

PREDICTING SUCCESSFUL COMPLETION OF BIOLOGY FROM COURSE
SATISFACTION AND CURRICULUM FORMAT FOR NONTRADITIONAL STUDENTS

by

Janet Elizabeth Forde

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

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APPROVED BY:

Michelle J. Barthlow, Ed.D., Committee Chair

Rebecca Lunde, Ed.D. Committee Member

ABSTRACT

The overall purpose of this study was to determine if there was a relationship between the biology curriculum design with student course satisfaction and the successful completion for nontraditional adult students. The current study was important in determining course curriculum format leading to nontraditional students' successful course completion. The selected college is a small two-year community college in the southeast United States. This quantitative, predictive correlation study surveyed 85 nontraditional students' satisfaction with the biology course curriculum format using the Online Course Satisfaction Scale. The survey data was correlated along with the type curriculum used in the course section (Open Educational Resources or publisher created content) and student course satisfaction to predict successful course completion using binary logistic regression. The results of the statistical analysis showed curriculum type and student course satisfaction were not significant predictors of successful completion. Based on the results gathered from this research, nontraditional students did not successfully complete the course significantly better with one type of curriculum compared to the other. This study points to the need for further research to determine what factors can contribute to greater successful completion for nontraditional students.

Keywords: nontraditional student, curriculum, curriculum design, biology course design, biology curriculum, online learning, student success

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Dedication

This dissertation is dedicated to my loving and supportive husband (Bob Forde) and my children, the original three and the two added by marriage. This group has been my constant support, encouragement, and source of motivation to complete this work. One of my life goals was the completion of a doctoral degree. This wonderful group of people have allowed me the time and space to work without complaint and with selfless encouragement. I appreciate and love them all the more for all they have given me through this process. I also know that I could not have had the strength nor the perseverance to complete this work without the constant presence of my Lord and Savior Jesus Christ. It is through His love, mercy, and grace that I am able to complete this work. He has guided me through this and will continue to guide me as I continue to utilize the knowledge gained through this doctoral process.

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List of Abbreviations

Online Course Satisfaction Scale (OCSS)

Open Educational Resources (OER)

Publisher Created Content (PUB)

CHAPTER ONE: INTRODUCTION

Overview

The purpose of this quantitative predictive correlational study was to determine if nontraditional student success could be predicted based on the presentation of the biology course curriculum and student satisfaction. This chapter provides a background for nontraditional students enrolled in community colleges, postsecondary instructional strategies, and an overview of the theoretical concepts of andragogy and self-directed learning. The problem statement examines the range of recent literature concerning this topic. The significance of the current study and the research questions will follow the purpose of the current study. The current chapter concludes with a listing of definitions of the key terms used in the study.

Background

Nontraditional adult students are attending postsecondary community college institutions in increasing numbers to attain or complete a degree. According to the National Center for Education Statistics (2019), almost one-quarter of all postsecondary undergraduate students attending two-year institutions were nontraditional students. The nontraditional adult students attending these community colleges typically have additional life obligations beyond the traditional 18 – 24-year-old college student. The family and work obligations of the nontraditional student can result in life obligations that make obtaining a postsecondary degree more challenging. The continued presence of nontraditional students in postsecondary classrooms leads to the call for determining the most effective curriculum to facilitate learning for these students. Shortlidge et al. (2019) suggested that nontraditional students may respond to classroom strategies differently than other student groups. Consequently, the purpose of this

research was to determine if the current biology curriculum facilitated successful nontraditional student course completion.

The first two-year community colleges were established in the United States in the early 1900s and then greatly expanded in the mid-1900s (Grubbs, 2020). Initially, community colleges were focused on vocational education and the general education of the local community. Today, these community colleges provide an opportunity for students to complete a technical certificate, health care training, or an associate degree. These certificates and degrees can lead to employment, or the education can be continued at a four-year institution. The current and continued need for an educated workforce led to the initiation of Tennessee's Drive to 55 (Drive to 55 Alliance, 2018). This education initiative aims to achieve the goal of 55% of the working population having completed a degree or certificate by the year 2025. To help achieve this goal, a tuition grant was established that allows adults wishing to return to complete a certificate or degree the opportunity to do so free of the cost of tuition (Tennessee Reconnect, 2018). Nontraditional adult students taking advantage of this opportunity enroll in classes at the two-year community colleges. Nontraditional adult students are typically age 25 or older with family obligations and full-time employment (Daiva, 2017; Ellis, 2019a; Glowacki-Dudka, 2019; Kasworm, 2018; Kimmel et al., 2016; Robertson, 2020). The nontraditional adult student balances financial obligations and family, along with the responsibilities of college courses (MacDonald, 2018). An increase in the number of nontraditional students enrolling in community college courses has drawn attention to the instructional strategies utilized in postsecondary institutions.

Postsecondary instructional strategies are more likely to be chosen based on course requirements and learning outcomes than on educational needs associated with the age of the

students (Bengo, 2020). Typically, postsecondary instructional strategies are focused on the traditional-aged students' learning needs (Bengo, 2020; Kasworm, 2018). Most college classrooms contain a mix of nontraditional and traditional students. In a mixed student classroom, both traditional-aged and nontraditional students, the professor must choose an effective strategy for the majority of the students (Griffin, 2020). Since the majority of the current college students are between the ages of 18 and 24 (Ellis, 2019a), nontraditional students are forced to utilize instructional strategies best suited for younger students. To facilitate successful learning, the nontraditional student needs acknowledgment of their life experiences, interaction with the instructor and the other students, and practical application of the course material (MacDonald, 2018). Differences in the educational needs of nontraditional students require a different philosophy when developing curriculum to account for the unique knowledge and skill needs of these students (Owusu-Agyeman et al., 2018). Nontraditional students need instructors to be not merely dispensers of knowledge but rather facilitators of learning. The course curriculum utilized in the teaching of nontraditional students must reflect the interactive and cooperative relationship that should exist between the nontraditional student and the faculty.

The concept of andragogy, as proposed by Knowles (1980), acknowledges that adult learners have learning needs different from children. Knowles noted that the greatest of the ancient teachers were teaching adults and utilized different teaching and learning techniques than were used to teach children (Knowles, 1990). Adult education began to be formally recognized during the 1920s (Knowles, 1980; Knowles et al., 2005). Based on the concept that adult learners have different educational needs than children, the concept of andragogy was developed. Knowles recognized six assumptions concerning the needs of adult learners (Knowles, 1990;

Knowles et al., 2020). The application of these assumptions allows for the development of curriculum that facilitates learning for adult students.

Self-directed learning is one of the core concepts of andragogy. Garrison (1997) proposed a model for self-directed learning that integrated external management, internal monitoring, and self-motivation to fulfill learning in an educational setting. This approach allows learners to assume personal responsibility for the learning outcomes from cognitive and contextual educational experiences (Garrison, 1997). Nontraditional students utilizing the concept of self-directed learning will realize that the external educational activities and the internal reflection on those activities facilitate the learning process (Garrison, 1997; Jones, 2019). The self-directed learning model incorporates three intertwining concepts: task control, self-monitoring, and motivation (Garrison, 1997). Self-directed learning, along with the theory of andragogy, allows for the conclusion that course curriculum must reflect the maturity and thought processes found in nontraditional adult students.

Problem Statement

The enrollment of nontraditional students in community college courses results in the need for an assessment of the current curriculum to determine its effectiveness to facilitate learning and success for this group of students. Nontraditional students have life obligations such as family and work (Daiva, 2017) that traditional students do not face. Physical and psychological maturity produced changes in thinking skills (Merriam, 2001, 2017; Merriam & Baumgartner, 2020) reflected in the educational needs of the nontraditional student. Knowles et al. (2020) acknowledged that the adult learner was ready to learn when enrolling in postsecondary courses and goal-oriented to complete the courses because it applied to the goal of their education. The educational success and course completion for nontraditional students may

be linked to the curriculum utilized (Dieterich & Hamsher, 2020).

Postsecondary course structure should reflect the high expectations, life experiences, clear assignment instructions, critical thinking, and collaboration that are a part of the nontraditional students' life as a whole. MacDonald (2018) noted that instructors should move toward a curriculum incorporating more interaction, connection, and life experiences to engage nontraditional students. The materials utilized in a course and, thus, course curriculum format, were found to impact students' successful completion (Rios et al., 2018). The presence of nontraditional students in postsecondary classrooms must be taken into consideration when developing course materials (Ellis, 2019a). Improving online course structure and format are expected to improve student satisfaction with online courses (Harsasi & Sutawijaya, 2018). Research by Kurucay and Inan (2017) indicated a correlation between student success and students' satisfaction with the course. Ng and Baharom (2018) noted student satisfaction to be an indicator of the quality of an online course.

Research determined course curriculum format had an impact on nontraditional students' success and satisfaction in education courses (Shin & Cheon, 2019), nursing courses (Alharbi, 2018), and radiography courses (Cherry & Flora, 2017). Even online doctoral course curriculum format impacted student satisfaction and successful course completion (Thompson et al., 2018). Well-designed online course curriculum format has been found to improve students' successful completion (Gavassa et al., 2019). However, little research exists describing the online course curriculum format leading to nontraditional students' successful completion of online biology courses.

The incorporation of active learning techniques in the lecture classroom was found to aid adult students in the learning process in biology and chemistry courses (Shortlidge

et al., 2019). Development of curriculum should incorporate developing relationships and active learning while being incorporated with the students' life experiences in accordance with the principles of the theory of andragogy. Kiernan and Lotter (2019) found that nontraditional students participating in biology courses that incorporated investigation, collaboration, and use of nontraditional students' prior knowledge led to greater success in biology courses.

Research was necessary to determine which online course curriculum format components provide quality learning, which will then lead to course satisfaction and successful completion of biology courses for nontraditional students. Incorporating these principles in the classroom would implement the assumptions made in the theory of andragogy (Knowles et al., 2020) concerning the education of adults. The problem is the current research has not fully addressed the implications for nontraditional students' success concerning the use of a biology curriculum designed for nontraditional-aged students.

Purpose Statement

The purpose of this quantitative predictive correlational study was to determine if nontraditional student success could be predicted based on the type of presentation of biology course curriculum and student satisfaction. This study examined the relationship(s), if any, between nontraditional adult learners' successful course completion with the current type of presentation of the biology curriculum and student satisfaction. Students participating in the study were nontraditional students enrolled in one of the sections of a biology course at a rural community college in the southeast United States. Nontraditional adult learners are characterized as being 25 years of age or older, financially independent, working a full-time job, and having either delayed beginning a postsecondary degree immediately following high school or returning to postsecondary education to complete a degree (Chen, 2017).

The criterion variable, successful completion of biology courses, for the purposes of this study, was operationally defined as the nontraditional student receiving an A, B, or C (Chan & Wang, 2020) in the biology courses. The predictor variables, student course satisfaction and curriculum format, were utilized as predictors of students' successful completion of the biology course. Student satisfaction was measured based on the nontraditional students' conceptions of their learning experience during the course (Alqurashi, 2019), as expressed in the results of the Online Course Satisfaction Scale (Bayrak et al., 2020). Curriculum format was based on the registration choice made by the students between the two online course curriculum formats utilized in the biology courses.

The biology course material could be presented in two online formats. The course content remained consistent for each of the online course curriculum formats. The online formats were operationally described based on the source of the course material. The course materials were derived from either an educational publisher or utilizing open educational resources (OER) as designated in the course schedule (██████████ Community College, 2021). The predictive correlative design of this quantitative study explored the relationship between the criterion variable (successful completion of the biology course) and the predictor variables (student satisfaction and course curriculum format) for nontraditional students enrolled in the biology courses at one of the community colleges in the Tennessee community college system.

Significance of the Study

The return of nontraditional students to postsecondary education has resulted in the need to investigate the curriculum format for this student body in comparison to the current course offerings. It has been proposed that online course format may be the best at meeting the needs of nontraditional students due to the scheduling flexibility and the ability to work from home

(Mkhatshwa & Hoffman, 2019). These possible advantages may account for the increase in nontraditional online enrollment. However, nontraditional students indicated that the online format was the least favored course format and that improvements to online course curriculum were necessary for general student success. Curriculum changes to general online course design include improved student-student interactions, instructor-student communication, timely instructor feedback, and challenging course curriculum (Rayens & Ellis, 2018). Because of the nontraditional students' other life roles that involve critical thinking and decision making, the nontraditional student will be more engaged with activities that include collaborative learning, decision processing, and knowledge sharing (King-Spezzo et al., 2020).

Nontraditional students have the potential to be more successful if the unique needs of this student population are met (Remenick, 2019). Students from underserved populations, such as nontraditional students, typically show improvement in understanding and performance when course curriculum was evaluated and enhanced (Long et al., 2020). Long et al. further noted that there was little research on the effects of curriculum development at the technical college level that enhanced completion and success for traditionally disadvantaged groups of biology students. Utilizing a well-designed online laboratory science course was found to be an effective learning environment for students to gain science knowledge (Faulconer & Gruss, 2018). Dos Santos (2020) noted further research was needed to assess online education in a variety of fields, including biology and science education. Kiernan and Lotter (2019) also noted that there was a gap in the literature concerning meeting the needs of nontraditional students taking biology courses. Few research studies are available that address the needs of nontraditional students in the postsecondary biology classroom. The information available from this study could lead to better curricular design resulting in greater success for nontraditional students in biology courses.

Research Question

The purpose of this study was to determine if there was a relationship between curriculum structure and course completion for nontraditional students in online biology courses using open educational resources (OER) curriculum and biology courses using traditional publisher-created curriculum.

RQ1: How accurately can successful completion of a biology course be predicted from the linear combination of student course satisfaction scores and curriculum format for nontraditional community college students?

Definitions

1. *Completion* – For the purposes of this study, completion was defined as either successful completion, earning an A, B, or C in the general biology course (Chan & Wang, 2020), or unsuccessful completion, earning a D, F, or withdrawal.
2. *Course satisfaction* – For the purposes of this study, course satisfaction will be defined by the students' perception of the instruction and interaction with the course (Bayrak et al., 2020).
3. *Curriculum* – What is taught, a plan for all the information and experiences that a student encounters while completing a course; a plan for what is to be taught that will later be used for instruction to give direction to learning (Gordon et al., 2019).
4. *Curriculum format* – The format of the course curriculum based on the use of open educational resources (OER) or publisher prepared content (Calabrese et al., 2019).
5. *Nontraditional students* – Defined by these characteristics: aged 25 and over with other life responsibilities, such as working full-time, financial independence, children or

other non-spousal dependents, delayed or returning enrollment in post-secondary educational institutions (Chen, 2017; Remenick, 2019).

6. *Student satisfaction* – For the purposes of this study, student satisfaction will be defined as a general concept that affects student’s experiences with the course and can be influenced by individual differences, course design, and instructional methods (Alqurashi, 2019; Rios et al., 2018).
7. *Success* – For the purposes of this study, success is synonymous with successful completion; students receiving an A, B, or C in the biology course (Chan & Wang, 2020).

CHAPTER TWO: LITERATURE REVIEW

Overview

The success of nontraditional undergraduate students was explored utilizing a systematic review of the literature from the perspective of the influence of curriculum and instruction in the online learning environment. A review of the current literature as it relates to the topic of study is presented in this chapter. The theories of andragogy and self-directed learning will be discussed, as these theories relate to curriculum impact on nontraditional student completion. These theories are directly related to the characteristics of nontraditional learners and how those characteristics can be utilized to aid in the successful completion of a postsecondary degree. The discussion of theories will be followed by a synthesis of the current literature related to online learning environments and the development of curriculum and instruction related to nontraditional students. The review of the literature has exposed a gap in the literature, revealing a paucity of data concerning the influence of online curricula on the successful completion of biology courses by nontraditional students.

Theoretical Framework

The theoretical framework of this study was based on the concepts of andragogy and self-directed learning. Each of these theories focuses on distinguishing the nontraditional student from the traditional-aged student. Andragogy, as developed by Knowles (1980), attributes differences in learning between nontraditional and traditional-aged students, not only to age and maturity, but also to life experiences, distinguishing principles differing between adult and traditional-aged students. The concept of self-directed learning, as presented by Garrison (1997), based on the work of Knowles (1980), considered the ideas of motivation for learning and thinking abilities as a basis for nontraditional students to successfully complete learning tasks.

The differences between nontraditional and traditional-aged students could affect the successful completion of assigned tasks in community college courses.

Andragogy

For many adults, post-secondary education was not attainable during what is considered the traditional time of life for college, immediately following high school. These individuals, commonly referred to as *nontraditional students*, have been recognized as having different needs that must be met in order for them to be successful in completing their degree in higher education. Knowles (1980) acknowledged differences between adult learners and child learners with his work concerning life-long learning. This acknowledgment of the learning needs of adults led to the development of andragogy as an adult learning theory. Knowles noted that the greatest teachers of ancient times were teachers of adults and not children (Knowles, 1990; Knowles et al., 2005). The experiences of teaching adults resulted in these teachers utilizing different techniques than those used to teach children (Knowles, 1990; Tainsh, 2016). Knowles et al. (2005) further noted that adult learners utilize inquiry to initiate learning rather than the more passive receiving of disseminated information. Based on historical records from the seventh through the twelfth centuries, Knowles (1980) found that the focus of education had been on teaching children, known as pedagogy. The education of adults began to be formally organized during the 1920s (Knowles, 1980; Knowles et al., 2005).

The foundations of adult learning theory, as known today, were first developed by Eduard C. Lindeman in his work *The Meaning of Adult Education* (Knowles et al., 2005). Lindeman (1926) noted foundational concepts associated with adult learning were based on needs and interests. According to Lindeman, the foundations of adult learning were the importance of the adult learners' previous experiences and knowledge and the motivation for

learning related to life situations. Lindeman further noted the important techniques utilized for teaching in the adult learning process should be self-directed and allow for personal differences.

Knowles (1990) determined that pedagogy was appropriately applied in the early and formative years of life and learning. However, Knowles noted that in the absence of specific learning methodologies, educators were utilizing techniques appropriate for pedagogy when teaching adults. Knowles suggested that with an increase in age and maturity, there comes a need for more self-direction with the development of the learners' self-concept. As noted by Knowles (1980), traditional learning techniques, such as "lectures, assigned readings, drills, quizzes, rote memorizing, and examinations" (p. 40) did not appeal to adult learners and resulted in high rates of attrition.

Based on the idea that adults learn differently than children, andragogy was developed to meet the needs of adult learners. The theories concerning pedagogy describe learners as submissive to the decisions of the educator who determined what and when it would be learned, how it would be presented, and ultimately if it had indeed been learned (Knowles, 1990; Knowles et al., 2005). Based on biological, social, and even legal differences between children and adults, Knowles proposed differing educational philosophies and techniques for use with adult learners (Knowles, 1990; Knowles et al., 2005; Tainsh, 2016).

Knowles et al. (2005, 2020) recognized six assumptions based on the needs of adult learners. First, the need to know describes the need of the adult to understand why something is important to be learned (Knowles et al., 2020). Adult learners need to be aware of the benefits of learning, the detriment of not learning, and gaps between what they know and what they need to know (Knowles, 1990). The learners' self-concept is the second assumption of adult learners (Knowles et al., 2020). Becoming responsible for their own decisions and their own lives allows

the adult student to develop a mature self-concept which drives a need to be treated and seen by others as capable (Knowles et al., 2005; Remenick & Goralnik, 2019). The nontraditional students' experiences will play a role in the adult learners' learning process, allowing for differences in how learning takes place. But this also potentially causes conflict when long-held habits and biases hinder their learning process. This relationship is the third assumption presented by Knowles et al. (2005, 2020). Fourth, the adult learner will develop a readiness to learn based on their need to know in order to manage life situations and move to accomplish the tasks associated with the next phase of life. The adult orientation to learning is problem or task based (Ornelles et al., 2019). This fifth assumption is based on the idea that adult learners will be more motivated to learn when there is a direct application to their life situations (Knowles et al., 2005; Ornelles et al., 2019; Tainsh, 2016). The sixth and last of Knowles's assumptions concerning adult learners is that they are more internally motivated (Knowles et al., 2020). Adult learners could be motivated by life situations, such as salary, promotion, and job advancement. The adult learner is more internally motivated to learn to continue growing and developing when learning is based on personal interests and goals (Knowles et al., 2005; Ornelles et al., 2019).

The different assumptions between adult learners and child learners led to differences in practice in educational environments. The adult learners require a learning environment in which they were acknowledged, accepted, and respected as a contributing member of the class (Knowles, 1980; Tainsh, 2016). Merriam (2001) acknowledged that adult learners are responsible for other aspects of their lives and, as such, can be capable of input into their own learning. The manner in which the instructor interacts with the students will exemplify to the students acceptable interactions allowing them to contribute to the class learning environment.

Rather than the instructor dispensing information to students, the adult learner would learn best when involved in the learning process (Knowles, 1980; Remenick & Goralnik, 2019). Knowles (1980) suggested the construction of competencies by which the adult learner could gauge and evaluate their current level of knowledge and establish a measurement of the gap to attain those competencies required in the course. Knowles described the instructor as a facilitator, helping the adult learner learn and allowing them to take responsibility for their own learning. It was further suggested by Knowles that the instructor must find a means of developing a system of self-evaluation in adult students, which allowed the adult students to objectively evaluate feedback concerning performance on assignments. Learning which produces the most significant impact in adult students are methodologies and techniques emphasizing the internal, self-directed learning processes (Knowles, 1980; Ornelles et al., 2019; Remenick & Goralnik, 2019).

Self-Directed Learning

Self-directed learning is a core concept of andragogy and adult learning. Knowles describes self-directed learning in terms of the external learning environment and the manner in which learning will take place (Knowles, 1980, 1990; Knowles et al., 2005). Self-directed learning encourages active participation in the learning process and lifelong learning, motivation, and self-confidence (Tekkol & Demirel, 2018), allowing learners to manage their own learning (Jones, 2019). Knowles (1975) described self-directed learning as the use of the adult student's experiences as a resource for learning, along with the course content provided by the instructor. Tough (1979), a pioneer in self-directed learning, noted reasons adults continue their education. These reasons, as indicated by Tough, are the anticipation of benefit from the learning

experience, curiosity, the intent to attain a particular skill or set of knowledge, and learning used to help attain a particular goal or outcome resulting from the learning experience.

Garrison (1997) proposed a model of self-directed learning incorporating, not only external contextual control, but also, internal cognitive responsibility and motivation. The concept of the self-motivated learner incorporates the ideas of the learner, assuming personal responsibility for their learning and initiating collaboration with the educator for evaluation and management of the learning, resulting in worthwhile and relevant learning outcomes (Garrison, 1997). Nistor and Herman (2016) suggested that to successfully utilize self-direction the student must have an understanding of their needs, as well as a realization of the gap between what they already know and the knowledge needed to succeed. The goal of expertly executed self-directed learning will be to monitor the learning process and the acceptance of responsibility to obtain meaning from the learning task (Garrison, 1997). Garrison determined the dispensing of information by an educator is in conflict with the concept of the self-directed student. Self-directed students have the ability to interpret information and develop meaning by taking responsibility for their learning (Garrison, 1997; Merriam, 2017). The adult student must take an active role in interacting with learning material in the learning process to achieve success. Garrison (1997) suggested that when students begin a learning task with enthusiasm, take responsibility for their learning, and establish control through self-management, they will create self-direction for the learning to take place. Self-directed learning allows for adaptivity in an ever-changing world, encouraging nontraditional students to prepare for a complex working environment (Morris, 2019). The utilization of self-directed principles would result in a student who views challenges in place of problems and has the ability to efficiently utilize such learning

skills as organization, time-management, and study pacing in order to sustain curiosity and a desire to learn (Du Toit-Brits, 2020).

Related Literature

Nontraditional students are generally considered students older than the typical 18 – 24 year old postsecondary student. These students have characteristics differing from the typical aged student and also face challenges to completing their education that the traditional aged student does not face. Research shows that within the online learning environment the overall course development, assignment development, and the curriculum and instruction can each play a role in the success of the nontraditional student. A college course designed to engage, motivate, and encourage participation can be beneficial in determining nontraditional student satisfaction and ultimately successful completion of college courses.

Nontraditional Students

The most common descriptor for a nontraditional postsecondary student has typically been associated with age. Nontraditional students are commonly students 25 years of age and older enrolled in postsecondary educational institutions (Daiva, 2017; Ellis, 2019a; Glowacki-Dudka, 2019; Kimmel et al., 2016; Robertson, 2020). Warden and Myers (2017) noted that characteristics beyond age were important in characterizing nontraditional students. The nontraditional student has been typically defined by a delay in enrollment into higher education and over the age of 24 (Robinson, 2020). Nontraditional students may have used computers and technology for work or personal fulfillment, but these tools have not generally been used for learning in a formal educational environment (Darney & Larwin, 2018; Robinson, 2020).

In contrast, traditional students are those that enrolled in higher education institutions directly from high school and are between the ages of 18 and 24 (Robinson, 2020). Additionally,

traditional-aged students have grown up during the computer age and have a level of comfort with technology and use of the Internet by lifelong association, allowing these students to engage in online learning technologies and quickly transition to online learning. In comparison, nontraditional students generally are older, have more children, work longer hours, and study part-time and online (Chung et al., 2017). It has been noted that nontraditional students may not have obtained a high school diploma and, in some cases, may be a first-generation college student, which could speak to these students' support network for completion of coursework and ultimately their degree (Carreira & Lopes, 2021). While the core definition of nontraditional students was well defined concerning age, work, and delayed entry (Chung et al., 2017), the boundaries of this definition allow for a greater diversity of individuals' ages, circumstances, and motivations. Nontraditional students make up approximately 40% of the postsecondary student body (Ellis, 2019a; Glowacki-Dudka, 2019; Robertson, 2020). Adult students are characteristically different from the traditional 18–24-year-old college student and have life situations that result in unique challenges to degree completion.

Characteristics

Daiva (2017) noted key characteristics of the adult postsecondary students, such as responsibility, experience, internal motivations, independence, and a determination to complete their degrees. The most common designation for nontraditional students was based on age, however, many are parents, have full-time employment, and study online (Chung et al., 2017). These key characteristics were found to influence engagement in educational pursuits in order to increase and improve personal knowledge and in pursuit of special interest learning (Remenick & Goralnik, 2019). In order to be considered a nontraditional student, a student was required to identify with a minimum of one of the following identifiers: aged 25 years or older, enrolled in

postsecondary course part-time, full-time employment, have children, served in the military, delayed entry into postsecondary education at least one year following high school, obtained a GED rather than a high school diploma, or reentry into a postsecondary degree program (MacDonald, 2018; Singh, 2019). Nontraditional students may have been absent from an academic setting for a period of time and must balance reentry into an educational environment along with personal and professional commitments (Squires, 2018), resulting in nontraditional students needing increased support to develop their study skills (Siivonen & Filander, 2020) necessary to successfully complete online courses. Additionally, nontraditional students must adapt to a method of distance learning that was altogether different from the traditional classroom learning method (Bok, 2021). The characteristics of the adult student result in educational needs and motivations differing from traditional students (Daiva, 2017; Ellis, 2019a).

Kasworm (2018) suggested four identifiers be used to define nontraditional adult students. The four identifiers suggested by Kasworm are age 25 years and older, a time gap in formal education, fulfilling adult roles, and independence from parental household. These identifiers are useful in understanding the challenges faced by nontraditional adult students. Nontraditional students may have similar general characteristics, but each will also have individual learning needs and styles, study practices, and motivations for continuing their education (Squires, 2018).

Challenges to Academic Success

In general, the current postsecondary environment has been structured to accommodate the traditional-aged students whose primary focus is aimed toward their education. The traditional student was characterized as enrolled full-time and living on or near campus (Chen, 2017; Kasworm, 2018). Sun (2019) noted that the majority of postsecondary institutions

maintained daytime and weekday operational hours for campus administrative offices. These hours are convenient and accessible to traditional students but create a barrier to nontraditional students who are likely to be engaged at their place of employment during these hours. Chen (2017) further noted that the campus physical structures, campus social structures, and curriculum and instruction have focused on traditional-aged students. Rabourn et al. (2018) noted that postsecondary institutions, despite increased nontraditional student enrollment, continue to create policies that favor traditional students and hinder nontraditional student success.

The youth-centered postsecondary accommodations can lead to barriers for the nontraditional student. In addition to these barriers, the nontraditional student faces additional barriers to their success. Nontraditional students struggle to maintain balance between varying life roles (Bok, 2021; Dos Santos, 2020; Kasworm, 2018; Lin, 2016). The nontraditional student has additional life roles as an employee, family member, and a community member (Bengo, 2020; Daiva, 2017; Hansen et al., 2019; Lin, 2016; MacDonald, 2018). Kara et al. (2019) noted that barriers to nontraditional student success can be categorized as either internal, external, or institutional. Personal or internal barriers or challenges were associated with finding balance between family responsibilities, work obligations, personal needs, and school demands (Hansen et al., 2019; Kara et al., 2019). External challenges were associated with time management, work demands, scheduling conflicts, technical difficulties, and even a study environment (Kara et al., 2019). Institutional barriers were associated with cost, course requirements and delivery, and the time demands associated with the program (Hansen et al., 2019; Kara et al., 2019). Ardissonne et al. (2021) noted the greatest challenge which effected continued enrollment and

timely completion of the degree was the cost of tuition, which must be balanced with the adult students' other financial obligations.

Success for the nontraditional student in part depends upon time management, organization, and balance between each of the varying life roles (Bok, 2021; Carreira & Lopes, 2021; Tekkol & Demirel, 2018). Nontraditional students were found to be highly influenced by work-related challenges, which then influenced student satisfaction with online courses (Abdrahim, 2020). Despite these challenges, nontraditional students continue to pursue postsecondary degrees to fulfill professional certification requirements, create financial opportunities, or merely for the love of learning (Bengo, 2020). Chung et al. (2017) found that the life experiences and responsibilities established prior to the onset of postsecondary educational pursuits contribute to greater resilience, retention, and academic performance for nontraditional students. Research indicates that some nontraditional students may enroll in higher education as a strategy for success rather than a life experience (Renirie, 2017). The life experiences typically associated with mature age, working full-time, and being a provider may impart experiences that allow for greater resilience than younger, less experienced, traditional-aged higher education students (Chung et al., 2017). However, academic success for nontraditional students must incorporate an understanding of the varying life roles these students are required to fulfill, along with appropriate course content, design, and delivery (Bok, 2021).

Online Learning Environment

The online learning environment can play a role in nontraditional student engagement, completion of courses, and ultimately the completion of the requirements for their degree. The independence, flexibility, and learning processes associated with online courses allow the acquisition of skills beyond the topic of study for community college students (Levy, 2017).

Research indicated online courses require the implementation of different pedagogy and differing learning skills for online students compared to traditional classrooms (Harsasi & Sutawijaya, 2018). Smith and Kennedy (2020) noted the development of online courses should be based on pedagogy appropriate to the students' needs, formed on determined learning outcomes, and utilized a theoretical framework. The pedagogy chosen for an online course should promote active learning, encourage deep learning, and contribute to multiple ways of reasoning and thinking. Nontraditional students' early academic experiences engaged in face-to-face interactions and continues in their current work environment making interaction and collaboration important elements in online learning (Robinson, 2020). Online learning has the opportunity to encourage self-directed learning (Levy, 2017). The utilization of the assumptions of andragogy presented by Knowles et al. (2005, 2020) was found to successfully implement the goals of online course development (Smith & Kennedy, 2020).

The convenience of the online learning environment has led many adult learners to utilize this as a means of meeting life responsibilities and attaining a postsecondary degree (Carreira & Lopes, 2021; Ellis, 2019b). The multidimensional aspect of the online learning environment has allowed students to continue their education utilizing technologies while receiving individualized instruction, thus meeting the varied needs of the adult students (Decelle, 2016). Nontraditional students have been found to prefer online courses to face-to-face courses due to the flexibility offered in the online format (Woods & Frogge, 2017). Nontraditional students have been found to more readily adjust to the independence, self-responsibility, and time management required of the postsecondary online learning environment (Siivonen & Filander, 2020). Adult learners have been found to respond well to instructors and assignments, which allowed independence and an acknowledgment of prior learning and knowledge (Mokel, 2021). Many students saw the ability

to participate in classes from any location and at any time as a positive aspect of online coursework (Knowles et al., 2020; Turhangil Erenler, 2019; Uusiautti et al., 2017).

It has been noted that postsecondary institutions have considered multiple modifications to determine the best online environment for adult students (Ellis, 2019b). In addition, Forman and Chapman (2021) found the technology utilized to obtain course information or complete assignments was a potential barrier to nontraditional student engagement and completion. Research has shown that the overall design of the online program facilitated students' progress and interaction (Provident et al., 2015). The online course format was found to improve student achievement (Gavassa et al., 2019). To avoid nontraditional students' potential frustration with technology, only a few technologies should be utilized in the design of the online course, but these should be consistently used throughout the online course (Forman & Chapman, 2021). Darney and Larwin (2018) suggested introducing technologies using an instructor-led instructional approach to relieve any potential stress associated with acquiring the skills necessary to use the technology for assignment completion.

Online instruction should be planned utilizing activities that promote collaboration between students and allow for decision-making and knowledge sharing for each student (King-Spezzo et al., 2020). Based on research by Uusiautti et al. (2017), the ideal online environment for teaching and learning must have a positive, active, caring instructor, the ability to interact with other students and the instructor, flexibility in time and place for study, access to technical help and adequate internet connections. A course design leading to the acquisition of knowledge for nontraditional students should encourage student engagement with the course content, and presentations should be delivered in a manner which encourages participation in course activities and completion of assignments (Ng & Baharom, 2018). Applying the assumptions of andragogy

to the online environment would allow nontraditional students greater satisfaction with their coursework and the opportunity for increased knowledge retention (Knowles et al., 2020). Du Toit-Brits (2020) noted that the online learning environment, created utilizing the principles of self-directed learning, facilitated the engagement and learning of adult students.

Course Development

Online courses must be designed with a quality environment favorable to learning with an ease of navigation and interaction (Rios et al., 2018). Differences have been noted in the approaches to course structure regarding nontraditional students and those of traditional-aged students (Dieterich & Hamsher, 2020). The learning process for first-time undergraduate students has been found to be different from nontraditional students. Research has suggested that online courses may be the best course structure for nontraditional students due to the ability to work from home and the flexibility of scheduling assignment completion (Abdrahim, 2020; Mkhathswa & Hoffman, 2019). Dos Santos (2020) noted that nontraditional students indicated a preference for the online learning environment because it provided a self-controlled and self-paced learning environment facilitating individual learning needs.

The online course structure should be appropriate to the nontraditional student and developed to facilitate this group's educational success (Dieterich & Hamsher, 2020). A course structure utilizing scaffolding from a logical course design with clear instructions and ease of locating assignments were found to contribute to student satisfaction with online courses (Muljana & Luo, 2019). It has been suggested that faculty and administration should consider scheduling and course format with consideration given to the unique characteristics of nontraditional students (Woods & Frogge, 2017). The online learning environment should be

designed with regard to the nontraditional student, the subject of the course, and the learning context (Sorgenfrei & Smolnik, 2016).

An effective learning environment established by course content and meaningful interactions help establish student satisfaction (Turhangil Erenler, 2019), which, in turn, influences student engagement and completion. All students' performance and final grades benefit from the use of improved online course design and the use of well-developed learning strategies (Chen et al., 2018). Learning environments should be created which allow for self-directed learning (Du Toit-Brits, 2020). It has also been suggested that online courses should be developed to allow the instructor to act as a facilitator promoting self-directed learning for nontraditional students (Decelle, 2016). Dieterich and Hamsher (2020) further suggested that online course structure for nontraditional students should include clear assignment instructions, cognitive activities, assignments with high expectations, and rapid, individualized, constant, constructive feedback. Ng and Baharom (2018) noted the need for specific, clear instructions for nontraditional students as an essential element in all course design. Both improved grades and course retention can be enhanced by course design (Wilton et al., 2019).

An effective course structure must be identified to facilitate the implementation of curriculum for the nontraditional student. It is necessary to design and organize courses to encourage engagement and show the relevance and purpose of the material without causing the students to be overwhelmed by the presentation of the course requirements (Squires, 2018). It is important to facilitate organization by use of schedules, calendars, and hyperlinked assignments to aid students' participation and motivation (Faulconer & Gruss, 2018). Belland et al. (2017) further suggested that a scaffold course structure would aid in the elimination of frustration

concerning the course and assignment structure, allow for critical thinking, facilitate timely and constructive feedback, and provide task structure, direction, and demonstration.

Design Encouraging Participation

Online courses should be developed that encourage nontraditional students in collaborative learning, sharing knowledge, and encourage student decision-making (King-Spezzo et al., 2020). Nontraditional students' success in an online course has been linked to students' self-determination and ability to remain self-directed (Iloh, 2019). Nontraditional students who spent time becoming familiar with the course structure, engaged with the course materials, and understood and determined to meet the instructor's expectations were more successful in online courses (Abdrahim, 2020). Expressing and maintaining clear course goals was determined to facilitate learning, increase motivation, and improve retention (Diep et al., 2019).

Martin and Bolliger (2018) noted maintaining student engagement through the use of interactive course activities and instructor-led facilitation in online courses was also beneficial in encouraging engagement for nontraditional students. A course design which facilitates access to course materials and learning encourages participation and motivation for online students (Khan et al., 2021). Muir et al. (2020) found the use of strategies by instructors leading to student interaction with both the instructor and the course content influenced students to establish and maintain engagement with the course material. Forman and Chapman (2021) found instructor feedback to be an important element to encourage continued engagement of the students with course content. Self-directed nontraditional learners will respond to a learning environment that promotes problem-solving and critical thinking, thus encouraging nontraditional students to completion (Tainsh, 2016). Problem-solving and critical thinking assignments are components of an online course that will allow students to understand and apply course materials to their

previous experiences in order to solve problems and make connections with real-world situations (Tainsh, 2016). Four concepts which researchers noted aided online biology students to maintain participation and motivation to complete the course were clear communication, opportunity to explore topics, course activities creating cognitive demand, and an opportunity to reflect (Humphrey & Wiles, 2021). The application of learning with previous experience will allow the nontraditional student participation in course assignments and collaborations.

Curriculum and Instruction

The development of effective curriculum and instruction for nontraditional students within online courses follows the same principles of andragogy and self-directed learning that are necessary for the development of the overall online program (Tainsh, 2016). A well-designed online course which will encourage engagement and participation will have clearly stated guidelines and assignment directions, as well as timely feedback from the instructor (Uusiautti et al., 2017). To engage nontraditional students, the online course curriculum must be innovative and utilize techniques established for effective online teaching (Tainsh, 2016). Organizing course content into smaller groups of assignments, even if the course contained a large amount of content, had a positive effect on student satisfaction with the course (Shin & Cheon, 2019). Further, grouping the content into manageable chunks allowed students to pace their learning through the workload and allowed students to remain motivated to complete the course. Assuring approaches to the course are manageable and practical will aid in achieving student satisfaction and motivation to complete (Rios et al., 2018).

Nontraditional students have been found to have high levels of motivation in successfully completing online classes (Woods & Frogge, 2017). Jobe et al. (2018) noted that one of the barriers to nontraditional student success was the failure to set requirements concerning the time

required and an accurate accounting of the workload within a course. The practice of continuous curriculum planning and improvement allowed students an enhanced learning experience (Long et al., 2020). The curriculum and implementation must be designed with a strategy of engagement and motivation, applying the principles of andragogy and self-directed learning in order to encourage nontraditional student success.

Open Educational Resources (OER) are resources for teaching, learning, and research found in the public domain or materials which have been created and released under a licensing that allows the use and re-purposing of the intellectual property without payment (Fine & Read, 2020; Ikahihifo et al., 2017; Mathew & Kashyap, 2019; Piña & Moran, 2018). Research has indicated many students do not purchase traditional textbooks due to the cost of the materials (Cuttler, 2019). Cuttler noted online students tend to access the open resource textbook more often than the traditional textbook and were more likely to use the OER resource to study for or complete assignments. OER materials may increase engagement because the materials' flexible and adaptable nature further allows instructors the ability to provide information as it best applies to the learning outcomes of the course (Ikahihifo et al., 2017).

Students were found to feel OER course materials were of equal or better quality than traditional course materials (Cuttler, 2019; Ikahihifo et al., 2017; Jaggars et al., 2018). When OER materials were used, students were found to be more satisfied with the course materials, the quality of the course, and the financial obligation than students who previously used traditional materials (Piña & Moran, 2018). Students with access to OER materials were more likely to use the textbook than students required to purchase the traditional textbook (Cuttler, 2019). Mathew and Kashyap (2019) noted students perceived the OER materials to be more readable and understandable than the traditional textbooks, in addition to the cost savings by utilizing the OER

materials. Ikahihifo et al. (2017) found the majority of students were more engaged with the OER course materials compared to engagement with a traditional textbook. Researchers did not note differences in student performance; however, students rated the OER materials higher for understanding, readability, and cost (Mathew & Kashyap, 2019). Other research showed students in courses utilizing an OER textbook were significantly more likely to spend time utilizing the textbook for study and course assignments (Cuttler, 2019). Cuttler suggested the use of OER textbooks may increase engagement with course materials for online students.

Nontraditional graduate students were found to perceive OER course materials to be equal to the traditional course materials used previously (Abri & Dabbagh, 2019). Researchers found older undergraduate students had a positive perception of OER materials used in courses (Fine & Read, 2020). These researchers further concluded students positively favored OER materials in relation to lower cost for courses and for higher education in general (Fine & Read, 2020). Calabrese et al. (2019) noted students favored the accessibility of the OER textbook compared to the publisher textbook used in a nutrition course. Students noted the savings from use of OER resources alleviated some of the stress of educational, financial obligations and allowed some to reinvest the saved funds in materials for classes utilizing traditional resources (Ikahihifo et al., 2017).

Dieterich and Hamsher (2020) found that instructor behaviors can impact nontraditional student success. The instructors must display cognitive behaviors to reveal a knowledge of the course content and provide encouragement, care, and instructor presence in the course. Maintaining a consistent instructor presence with a commitment to supporting students must be incorporated into the methods and practices utilized in the course design (Levy, 2017). In an online learning environment, the instructor must fulfill several roles beyond that of educator and

subject matter expert. The online instructor must have an in-depth knowledge of the course design, be a facilitator for course content, course technology, and course processes, and act as an administrator, advisor, assessor of student work, and researcher of unknown information (Uusiautti et al., 2017). A significant predictor of student success was students' interactions with the instructor through frequent posts, rapid response to email, constructive feedback, and demonstration of a sense of caring (Jaggars & Xu, 2016; Martin & Bolliger, 2018). Instructor interaction with students was determined to be important because it helps students focus and maintain discussions on the topic of the course (Diep et al., 2019). Maintaining a teaching presence and timely instructor feedback were found to be helpful in establishing student satisfaction with the online course experience (Rios et al., 2018).

Assignment Development

The current nontraditional student is not satisfied with the traditional lecture and examination format of college courses (Norris, 2019). The majority of teaching and learning strategies have been designed for traditional-aged students (Singh, 2019); thus modification in current course structure may be required to address the barriers to success faced by nontraditional students (Mew, 2020). New approaches in course design and curriculum will be required to bring nontraditional students to course and degree completion. Instructors must reevaluate course design and information delivery techniques of course materials to encourage engagement and greater learning for nontraditional students (Singh, 2019).

Khan et al. (2021) noted the manner course material is delivered by faculty can affect student motivation concerning learning in the online format. Research concerning the learning styles of nontraditional students revealed a vast array of preferences, with no one learning style dominating as a preference for this group of students (Amponsah, 2020). Further, this research

revealed the educational context and content were the major determination of the learning style utilized by the nontraditional students (Amponsah, 2020). It is important to note, nontraditional students require engagement not only with other students and the instructor but, in addition, with learning materials and activities which promote active learning (Martin & Bolliger, 2018).

A variety of assignments utilized within an online course will facilitate nontraditional students to explore multiple applications of previous experiences with the course material. Assignments that challenge students are valuable to improve self-directed learning and encourage students to take ownership of their educational experiences (Tainsh, 2016). Assignments should have clear instructions and guidance, and student feedback should reflect the instructor's knowledge of the course material, as these qualities were found to be associated with students' satisfaction with the online course (Rios et al., 2018). Online delivery of course content should include assignments designed to encourage participation (Ng & Baharom, 2018) which will influence student satisfaction with the course. Remenick and Goralnik (2019) found that courses built on the principles of andragogy resulted in greater satisfaction for a diverse group of adult learners. Beginning the learning process by making use of the nontraditional students' life experiences acknowledges their independence and capacity to make decisions (Bengo, 2020). Courses developed for nontraditional students need a balance between autonomy and adequate support, an emphasis on active learning, assignments that allow adult learners to utilize previous knowledge, allow each adult student to be an active participant in the course assignment, and to change the focus of the assignment from the individual to the community (Bengo, 2020; Remenick & Goralnik, 2019). Cavanaugh et al. (2016) found that a range of online activities aid in maintaining engagement for adult students.

Intentional course design utilizing repetition and consistency aid nontraditional students in knowing what to expect each week and the confidence to complete assignments (Alpay et al., 2017). In addition, frequent interaction, established performance criteria, clear learning objectives, and easy-to-follow course organization aided in the course success of nontraditional students (Pawl, 2018). Kennan et al. (2018) found nontraditional students preferred organized content, instructor presence, and meaningful feedback in online courses. The removal of elements of the course design that added no value or learning opportunities was found to enhance student success and allow instructors to better enhance learning and practical application of knowledge for nontraditional students in statistics classes (Singh, 2019). Changes to course assignments resulted in nontraditional students' ability to apply critical thinking to the learning process in nursing classes, which resulted in deeper learning (Norris, 2019).

Changes and improvements to specific courses have led to greater learning, knowledge acquisition, and satisfaction for nontraditional students. The use of pre-recorded lectures intended to be utilized prior to class meetings was found useful for nontraditional students to apply science knowledge and motivated nontraditional anatomy students to complete active learning assignments (Thalluri & Penman, 2020). Additionally, the use of pre-recorded lectures allowed students to participate in active learning, leading to greater attention to the information, discussion, and a greater depth of knowledge.

Nontraditional medical students utilized a self-directed learning approach to expose gaps in their knowledge leading to greater learning and application of knowledge and potentially providing motivation for continued self-directed learning (Sawatsky et al., 2017). Nontraditional nursing students enrolled in a RN-BSN bridging program were found to rate higher in self-management, engaging to a greater degree in self-directed learning when nursing courses were

redesigned to incorporate self-directed learning activities (Alharbi, 2018). The effectiveness of online courses was evaluated by faculty for radiography students and found learning was enhanced by the use of instructor-generated media, simulations and interactive media, graphics, embedded videos, tutorials integrated into the module, and active learning activities to determine knowledge gains when the module is completed (Cherry & Flora, 2017). Online learning has encouraged the use of technology in online nursing courses, but the integration of these technologies must occur only after they have been thoroughly investigated for the appropriate application and effective use in the online nursing courses (Perfetto, 2019).

Implementing course design elements which intentionally included instructor involvement in group discussions and online meetings with the instructor were noted to potentially improve student satisfaction for nontraditional students in an online psychology course (Haywood & Murty, 2018). Online doctoral students were found to be influenced by intentional interaction between the instructor and student (Thompson et al., 2018). These researchers concluded an importance in a course design allowing online students and faculty to interact, the need for the instructor to intentionally interact with the online students, and the interaction between the instructor and the online student was important in improving student performance in the online program (Thompson et al., 2018). The elimination of course activities that detract from or merely do not add to learning will lead to improved quality of the course design.

The use of interactive multimedia may be useful to improve nontraditional students' understanding of the weekly course topics leading to greater student success (Alpay et al., 2017). Active learning techniques improved course effectiveness and encouraged student engagement, which, in turn, led to greater persistence, retention, and student satisfaction (Harris et al., 2020).

Further, the use of technology for auto-graded quizzes and assignments was found to allow nontraditional students to determine the effects of their effort and provided more opportunity for the instructor to spend valuable time interacting with the nontraditional students (Singh, 2019). Instructor feedback helps nontraditional students link prior knowledge and experiences with new knowledge, which provided enhanced learning opportunities for nontraditional students (Pawl, 2018). To improve nontraditional student success and retention, Alpay et al. (2017) utilized consistent weekly assignments and the application of course information to current events, which allowed nontraditional students to make connections outside the classroom. Gaston and Lynch (2019) noted the need for further research to identify and develop course design to continue to increase student engagement. Developing simplified and directly applicable assignments and promoting the use of course materials in line with nontraditional student characteristics can contribute to the success of nontraditional students (Singh, 2019).

Engagement, Motivation, and Satisfaction

Engagement has been described as the effort and amount of time students participate in a purposeful, educational activity (Rabourn et al., 2018). Engagement was a vital contribution to student satisfaction, performance, and motivation. (Rios et al., 2018). Blakey and Major (2019) noted engagement was found in students logging into the online course, completing assignments, putting forth the effort, and having a dialogue with instructors and fellow students.

Communication between students and instructors was found to be crucial for motivation and thus student success (Khan et al., 2021). Ellis (2019b) suggested that active learning activities engage nontraditional students and increase overall performance. Active learning was recognized as anything course related other than listening, notetaking, or merely watching, that engaged all the students in the class session (Chen et al., 2018). When compared to traditional teacher-centered

class design, active learning has been found to increase student performance (Tamari et al., 2020). Active learning was found to have a positive effect on student performance and more successful completion of science classes (Chen et al., 2018). Techniques utilizing active learning require students to interact and engage with course materials, encouraging student motivation for completion (Harris et al., 2020). The traditional lecture format does not promote knowledge retention nor encourage the active learning (Sautière et al., 2019) needed by nontraditional students. Rabourn et al. (2018) found that student engagement can take a variety of forms and can be individual or a collaborative effort with peers.

Courses designed utilizing a standard rubric and a set of uniform criteria encouraged increased student engagement in online nursing courses (Gaston & Lynch, 2019). The use of learning tools, such as short online quizzes, was found to be an effective strategy in science education (Chen et al., 2018). To create course content that encourages engagement, instructors should allow students to connect course content with their own personal interests, utilize activities and scenarios that will be realistic to the student, encourage students to utilize real-world data for analysis, and study real-life case studies (Blakey & Major, 2019). Shin and Cheon (2019) noted student satisfaction was higher in courses that utilized informational elements, such as an announcement page and a schedule page, as these elements encouraged engagement with course materials. Rabourn et al. (2018) further noted that student engagement was related to student participation and continued student motivation. Blakey and Major (2019) noted an important component of engagement was communication among all participants of a course, all students, and the instructor. Instructor-student interaction has been found to be important in maintaining course engagement for nontraditional students (Martin & Bolliger, 2018; Muir et al., 2020). Adult student engagement has been linked to satisfaction with the

learning environment, motivation to remain engaged in the learning activities, and student retention (Rabourn et al., 2018). The use of learning tools, instructor feedback, and collaboration with peers can be effective strategies for encouraging nontraditional student engagement (Muir et al., 2020). Thus, the students' ability to remain motivated, manage time requirements, and multitask commitments affects their satisfaction with online courses (Rios et al., 2018).

Student satisfaction has been described as the pleasure students receive from their online learning experience (Kurucay & Inan, 2017). Student satisfaction can have an influence on student performance and completion (Harsasi & Sutawijaya, 2018). Research indicated a direct relationship between student satisfaction with a course and student learning and successful completion of the online course (Kurucay & Inan, 2017). Kuo and Belland (2016) found a relationship between satisfaction and performance to be positively correlated with greater satisfaction leading to improved academic performance. Student satisfaction was found to be impacted by technology, self-efficacy, student personality, and the materials utilized in the course design (Rios et al., 2018). Turhangil Erenler (2019) found student interactions with other students, the course instructor, the course management system, and the use of other technology influences student satisfaction.

Student interaction with course content in an asynchronous design and internet proficiency were also useful as predictors of student satisfaction (Ng & Baharom, 2018). Research has suggested greater student satisfaction was based on whether students perceived the course materials were helpful to understanding the course content, stimulated engagement in the course, aided in making use of past knowledge and experiences, and were presented in a manner easy to access (Alqurashi, 2019). Rios et al. (2018) determined two principal predictors of student satisfaction were student-instructor interactions and how the student engaged with the

course content. These researchers found student satisfaction linked to student access to instructor's contact information, course expectations, weekly announcements, participation requirements, course policies, and expectations for grading.

Alqurashi (2019) also noted student satisfaction was related to the quality of interactions between the student and the instructor. Additionally, Harsasi and Sutawijaya (2018) found course structure, instructional quality, assignment flexibility, and use of a well-constructed learning platform have a positive influence on students' satisfaction with a course. In general, student satisfaction was found to be influenced by student interactions, instructor practices, course quality, and flexibility of time and place (Muljana & Luo, 2019; Turhangil Erenler, 2019). However, the adult students' interaction with the course content was determined to be the most important predictor of student satisfaction (Alqurashi, 2019; Kuo & Belland, 2016).

Rios et al. (2018) did note student conscientiousness played a role in overall course satisfaction, with more conscientious students being more likely to be satisfied with online courses. Online course structure was found to have an impact on student satisfaction, thus improving the quality of online courses was expected to improve learning outcomes and positively influence student satisfaction (Harsasi & Sutawijaya, 2018). Strongly held student satisfaction points to instruction that challenged students to engage in learning, indicating that student interaction in the online course is a pivotal indicator of the degree of student satisfaction.

Student satisfaction has been used as an indicator of quality in online learning (Ng & Baharom, 2018). Student satisfaction has been used as a tool to determine how students perceive the quality of online courses (Kurucay & Inan, 2017). Greater nontraditional student satisfaction was found in courses which were designed with clarity of purpose, respect for students, and intentionally designed to meet nontraditional students' needs (Ng & Baharom, 2018). Hensley et

al. (2021) stated student satisfaction and engagement were directly influential in determining the success of students in their program of study. Student satisfaction should be considered of vital importance when developing an online course (Kurucay & Inan, 2017; Rios et al., 2018).

It was further suggested that course structure could influence nontraditional student engagement and motivation to complete (Dieterich & Hamsher, 2020). Courses' design should incorporate best practices, making use of key learning, motivation, and development principles while allowing for individuality (Squires, 2018). Ng and Baharom (2018) suggested online course design for nontraditional students should include learning content applicable to the online environment, activities and assignments that lead to knowledge acquisition, clear and understandable instructions, a learning platform that was easy to navigate, the ability for nontraditional students to transfer acquired knowledge to applicable situations, and social support provided by social interaction and instructor presence. Course content for science classes must allow for a dynamic presentation in order to capture the attention of adult students (Bliss, 2019), contributing to engagement and motivation and thus to student satisfaction. Ellis (2019a) noted that engaged and motivated nontraditional students displayed more perseverance than traditional students. Despite the limited interaction between students and instructors, online courses may provide students the opportunity to connect newly acquired knowledge with old knowledge, apply real-world application, and participate in self-regulated learning (Iloh, 2019). To better understand the relationship between adult students and the online learning environment, Kuo and Belland (2016) called for further research comparing student satisfaction and course content interaction.

Course design has the potential to improve undergraduate performance in biology courses. Typically, general biology courses consist of a lecture portion and a laboratory portion

of the course. In each type of class, basic biological information was dispensed to the students, but the means of learning was unique to the class environment. The lecture portion of the course has the greatest quantity of information. The lecture portion can utilize lecture videos (Harris et al., 2020), webinars, and discussion boards (Muir et al., 2020). Active learning techniques, such as the use of visual aids, annotated PowerPoint presentations, group interaction, case studies, and instructor feedback encourage engagement in the course and can improve engagement with course materials (Arjomandi et al., 2018). Muir et al. (2020) further recommend the use of announcements and emails to encourage student engagement in the online course. Humphrey and Wiles (2021) determined biology courses transitioned to an online format require repeated and explicit explanation and communication about class expectations and course learning outcomes.

The laboratory portion of the general biology course was a weekly session in which a specific topic from the lecture was examined in greater detail. As with any higher education science course, this was content-heavy with a large quantity of new vocabulary students would be required to know in order to understand the biological structures and functions presented in the course. While students do not complete a traditional hands-on laboratory exercise in an online lab, Harris et al. (2020) noted online laboratory sessions may require students to collect data, analyze results, and draw conclusions while drawing from the information obtained from the information presented in the lecture portion of the course.

Summary

The success of nontraditional students in higher education is impacted by the students' engagement with the course material and the motivation to complete the assignments. The continued enrollment of nontraditional students in institutes of higher education requires that

curriculum and instruction must be adequate to encourage these students to persist to completion. Researchers have explored the characteristics that differentiate nontraditional students from traditional students and course community needs associated with nontraditional student success. Researchers have examined the validity of andragogy as an adult learning theory. The six descriptors of nontraditional students described in andragogy have been recognized by researchers as important in the success of these students. However, little research has been done on the application of these descriptors to biology course curriculum in the online course environment to encourage nontraditional student persistence and completion. In current online science courses, the majority of the course curriculum is presented to the students in the form of “lectures, assigned readings, drills, quizzes, rote memorizing, and examinations” (Knowles, 1980, p. 40). As indicated in examining the theory of andragogy, these formats are not appropriate for nontraditional student success in these courses. Kiernan and Lotter (2019) noted a gap in the literature addressing the educational needs of nontraditional students completing online science courses.

Studies have been conducted with nontraditional students concerning barriers to completion, sense of community, and perceived learning. The online course environment has been evaluated to determine to what degree it matches with the five descriptors found in andragogy. Course design undertaken by experts in the field of knowledge will result in a curriculum that promotes student learning, student success, and interaction between students and instructor (Gruber, 2018). Careful course planning utilizing strategies and technologies appealing to nontraditional students will result in a course design encouraging nontraditional student success (Squires, 2018). Student interaction with course content was found to be significant when predicting student satisfaction (Kuo & Belland, 2016; Rios et al., 2018). From

these and other previously mentioned findings, further research should determine if the type and organization of the course content is significant in determining student satisfaction. By examining the curricula in online biology courses and the student satisfaction within the curricula, educators can better determine the curricula and instruction necessary to improve completion rates for nontraditional students in postsecondary biology courses and the impact current online curricula and instruction have on nontraditional student completion.

CHAPTER THREE: METHODS

Overview

As nontraditional students return to higher education to complete their degree, the differences in educational needs compared with traditional-aged students may affect curriculum choices in postsecondary courses. This predictive correlation study was designed to investigate the relationship between student satisfaction with course curriculum and successful course completion for nontraditional students at a community college in Tennessee. The design of this study was used to examine the course grade and the students' perceived satisfaction with the format of the course curriculum. This chapter details the design, participants, setting used for the study, and the rationale used to determine the statistical analysis.

Design

This quantitative, predictive correlational study was designed to determine if course satisfaction and the format of the course curriculum could be used to predict nontraditional students' successful course completion in biology. A quantitative design was appropriate for this study because this research was intended to determine the extent of the effect of the variables on the participants from the research population. Gall et al. (2007) noted that the use of predictive research was useful in the development of programs that increase students' chances for successful completion.

This study was used to explore the relationship between student successful completion of the biology course (criterion variable) and student satisfaction with the course curriculum format (predictor variables). The criterion variable was successful completion of the biology course. For this research, successful completion was defined as the nontraditional student receiving an A, B, or C in the biology course, and unsuccessful completion was defined as a nontraditional

student receiving a D, F, or withdrawal from the course. The predictor variables were course satisfaction and curriculum format. Student satisfaction was determined through the results compiled from the completion of a survey designed to measure student satisfaction with the course curriculum format. The course curriculum format variable was determined through access to enrollment records indicating whether the nontraditional students were enrolled in the online biology course designed using the OER course materials and formatted based on the principles of the theory of andragogy or the biology course designed using the traditional publisher created content (PUB) and formatted based on publisher pre-selected course activities.

Gall et al. (2007) noted that predictive educational research was useful in guiding students to be successful in specific educational settings. Warden and Myers (2017) found that a correlative research design was appropriate to determine the significance of relationships between active learning variables affecting course outcomes for nontraditional students. This research study was designed to determine if student satisfaction with the different course curricula can predict successful course completion of nontraditional students. Ellis (2019a) noted the course activities utilized could result in the persistence of nontraditional students to complete courses. An increase in nontraditional student engagement resulted from nontraditional student satisfaction with course curriculum (Choe et al., 2019). The data collected was used to determine if there was a statistically significant relationship between curriculum format, student satisfaction with the course curriculum, and academic achievement for nontraditional biology students.

Research Question

One research question was developed for this study:

RQ: How accurately can successful completion of a biology course be predicted from a linear combination of student course satisfaction scores and curriculum format for nontraditional community college students?

Hypothesis

The null hypothesis for this study is:

H₀: There will be no significant predictive relationship between the criterion variable (completion of the biology course) and the linear combination of predictor variables (student course satisfaction scores and curriculum format) for nontraditional community college students.

Participants and Setting

Population

This study took place at a rural community college in Tennessee with a total student population of fewer than 10,000 students. The use of Tennessee Reconnect tuition funds encouraged nontraditional students to return to complete an associate degree. The target population of this research was nontraditional students attending the community college. Nontraditional students, aged 25 and older, currently make up 23% of the student population of this community college (College Data Profile, 2020). From this population of nontraditional students, the participants were drawn.

Participants

The participants of the study consisted of a convenience sample of students attending the community college who enrolled in biology courses at the small rural community college in Tennessee. Students enrolled in the biology courses were contacted via the learning management system announcements introducing the purpose of the study and distribution of consent to complete the survey. This sample was purposefully chosen because it best fits the

population determined pertinent to this study (Gall et al., 2007). Warner (2013, p.1034) stated “[I]t is difficult to provide recommendations about the sample size required to have adequate statistical power in binary logistic regression.” The sample was 85, which exceeds the minimum sample size of 66 when assuming a medium effect size with a power of 0.7 and an alpha of .05 (Gall et al., 2007).

Data describing student age and other nontraditional student indicators was retrieved along with the indication of successful completion from the college records database. The undergraduate, nontraditional student sample consisted of 59 females, 26 males, 2 Asian, 6 Black students, 4 Hispanic students, 4 Multiracial, 65 White students, and 4 students of other ethnic groups. Based on adherence to one or more of nine criteria, students were classified as nontraditional. The ages of the nontraditional students in this research ranged from 18 to 53 years of age.

One or more of nine criteria were used to designate nontraditional students. The criteria were 25 years of age or older, full-time employment, parent of one or more children, served or serving in the military, delayed entry into college after taking off more than the summer following high school graduation, re-entry into college after beginning or not continuing coursework for more than one semester, and/or qualify as independent on taxes/FAFSA or qualify for TN Reconnect. A survey to determine student satisfaction with curriculum format was electronically distributed by the office of quality assurance. The collected survey data was aggregated by the office of quality assurance and released to the researcher for analysis. Descriptive statistics were then used to further describe the sample population.

Setting

The rural community college is one institution from a state-wide system of community

colleges and colleges of applied technology (Community Colleges, n. d.). This community college regularly offered biology courses for students in fulfillment of general education requirements for completion of an associate degree. The biology courses were offered in on-ground, face-to-face format, and online formats. The online formats either utilized OER or traditional PUB curricula. Student placement in one of the online formats was determined by each student at the time of registration. This research study surveyed the nontraditional students who had enrolled in the online biology courses to determine if there was greater satisfaction with one of the online formats for nontraditional students in biology courses.

Instrumentation

The instrument used for this study was the Online Course Satisfaction Scale (OCSS) (Bayrak et al., 2020). The purpose of OCSS was to provide a valid and reliable, practical instrument to measure students' satisfaction with online courses. The OCSS, as developed by Bayrak et al., was used to collect data concerning student satisfaction. The survey results were then used as data for the student satisfaction predictor variable in the current research. The OCSS was developed by Bayrak et al. (2020) to focus on students' satisfaction with course format, instruction, and instructor interaction. These researchers determined an importance for instructors to obtain perceptions and opinions from online students when developing, designing, redesigning, and implementing online courses. OCSS was developed to further the success of online courses at the researchers' institutions of higher education.

Due to the recent development of OCSS (Bayrak et al., 2020), there are no other current studies which have made use of this instrument. The current research was conducted in part to determine if there was a correlation between student satisfaction and successful course completion. The OCSS, as developed by Bayrak et al., was an appropriate instrument to use for

this study because the items contained in the instrument focus on student course satisfaction. The researchers developing OCSS consulted with six experts to determine the scope validity of the items created for the survey. The construct validity of the survey was found to be 0.949. The OCSS, as completed by Bayrak et al., consisted of eight items used to describe student satisfaction with the online course structure and facilitation. This instrument used a 5-point Likert scale to rate each of the eight items in the instrument from strongly agree to strongly disagree. The possible responses to each item were 5 - strongly agree; 4 – agree; 3 – neither agree nor disagree; 2 – disagree; and 1 – strongly disagree. The combined possible score for the OCSS ranges from eight to 40 points. The lowest possible score of eight points indicates the student did not agree with any of the statements concerning the online course and was dissatisfied with the online course, and a score of 40 indicates that the student strongly agreed with each of the items and was satisfied with the online course structure and facilitation.

The research included a survey using OCSS to determine the degree of influence the biology teaching methodologies and curriculum had on the nontraditional students' perceptions of the course and the ability of the nontraditional students to successfully engage with the course activities. The survey was distributed to the participants from the office of quality assurance via the learning management system announcements. It was estimated that the survey was completed by the participants in approximately 20 minutes. Instrument scores were collected and aggregated with demographic and course completion data by the office of quality assurance and then distributed to the researcher. The purpose of the use of this instrument was to measure student satisfaction with biology course activities. Reliability of the instrument was determined utilizing Cronbach's alpha. The reliability of the instrument was found to be valid, with a

Cronbach alpha of 0.938 (Bayrak et al., 2020). Permission was granted for the use of this instrument. See Appendix A for a copy of the permission.

The research included a survey using OCSS to determine the degree of influence the biology teaching methodologies and curriculum had on the nontraditional students' perceptions of the course and the ability of the nontraditional students to successfully engage with the course activities. The survey was distributed to the participants from the office of quality assurance via course announcements in the learning management system. It was estimated that the survey would be completed by the participants in approximately 20 minutes. Instrument scores were collected and aggregated with demographic and course completion data by the office of quality assurance and then distributed to the researcher.

Procedures

The relevant population for this study consisted of the nontraditional students attending a small rural community college who were enrolled in an online section of the biology courses. IRB approval was gained from the attending university and the research institution granted permission to conduct the study by requesting access to course completion status, end-of-term course grade, permission to administer the survey to each of the nontraditional students enrolled in biology courses, and general demographic data, including sex and ethnicity. See Appendix B for IRB approval. After IRB approval, an invitation to participants was written and distributed to the research population seeking participation in the research study along with the necessary consent. Included in the notice of invitation was the information that the survey would take approximately 20 minutes to complete and that all responses would be kept anonymous. To further ensure anonymity, on the researcher's behalf, the survey was administered by the office of quality assurance. The survey was made available to the participants utilizing the learning

management system to ensure that students enrolled in biology courses had access to the survey. Upon completion of the survey, the results were collected by the office of quality assurance. The office of quality assurance correlated the survey responses with the end-of-term grade and demographic data. The anonymous aggregated data was compiled and sent to the researcher for analysis.

Data Analysis

The statistical analysis chosen for this study was logistic regression because this research design allowed for analyzing the relationship between an outcome and the predictor variables (Salkind, 2010). Logistic regression was an appropriate analysis for this study because the analysis determines the relationship between a dichotomous criterion variable and a set of predictor variables (Gall et al., 2007). Nontraditional student successful completion was a dichotomous variable, and the analysis had a defined set of predictor variables (course satisfaction and curriculum format). Salkind (2010) noted that logistic regression had a broad application to categorical outcomes and was consistent with real-world data. A logistic regression was appropriate because this statistical technique was used when the research design called for the analysis of the relationship between criterion and one or more predictor variables.

The purpose of this study was to determine if nontraditional student satisfaction and course curriculum format could predict successful completion of biology courses. The data collected was analyzed with SPSS. Descriptive statistics were analyzed to determine the mean and standard deviation of the OCSS data for the participants in the research sample. The researcher conducted a data screening to determine any inconsistencies in the data and check for any missing data points for each of the variables. Missing data resulted in listwise deletion, as suggested by Warner (2013). Due to the lack of current studies which make use of the OCSS

(Bayrak et al., 2020), Cronbach's alpha coefficient was calculated from the results of the survey data in order to test the scale score reliability. The sample was 85, which exceeded the minimum sample size of 66 when assuming a medium effect size with a power of 0.7 and an alpha of .05 (Gall et al., 2007). The effect size was reported as R squared (Warner, 2013). The null hypothesis will be rejected at the 95% confidence level with an alpha of .05.

Criterion Variable

The criterion variable was successful completion of the biology course. Successful completion was defined as the nontraditional student receiving an A, B, or C in the biology course, and unsuccessful completion was defined as a nontraditional student receiving a D, F, or withdrawal from the course. This criterion variable was dichotomous with the student successfully completing the biology course (completion with an A, B, or C) or the student was unsuccessful completing the biology course (completion with a D, F, or withdrawal). This criterion variable was coded as "1" for successful completion and a "0" for unsuccessful completion.

Predictor Variables

The predictor variables were course satisfaction and curriculum format. The first variable was course satisfaction and was measured through the completion of the OCSS survey designed to determine the satisfaction of nontraditional students with curriculum format. This instrument yields a continuous variable.

The second predictor variable was curriculum format. This variable was determined through access to enrollment records indicating whether the nontraditional students were enrolled in the online biology course designed using the OER and formatted based on the principles of the theory of andragogy or the biology course designed using traditional publisher

created content (PUB) and formatted based on publisher pre-selected course activities. The curriculum format variable was coded “1” for OER curriculum format and “0” for PUB format.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this study was to determine if a relationship exists between student satisfaction with course curriculum and successful course completion for nontraditional community college students at a community college in the Tennessee community college system. The use of predictive research has been noted (Gall et al., 2007) to be useful in the development of programs that increase students' chances for successful completion. The independent variables were students' perceived satisfaction with the course curriculum and the type of curriculum used in the course (OER or PUB). The dependent variable was dichotomous: whether a student successfully completed the course or not. A binary logistic regression was used to test the null hypothesis. The Findings section includes the research question, null hypothesis, data screening, descriptive statistics, assumption testing, and results.

Research Question(s)

One research question was examined during this study:

RQ1: How accurately can successful completion of a biology course be predicted from the linear combination of student course satisfaction scores and curriculum format for nontraditional community college students?

Null Hypothesis

The null hypothesis for this study is:

H₀: There will be no significant predictive relationship between the criterion variable (completion of the biology course) and the linear combination of predictor variables (student course satisfaction scores and curriculum format) for nontraditional community college students.

Data Screening

Data from 85 nontraditional students enrolled in General Biology I were analyzed for this study. The student data was retrieved from those nontraditional students enrolled in sections of the General Biology I course during the spring, summer, and fall semesters of the year 2022. This sample was purposefully chosen because it was deemed the best fit pertinent to the completion of this study (Gall et al., 2007).

The researcher sorted the data and scanned for inconsistencies on each variable. No data errors or inconsistencies were identified. Extreme outliers are points that do not fit the regression model well. Casewise diagnostics were used to examine for extreme outliers, which are cases with standardized residuals greater than 2.5. No outliers were identified, as indicated in Table 1, so all data were retained.

Table 1

Casewise diagnostics

Casewise List^a

a. The casewise plot is not produced because no outliers were found.

Descriptive Statistics

Descriptive statistics were obtained on each of the continuous independent variables. The sample consisted of 85 participants. A grade of an A, B, or C was used to determine the successful completion of the course. The course grade of D, F, or withdrawal was used as an indication of unsuccessful completion. Descriptive statistics are found in Table 2.

Table 2

Descriptive Statistics

	<i>N</i>	Min	Max	<i>M</i>	<i>SD</i>
Total of Survey Responses	85	8	40	30.74	7.548
Valid N (listwise)	85				

Assumption Testing

Assumption of Linearity

Binary logistic regression requires a linear relationship between the continuous independent variables and the logit transformation of the dependent variable. The Box-Tidwell approach was used to test this. The continuous variable, total of survey responses, was found to be linearly related with $p > .05$. Based on this assessment, the continuous independent variable was found to be linearly related to the logit of the dependent variable. The assumption of linearity was tenable.

Assumption of the Absence of Multicollinearity

A Variance Inflation Factor (VIF) test was conducted to ensure the absence of multicollinearity. This test was run because, if an independent variable (x) is highly correlated with another independent variable (x), they essentially provide the same information about the dependent variable. If the VIF is too high (greater than 10), then multicollinearity is present. Acceptable values are between 1 and 5. The absence of multicollinearity was met between the variables in this study. See Table 3 for collinearity statistics.

Table 3

Collinearity Statistics

Model	Collinearity Statistics	
	Tolerance	VIF

1	Course Type PUB or OER	.993	1.007
	Total of Survey Responses	.993	1.007

a. Dependent Variable: Successful Completion

Results

A binary logistic regression was conducted to determine if successful course completion can be predicted from a combination of course satisfaction and curriculum type. The logistic regression model was not statistically significant, $\chi^2(3) = 5.719, p = .221$ as seen in Table 4.

Table 4

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	5.719	2	.221
	Block	5.719	2	.221
	Model	5.719	2	.221

The model explained 9% (Nagelkerke R^2) of the variance in successful completion as shown in Table 5.

Table 5

Model Summary

Step	-2 log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	91.491 ^a	.065	.095

a. Estimation terminated at iteration 4 because parameter estimates changed by less than .001

The model correctly classified 63% of cases, sensitivity was 100.0%, specificity was 0.0%, in Table 6. The positive predictive value was 74.1% and the negative predictive value was 0.0%.

Table 6*Classification Table^a*

		Predicted			
		Successful Completion		Percentage Correct	
Observed		No	Yes		
Step 1	Successful Completion	No	0	22	.0
		Yes	0	63	100.0
Overall Percentage					74.1

a. The cut value is .500

None of the independent variables were statistically significant as shown in Table 7.

Table 7*Logistic Regression Predicting Successful Completion
Variables in the Equation*

		B	SE	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Total of Survey Responses	.018	.034	.267	1	.605	1.018	.952	1.088
	Course Type PUB or OER	.836	.507	2.721	1	.099	2.307	.855	6.227
	Constant	.088	1.070	.007	1	.934	1.092		

a. Variable(s) entered on step 1: Total of Survey Responses, Course Type Publisher or Open Educational Resources.

CHAPTER FIVE: CONCLUSIONS

Overview

A binary logistic regression was performed to determine if there was a predictive relationship between predictor variables (course satisfaction and curriculum type) and a single criterion variable (successful completion). An examination of the statistical findings gained from the binary statistical regression is included in this chapter. This chapter will include a discussion of the study, including the study's focus, research question, null hypothesis, implications, and the study's limitations. This chapter will conclude with recommendations for future research.

Discussion

The purpose of this study was to determine if nontraditional student success can be predicted based on the type of presentation of biology course curriculum and student satisfaction. Using a quantitative predictive correlational approach, this study explored the relationship between the criterion variable (successful completion) and the predictor variables (curriculum type and student satisfaction). The binary logistic regression was completed on the data collected from nontraditional students' completion of the satisfaction survey and the final grade data collected.

Null Hypothesis

The research question this study sought to answer was, "How accurately can successful completion of a biology course be predicted from a linear combination of student course satisfaction scores and curriculum format for nontraditional community college students?" The null hypothesis for this research question was, "There will be no significant predictive relationship between the criterion variable (completion of the biology course) and the linear

combination of predictor variables (student course satisfaction scores and curriculum format) for nontraditional community college students.”

The results of this study showed that the use of student satisfaction survey scores and curriculum type were not significantly predictive of students’ likelihood to successfully complete general biology I at the subject college. To better understand if the choice of curriculum facilitated successful completion, both course types were similarly designed having utilized comparable organization of the course materials. As suggested by Shin and Cheon (2019), the course materials were grouped into manageable chunks or modules in order to allow students to pace their study and complete the course. These results support the previous findings that a course design which facilitates organized content would contribute to students’ successful completion (Kennan et al., 2018; Khan et al., 2021). Further, the lack of a significant difference between the course types (OER or PUB) was consistent with the findings of Abri and Dabbagh (2019). Researchers also found nontraditional students had a positive perception of OER materials used in courses (Fine & Read, 2020).

The current findings may have also been influenced by the initiation of a program to allow students to purchase PUB course materials included with tuition. The inclusion of this course materials cost could have influenced students’ willingness to access the course materials. Cuttler (2019) found that many students do not purchase traditional textbooks due to cost. By including the cost of the course materials in the tuition cost, students were not required to make additional purchases and course materials were available to each student on the first day of class. The OER course materials were similarly available for each student when the course began but at no cost. The ease of access to the course materials for each curriculum type may have

contributed to the lack of significance between students using the two curriculum types (PUB or OER).

Knowles (1980) noted in the adult learning theory the need for nontraditional students to utilize self-directed learning. The basic course design incorporated into each of the course types allowed students to self-pace through each of the modules. This ability to schedule and navigate the course materials at each student's selected pace may have contributed to the lack of significance between the two curriculum choices for the course. The ability for these nontraditional students to successfully complete the course shows the potential use of external contextual control and internal cognitive motivation as proposed by Garrison (1997) in the model for self-directed learning.

The results of this study did not support the premise that a significant predictive relationship exists between successful completion (criterion variable) and the combination of student course satisfaction and curriculum type (predictor variables). This finding was in line with much of the data suggesting that access to required course curriculum was necessary for successful completion.

Implications

This study contributes to the body of knowledge that focuses on the use of OER in the higher education classroom and possible criteria leading to nontraditional student success. This research was begun with the hope of finding a feature that if implemented would definitively aid nontraditional students in the successful completion of an information-heavy course. The findings of the study revealed no significance in the choice of curriculum and the degree of satisfaction in the course as determinants of successful completion.

An implication of this study is the result indicating no student preference for either the PUB or OER curriculum. Curriculum type did not predict successful completion. The results indicate that students have no preference in which curriculum was used. The cost of course materials can be a burden to many nontraditional students (Ardissone et al., 2021). The use of OER course materials can aid in student success by taking into account nontraditional students' other financial obligations. In order to aid the nontraditional students financially, the zero-cost option, OER curriculum, is the better choice. The lack of significance between the use of PUB or OER could indicate that student success would not be affected by the use of OER. This research contributes to the ongoing body of knowledge by focusing on which curriculum best leads to nontraditional student successful completion.

Limitations

This study and the findings from the research are based on the perceptions of 85 nontraditional students at a small community college in the southeast United States. It is important to note that at a different place and time those perceptions could vary from those found in this study. This sample population may not be representative of all nontraditional students enrolled in all online biology classes at the other institutions of higher education. This can limit the generalizability of the results of this study.

The nonrandom sample population of this study was limited to those nontraditional students enrolled in general biology I in the target sections for three consecutive semesters. The limited sample population also limited the external validity of this research. Due to the small sample population of this study, drawing valid conclusions for the entire nontraditional student population would be difficult. It is unknown whether this is a representative population of all nontraditional students within the community college or a greater population outside the college.

Another limitation of this study was the research design. From the nonrandom sample population chosen for this study, no cause/effect conclusions can be drawn. A correlational study does not answer the questions concerning the cause of a relationship or the lack thereof. The focus of this research was to determine if a relationship existed between successful completion and a combination of student satisfaction and curriculum type. This research could also not show whether one variable influenced another to be more or less significant to the findings.

Students were given the option to opt out of this study. The students included in this sample population could represent those for whom curriculum choice and course satisfaction are not determinants of successful completion. This sample population was self-selected and that can be a limitation due to the possibility these students could be more likely to succeed or be indifferent to the curriculum used in the course.

Recommendations for Future Research

1. Repeat study with a larger nontraditional student population from other community colleges and universities. Since this study used data from only three semesters and only those enrolled in General Biology I to determine the sample population, further study is warranted to determine if this sample population is representative of the larger nontraditional student population.

2. A similar study to determine if curriculum type (PUB or OER) or student course satisfaction alone is a predictor of successful completion. The combination of student course satisfaction and curriculum type was not a significant predictor of successful course completion. Further study is warranted to determine if either of these variables alone could be used to predict successful course completion.

3. A similar study focusing on determining if immediate course materials access impacts successful completion. Each of the curriculum types presented in this study utilized immediate access to course materials. Prior to the beginning of this study, the PUB course materials were made available on the first day of the semester due to embedding course materials costs in course tuition. The OER course materials were made available the first day of the semester by embedding course materials and information links in the course shell in the learning information system. Further research is warranted to determine if immediate access to course materials can be a determinant of successful completion for nontraditional students.

4. A qualitative study to help determine the reason students like or dislike the curriculum used in the course and the effect of that curriculum on their satisfaction with the course and their motivation to successfully complete the course could be another choice. A qualitative study would allow for the exploration into what cause/effect curriculum type has on students' perception of the online biology course. This information could then be used to inform instructors and course designers to better serve the nontraditional student population.

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APPENDIX A: PERMISSION TO USE SURVEY INSTRUMENT

FATMA BAYRAK <fbayrak@hacettepe.edu.tr>

Dear Forde,

Thank you for reaching out. The scale in the publication is open for your use. As mentioned in the study, the scale was developed in Turkish. Therefore, it is necessary to do an adaptation study to use it in a different language.

Good luck with your study,

Sincerely,

Fatma

APPENDIX B: IRB PERMISSION LETTER

December 22, 2021

Re: IRB Exemption - IRB-FY21-22-399 PREDICTING SUCCESSFUL COMPLETION OF BIOLOGY FROM COURSE SATISFACTION AND CURRICULUM FORMAT FOR NONTRADITIONAL STUDENTS

Dear Janet Forde, Michelle Barthlow,

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under the following exemption category, which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:104(d):

Category 2.(i). 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).

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.

Your stamped consent form(s) and final versions of your study documents can be found under the Attachments tab within the Submission Details section of your study on Cayuse IRB. Your stamped consent form(s) should be copied and used to gain the consent of your research participants. If you plan to provide your consent information electronically, the contents of the attached consent document(s) should be made available without alteration.

Please note that this exemption only applies to your current research application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued exemption status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this exemption or need assistance in determining whether possible modifications to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,

G. Michele Baker, MA, CIP

Administrative Chair of Institutional Research
Research Ethics Office