple linear regression was carried out to investigate the direct association between SDLR level and the variable of age. The regression results indicate a positive association between SDLR scores and age (Figure 4), which was confirmed with a Pearson's correlation coefficient of 0.610 (Table 7).

**Figure 4**

*The Scatterplot for SDLR Scores and Age*



**Table 7**

*Pearson's Correlation Coefficient for SDLR Scores and Age*

		SDLR	Age
Pearson Correlation	SDLR	1.000	.610
	Age	.610	1.000
Sig. (1-tailed)	SDLR	.	<.001
	Age	.000	.
N	SDLR	155	155
	Age	155	155

Moreover, the regression results show that the variable of age explained 37.2% of the variance in the SDLR scores, and the model was significant ( $R^2 = .372$ ,  $F(1,153) = 90.777$ ,  $p < .001$ ). It was also found that age significantly predicted the SDLR level ( $\beta_1 = 3.79$ ,  $p < .001$ ), and the final predictive model (regression equation) was:  
 SDLR score = 69.49 + 3.79 (age).

Based on the regression results, there was sufficient evidence to support the alternative hypothesis and reject the null hypothesis stating that there will be no significant difference in SDLR level among FAU predoctoral students based on age. The linear regression results are summarized in Tables 8, 9, and 10.

**Table 8**

*The Model Summary Table for the Age Variable*

<i>R</i>	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>	Std. Error of the Estimate
.610 <sup>a</sup>	.372	.368	12.69866

**Table 9**

*The ANOVA Table for the Age Variable*

Model	<i>df</i>	<i>f</i>	Sig.
Regression	1	90.777	<.001
Residual	153		

**Table 10**

*The Coefficients Table for the Age Variable*

Variable	<i>B</i>	Std. Error	Beta	<i>t</i>	Sig.
Constant	69.490	8.651		8.033	<.001
Age	3.793	.398	.610	9.528	<.001

RQ3: Does the level of SDLR among predoctoral students at FAU differ by sex?

Hypothesis 3: There will be a significant difference in the level of SDLR among predoctoral students at FAU based on sex. To test this hypothesis, an independent samples t-test was conducted to determine if there was a significant difference between SDLR and sex. No significant difference existed by sex for the SDLR scores for female participants

( $M = 150.22$ ,  $SD = 15.46$ ) and male participants ( $M = 152.65$ ,  $SD = 16.57$ ),  $t(153) = -.940$ ,  $p = .349$ .

The t-test results did not support the alternative hypothesis; therefore, the null hypothesis that there will be no significant difference in SDLR level among FAU preidental students based on sex was retained. The independent samples t-test results are summarized in Tables 11 and 12.

**Table 11**

*Descriptive Statistics by Sex*

Sex	<i>n</i>	<i>M</i>	<i>SD</i>
Female	84	150.22	15.46808
Male	71	152.6479	16.57287

$N = 155$

**Table 12**

*Independent Samples t-Test for the Sex Variable*

	<i>F</i>	<i>Sig.</i>	<i>t</i>	<i>df</i>	<i>Sig</i>
Equal variances assumed	.505	.479	-.940	153	.349
Equal variances not assumed			-.934	144.89	.352

RQ4: Does the level of SDLR among preidental students at FAU differ by ethnicity/race?

Hypothesis 4: There will be a significant difference in the level of SDLR among preidental students at FAU based on ethnicity/race. To test this hypothesis, a two-way ANOVA was performed to analyze the effect of ethnicity and race on the level of SDLR, followed by Tukey's HSD test to determine where the significant differences existed. The two-way ANOVA results showed no statistically significant interaction between the effects of ethnicity and race on the level of SDLR,  $F(1, 150) = 3.43$ ,  $p = .066$ ,  $\eta^2 = .022$

(small effect size). Eta squared ( $\eta^2$ ) is a measure of effect size representing the proportion of variance attributed to each main effect and interaction effect in the ANOVA model (Richardson, 2011)

Simple main effects analysis showed that ethnicity did not have a statistically significant effect on the level of SDLR,  $p = .072$ ,  $\eta^2 = .021$  (small effect size). In contrast, a simple main effects analysis showed that race had a statistically significant effect on the level of SDLR,  $p = .024$ ,  $\eta^2 = .048$  (medium effect size).

Tukey's HSD test for multiple comparisons found that the mean value of the SDLR score was significantly different between Blacks or African Americans ( $M = 146.46$ ,  $SD = 16.49$ ) and Whites ( $M = 154.04$ ,  $SD = 15.52$ ),  $p = .024$ , 95%  $C.I = -14.340$ ,  $-0.80$ . There was no statistically significant difference in mean SDLR scores between Asians ( $M = 148.52$ ,  $SD = 14.54$ ) and Blacks or African Americans ( $M = 146.46$ ,  $SD = 16.49$ ),  $p = .88$  or between Asians ( $M = 148.52$ ,  $SD = 14.54$ ) and Whites ( $M = 154.04$ ,  $SD = 15.52$ ),  $p = .37$ .

The ANOVA results did not support the alternative hypothesis regarding ethnicity; therefore, the null hypothesis stating that there will be no significant difference in SDLR level among FAU predoctoral students based on ethnicity was retained. On the contrary, the ANOVA results supported the alternative hypothesis regarding race; therefore, the null hypothesis stating there will be no significant difference in SDLR level among FAU predoctoral students based on ethnicity was rejected. The results of the two-way ANOVA are summarized in Tables 13, 14, and 15.



**Table 13***Descriptive Statistics by Ethnicity/Race*

Ethnicity	Race	<i>n</i>	<i>M</i>	<i>SD</i>
Hispanic, Latin, or of Spanish origin	Blacks or African American	25	142.04	16.68
	White	50	154.10	14.97
	Total	75	150.08	16.47
Non-Hispanic, Latin, or of Spanish origin	Asian	17	148.52	14.54
	Blacks or African American	18	152.61	14.49
	White	45	153.97	16.28
	Total	80	152.51	15.50
Total	Asian	17	148.52	14.54
	Blacks or African American	43	146.46	16.49
	White	95	154.04	15.52
	Total	155	151.33	15.97

**Table 14***Tests of Between-Subjects Effects for the Ethnicity/Race Variables*

Source	Type III <i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>Sig</i>	$\eta_p^2$
Corrected Model	3019.604 <sup>a</sup>	4	754.901	3.120	.017	.077
Intercept	2601662.695	1	2601662.695	10753.353	<.001	.986
Ethnicity	792.430	1	792.430	3.275	.072	.021
Race	1843.811	2	921.905	3.810	.024	.048
Ethnicity * Race	829.941	1	829.941	3.430	.066	.022
Error	36290.951	150	241.940			
Total	3589187.000	155				
Corrected Total	39310.555	154				

a. R Squared = .077 (Adjusted R Squared = .052)

**Table 15**

*Multiple Comparisons Results for the Ethnicity/Race Variables*

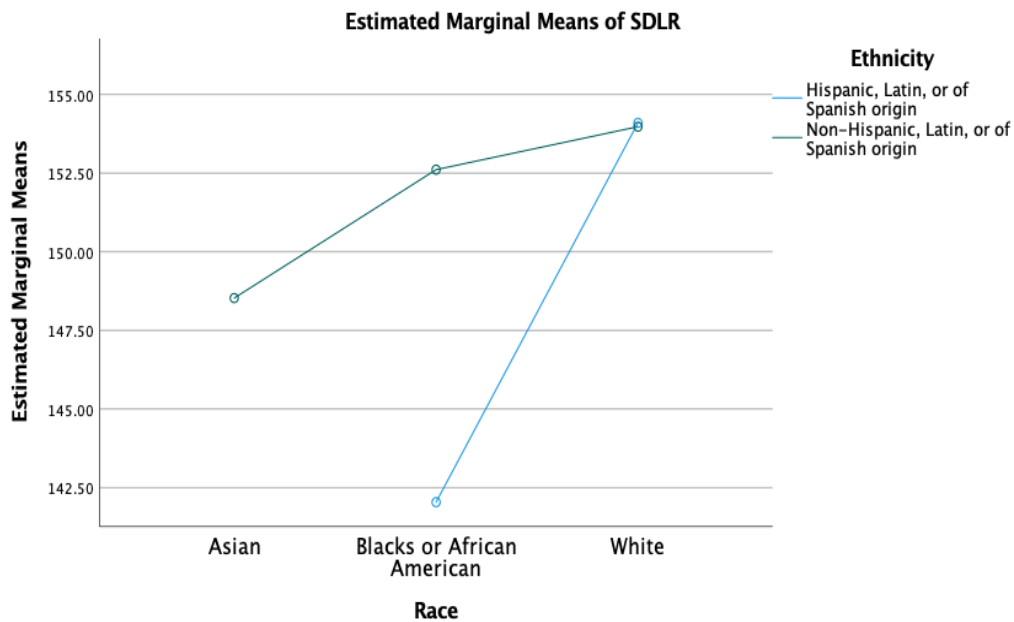
Race	Race	MD	SE	Sig.	95% Confidence Interval	
					Lower	upper
A	BAA	2.0643	4.45624	.889	-8.4846	12.6132
	W	-5.5127	4.09615	.372	-15.2091	4.1838
BAA	A	-2.0643	4.45626	.889	-12.6132	8.4846
	W	-7.5770*	2.85889	.024	-14.3446	-.8094
W	A	5.5127	4.09615	.372	-4.1838	15.2091
	BAA	7.5770*	2.85889	.024	.8094	14.3446

\* The mean difference is significant at the 0.05 level.  
 A= Asian; BAA= Black or African American; W= White.

The plot of the mean SCLR score for each combination of groups of ethnicity and race is plotted in a line graph as shown in Figure 5.

**Figure 5**

*Plot of the results for SCLR and Ethnicity/Race*



RQ5: Does the level of SDLR among predoctoral students at FAU differ by college/major?

Hypothesis 5: There will be a significant difference in the level of SDLR among predoctoral students at FAU based on college/major. Due to the lack of diversity in the college variable, I could not examine the influence of the college variable on the SDLR level.

A one-way ANOVA was conducted to examine if there was a statistically significant difference between the level of SDLR and the academic major. The ANOVA results showed no statistically significant differences between the means of the academic majors,  $F(3, 151) = .584, p = .626, \eta^2 = .011$  (small effect size).

The ANOVA results did not support the alternative hypothesis. Consequently, the null hypothesis that there will be no significant difference in SDLR level among FAU predoctoral students based on the academic major was retained. The one-way ANOVA results are summarized in Tables 16, 17, and 18.

**Table 16**

*Descriptive Statistics by Academic Major*

Academic Major	<i>n</i>	<i>M</i>	<i>SD</i>
Biology	56	153.48	14.83
Chemistry and Biochemistry	34	149.17	16.44
Health Science	34	150.70	16.82
Neuroscience and Behavior	31	150.51	16.83

*N* = 155

**Table 17***One-way ANOVA Results for the Academic Major Variable*

	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>Sig</i>
Between Groups	450.831	3	150.27	.584	0.626
Within Groups	38859.72	151	257.34		
Total	39310.55	154			

**Table 18***Tests of Between-Subjects Effects for the Academic Major Variable*

Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>Sig</i>	$\eta_p^2$
Corrected Model	3	150.277	.584	.626	.011
Intercept	1	3347494.379	13007.598	<.001	.989
Major	3	150.277	.584	.626	.011
Error	151	257.349			
Total	155				
Corrected Total	154				

a. R Squared = .011 (Adjusted R Squared = -.008)

RQ6: Does the level of SDLR for pre dental students at FAU differ by year of study?

Hypothesis 6: There will be a significant difference in the level of SDLR among pre dental students at FAU based on the year of study. To test this hypothesis, a one-way ANOVA was conducted to investigate if there was a statistically significant difference between the level of SDLR and the year of study, followed by Tukey's HSD test to determine where the significant differences existed. The ANOVA results showed a statistically significant difference in the mean SDLR score between at least three groups,  $F(3, 151) = 74.41, p < .001, \eta^2 = .597$  (large effect size).

Tukey's HSD test for multiple comparisons showed that the mean value of the SDLR score was significantly different between freshmen ( $M = 134.37$ ,  $SD = 11.22$ ) and juniors ( $M = 156.89$ ,  $SD = 9.84$ ),  $p = <.001$ , 95%  $C.I. = -29.18, -15.12$ , as well as between freshmen ( $M = 134.37$ ,  $SD = 11.22$ ) and seniors ( $M = 164.49$ ,  $SD = 8.77$ ),  $p = <.001$ , 95%  $C.I. = -36.39, -23.10$ . Also, the mean value of the SDLR score was significantly different between sophomores ( $M = 138.48$ ,  $SD = 11.73$ ) and juniors ( $M = 156.89$ ,  $SD = 9.84$ ),  $p = <.001$ , 95%  $C.I. = -24.40, -12.41$ , as well as between sophomores ( $M = 138.48$ ,  $SD = 11.73$ ) and seniors ( $M = 164.49$ ,  $SD = 8.77$ ),  $p = <.001$ , 95%  $C.I. = -31.54, -20.46$ .

Furthermore, Tukey's HSD test indicated that juniors ( $M = 156.89$ ,  $SD = 9.84$ ) and seniors ( $M = 164.49$ ,  $SD = 8.77$ ) differed significantly,  $p = .004$ , 95%  $C.I. = -13.25, -1.93$ . There was no statistically significant difference in mean SDLR scores between freshmen ( $M = 134.37$ ,  $SD = 11.22$ ) and sophomores ( $M = 138.48$ ,  $SD = 11.73$ ),  $p = .49$ .

The ANOVA results supported the alternative hypothesis; therefore, the null hypothesis stating there will be no significant difference in SDLR level among FAU predoctoral students based on year of study was rejected. The results of one-way ANOVA are summarized in Tables 19, 20, 21, and 22.

**Table 19***Descriptive Statistics by Year of Study*

Year of Study	<i>n</i>	<i>M</i>	<i>SD</i>
Freshman	23	134.73	11.22
Sophomore	41	138.48	11.73
Junior	38	156.89	9.84
Senior	53	164.49	8.77

*N* = 155**Table 20***One-way ANOVA Results for the Year of Study Variable*

	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>Sig</i>
Between Groups	23449.05	3	7816.35	74.41	<.001
Within Groups	15861.50	151	105.04		
Total	39310.55	154			

**Table 21***Tests of Between-Subjects Effects for the Year of Study Variable*

Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>Sig</i>	$\eta_p^2$
Corrected Model	3	7816.351	74.411	<.001	.597
Intercept	1	3127437.194	29772.905	<.001	.995
Year	3	7816.351	74.411	<.001	.597
Error	151	105.043			
Total	155				
Corrected Total	154				

a. R Squared = .597 (Adjusted R Squared = .588)

**Table 22**

*Multiple Comparisons Results for the Year of Study Variable*

YOS	YOS	MD	SE	Sig.	95% Confidence Interval	
					Lower	upper
F	SO	-3.748674	2.67004	.499	-10.6851	3.1877
	J	-22.15560*	2.70765	<.001	-29.1897	-15.1215
	SE	-29.75143*	2.55911	<.001	-36.3997	-23.1032
SO	F	3.74867	2.67004	.499	-3.1877	10.6851
	J	-18.40693*	2.30788	<.001	-24.4025	-12.4114
	SE	-26.00276*	2.13166	<.001	-31.5405	-20.4650
J	F	22.15561*	2.70765	<.001	15.1215	29.1897
	SO	18.40693*	2.30788	<.001	12.4114	24.4025
	SE	-7.59583*	2.17859	.004	-13.2555	-1.9361
SE	F	29.75144	2.55911	<.001	23.1032	36.3997
	SO	26.00276*	2.13166	<.001	20.4650	31.5405
	SE	7.59583*	2.17859	.004	1.9361	13.2555

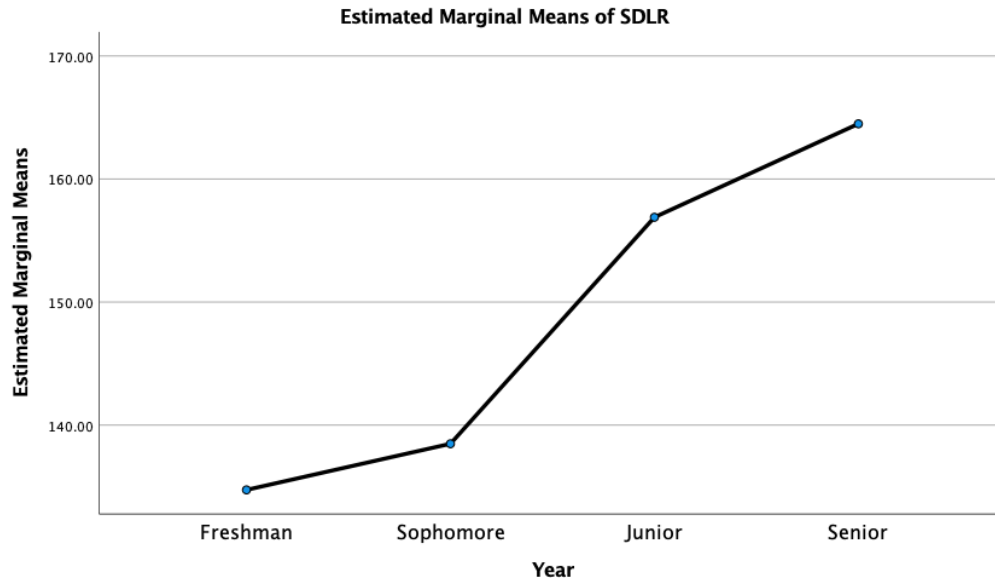
\* The mean difference is significant at the 0.05 level.

YOS = Year of Study; F = Freshman; SO = Sophomore; J = Junior; SE = Senior.

The mean SDLR score for the year of study is plotted in a line graph (Figure 6).

**Figure 6**

*Profile Plots of SDLR and Year of Study*



## Chapter Summary

This chapter presented the results of the six research questions that guided this research study. In addition, this chapter presented an overview of the sample and the demographic characteristics of the participants. A total of 155 FAU predoctoral students participated and completed the online survey, including the demographic questions and Fisher et al.'s (2001) *SDLRSNE*. Internal consistency reliability of the 40-item *SDLRSNE* and the subscales were assessed using Cronbach's alpha. The results show that the participating FAU predoctoral students had SDLR total scores ranging from 119 to 179, with a mean of 151.33. This mean was not significantly different from Fisher et al.'s (2001) mean of 150.55.

The present study's findings showed a statistically significant difference in SDLR level among FAU predoctoral students based on age, race, and year of study. On the other hand, there was no statistically significant difference in SDLR level among FAU predoctoral students based on sex, ethnicity, and academic major. The effect of the college variable on SDLR was not investigated as all participating FAU predoctoral students were enrolled in the Charles E. Schmidt College of Science.



## CHAPTER 5. DISCUSSION AND CONCLUSION

Chapter One was an introduction to the research study involving the statement of the problem, the purpose of the study, significance, and research questions and hypotheses. Additionally, it covered the study limitations and delimitations, definitions of terms, and the outline of the study. Chapter Two covered the literature review on self-directed learning (SDL) and self-directed learning readiness (SDLR), including SDL definitions, history, models, and instruments evaluating SDLR. Chapter Three discussed the methodology used in this research study, including research design, variables, demographic information, target population, sample size, instrumentation, data collection, and data analysis plan for each of the six research questions. Chapter Four presented an overview of the sample, demographic characteristics of the participants, scale reliability, and the results of the data analysis for each of the six research questions, including descriptive and inferential statistical analyses. This dissertation's final chapter presents a synoptic review of the research study. It summarizes and discusses the study's major findings and results presented in Chapter Four concerning each research question and its respective hypothesis. It also addresses the limitations and strengths of this research study, proposes opportunities and recommendations for future studies, and discusses implications for practice.

### **Review of the Study**

Dental schools require a high aptitude for learning new knowledge and skills, enabling dental students to cope and keep up with the ever-increasing changes in

dentistry (Siddiqui et al., 2021). Therefore, dental students need to be motivated, confident, and independent to become lifelong learners, and to acquire such qualities; dental students should be self-directed learners (Arooj et al., 2021). Moreover, SDL is the cornerstone of modern dental education, and most dental schools design their curricula to promote self-direction and provide their students with the essential competencies to evolve into lifelong learners (Marchan, 2021; Premkumar et al., 2014).

The literature is vast regarding medical, dental, and nursing student readiness for the SDL approach but sparse regarding pre-dental student readiness for such an approach. Therefore, this research study focused on pre-dental students to fill the gap in the literature concerning SDLR among pre-dental students. In addition, I was able to examine if certain demographic variables, including age, sex, ethnicity/race, college/major, and year of study, could impact readiness for the SDL approach among pre-dental students.

This quantitative cross-sectional research study used an online survey designed by Qualtrics<sup>XM</sup> to assess the level of SDLR among pre-dental students at Florida Atlantic University. In addition, the study investigated whether the SDLR level will differ based on selected demographic variables, including age, sex, ethnicity/race, college/major, and year of study.

Six major research questions and hypotheses guided the present study:

RQ1: What is the level of SDLR among pre-dental students at FAU?

H1: Pre-dental students at FAU would have SDL readiness scores for the SDL approach, in which a total score >150, with a maximum of 200, implies a high level of SDLR (Fisher et al., 2001).

RQ2: Does the level of SDLR among pre-dental students at FAU differ by age?

H2: There will be a significant difference in the level of SDLR among predoctoral students at FAU based on age.

RQ3: Does the level of SDLR among predoctoral students at FAU differ by sex?

H3: There will be a significant difference in the level of SDLR among predoctoral students at FAU based on sex.

RQ4: Does the level of SDLR among predoctoral students at FAU differ by ethnicity/race?

H4: There will be a significant difference in the level of SDLR among predoctoral students at FAU based on ethnicity/race.

RQ5: Does the level of SDLR among predoctoral students at FAU differ by college/major?

H5: There will be a significant difference in the level of SDLR among predoctoral students at FAU based on college/major.

RQ6: Does the level of SDLR for predoctoral students at FAU differ by year of study?

H6: There will be a significant difference in the level of SDLR among predoctoral students at FAU based on the year of study.

Data relevant to the current study's purpose were collected from a convenience sample of 155 FAU predoctoral students. Participants were administered the *Self-Directed Learning Readiness Scale for Nursing Education (SDLRSNE)* developed by Fisher et al. (2001) and the demographic questions. Data collection started on January 10, 2022, and ended on May 6, 2022, during the Spring semester.

In the sample profile, the age ranged from 18 to 31 ( $M = 21.58$ ,  $SD = 2.57$ ). There were 84 (54.19%) female participants and 71 (45.81%) male participants. For ethnicity, 75 (48.39%) participants were of Hispanic, Latin, or Spanish origin, and 80 (51.61%) participants were not of Hispanic, Latin, or Spanish origin. Regarding participants' race,

17 (10.97%) participants were Asian, 43 (27.74%) participants were Black or African American, and 95 (61.29%) participants were White. No participants self-identified as American Indian or Alaska Native, or Native Hawaiian or Other Pacific Islander.

All participants ( $n = 155$ ) were students at the Charles E. Schmidt College of Science, and no other colleges were identified. As for the current (or anticipated) academic major, fifty-six (36.13%) participants reported biology, 34 (21.94%) participants reported chemistry and biochemistry, 34 (21.94%) participants reported health science, and 31 (20%) participants reported neuroscience and behavior. Of the 155 participating FAU predoctoral students, 23 (14.84%) were freshmen, 41 (26.45%) were sophomores, 38 (24.52%) were juniors, and 53 (34.19%) participants were seniors.

### **Major Findings and Discussion**

The reliability of the *SDLRSNE* scale and subscales developed by Fisher et al. (2001) was tested using Cronbach's alpha, in which the alpha coefficient of the overall scale ( $n = 40$ ) was 0.89. Subscales alpha coefficient for self-management ( $n = 13$ ), desire for learning ( $n = 12$ ), and self-control ( $n = 15$ ) were ( $\alpha = .62$ ), ( $\alpha = .79$ ), and ( $\alpha = .82$ ), respectively. The alpha coefficients for the participating FAU predoctoral students supported the three domains proposed by Fisher et al. (2001). Therefore, *SDLRSNE* reliability analysis and results according to the responses of the participating FAU predoctoral students showed that the *SDLRSNE* is a reliable and valid research tool for evaluating SDLR among predoctoral students.

Furthermore, the similarity of the results of the present study with Fisher et al.'s (2001) results and other current empirical research (Alsufyani et al., 2020; Ballard et al., 2022; Kumar et al., 2021; Millanzi et al., 2021; Siddiqui et al., 2021) reaffirm the internal

consistency reliability of the *SDLRSNE* used in this research study. Accordingly, researchers and educators can use the *SDLRSNE* to examine the readiness of predoctoral students for the SDL approach.

According to Fisher et al. (2001), the SDLR score reflects the overall level of the learner's readiness towards the SDL approach, while scores in its three subscales represent the learner's skills and abilities of self-management, desire for learning, and self-control. In addition, Fisher et al. (2001) stated that a total score exceeding 150 suggests readiness for the SDL approach. Accordingly, when using 150 as a cut-off score for SDLR, the finding from this study showed a positive attitude of FAU predoctoral students towards the SDL approach, as more than half of the participants (56.77%) scored higher than 150.

The total SDLR scores of FAU predoctoral students ranged from 119 to 179 ( $M = 151.33$ ,  $SD = 15.97$ ). FAU predoctoral students' mean total score of SDLR is similar to Fisher et al.'s (2001) mean score of 150.55 and Smedley's (2007) of 151.09. FAU predoctoral students' mean scores for self-management, desire for learning, and self-control were 45.63 ( $SD = 4.32$ ), 46.39 ( $SD = 5.51$ ), and 58.30 ( $SD = 6.81$ ), respectively. These mean values are comparable to Fisher et al. (2001) of 44.26 for self-management, 47.31 for the desire for learning, and 58.98 for self-control. Furthermore, these mean values are consistent with Smedley's (2007) subscales of 44.79 for self-management, 47.18 for the desire for learning, and 59.12 for self-control. Similar to Fisher et al. (2001) and Smedley (2007), the results showed that FAU predoctoral students scored the least in the self-management domain, higher in the desire for learning domain, and the best in the self-

control domain. For FAU predoctoral students, it seems that a lack of self-management skills is the most important factor limiting their readiness for the SDL approach.

The COVID-19 pandemic could be one of the reasons that adversely impacted self-management skills among FAU predoctoral students. The literature shows that the COVID-19 pandemic dramatically affected the educational systems worldwide, creating an uncertain and stressful learning environment that negatively affected self-management (Cengizhan, 2021; Rajab et al., 2020; Rehman et al., 2021). However, only a few studies have evaluated SDLR in the context of this pandemic and whether it has enabled or hindered the SDL approach (Singaram et al., 2022). In a research study outlining SDL's benefits during the COVID-19 pandemic, the author emphasized the necessity of SDL as a response to the new normal, revealing significant issues regarding the value of SDL in health professions training (Mahlaba, 2020). Furthermore, Roberson Jr et al. (2021) conducted a study to examine and elaborate on the concept of SDL during the COVID-19 pandemic; the authors concluded that the SDL approach is still applicable today as it was in the past, and it is considered a longstanding and essential skill, particularly for uncertain times.

Some researchers reported a mean SDLR score higher than the mean noted in Fisher et al.'s (2001) study, Smedley's (2007) study, and this present research study. To illustrate, in a study conducted by Alsufyani et al. (2020) to identify the SDLR among nursing students, the authors found high SDLR levels among the participants, and the mean SDLR score was 162.61. Örs (2018) concluded that the mean total score of SDLR of the research participants was 156.65. The mean values of self-management, desire for learning, and self-control subscales were 49.03, 59.53, and 48.10, respectively. El-Gilany

and Abusaad (2013) stated that the total mean score of SDLR among the participants in their research study was 159.6. In addition, the mean score for the self-management domain was 51.3, the desire for learning domain was 48.4, and the self-control control was 59.9.

The mean SDLR score of FAU pre dental students in this research study is inconsistent with other research studies and contradicts their findings that showed a mean SDLR score lower than the cut-off score of 150 suggested by Fisher et al. (2001). For example, AlRadini et al. (2022) reported that the mean SDLR score among medical students in their research study was 124, indicating a low readiness level for SDL. In addition, the mean subscales' scores for self-management, desire for learning, and self-control were 38, 38, and 48, respectively. Ballad et al. (2022) found that the mean SDLR score among research participants was 149.58. Balamurugan and Kumar (2015) reported a mean SDLRS score of 144.6 among undergraduate medical students in different academic years, with only 38% of the respondents scoring >150. In a study conducted by Alharbi (2018) to assess the SDLR of nursing students, the author found that the total mean score of SDLR among research participants was 144, implying a low readiness level for SDL.

The present study evaluated the level of SDLR among FAU pre dental students based on their age using linear regression to analyze the direct association between SDLR level and the age variable. The findings showed a positive association between SDLR scores and age, and the variable of age accounted for 37.2% of the variance in the SDLR scores among FAU pre dental students. This finding suggests that as age increases, the readiness for the SDL approach increases accordingly, further supporting the arguments

of Kocaman et al. (2009) and Smedley (2007) regarding SDLR and age, as they indicated that readiness for the SDL approach could be considered a maturational process. The finding from this present research study agrees with the existing literature and the results of previous studies, in which learners' readiness for the SDL approach increased with age, and they became more able to control their own learning (Alkorashy & Assi, 2017; Alsufyani et al., 2020; Cadorin et al., 2016; Hoban & Sersland, 2000; Qamata-Mtshali, 2012; Reio & Davis, 2005; Slater et al., 2017; Williams et al., 2013; Yuan et al., 2012).

Conversely, some scholars reported no or a negative association between SDLR and the variable of age. For example, Abou Shousha and El Sherbini (2014), Malekian et al. (2016), and Rascón-Hernán et al. (2019) found no association between age and SDLR among their research participants, and age has no significant impact on their SDL abilities. Likewise, Premkumar et al. (2014) argued that age does not significantly influence SDLR. Moreover, in a research study conducted by Yoo et al. (2000) to assess SDLR among Korean adult learners, the authors stated that the younger participants demonstrated higher readiness for SDL.

Regarding sex, this research study included a fairly balanced sample of female participants (54.19%) and male participants (45.81%), allowing for in-depth examination and investigation of the relationship between sex types and readiness for the SDL approach. In addition, the present study used an independent samples t-test to determine whether there were statistically significant differences in SDLR scores by sex. The findings showed no significant difference between FAU predoctoral students' sex and their SDLR levels. This finding is congruent with other research studies reported that sex variable has no significant effect on SDLR (Alkorashy & Assi, 2017; Alsufyani et al.,



2020; Atreya et al., 2020; Ballad et al., 2022; Premkumar et al., 2014; Said et al., 2015; Soliman & Al-Shaikh, 2015). Accordingly, it can be proposed that readiness for the SDL approach is not a sex-specific attribute.

On the contrary, the present study conflicts with other research studies that reported a relationship between the variable of sex and SDLR among their research participants in favor of females (Balamurugan & Kumar, 2015; Kerr et al., 2020; Slater et al., 2017). However, it must be taken into account that the participants in these research studies were mostly females, which may have led to biased outcomes. To illustrate, in the study by Balamurugan & Kumar (2015), 61% of the participants were females. While in Kerr et al.'s (2020) study, all participants were females. Finally, 53.42% of female participants were in Slater et al.'s (2017) study.

As mentioned earlier in Chapter Three, some research studies reported a relationship between SDLR and ethnicity/race (Reio, 2004; Smith et al., 2013). In addition, racial and ethnic diversity in the United States is growing every year (Jensen et al., 2021), which makes it essential to investigate their impact on the readiness to engage in the SDL process. However, there is a considerable lack of literature and empirical studies regarding the effect of ethnicity and race on the readiness of predoctoral students for the SDL approach. Therefore, the present study utilized a two-way ANOVA to investigate the influence of both ethnicity and race on SDLR levels among FAU predoctoral students.

The present study's findings showed no significant interaction between the effect of ethnicity and race of FAU predoctoral students on their level of SDLR. In addition, a simple main effects analysis revealed that ethnicity did not significantly impact the SDLR

levels, while race significantly impacted the SDLR levels. Finally, Tukey's HSD test was performed to determine where significant racial differences existed. The results showed that the mean SDLR score significantly differed between Blacks or African Americans and Whites. In contrast, there was no statistically significant difference in the mean SDLR scores between Asians and Blacks or African Americans or Asians and Whites.

The present study's findings are analogous to the results from previous studies. For example, Carson (2012) reported no significant difference in SDL based on ethnicity. In addition, Hall (2011) found that ethnicity has no significant effect on SDL. However, Smith et al. (2013) found significant differences between White and Black or African American participants regarding SDL practices. Likewise, in Reio's (2004) study, Blacks or African American participants demonstrated lower levels of SDL than their counterparts of White participants.

It should be noted, however, that the participants in these research studies were mostly whites, which may have resulted in biased outcomes. In the present study, 61.29% of the participants self-identified as White. There were 59.38% White participants in the study conducted by Smith et al. (2013), while there were 72% White participants in Reio's (2004) study.

As mentioned in Chapter Four, I could not assess the SDLR level among FAU predoctoral students based on the type of college, as all the participating FAU predoctoral students were enrolled in the Charles E. Schmidt College of Science. However, concerning the academic major, a one-way ANOVA was conducted to examine if there was a statistically significant difference between the level of SDLR and the academic major. The results showed no significant difference in SDLR level among FAU predoctoral

students based on the academic major. This could be due to the fact that the SDLR levels of the pre dental students from the four academic majors were broadly similar, and they are believed to possess similar attitudes and characteristics concerning SDL. Moreover, although the four academic majors have differences, these programs have likely been designed and followed similar strategies to foster autonomy and SDL among their students.

Very few studies evaluated students' readiness for the SDL approach based on their college and major. In a study conducted by Alfaifi (2016) to assess SDLR levels of university students based on the type of college, the author found a significant difference between the SDLR and college. The Administration and Finance College had the highest SDLR score, followed by the Computation and Information College and Health Sciences College. On the other hand, the Sciences and Theoretical Studies College has the lowest SDLR score. Tekkol and Demirel (2018) evaluated SDLR among college students based on their academic major and found a significant difference between SDL abilities and academic majors. Natural science major showed the lowest SDL scores, followed by health sciences and social sciences. In contrast, fine arts showed the highest SDL score. In addition, Prabjane and Inthachot (2013) reported that SDLR differs across academic majors; however, they did not identify where the differences existed.

For the year of study and its effect on SDLR among FAU pre dental students, the findings from this research study indicated that freshmen and sophomores had low SDLR levels of <150, while juniors and seniors had higher SDLR levels of >150. Furthermore, the results of a one-way ANOVA showed a statistically significant difference in the SDLR level based on the year of study. Tukey's HSD test for multiple comparisons

revealed that the SDLR level significantly differed between freshmen and juniors and between freshmen and seniors. Likewise, the SDLR level was significantly different between sophomores and juniors and sophomores and seniors. In addition, the SDLR level significantly differed between juniors and seniors. On the other hand, there was no statistically significant difference in the SDLR level between freshmen and sophomores.

It may be inferred from these findings that the SDLR is present in all years of study, but in varying degrees, as the present study indicated that the more the FAU predoctoral students progress in the years of study, the greater their SDLR. This could be explained by the fact that educators and students in the first two years rely heavily on teacher-centric teaching methods, including direct instruction, traditional lectures, mnemonics, and memorizing. This sort of environment provides minimal opportunity for independence and discourages the development of SDL. The present study's findings support the argument of other scholars who reported that SDLR level positively increases across years of study (Alharbi, 2018; Alkorashy & Assi, 2017; Kocaman et al., 2009; Örs, 2018; Prabjanee & Inthachot, 2013; Turunen et al., 1997; Yuan et al., 2012).

The present study's findings, however, contradict other research studies that concluded that readiness for the SDL approach is not linked to any particular year of study (Alsufyani et al., 2020; Chen et al., 2006; Örs, 2018; Park & Hong, 2016; Tekkol & Demirel, 2018; Williams et al., 2013). Moreover, these findings conflict with the results of research studies that showed a decrease in SDL levels as students progressed through their education (Harvey et al., 2003; Premkumar et al., 2013; Premkumar et al., 2014; Walker & Lofton, 2003).

## **Limitations**

The empirical results reported in this research study should be considered in light of some limitations. First, the data were collected from predoctoral students at FAU, which is a public four-year university located southeast of Florida. Consequently, the results cannot be generalized to predoctoral students studying in other regions or states or students enrolled in universities or colleges whose systems differ from FAU, such as private universities and community colleges. To address this limitation, future research should expand beyond FAU to include other types of academic settings and predoctoral societies. Furthermore, future research should have a more diverse sample regarding race, college types, and other demographic variables such as college entrance exam scores and types of schools (public, private, charter, and magnet schools).

Another limitation is that the current research study took a snapshot of FAU predoctoral students' SDLR using a cross-sectional research design, capturing information based on data gathered for a specific point in time. Accordingly, a longitudinal research design is recommended for future research.

Lastly, this research study used a self-report measuring instrument to record FAU predoctoral students' perceptions of their SDLR and how they performed and approached different aspects of self-management, desire for learning, and self-control skills. Therefore, there is the possibility of bias because I could not guarantee that participants honestly reported their self-perceived SDLR. Accordingly, it would be beneficial to design a scale that could actually examine the factual SDLR.

## **Strengths**

The present research study featured some strengths. First, the current study was one of the first to evaluate SDLR in the context of pre dental students and provided insight into the roles of age, sex, ethnicity/race, college/major, and year of study in the readiness of pre dental students towards the SDL approach. Second, the present study employed a quantitative research design based on numerical data that can be analyzed and interpreted using statistical methods to maintain objectivity and reduces subjectivity (Wright et al., 2016). Finally, FAU is distinguished by its diversity and student body that represents a variety of ethnic and racial backgrounds, which facilitated and contributed to investigating the effect of ethnicity/race on the readiness for the SDL approach among FAU pre dental students.

## **Recommendations for Future Studies**

Based on this research study's data analysis, findings, and limitations, the following recommendations are vital for future studies:

1. The study should be replicated to include a more diverse and larger sample of pre dental students from other academic settings from different states, such as private universities, community colleges, and HBCUs, to increase the generalizability of the findings.
2. This study evaluated SDLR among undergraduate students. A similar study could include graduate students who intend to apply for admission to dental schools to examine whether there is a difference between undergraduate and graduate students regarding their SDLR. It can also shed light on the effect of SDL on graduate students' retention rate and perseverance to degree completion.

3. Qualitative research investigations of SDLR among predoctoral students may be fruitful in explaining other factors that may significantly impact SDLR and offer a different perspective to the body of research. Qualitative research can shed more light and provide further details about behaviors, emotions, and personality traits that cannot be explained using a quantitative approach (Demetrius & Bryan, 2012).
4. The findings from this research study revealed that as FAU predoctoral students age and progress in their years of study, their readiness for the SDL approach increases accordingly. Therefore, using a longitudinal research study design to measure SDLR among predoctoral students during their studies or over an extended period of time will help confirm the results of this research study. Longitudinal studies assist researchers in determining patterns efficiently and making connections more clearly (Caruana et al., 2015).
5. As mentioned earlier, the *SDLRSNE* instrument utilized in this research study measured the participants' perceptions of their extent of readiness for the SDL approach. Therefore, developing a research instrument that could assess the actual SDLR among the predoctoral student, not based on their perception, would be of interest to educators and instructors, particularly those responsible for designing and evaluating the course curriculum to foster SDL skills in students.

### **Implications for Practice**

This research study aimed to assess the readiness level for the SDL approach among FAU predoctoral students. In addition, the present study sought to investigate whether their SDLR levels will differ based on age, sex, ethnicity/race, college/major,

and year of study. Assessing SDLR levels among FAU predoctoral students may contribute to motivating them to self-assess their performance and identify their weaknesses and strengths concerning the skills required to engage in the SDL process. According to AlRadini et al. (2022), the evaluation of readiness for the SDL process assists in understanding the actual value of SDL in a given context. Measuring readiness for the SDL approach among students is a substantial factor in educational planning to develop the most appropriate curricula, teaching methods, modules, and learning activities to foster independence, critical thinking, and personality characteristics required for SDL (AlRadini et al., 2022).

The research study showed that the FAU predoctoral students in the first two years of study are less ready for the SDL than their counterparts in the advanced years of study. Therefore, this study serves as a call for FAU educators and instructors, particularly those teaching freshmen and sophomores, to gradually relinquish their role as knowledge transmitters and embrace the role of learning facilitators, adopt more learner-centered teaching strategies, and embed additional opportunities and activities throughout the curricula to promote independence, confidence, and critical thinking required for the SDL.

The present study's findings revealed that FAU predoctoral students scored the lowest in self-management. The self-management domain represents such skills as time management, self-discipline, careful planning, prioritization, problem-solving, structured and systematic learning strategies, and seeking further information (AlRadini et al., 2022). Thus, educators and curriculum specialists at FAU should consider this finding to



invent and put into practice strategies to improve the abilities mentioned above among FAU pre dental students to help them build lifelong independence (Smedley, 2007).

Even though FAU pre dental students showed a positive attitude towards the SDL approach, the present study's findings revealed that 67 (43.23%) FAU pre dental students had low readiness levels for the SDL approach. There is a broad consensus that many people lack critical thinking and problem-solving abilities, that not all adult learners are self-directed, and that some may never evolve to become self-directed (Brookfield, 1995; Fisher et al., 2001; Sutherland & Crowther, 2006). Therefore, It is essential to have a balanced teacher-centered and learner-centered learning environment to acknowledge the difference in SDLR levels among the students (Smedley, 2007). Furthermore, it is imperative to guide the students with low SDLR levels to understand the SDL concept and assist them in self-analyzing the actions and steps that must be taken to make changes or enhancements to improve the skills and abilities required for the SDL approach (Hawkins, 2018). Such students will also need direct and constant contact with their educators, precise directions, clear instructions, support, and motivation to achieve the best learning outcomes (Smedley, 2007).

The present study may provide FAU prehealth advisors with information about the extent of SDLR among FAU pre dental students interested in applying for dental schools. Thus, early in the orientation stage or advising sessions, FAU pre-health advisors can increase the awareness of FAU pre dental students and explicitly emphasize the vital role of SDL related to academic success and perseverance during dental school (Montas et al., 2021).

Finally, dental schools should not assume that pre-dental students applying for dental admission have the skills and abilities required for the SDL approach. Therefore, dental schools may consider assessing the readiness of the incoming dental students for the SDL approach to identify areas of improvement. The SDL process and benefits and the lifelong learning role within dental education and profession should be well explained to newly admitted dental students during the orientation stage or early in the program. In addition, dental faculty members must instill within dental students that SDL is not confined solely to what is being learned in dental schools but throughout life for their professional growth and success in diverse, ever-changing dental settings. According to Merriam and Bierema (2014), “guiding students towards greater learning autonomy for social and self-directed learning is imperative for continuous lifelong learning post-graduation” (p. 73).

Moreover, dental faculty members need to interact closely as a facilitator with newly admitted dental students in the initial stages of the SDL process and gradually implement student-centered activities and modules to improve SDL skills and abilities. In addition, dental schools can provide elective courses that enable dental students to investigate a specific area of interest and conduct independent research projects.

### **Conclusion**

In conclusion, SDL has been recommended in health professions education programs, including dental education, as the methodology of choice for successful training and lifelong learning (Murad et al., 2010). However, for pre-dental students to demonstrate readiness for the SDL approach, they should own the required skills, attitudes, and characteristics for such an approach (Fisher et al., 2001; Wiley, 1983). This

quantitative cross-sectional online survey-based study sought to evaluate the SDLR level among predoctoral students at FAU. Furthermore, the study examined whether SDLR levels would differ based on age, sex, ethnicity/race, college/major, and year of study. A total of 155 FAU predoctoral students participated and completed all the online survey items, resulting in a 31.12% response rate.

All data were analyzed using SPSS. Internal consistency reliability of the *SDLRSNE* was tested using Cronbach's alpha, and the results indicated that the alpha coefficient for the total items ( $n = 40$ ) was 0.89. Research questions and hypotheses were answered and tested using descriptive and inferential statistics, including a one-sample t-test, a linear regression, an independent samples t-test, a one-way ANOVA, and a two-way ANOVA.

The results show that the FAU predoctoral students had SDLR total scores ranging from 119 to 179, with a mean of 151.33. The mean scores for self-management, desire for learning, and self-control subscales were 45.63, 46.39, and 58.30, respectively. There was a statistically significant difference in SDLR level among FAU predoctoral students based on age, race, and year of study. Contrastingly, there was no statistically significant difference in SDLR level among FAU predoctoral students based on sex, ethnicity, and academic major. I could not examine the effect of the college variable on SDLR, as all participants were enrolled in the Charles E. Schmidt College of Science, and no other colleges were reported among the participating FAU predoctoral students.

This research study featured some limitations, including a self-report measuring scale, non-probability voluntary sampling, a cross-sectional methodology, and participants were only FAU predoctoral students. However, the present study has several

strengths; it was among the first to evaluate SDLR among pre dental students and was conducted at one of the most racially and culturally diverse universities in Florida's State University System.

Recommendations for future research were identified to include a larger and more diverse sample of pre dental students beyond FAU and graduate students who intend to apply for dental schools. The other recommendations focused on research methodology, including qualitative design and longitudinal studies. In addition, the development of a measurement tool capable of evaluating the actual SDLR among pre dental students rather than their perception.

Implications for practice were identified, including explicitly identifying the significant role of measuring the readiness for the SDL approach among pre dental students. Suggestions were made as to the value of pre dental students self-evaluating their own performance, the role of the FAU educators in designing the most appropriate curricula to promote SDL, the role of FAU prehealth advisors in increasing FAU pre dental students' awareness concerning SDL, and the role of dental schools and faculty members in promoting and improving SDL among newly admitted dental students.

## APPENDICES

## Appendix A. Email Invitation Letter

Dear Preparental Student

My name is Fahad Algahtani. I am a Ph.D. candidate in Educational Leadership and Research Methodology at the College of Education at Florida Atlantic University. I am kindly requesting your participation in a doctoral research study that I am conducting entitled “Self-Directed Learning Readiness Among Preparental Students at FAU.” This study aims to evaluate the level of self-directed learning readiness (SDLR) among preparental students at FAU and to investigate whether their SDLR levels will differ based on selected demographic variables, including age, sex, ethnicity/race, college/major, and year of study.

The study involves completing a questionnaire that will take at most 10 minutes. Your participation in this study is completely voluntary. Your responses will be kept confidential and anonymous. If you would like to participate in this research study, please click the survey link below to be directed to the survey Website, or you may copy and paste the survey link into your Internet browser.

Thank you for your time and consideration.

Link to Survey:

[https://fau.az1.qualtrics.com/jfe/form/SV\\_byzbXdSmZOicqAS](https://fau.az1.qualtrics.com/jfe/form/SV_byzbXdSmZOicqAS)

## Appendix B. Cover Letter

Thank you for your interest in participating in our research study. The study aims to evaluate self-directed learning readiness among predoctoral students at Florida Atlantic University. Also, it will examine whether the level of self-directed learning readiness will differ based on selected demographic variables, including age, sex, ethnicity/race, college/major, and year of study.

Your participation is completely voluntary and anonymous, and there will be no adverse effects on you in any way if you choose not to participate in this research study. There are no known risks involved in participating in this research study.

You will receive no direct benefits from participating in this research study. However, by participating and completing the questionnaire, you will have the opportunity to know your current level of readiness for the self-directed learning approach at the end of the survey.

If you decide to participate in this research study, you will be asked to complete a questionnaire that will take no more than 10 minutes. You may skip any questions that make you feel uncomfortable, and you are free to withdraw and exit the survey at any time without any penalty.

The information collected from you will be presented in aggregate form only, and the researchers will never know who participated or who did not. Furthermore, only the principal investigators (Dr. Valerie Bryan) and co-investigator (Fahad Algahtani) will have access to the data that will be retained in a password-protected computer for at least three years after completing the research.

If you experience problems or have questions regarding your rights as a research subject, contact the Florida Atlantic University Division of Research at (561) 297-1383. For other questions or concerns about the research study, you may contact me, Fahad Algahtani, via phone at (954) 706-8404 or email [Falgahtani2018@fau.edu](mailto:Falgahtani2018@fau.edu). You may also contact my research supervisor, Dr. Valerie Bryan, via phone at (561) 297-2265 or email [Bryan@fau.edu](mailto:Bryan@fau.edu).

By completing and submitting this electronic survey, you acknowledge that you are at least 18 years old, have read the above information, and voluntarily agree to participate in this research study. You may print a copy of this consent statement for personal records or future reference.

If you agree to participate, please check the box labeled “I agree” and proceed with taking the survey questions. If you refuse to participate, please check the box labeled “I do not agree,” and you may close the browser and exit the survey.

Thank you for your participation.

Sincerely,

- I agree to participate in this research study
- I do not agree to participate in this research study



### Appendix C. Demographic Questionnaire

1- What is your age? \_\_\_\_\_

2- What is your sex?

Male

Female

3- Are you of Hispanic, Latino, or of Spanish origin?

Yes

No

4- How would you describe yourself?

American Indian or Alaska Native

Asian

Black or African American

Native Hawaiian or Other Pacific Islander

White

5- What college are you currently attending? \* A drop-down list included FAU colleges

6- What is your current (or anticipated) major? \* A drop-down list included FAU majors

7- Which year of study are you currently in?

Freshman (0-29 credits)

Sophomore (30-59 credits)

Junior (60-89 credits)

Senior (90 credits or more)

Appendix D. Fisher et al.'s (2001) 40-item SDLRSNE

Self-management

Please read each statement carefully and answer the questions as honestly as possible, in a way that shows how you really are, not how you would like to be or how you think you should be.

1- I solve problems using a plan

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

2- I prioritize my work

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

3- I do not manage my time well

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly disagree

4- I have good management skills

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

5- I set strict time frames

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

6- I prefer to plan my own learning

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

7- I am systematic in my learning

- Strongly disagree
- Disagree
- Undecided
- Agree

Strongly Agree

8- I am confident in my ability to search out information

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

9- I set specific times for my study

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

10- I am self-disciplined

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

11- I am disorganized

Strongly Agree

Agree

Undecided

- Disagree
- Strongly disagree

12- I am methodical

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

13- I can be trusted to pursue my own learning

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

Desire for Learning

Please read each statement carefully and answer the questions as honestly as possible, in a way that shows how you really are, not how you would like to be or how you think you should be.

1- I need to know why

- Strongly disagree
- Disagree
- Undecided
- Agree

Strongly Agree

2- I critically evaluate new ideas

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

3- I learn from my mistakes

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

4- I am open to new ideas

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

5- When presented with a problem I cannot resolve, I will ask for assistance

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

6- I like to evaluate what I do

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

7- I do not enjoy studying

Strongly Agree

Agree

Undecided

Disagree

Strongly disagree

8- I have a need to learn

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

9- I enjoy a challenge

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

10- I want to learn new information

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

11- I enjoy learning new information

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

12- I like to gather the facts before I make a decision

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree



## Self-control

Please read each statement carefully and answer the questions as honestly as possible, in a way that shows how you really are, not how you would like to be or how you think you should be.

1- I am able to focus on a problem

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

2- I prefer to set my own learning goals

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

3- I am responsible

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

4- I have high personal expectations

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

5- I have high personal standards

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

6- I have high beliefs in my abilities

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

7- I am aware of my own limitations

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

8- I am logical

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

9- I evaluate my own performance

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

10- I prefer to set my own criteria on which to evaluate my performance

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

11- I am responsible for my own decisions/actions

- Strongly disagree
- Disagree
- Undecided
- Agree

Strongly Agree

12- I can find out information for myself

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

13- I like to make decisions for myself

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

14- I prefer to set my own goals

Strongly disagree

Disagree

Undecided

Agree

Strongly Agree

15- I am not in control of my life

Strongly Agree

Agree

Undecided

Disagree

Strongly disagree

## Appendix E. IRB Approval Letter



**Institutional Review Board**  
Division of Research  
777 Glades Rd.  
Boca Raton, FL 33431  
Tel: 561.297.1383  
[fau.edu/research/researchint](http://fau.edu/research/researchint)

Patricia Maslin-Ostrowski, Ed.D., Chair

DATE: November 22, 2021

TO: Valerie Bryan  
FROM: Florida Atlantic University Social, Behavioral and Educational Research IRB

PROTOCOL #: 1506256-1  
PROTOCOL TITLE: [1506256-1] Self-Directed Learning Readiness Among Pre dental Students at Florida Atlantic University

SUBMISSION TYPE: New Project  
REVIEW CATEGORY: Exemption category # 2

ACTION: DETERMINATION OF EXEMPT STATUS  
EFFECTIVE DATE: November 22, 2021

Thank you for your submission of New Project materials for this research study. The Florida Atlantic University Social, Behavioral and Educational Research IRB has determined this project is EXEMPT FROM FEDERAL REGULATIONS under 45 CFR 46.104 (Exempt Category). Therefore, you may initiate your research study.

Since your research involves *FAU Pre dental Association supervised by the FAU Pre-Health Professions Office* you may not begin your research at these institutions until you receive their permission.

**Principal Investigator (PI) Responsibilities:** The PI assumes the responsibilities for the protection of human subjects in this study as outlined in Human Research Protection Program (HRPP) Manual Section 8-1, Exemptions.

**Continuing Review:** Exempt Studies do not need to be renewed.

**Modifications:** In general, investigators are not required to submit changes to the Florida Atlantic University Social, Behavioral and Educational Research IRB once a research study is designated as exempt as long as those changes do not affect the exempt category or criteria for exempt determination (changing from exempt status to expedited or full review, changing exempt category) or that may substantially change the focus of the research study such as a change in hypothesis or study design. If the study is modified to add additional sites for the research, please note that you may not begin the research at those sites until you receive the appropriate approvals/permissions from the sites.

Please contact the HRPP office if you have any questions about whether a change must be submitted for IRB review and approval.

**Reportable Events:** If issues should arise during the conduct of the research, such as unanticipated problems that may involve risks to subjects or others, or any problem that may increase the risk to the human subjects and change the category of review, notify the IRB office promptly. Any complaints from

participants that may change the level of review from exempt to expedited or full review must be reported to the IRB. Please report new information through the study's workspace and contact the IRB office with any urgent events. Please visit the Human Research Protection Program (HRPP) website to obtain more information, including reporting timelines.

**Personnel Changes:** After determination of the exempt status, the PI is responsible for maintaining records of personnel changes and appropriate training. The PI is not required to notify the IRB of personnel changes on exempt research.

**Closure:** Investigators are not required to notify the IRB when the research study can be closed. However, the PI can choose to notify the IRB when the study can be closed and is especially recommended when the PI leaves the university. Closure indicates that research activities with human subjects are no longer ongoing, have stopped, and are complete. Human research activities are complete when investigators are no longer obtaining information or biospecimens about a living person through interaction or intervention with the individual, obtaining identifiable private information or identifiable biospecimens about a living person, and/or using, studying, analyzing, or generating identifiable private information or identifiable biospecimens about a living person.

**Exemption Category.** The full regulatory text from 45 CFR 46.104(d) for the exempt research categories is included below.

**Exempt 1.** Research, conducted in established or commonly accepted educational settings, that specifically involves normal educational practices that are not likely to adversely impact students' opportunity to learn required educational content or the assessment of educators who provide instruction. This includes most research on regular and special education instructional strategies, and research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

**Exempt 2.** Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met:

- (i) The information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects;
- (ii) Any disclosure of the human subjects' responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, educational advancement, or reputation; or
- (iii) The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by 45 CFR 46.111(a)(7).

**Exempt 3.** (i) Research involving benign behavioral interventions in conjunction with the collection of information from an adult subject through verbal or written responses (including data entry) or audiovisual recording if the subject prospectively agrees to the intervention and information collection and at least one of the following criteria is met:

- (A) The information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects;
- (B) Any disclosure of the human subjects' responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, educational advancement, or reputation; or
- (C) The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by 45 CFR 46.111(a)(7).

(ii) For the purpose of this provision, benign behavioral interventions are brief in duration, harmless, painless, not physically invasive, not likely to have a significant adverse lasting impact on the subjects, and the investigator has no reason to think the subjects will find the interventions offensive or embarrassing. Provided all such criteria are met, examples of such benign behavioral interventions would include having the subjects play an online game, having them solve puzzles under various noise conditions, or having them decide how to allocate a nominal amount of received cash between themselves and someone else.

(iii) If the research involves deceiving the subjects regarding the nature or purposes of the research, this exemption is not applicable unless the subject authorizes the deception through a prospective agreement to participate in research in circumstances in which the subject is informed that he or she will be unaware of or misled regarding the nature or purposes of the research.

**Exempt 4.** Secondary research for which consent is not required: Secondary research uses of identifiable private information or identifiable biospecimens, if at least one of the following criteria is met:

- (i) The identifiable private information or identifiable biospecimens are publicly available;
- (ii) Information, which may include information about biospecimens, is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained directly or through identifiers linked to the subjects, the investigator does not contact the subjects, and the investigator will not re-identify subjects;
- (iii) The research involves only information collection and analysis involving the investigator's use of identifiable health information when that use is regulated under 45 CFR parts 160 and 164, subparts A and E, for the purposes of "health care operations" or "research" as those terms are defined at 45 CFR 164.501 or for "public health activities and purposes" as described under 45 CFR 164.512(b); or
- (iv) The research is conducted by, or on behalf of, a Federal department or agency using government-generated or government-collected information obtained for non-research activities, if the research generates identifiable private information that is or will be maintained on information technology that is subject to and in compliance with section 208(b) of the E-Government Act of 2002, 44 U.S.C. 3501 note, if all of the identifiable private information collected, used, or generated as part of the activity will be maintained in systems of records subject to the Privacy Act of 1974, 5 U.S.C. 552a, and, if applicable, the information used in the research was collected subject to the Paperwork Reduction Act of 1995, 44 U.S.C. 3501 et seq.

**Exempt 5.** Research and demonstration projects that are conducted or supported by a Federal department or agency, or otherwise subject to the approval of department or agency heads (or the approval of the heads of bureaus or other subordinate agencies that have been delegated authority to conduct the research and demonstration projects), and that are designed to study, evaluate, improve, or otherwise examine public benefit or service programs, including procedures for obtaining benefits or services under those programs, possible changes in or alternatives to those programs or procedures, or possible changes in methods or levels of payment for benefits or services under those programs. Such projects include, but are not limited to, internal studies by Federal employees, and studies under contracts or consulting arrangements, cooperative agreements, or grants. Exempt projects also include waivers of otherwise mandatory requirements using authorities such as sections 1115 and 1115A of the Social Security Act, as amended. (i) Each Federal department or agency conducting or supporting the research and demonstration projects must establish, on a publicly accessible Federal Web site or in such other manner as the department or agency head may determine, a list of the research and demonstration projects that the Federal department or agency conducts or supports under this provision. The research or demonstration project must be published on this list prior to commencing the research involving human subjects.

**Exempt 6.** Taste and food quality evaluation and consumer acceptance studies: (i) If wholesome foods without additives are consumed, or (ii) If a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.



\*Exempt categories (1), (2), (3), (4), and (5) cannot be applied to activities that are FDA regulated.

\*Each of the exemptions at this section may be applied to research subject to subpart B (Additional Protections for Pregnant Women, Human Fetuses and Neonates Involved in Research) if the conditions of the exemption are met.

\*The exemptions at this section do not apply to research subject to subpart C (Additional Protections for Research Involving Prisoners), except for research aimed at involving a broader subject population that only incidentally includes prisoners.

\*Exemptions (1), (4), (5), and (6) of this section may be applied to research subject to subpart D (Additional Protections for Children Involved as Subjects in Research) if the conditions of the exemption are met. Exempt (2)(i) and (ii) only may apply to research subject to subpart D involving educational tests or the observation of public behavior when the investigator(s) do not participate in the activities being observed. Exempt (2)(iii) may not be applied to research subject to subpart D.

If you have any questions or comments about this correspondence, please contact Donna Simonovitch at:

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**This letter has been electronically signed in accordance with all applicable regulations,  
and a copy is retained within our records.**



**Are you a  
Pre-Dental student  
(18 years or older) at FAU planning to apply  
for dental schools?**

**You Are *Invited* to participate in a research study (*online survey*)  
that will take no more that **10 minutes** to complete**

**You will have the *opportunity* to know your current *level of readiness* for  
the *self-directed learning* approach**



**Self-Directed Learning Readiness Among Pre-Dental Students  
at Florida Atlantic University (FAU)**

**Principal Investigator: Dr. Valerie Bryan (Professor, College of Education, FAU)  
Co-investor: Fahad Algahtani (Ph.D. student, College of Education, FAU)**

The study aims to evaluate self-directed learning readiness among pre-dental students at FAU and whether it will differ based on age, sex, ethnicity/race, college/major, and year of study.

Your participation is completely **voluntary** and **anonymous**.

Scan the QR code, complete the survey, and find your self-directed learning readiness score at the end of the survey.



**FOR MORE INFORMATION**

Dr. Valeri Bryan, via phone at (561) 297-2265 or [Brvan@fau.edu](mailto:Brvan@fau.edu)  
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