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Predisposing characteristics of learner success in online education

Shauna E. Tonkin

William & Mary - School of Education

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**PREDISPOSING CHARACTERISTICS OF
LEARNER SUCCESS IN
ONLINE EDUCATION**

A Dissertation

Presented to

**The Faculty of the School of Education
The College of William and Mary in Virginia**

In Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

by

Shauna E. Tonkin

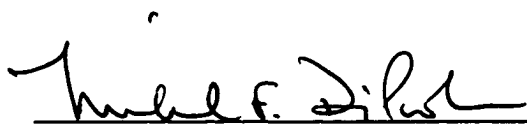
March 2003

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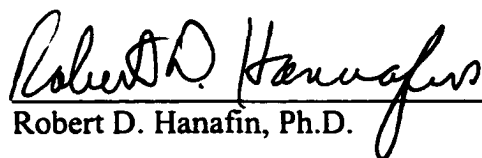
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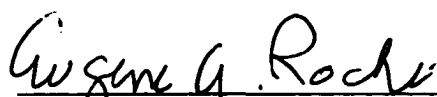
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**PREDISPOSING CHARACTERISTICS OF
LEARNER SUCCESS IN
ONLINE EDUCATION
ABSTRACT**

This study explored the relationship between an individual's critical thinking skills and personality characteristics and success in an online doctoral degree program. Critical thinking skills were measured by the Watson-Glaser Critical Thinking Appraisal (WGCTA) and personality characteristics were identified the Myers-Briggs Type Indicator (MBTI). Success was defined by an individual's pass/no pass status for comprehensive exams. Correlation and regression statistics yielded no significant relationship between WGCTA scores and pass/no pass (N=103); between E-I and S-N and pass/no pass (N=106); and between S-N and T-F and pass/no pass (N=106). Statistically significant relationships were found between critical thinking and grade point average (GPA) and between critical thinking and personality characteristics. This study recommended that more meaningful aspects of success be identified to better understand success in graduate online education.

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**Predisposing Characteristics of Learner Success in
Online Education**

CHAPTER 1

The Nature and Significance of the Study

Introduction

This study explored the relationship between an individual's critical thinking skills and personality characteristics and success in an Internet-based graduate degree program. Online courses and programs are becoming increasingly common in higher education, yet existing research does not provide a well-developed understanding of the types of individuals who persist and succeed in this mode of distance education. This study was conducted in hopes of promoting a greater awareness of learner characteristics that contribute to success in online programs.

Explanation of the Problem

Throughout the past decade, colleges and universities have experienced a steady growth in enrollment. The increased demand for postsecondary education has been due, in part, to “rapidly changing societal and work environments” (Eastmond, 1998, p.33) that have brought an influx of nontraditional students into traditional academic settings. These nontraditional students are adult learners, twenty-five years or older, who pursue education for career development and advancement, job security and other personal and professional reasons (Peters, 1998). They possess a broader range of characteristics than their younger counterparts and demand more access and greater flexibility in the programs and courses offered by colleges and universities. In response, many institutions are seeking innovative solutions to accommodate this diverse student population.

One emerging strategy for delivering higher education is the use of Internet-based technologies. Online courses and programs promise greater access to education by larger numbers of students and are proliferating in higher education (Schellens & Valcke, 2000). Although this form of instructional delivery enjoys increased acceptance, dropout rates in distance education are estimated to be as high as seventy percent at some institutions (Carr, 2000). While retention has been studied in great depth in traditional settings, not much is known about the type of student who persists and succeeds in the online classroom.

Student persistence and academic performance are key measures of educational effectiveness (Webster & Hackely, 1997), yet the variables that contribute to success in online programs have not been adequately described (Merisotis & Phipps, 1999). Studies relating to Internet-based learning have been conducted under the umbrella of traditional distance education research and have focused primarily on learning environments, learner experiences and instructional models in individual courses. The relationship between student characteristics and success in online environments is less understood. Successful students are thought to be self-directed learners who are comfortable using computers and electronic technology, or who are compelled by personal reasons to pursue distance learning; however, most of this information is not based on empirical data or critical analyses (Brace-Govan & Clulow, 2000; Porrás-Hernández, 2000; Hara & Kling, 1999). Additionally, the literature has described student behaviors in single courses but these concepts have not been studied in the context of a degree program. Therefore, this

study examined specific student characteristics that may contribute to persistence and success in an online degree program.

Background

Distance-learning theory and research typically have emphasized the unique nature of non-traditional education. Correspondence courses, programmed texts, audio and videotapes, television networks and telephone conferences have been the primary technologies used to deliver coursework in an attempt to replicate, as much as possible, the experience of face-to-face classes. Since the mid-1990s, colleges and universities have experimented with Internet-based courses that link students with learning opportunities independent of time and place.

Some researchers have contended that online systems must be accompanied by new approaches to instruction that move beyond access to information to a greater focus on student learning outcomes (Rovai, 2002; Yanosky, 2001). These models emphasize characteristics of the learning environment, instructional strategies and learner readiness (Grasha & Yangarber-Hicks, 2000; Gunawardena & Duphorne, 2000). Frequent and meaningful interactions between student and instructor must occur regardless of geographical separation (Gardiner, 1998; Swenson, 1995), and learners are expected to demonstrate higher order thinking skills as well as independence of effort. With this in mind, Aragon, Johnson and Shaik (2000) expressed concern about the barriers to effective learning in web-based environments, suggesting that the "capabilities and efficacy of such programs have yet to be fully investigated" (p.17). Moore (1998) stated that while new technologies can link

learners and teachers in powerful ways, "postsecondary educators have so generally failed to study the learner with the same devotion with which they have studied the information they expect their students to study" (p. 2). So, while the value of interpersonal communications is not minimized in discussions of effective distance education, learner characteristics play a central role in assessing successful outcomes. Consequently, there exists a valid need to examine more closely these issues in online environments.

Of primary importance is the ability to attract and retain students until they achieve their educational goals. In spite of the promises and expectations of online education, institutions are struggling to keep learners in distance programs. Individuals are attracted to online learning for the flexibility and access it provides, yet attrition rates can be three to four times higher than the average twenty percent dropout rate typically found in traditional programs (Snyder, 2001; Carr, 2000). Retention studies have been conducted in traditional distance learning programs, but the phenomena in web-based education have not been adequately addressed (Martinez, Bunderson, Nelson and Ruttan, 1999).

Conceptual Framework

Introduction

This study focused on learner predisposing characteristics that influence success in graduate online educational programs. Pertinent to this research are concepts of success in higher education within distance learning environments. These

concepts encompass discussions of retention in undergraduate and graduate programs, online learning environments, critical thinking and personality type.

Student Success in Higher Education

Student success is often viewed within the framework of retention, attrition and persistence; student success is defined by satisfactorily completing a course or program of study. Shelton, Stevens and Mecca (1995) stated, "Often times, the word success is used to define retention. The word persist describes the functional aspect of retention (process) while success may be viewed as the functional end (product)." (p.4) Tinto's (1975) research in higher education retention and attrition set the direction for studies throughout the latter part of the twentieth century. He identified the variables related to student retention as: (1) adjustment; (2) goals; (3) uncertainty; (4) commitment; (5) congruence; and (6) isolation. As Tinto (1997) continued to research these issues, he concluded that retention and success are rooted in the intellectual and social aspects of educational communities within the context of the institution. However, Braxton, Milem and Sullivan (2000) suggested that Tinto's model be expanded to include the variables of active-learning instructional strategies, organizational attributes, student expectations and student experiences. They posited that these factors interact dynamically to explain more fully why students succeed in higher education.

Other researchers sought to define aspects of learner behavior, or motivational intentions, that impact persistence (House, 2001; Miltiadou & Savenye, 2000; Tuckman & Abry, 1998). Studies have also suggested that the congruence or "fit"

between personality type and environment result in higher levels of educational stability, satisfaction and achievement (Feldman, Smart & Ethington, 1999; House, 1999).

In spite of the large amount of research into persistence and success, most studies have focused on traditional undergraduates in face-to-face instructional settings (Cooke, Sims & Peyrefitte, 1995; Girves & Wemmerus, 1988). Researchers noted that Tinto's (1975) model, although well articulated, did not fully address the variables that impact graduate populations. Justice and Dorman (2001) claimed that non-traditional age students "experience the college classroom environment differently from younger students" (p. 237). Many graduate students study part-time while pursuing career and personal goals, and typically do not have the institutional connections that characterize traditional undergraduate educational experiences. Furthermore, Bair and Haworth (1999) posited that graduate education must be viewed specifically within the context of a masters or doctoral program to truly understand the issues of retention and persistence. They reported that attrition varies by discipline or field of study and can be partially understood by personality factors, typified as learner independence, motivation, the ability to endure frustration, and tolerance for institutional regulations and policies. This study attempted to add to the literature in graduate retention by examining characteristics of doctoral students that may influence success and persistence.

Success and retention in distance education programs

Beyond the experiences of students in traditional undergraduate and graduate classrooms, distance education presents a different environment in which to study persistence and success. Early research in distance education retention centered on the comparability of instruction between traditional and distance courses (Maushak, Chen, Martin, Shaw & Unfred, 2001) but has been criticized for its emphasis on delivering information rather than investigating achievement and persistence issues. Increased competition, diverse student populations, dwindling resources and heightened pressures for accountability directly impact the distance education programs at an institution, making a compelling case to study retention in non-traditional environments (Aragon, Johns & Shaik, 2000). Kember (1989) called for new conceptual models of success that did not attempt to conform distance education in some artificial manner to the conventions of traditional face-to-face instruction. In the same spirit, Powell, Conway and Ross (1990) proposed a holistic model of retention that investigated the experiences of students within the context of the distance-learning situation. The relationship of predisposing characteristics, life changes and institutional factors was identified as the major influence on student persistence and achievement. Predisposing characteristics were described as fixed or relatively stable traits that act as antecedent predictors interacting differentially with life changes and institutional factors.

The retention literature is replete with attempts to define a set of traits or behaviors that predict learner success, yet Thompson (1999) admitted that the

diversity of student populations in distance education limits the ability to create a generic profile. With the advent of technology-mediated education, such as Internet-based instruction, researchers have built on the notion that student characteristics interacting with the educational environment impact retention (Martinez, Bunderson, Nelson & Ruttan, 1999; Webster & Hackley, 1997). Additionally, Liu and Ginther (1999) posited that higher-order thinking and learner preferences are pertinent to understanding success in web-based education. The intersection of graduate education and distance education does not necessarily follow conventional models of retention and online contexts may require specific cognitive skills and learning preferences. Therefore, this study examined the relationship of predisposing characteristics of graduate students that influence success within the context of the web-based environment.

Online Learning Environments

Online classrooms present a different learning environment from face-to-face or traditional distance courses. Familiarity with computers and access to the Internet are prerequisites for participation. Interactivity with others in a virtual location is a fundamental aspect of online education, yet this learning environment is inherently complex. Real time or asynchronous communication is possible in text-based or multi-media enhanced settings. Overall structures, such as verbal or visual cues, immediate feedback and shared experiences of time and place, which typically reinforce learning in face-to-face classrooms, are not emphasized online (Cahoon, 1998a). Though hypertext allows learners to link content from a variety of sources

into a web of connected information, many individuals find it difficult to evaluate the reliability or validity of online information. As Marsick (1998) observed, “Before computers, we didn’t have to think as much ...[now] you have to know which variables are the most critical ... and what to spend time thinking about before you take action” (p.12). Consequently, the web-based environment establishes a set of expectations for teaching and learning behaviors that may not be required in other types of instruction.

In any given learning environment, the learner interacts with facets of the environment through cognitive and unconscious processes in order to make some meaning out of the experience. In traditional academic settings, aspects of the environment are somewhat flexible. Conversations among instructors and learners, in-class activities and visual and verbal cues allow spontaneous and immediate feedback that shapes the learning experiences.

In online classrooms, cultural understandings of learning are less clear. Systems of communication in this medium are still in their infancy and conventions are being created, revised and re-created through practice. Learners have the opportunity to interpret these exchanges from an individualistic perspective because the environment does not provide the type of feedback and reinforcement commonly found in face-to-face situations. However, the instructional system may not be responsive to these learner interpretations because the online classroom is dominated by text-based communications separated by time and space. These factors create a more psychologically complex environment that includes both fixed and ambiguous

elements. An individual's ability to negotiate these complexities is fundamental to success. This suggests that ways in which students perceive information and make decisions about that information should be examined in the context of online learning environments. These predisposing characteristics play an important role in student success and they have not been adequately considered when applying traditional models of retention to distance education.

Predisposing Characteristics

Successful adult learners are seen as being able to choose, analyze, revise and abandon intellectual tasks based on interactions between external factors and internal values (Jegade, Taplin, Fan, Chan & Yum, 1999). In other words, they approach learning in ways that engage cognitive and psychological functions within the context of the educational environment (Knowles, 1980). The online learning environment varies widely in structure; therefore, it is important to understand how students work in these settings. Mason (1998) stated that it is unlikely that all students would be equally prepared to learn in face-to-face and distance courses, citing that high levels of motivation and good time management skills are necessary for distance learning. Characteristics such as abstract thinking, self-directedness, (Knowlton, 2000), a willingness to take risks (Jagede, Taplin, Fan, Chan & Yum, 1999), an internal locus of control, a preference for reading over direct experiences and field independence (Pachnowski & Jurczyk, 2000) have been associated with achievement in online learning.

Maushak, Chen, Martin, Shaw and Unfred (2001) suggested that successful web-based students possess a well-developed repertoire of cognitive skills and an ability to understand associative relationships that link new information to existing knowledge. Additionally, Cahoon (1998) identified effective reasoning and problem-solving abilities as prerequisites to effective learning outcomes. The complex, seemingly unstructured nature of online classrooms requires a student to comprehend what is located on the Internet and to integrate the information "into some kind of coherent, conceptual scheme" (Jonassen, Dyer, Peters, Robinson, Harvey, King & Loughner, 1997, p. 120).

Clearly, there are many concepts advanced in the literature although they have not been fully supported by empirical research due to the relative newness of online learning. Furthermore, the topic has not been adequately addressed in the context of graduate education. There does appear to be general agreement that success in these environments is linked to higher level thinking abilities and affective dispositions (Brown, 1994). These cognitive abilities and psychological factors are aligned with research in critical thinking and personality type theory. Those lines of inquiry were thought to provide a better understanding of factors that contribute to learner success in higher education settings.

Critical thinking

Although no single definition of critical thinking emerges from the literature (Adams, Stove & Whitlow, 1999; Pepa, Brown and Alverson, 1997; Pascarella, 1989), it is considered to be a cognitive activity that seeks to arrive at a well-reasoned

and supportable conclusion (Kurfiss, 1988). Adams, et.al. indicated that critical thinking may be understood as an intentional process whereby learners consciously apply cognitive strategies to assimilate new information into existing internal structures. Information is continually evaluated from the basis of one's experience (Pepa, Brown and Alverson, 1997) and within a defined context (Brookfield, 1987). Critical thinking is also influenced by variables that are external to the individual (Garrison, 1992; Brookfield, 1987). This process encompasses the ability to identify and challenge assumptions, imagine and explore alternatives and critically assess the results of such inquiries. It includes the capacity to evaluate the quality of available data, detecting error and bias (Gardiner, 1994) and is associated with specific problems and conditions (Garrison). Critical thinking, therefore, is an aggregate of cognitive strategies that allow individuals to decide what to believe and how to respond accordingly (Leitsch & Van Hove, 1999).

Olgren (1998) posited that cognitive learning strategies affect learning outcomes and identified four levels at which a learner processes information. Selection strategies enable an individual to focus attention on relevant information and rehearsal strategies provide a means of recall through repetition. The first two strategies promote learning at a surface or verbatim level. The second two strategies of organization and elaboration allow learners to organize and elaborate upon new information creating deeper levels of understanding, integration and application. These more complex strategies reflect definitions of critical thinking that incorporate

the ability to recognize problems and patterns and to apply knowledge about inferences, abstractions and generalizations (Loo & Thorpe, 1999).

Attempts to measure and define critical thinking have occupied researchers' interest for over fifty years. The most widely used assessment instrument is the Watson-Glaser Critical Thinking Appraisal (WGCTA). Originally developed in the 1960s, this test identifies five subsets of critical thinking: inference; recognizing assumptions; deduction; interpretation; and evaluating arguments. A composite score of these areas provides an overall assessment of an individual's critical thinking abilities. Studies have shown that critical thinking, as measured by the WGCTA, is related to academic success in higher education programs (Behrens, 1996; Steward & Al-Abdulla, 1989). This investigated the relationship between scores on the WGCTA and success in an online graduate program.

Psychological type theory

Psychological type theory is based on Carl Jung's conception of individual personality. Jung theorized that individuals are motivated through the activity of personality and defined this activity in terms of mental functions. These mental functions influence the manner in which people perceive information and make decisions and seemingly random variations in individuals' behaviors are consistent when understood through the framework of psychological type theory (Lynch, 1987).

Jungian mental functions are two dichotomous pairs that describe either perceiving or judging behaviors. According to type theory, perceiving relates to gathering information and judging relates to reaching conclusions about what is

perceived. Sensing and Intuition are described as perceiving functions while Thinking and Feeling are identified as judging functions.

Jung also observed two opposite attitudes or orientations that define an individual's readiness to respond to internal and external stimuli. These attitudes are termed Extraversion and Introversion. An extravert directs energy and attention toward people and events in the external environment while introverts are focused toward thoughts and experiences in their inner environment. Jung theorized eight separate personality types when Extraversion or Introversion is coupled with the mental function of Sensing, Intuition, Thinking or Feeling.

The terms Sensing, Intuition, Thinking and Feeling have specific meanings within the Jungian typology. Sensing refers to information that is perceived through one of the senses. Persons who operate in a Sensing function are concerned with the present moment and focus on information that can be verified through their sense experiences. In contrast, Intuition relates to possibilities and patterns that are perceived beyond what is visible to the senses. Individuals who prefer Intuition rely more on personal insight and conceptual thought than concrete experiences. Jung (in Storr, 1983) considered Sensing and Intuition to be irrational functions "because they are both concerned simply with what happens and with actual or potential realities" (p.144).

Thinking and Feeling, as Jungian concepts, are considered rational functions. Thinking and Feeling functions limit or discriminate among the sensations or intuitions of an individual. Persons who demonstrate a preference for the Thinking

function are oriented to objective data and tend to use logic and principles of cause and effect to reach conclusions. The Feeling function focuses on values and an understanding of individual and group norms. The individual who prefers Feeling will appear to base decisions on somewhat subjective criteria and will give less emphasis to logical principles.

As an extension and elaboration of Jung's work, Isabel Myers and Katherine Briggs explicitly labeled a fourth dichotomy as Judging and Perceiving (Myers, McCaulley, Quenk & Hammer, 1998), and included that relationship in the description of psychological type theory. Judging or Perceiving, in combination with Extraversion or Introversion, identifies which of the two mental functions is preferred as dominant and which is auxiliary. Judging or Perceiving also describes an individual's orientation to the outer world. Thus, combining Extraversion or Introversion, Sensing or Intuition, Thinking or Feeling and Judging or Perceiving yields sixteen different personality types.

While psychological type is regarded as a somewhat fixed characteristic, the development of type and the demonstration of type-related behavior are dynamic. This means specific contexts or situations may influence behavior to appear inconsistent with an individual's reported type. Consequently, the mental functions and attitudes described in psychological type theory are discussed in terms of preferences, or preferred ways of thinking and behaving given a situation in which the individual feels most comfortable and confident.

From Myers' and Briggs' research, the Myers-Briggs Type Indicator (MBTI) was created as a tool to identify individual type. The purpose of the inventory is for greater self-understanding and the focus is on its potential usefulness in general populations. Form M, published in 1998, is the standard instrument administered to individuals and consists of ninety-three items presented in forced-choice formats. It is widely used in higher education settings for a variety of purposes (Macdaid, 1991), including assessing learning styles (Jensen, 1991), matching teaching and learning styles (Johnson, Johnson, Murphy, Weiss, & Zimmerman, 1998), advising students (Anchors, 1991), and predicting academic achievement (DiTiberio, 1998). This study examined the impact of psychological type on achievement and persistence and analyzed the data based on research that identified the central role of the Sensing-Intuition and Thinking-Feeling dichotomies in retention. These preferences represent the mental functions involved in perception and judgment and relate to cognitive activities such as "attention, memory, recall, and the processes of language and thought" (Newman, 1998, p. 63). Additionally, the MBTI dimensions of Extraversion-Introversion and Sensing-Intuition are related to specific learning styles that influence academic success (Schroeder, 1993) and were used to further investigate issues of persistence and achievement.

The relationship between psychological type, as operationalized by the MBTI, and learner success has scarcely been examined in online graduate education. This study was conducted, in part, to address that issue.

Learner characteristics in online environments

As reflected in the literature on persistence and attrition in higher education specifically related to distance learning situations, institutional and individual characteristics interact to influence student success. The online classroom presents a somewhat new challenge for instructors and students in distance settings due to the complexities of the virtual learning environment. Consequently, deeper understandings of learner characteristics are needed to design and deliver effective educational programs. This research analyzed the variables of critical thinking and psychological type in the context of online educational programs in order to gain greater insight into learner success. This included an investigation of these characteristics related to achievement measures. Because some literature suggested that the interaction between critical thinking and psychological type may be related to academic success, the relationship between the two variables was examined also.

Purpose of the Study

The purpose of this study was to determine whether the factors of critical thinking and psychological type influence student success in an online doctoral program.

This study acknowledged the importance of endowed potential and learned abilities in academic success. Typically, a minimum level of intelligence is expected when individuals are admitted to a degree program and appropriate technical skills are necessary for success in distance learning. However, studies in distance education emphasize the differences between traditional face-to-face and distance programs. It

seems reasonable, therefore, to expect that individuals will not respond to these instructional modes in the same manner. In other words, success in the online classroom may be predicted by additional factors that are not typically identified in the admission process.

Simonson, Smaldino, Albright and Zvacek (2000) affirmed that “it is important...to know as much as possible” (p. 128) about the learners in any particular learning situation, but suggested that the needs of distance students are considered “after the planning and organizing of the hardware, the content, and the instructional plan” (p. 128). A better understanding of the relationship between cognitive processes and preferences, as evidenced by critical thinking and psychological type, and the instructional environment help faculty, administrators and course designers gain insight into an online student’s needs. These insights, in turn, enable program developers to create and revise educational experiences that accommodate those needs, potentially improving student learning and retention.

Research Questions

Based on the purpose stated above, this study addressed the following questions:

1. Do critical thinking skills, as measured by WGCTA, influence student achievement as measured by successfully passing the comprehensive exams?
2. Do psychological type indicators, measured by a combination of the E-I and S-N components of MBTI, influence student achievement as measured by successfully passing the comprehensive exams?

3. Do psychological type indicators, as measured by a combination of the S-N and T-F components of MBTI, influence student achievement as measured by successfully passing the comprehensive exams?

Additional research issues were examined after the initial data analysis in an attempt to gain additional understanding about student characteristics and success. These included: (1) the relationship between GPA and pass rate; (2) the relationship between GPA and critical thinking; (3) the relationship between GPA and psychological type; and (4) the interaction between critical thinking and psychological type.

Definition of Terms

The following operational definitions and terms were used in this study.

Critical thinking. The capacity to evaluate skillfully and fairly the quality of evidence and to identify error, hypocrisy, manipulation, and bias. It is a process of making sense of external experiences by defining and challenging assumptions, demonstrating contextual awareness, imagining and exploring alternatives, and developing a reflective skepticism. Critical thinking is governed by underlying principles that have universal acceptance but are applied within specific contexts. The Watson-Glaser Critical Thinking Appraisal measures critical thinking ability in five component areas and is the most widely used inventory of its type.

Learning environments. The physical and/or virtual context in which actions and interactions take place among instructors and students for the purpose of affecting thinking and learning.

Online education. Educational courses and programs offered for undergraduate or graduate credit under the auspices of accredited institutions of higher education.

Success. In higher education settings, success is defined as the ability to satisfactorily complete the requirements of a course or program of study. In doctoral programs, success may be measured by continued enrollment and other benchmarks such as the completion of coursework, comprehensive exams and the dissertation. For the purposes of this study, learner success will be defined by passing the comprehensive exams.

Psychological type. A conceptual understanding of individual personality preferences or tendencies built on the theoretical work of Carl Jung and the practical research of Isabel Myers and Katherine Briggs. The seemingly random differences observed in people are due to predictable patterns that can be understood through descriptions of sixteen basic psychological type profiles. The Myers-Briggs Type Indicator assessments operationalizes type theory and is used for a variety of personal, professional and educational applications.

Limitations of the Study

The following limitations of this research proposal were acknowledged.

1. This study endeavored to describe the influence of critical thinking and personality type on success in online doctoral programs but did not attempt to determine causal influences in the development of these learner traits.

2. A comprehensive treatment of variables that relate to student success and retention could not be accomplished through this study due to the complexity of the issues. Consequently, this study analyzed only predisposing characteristics that influence academic success in online environments.
3. Doctoral students constitute a different population from most online learners. It is assumed that their critical thinking abilities and thus, their scores on the WGCTA would be higher than most other populations.
4. Students enrolled in distance programs self-select. They may be predisposed already to non-traditional education methods.
5. The sample from one university may not be representative of doctoral or online students at other institutions.

Conclusion

Colleges and universities are adopting and expanding distance-learning systems to accommodate greater numbers of students who seek the benefits of higher education. While distance education methodologies have existed for over one hundred years, the advent of the Internet has ushered in a new era of instruction that emphasizes asynchronous communication in virtual learning environments. Many individuals are attracted to web-based courses but dropout rates are often much higher than in traditional campus-based courses. Administrators, faculty and program designers in higher education may be able to increase retention and student success if they have a better understanding of the predisposing characteristics of students who persist in online courses. This study researched the relationship between cognitive

processes and preferences, defined as critical thinking skills and psychological type, and learner success in online doctoral programs. The following chapter presents a review of literature pertaining to the research questions.

CHAPTER 2

Related Literature

Introduction

The two major areas of study in higher education that converge to form the foundations for this study are distance education and the research on student retention and success in courses and programs of study. Specifically, learner characteristics that have predictive value in academic settings are discussed in the context of online education. The literature on these topics is presented separately and then reviewed in the context of critical thinking and psychological type.

Distance Education

Distance education in the United States comes from a rich and varied background. In the early 1800s, students could enroll in correspondence courses for shorthand training, language learning and entrance exam preparation. By the latter half of the century, undergraduate and graduate degrees at a distance were offered through institutions such as Illinois Wesleyan University or the University of Wisconsin. Purveyors of technical and vocational training entered the distance market in the early twentieth century, and the proliferation of courses with their resulting claims prompted the creation of the National Home Study Council (1926) to address quality assurance issues (Verduin & Clark, 1991). The years following World War II brought dramatic advances in technology. Telephones, radios, televisions and media playback devices found various roles in educational settings and distance education could be found in most countries by the end of the 1950s

(Keegan, 1990). Computers and the advent of digital technology have allowed more people than ever before to participate in distance learning activities and the Internet is now an important means to deliver courses and educational programs at a distance (Merisotis & Phipps, 1999).

Multiple definitions of the term "distance education" are used in the literature. This term may have first appeared in 1892 catalogues for the University of Wisconsin programs, and was defined by the separation of teacher and learner throughout the instructional period (Verduin & Clark, 1991). By the 1970s, distance education emerged as a field of study, yet Keegan (1980) observed that researchers did not share a general understanding of terms and concepts. This is due to the variety of methods used to deliver information and supervise learning, as well as the differences in goals and desired outcomes stated by institutions, faculty and students.

Moore (1973) preferred the term "independent learning and teaching" to describe educational activities that involve an autonomous learner separated from an instructor by space and time with communication mediated by "print, electronic or other non-human medium" (p.663). His definition of distance education centered on the types of instructional strategies that teachers and students use in these noncontiguous situations to mitigate the effects of distance.

Peters (in Keegan, 1980) identified the industrialized nature of distance education as an underlying construct. A team of content experts and support personnel most often manage the creation and distribution of educational materials, as well as the assessment of learning, ostensibly producing educational experiences that

are less personal and more mechanical in nature. This is in stark contrast to the traditional model of classroom teaching, which emphasizes the central role of the professor in determining the scope of instruction and the standards for achievement.

Referencing the psychological aspects of distance learning, Cropley and Kahl (1983) posited that distance education is defined by the ability to individualize many aspects of learning. Unlike face-to-face learning, students have a greater measure of control over when and where they access information and complete assignments. These differences impact the “activation, guidance and maintenance of learning activities” (p.31) and create a psychodynamic that is unique to distance education.

Eastmond (1998) attempted to summarize these issues by linking geographical distance, student and teacher interaction mediated by some type of technology, and institutional oversight as critical elements in a conceptual framework for distance education. Peters (1998) argued that the essence of distance education is a fundamental pedagogy, or teaching philosophy, that is derived from the sociological and psychological context of its participants. In light of these recent discussions, Keegan (2000) remarked that the “still fragile and tentative status of distance education” that existed in the 1970s and 1980s “has been replaced by the confident and vibrant state of the field today” (p. xi).

Distinctions between terms and definitions suggest a continuing uncertainty in the theoretical underpinnings of distance education and, as a result, Simonson, Schlosser and Hanson (1999) called for a new understanding of this subject. They maintained that European values and models of education have dominated the field of

inquiry. Conversely, American systems value “local control, classroom teachers, small classes, rapport between teacher and students, and highly personalized instruction” (p.60), and should inform theory and the development of new models for distance learning. Coupled with a focus on these values is the recognition that new technologies have dramatically altered the educational landscape by simultaneously provoking and supporting or impeding change (Keegan, 2000). Due to greater integration of information and communication technologies into the learning environment, traditional and non-traditional systems are converging. Consequently, Simonson, et.al. proposed that administrators and faculty should emphasize the equivalency of learning outcomes, no matter what mechanism is used to deliver instruction. Once those outcomes are established, instructional planning is based then on the characteristics of learners, the type of content, and the features of the technology that can support the teaching and learning activities.

The concept of similar learning outcomes gains great importance since a majority of colleges and universities now offer some type of distance learning (Gibson, 1998). Although recruiting students for distance programs has not been difficult, keeping them has proved to be more challenging. Carr (2000) noted that national statistics are not yet available but attrition rates in distance education are generally much higher than in face-to-face courses and programs. In light of the increasing popularity of distance education and the associated retention issues, the following discussion on student success in higher education has particular relevance for this study.

Success in Higher Education

Student success is often viewed within the framework of retention and persistence. Individuals who persist in a course of study are expected to be completers and are categorized as successful. Success in college and university programs is typically measured by grade point average (GPA) and whether one completes the course of study. GPA has limited usefulness due to the subjective and idiosyncratic aspects of evaluation across educational contexts. Some research suggests that GPA is more appropriately viewed as an intervening variable in persistence rather than solely an achievement outcome (Kennedy, Sheckley & Kehrhahn, 2000; Kember, Lai, Murphy, Siaw & Yuen, 1994). Consequently, examining the characteristics of learners in relationship to persistence is more helpful in understanding the complexities of retention, which is typically lower in distance education than in traditional courses (Carr, 2000).

A multitude of variables, such as Scholastic Assessment Test scores (Nauta & Kahn, 2000), GPA, satisfaction with the institution, financial resources, academic integration, social integration (Cambiano, Denny & De Vore, 2000; McGrath & Braunstein, 1997), self-efficacy, learning styles (Nelson, Dunn, Griggs, Primavera, Fitzpatrick, Bacilious & Miller, 1993) and outcome expectations (House, 2001) have been found to influence persistence; however, the importance of these components depends on the model of retention promoted by the research studies. As a result, most researchers agree that retention is a multivariate concept (Maushak, Chen,

Martin, Shaw & Unfred, 2001; Yaritza, 2001). Pertinent aspects of selected studies related to success and retention are summarized and presented in Table 2.1.

Table 2.1 Studies related to student persistence and success

Author	Topic	Methodology	Population	Independent Variable(s)
Braxton, Milem & Sullivan (2000)	Active learning experiences & social integration, institutional commitment & persistence	Longitudinal, quantitative	n=718	Student background characteristics; initial institutional commitment; active learning indicators
House (2001)	Relationship between self-belief variables, academic background & academic achievement	Quantitative	n=96	Academic self-concept (measured through survey instrument) & academic background (ACT score and high school rank)
Miltiadou & Savenye (2000)	Motivational constructs of instruction related to online learning	Meta-synthesis of research	n/a	Familiarity with computer-mediated communication procedures, self-efficacy, achievement goal orientation & self-regulation
Nauta & Kahn (2000)	Social & cognitive factors related to academic performance & persistence	Quantitative, using surveys, demographic data & GPA	n=255	Academic ability, self-efficacy, outcome expectations & performance goals
Nelson, Dunn, Griggs, Primavera, Fitzpatrick, Bacilious & Miller (1993)	Learning-style interventions related to retention & academic achievement	Experimental	n=1,089	Learning-style information & intervention

Tinto's (1975) research in student attrition issues set the direction for later studies. He maintained that the "foundations of the higher education enterprise rightly understood" (1987, p.3) provided insight into meaningful retention variables. These foundations were thought to be a commitment to the education of students, faculty and staff. Tinto acknowledged the complexity of attrition issues but posited that six distinct factors influenced student dropout: (1) adjustment; (2) goals; (3) uncertainty; (4) commitment; (5) congruence; and (6) isolation. The latter two components of congruence and isolation were categorized as features of integration and community membership. These concepts were thought to "best describe how [educational] experiences impact...student persistence" (p.7).

In a later writings, Tinto (1997) identified the importance of context and learner experience in addressing retention. Harking back to his concepts of integration and community membership, Tinto suggested that the college classroom "is the crossroads where the social and the academic meet" (p. 599) and that inquiries about learner success and retention should begin with questioning the influence of educational activities within the classroom. In an attempt to clarify these relationships, Tinto conducted a longitudinal study of first-year community college students in a multi-disciplinary curriculum that required cooperative learning and active involvement by a team of instructors. Data relating to student engagement during classroom instruction as well as out-of-classroom behaviors were collected, including current life situations, educational intentions, learning preferences, attitudes about education and perceptions of the institution. Additionally, information about

students' GPAs, earned credits and quarter-to-quarter enrollments was gathered from institutional records. Using a logit regression to analyze the quantitative data, the variables of college GPA, participation in the multi-disciplinary curriculum, hours studied per week, faculty perceptions and involvement with other students were significant predictors of persistence among students enrolled at the college.

Tinto's theory highlights the interactions of student and institution-related variables. Braxton, Milem and Sullivan (2000) commented that Tinto's work "enjoys near paradigmatic status" (p.569), having been cited in a multitude of articles and dissertations. The researchers suggested, though, that the literature on student success could be summarized into four basic propositions that shed light on retention problems. Entering students possess characteristics that influence their commitment to the institution. These include demographic and socioeconomic factors as well as educational ability and experience. Initial levels of commitment influence subsequent attitudes toward the learning environment, and in turn, attitudes are affected by the extent of student integration into the social communities of the college or university. As students experience an increasing commitment to the institution, they can be expected to persist in their educational programs. To that end, Braxton, et.al. proposed a model of retention that incorporated organizational attributes, student expectations and student experiences in extra-curricular activities and residence halls interacting with active learning instructional strategies. Their research found some support for the influence of active learning in the classroom on social integration and student persistence.

Motivational models seek to identify aspects of learner behavior that promote retention (House, 2001). Learner intentions and persistence in academic environments reflect cognitive engagement, which is seen as a precursor to achievement (Tuckman and Abry, 1998). House posited that learner intentions are rooted in personality characteristics and learning preferences. Miltiadou and Savenye (2000) further described motivational behavior as a function of an individual's thoughts rather than instinct or needs, which includes self-efficacy, achievement goal orientation, and self-regulation. Nauta and Kahn (2000) proposed that these social-cognitive perspectives help explain performance and persistence in terms of the learner's intentions interacting with the educational environment. In a longitudinal study of undergraduate students, Nauta and Kahn found that performance goals, outcome expectations and academic performance help to explain first-year college performance and freshman-to-sophomore persistence.

In a study conducted by Nelson, Dunn, Griggs, Primavera, Fitzpatrick, Bacilious and Miller (1993), the authors noted that the variety of available models did not isolate specific factors of attrition that could be targeted for intervention. They stated that reports on how learners approach, internalize and process information abounds, yet theorists largely disregarded this literature base in their retention studies. They suggested that examining learning preferences would help to explain the interaction between learner characteristics and environmental factors. Since academic skills are important determinants of success, Nelson, et.al. theorized that student self-awareness and self-regulation would influence retention and academic

achievement. Their research involved a process of identifying learning and cognitive styles using the Productivity Environmental Preference Survey (PEPS), which assessed environmental, emotional, sociological and physiological preferences. Learners in experimental groups received an interpretation of their respective PEPS profiles and various levels of instruction on applying their strengths in studying and completing assignments. Compared to the control group that received no intervention, students showed significant differences in academic achievement and retention, regardless of level of instruction received or academic status (probation or non-probation). The researchers stated that this study supported the concept that individuals who understand their learning and cognitive styles and regulate those preferences evidence improved academic achievement. Additionally, they suggested that self-awareness and self-regulatory skills paired with instructional environments that are congruent with those preferences could positively influence retention.

House (1999) suggested that cognitive-motivational and environmental factors should be considered simultaneously when studying student success. He proposed an input – environment – outcome (I-E-O) model to analyze the unique effects of students' entering characteristics and college environment on subsequent outcomes. Input was described as characteristics that students bring to the instructional setting such as past academic performance, cognitive abilities and motivational behaviors. Environmental variables included the breadth of experiences students encounter while enrolled in academic programs. To test this model, House posited that student satisfaction and degree completion would be impacted by input and environmental

components. He questioned 594 individuals who had entered college five years previously about their work habits and learning experiences as student. He then merged that information with institutional data provided by the students at the time they enrolled. Results of regression analyses showed student characteristics such as self-ratings of academic achievement and expectations of success, as well as responses to the instructional setting, to be related to stated measures of success.

The research in student success and persistence is relevant to this study in that learner characteristics interacting with environmental factors have been identified as important variables (Nauta & Kahn, 2000; House, 1999; Nelson et.al., 1993). One important limitation is that the literature cited thus far has been drawn from traditional undergraduate populations. Studies conducted with graduate students and research in distance settings demonstrate the need for conceptual frameworks that acknowledge the difference in populations and educational contexts. The next part of this review addresses the literature pertaining to retention and persistence in graduate education.

Graduate program retention

In spite of the large amount of research into success and persistence, the phenomena remain relatively unexplored at the graduate level (Girves & Wemmerus, 1988). Table 2.2 presents aspects of studies related to this topic.

Table 2.2 Studies related to graduate program retention

Author	Topic Variable(s)	Methodology	Population	Independent
Bair & Haworth, (1999)	Doctoral student attrition & persistence	Qualitative, meta-synthesis of research	n=118	n/a
Girves & Wemmerus (1988)	Graduate student degree progress	Survey, quantitative	n=486	Department characteristics; student characteristics; financial support; & student perceptions of relationship with faculty
Gunn & Sanford (1988)	Doctoral student retention review)	Analysis of trends in retention rates (longitudinal	n/a	n/a

Although the literature acknowledges distinct differences between undergraduate and graduate students, assumptions about graduate student success are often based on findings from undergraduate populations. This may be due to the smaller percentage of students pursuing masters and doctoral programs compared to those enrolled in undergraduate programs. The perception may exist that there is less of a need to study the topic; however, the contemporary context for higher education justifies a closer examination of graduate learners. Greater competition among institutions, the rise of for-profit educational organizations and an emphasis on life-long learning in business and industry establish a demand for colleges and universities to attract and retain qualified students.

Building on the framework from Tinto (1975), Girves and Wemmerus (1988) proposed a two-stage model that included student/advisor relationships and financial support as additional variables that uniquely influence graduate student persistence. The first stage considered characteristics of departments and students, as well as financial support and the individual's perception of relationships with faculty. These first stage variables were believed to interact with factors in the second stage, which consisted of grades, involvement and perceptions of satisfaction or alienation. The concept of success in graduate education was broadly defined by degree progress or "milestones attained" (p.166). Since graduate students often study on a part-time basis, it may take five or more years to complete a degree. In some cases, individuals pursue graduate education but do not aspire to finish the degree program. Consequently, measures that define success in traditional undergraduate programs,

such as GPA and degree completion, are not as useful in understanding graduate retention.

In testing their model, Girves and Wemmerus (1988) created a survey designed to elicit information from masters and doctoral students relative to the first-stage variables. Institutional data were combined with survey responses and analyzed using a hierarchical regression. They reported that models were differentiated at the masters and doctoral levels, but variables associated with academic integration were significant for both groups.

In 1988, Gunn and Sanford looked at retention trends in doctoral programs at a large state-supported university. They described retention as the process by which students enter a program and remain until graduated. Using institutional data on enrollments, they found that fifty percent of subjects had completed their degrees within eight years of beginning their programs, but the data were not stratified according to program or departmental affiliation. The authors contended that doctoral populations are difficult to study due to the manner in which data are collected and reported at the institutional level. They noted the need for normative comparisons of doctoral attrition, greater emphasis on issues related to specific academic disciplines and information on retention predictors in the research literature.

Bair and Haworth (1999) conducted a meta-synthesis of studies in doctoral student attrition published from the 1970s forward. They stated that forty to sixty percent of individuals who begin doctoral studies do not complete their degrees. This statistic has remained relatively constant for over fifty years despite careful selection

processes and the past academic achievements of those admitted to the programs. Bair and Haworth suggested that the importance of the doctoral degree in business, industry and education should prompt large-scale efforts to track and study retention issues, yet they argued that most research suffers from lack of basic understandings of the phenomena. Their analysis did reveal that attrition varies by discipline or field and students studying laboratory sciences persist at greater levels than individuals in humanities or social science programs. Bair and Haworth posited that doctoral students in humanities and social sciences might experience less structure in their curriculum and greater conceptual ambiguity in their studies. Additionally, these individuals tend to do much of their work in isolation in contrast to students who research in laboratory environments. The latter group often works under the direct supervision of faculty members to support their ongoing research projects.

Personality factors, typified as learner independence, motivation and the ability to endure frustration, as well as an understanding and tolerance of institutional regulations and procedures may contribute to persistence. In contrast, traditional indicators such as GPA, Graduate Record Exams scores and previous academic majors that are used for admission decisions do not appear to influence retention significantly. Consequently, Bair and Haworth (1999) called for further research that investigates the potentially meaningful relationships between individual characteristics and specific aspects of doctoral program experiences that promote retention and degree completion.

The literature on graduate student retention reinforces the need to study the interaction of cognitive and psychological factors on academic success. At the undergraduate level, institutional factors exert a significant amount of influence on academic socialization, yet the context of graduate study implies that student characteristics assume greater importance in understanding learner success. These characteristics are key components in distance settings and are discussed in the following section.

Persistence in distance education

Distance learners, on average, are over twenty-five years of age, have full-time careers and shoulder family and civic responsibilities. Changing social and work environments require them to continuously learn for career advancement, job security and a variety of other professional and personal reasons (Eastmond, 1998). Distance education programs respond to that that need by providing learning opportunities regardless of time and place constraints.

In early research on distance education persistence, comparability of instructional modes was of primary concern. Studies examined the impact of instructional systems on student achievement with the hope that the delivery technology would provide comparable or, in some situations, superior outcomes to face-to-face teaching (Maushak, Chen, Martin, Shaw & Unfred, 2001). This perspective has been criticized for its emphasis on the delivery of information rather than the quality of the teaching-learning experience (Grasha & Yangarber-Hicks, 2000). Identifying and understanding learner differences are of greater importance

since these variables impact student persistence and success in educational settings (Carr, 2000; The Web-Based Education Commission, 2000).

More than a decade ago, researchers noted that retention was a compelling topic as distance learning was being integrated into the mainstream of higher education (Powell, Conway & Ross, 1990). Attracting and keeping students is not a new problem yet increased competition, greater diversity in student populations, heightened pressures for accountability and the ever-present struggle for resources make this a current issue for post-secondary institutions. In light of the rapid growth of distance education, especially programs that use online technologies, there exists a need for investigating student success and persistence related to these non-traditional environments (Aragon, Johnson & Shaik, 2000).

Relative to this notion, Tinto (1982) commented that scholars “should give thought to just how far and in what directions we should stretch our existing models of dropout” (p. 687). He cautioned that his model was developed to describe some facets of attrition that occur within specific contexts (traditional undergraduate institutions) and it did not emphasize the characteristics of entering students. Kember (1989) echoed this idea and contended that traditional models of retention “are not directly applicable to distance education because of the characteristics of that form of education” (p. 278). He therefore argued that an appropriate conceptual model did not exist. From his review of available research, he surmised that conventional models of attrition were overlaid onto distance learning without addressing the differences in these educational systems. Cognitive and affective characteristics, as

well as the life experiences of distance learners coupled with a geographical separation from the institution interact in ways that are not accommodated in earlier theoretical work.

Powell, Conway and Ross (1990), in reviewing the literature on student success and persistence, remarked that the topic remained complex and the research often appeared contradictory. They advanced a more holistic model that investigated the experiences of distance learners in respect to the particular environment of distance education. Three broad components were included in the model: predisposing characteristics; life changes; and institutional factors. Predisposing characteristics are fixed or slow to change throughout the time that an individual is involved with the learning situation and exert a somewhat constant influence on persistence. They are antecedent predictors and interact differentially with life changes and institutional factors. These latter two variables are not viewed as direct causes of attrition and consequently, do not have much independent explanatory power. Powell, et.al. remarked that this framework “does not require the concurrent investigation of all three sets of factors for systematic progress toward a comprehensive explanation of student behavior” (p.4) because predisposing characteristics have the greatest potential for explaining persistence.

Garland (1994) conducted an ethnographic analysis of the situational, institutional, dispositional and epistemological barriers to adult persistence in distance coursework. She determined that complex variables contribute additively to impact an individual’s decision to withdraw from school. Of particular relevance is the

concept that adults in formal learning situations encounter a social contradiction in roles. In their roles as students they are often assumed to be dependent and less knowledgeable as compared to the instructor. In other social situations, learners operate within the context of adult roles that presume autonomy and competence. Garland suggested that the ability to negotiate these social contradictions contributes to the learner's success in the distance environment.

The concepts advanced by Powell, et.al (1990) and Garland (1994) provided insight into persistence in distance graduate education relative to this study. They acknowledged the complexity of issues that researchers encounter when studying the issues, yet identified that predisposing characteristics, independent of institutional variables, may help explain success more clearly in distance settings than in traditional learning environments. The next section discusses this perspective in the context of online learning situations.

Persistence in web-based distance education

Martinez, Bunderson, Nelson and Ruttan (1999) stated that comparative research on the effectiveness of different technologies for distance education has yielded largely ambiguous results. They called for stronger theoretical foundations that acknowledge student differences and their reactions to various technologies, and suggested that this line of inquiry has more potential to describe learning outcomes. These theories should integrate cognitive, conative and affective components which reflect the complex interactions that occur in the learning process. Reminiscent of the Powell, Conway and Ross (1990) model, the authors posited that new learning

paradigms are needed that recognize diverse sources for individual responses and are able to describe the higher-order psychological variables.

Webster and Hackley (1997) proposed that the integration of technology-mediated instruction into distance education systems influenced learning outcomes. Characteristics of the environment can attract the learner's attention, convey content and provide interaction and feedback. The extent to which the environment influences learning is a function of perception. In other words, learners may perceive the content and messages differently based on individual traits and the context of the educational setting. Consequently, even though student attitudes toward the online classroom are favorable, it does not follow that they will achieve success or prefer learning in that type of environment. Yu (2000) advanced a similar concept when he proposed an Input-Process-Outcome model for assessing the impact of technology-assisted instruction on learner achievement. The properties of the instructional media (input) interact with the manner in which an individual perceives and processes the information (process) to influence the learning outcome.

Throughout the history of persistence research, predisposing learner characteristics have been identified as important variables in explaining retention. As indicated in the previously reviewed literature, researchers have sought to articulate a set of traits or behaviors that influence an individual's success in higher education (Tinto, 1975; Nelson, Dunn, Griggs, Primavera, Fitzpatrick, Baciliou and Miller, 1993; Garland, 1994; Feldman, Smart and Ethington, 1999; House, 1999; Bair & Haworth, 1999), yet Thompson (1999) observed that the "dynamic nature of the

individual learner is one obstacle to constructing a generic ‘profile’ of the distance learner” (p.10). Although demographic characteristics such as gender, age, ethnicity and life-roles have been studied in relationship to retention, those traits have not held up as consistent predictors of success. Instead, understanding learner attributes that relate to the context of the learning situation is more appropriate in graduate distance education. Consequently, examining the predisposing characteristics of cognitive processes and learning behaviors in the context of online environments holds more promise for explaining persistence in contemporary distance education (Thompson; Gibson & Graff, 1992; Powell, Conway & Ross, 1990).

This section presented literature relating to student success in higher education, identifying the relevance of research in distance graduate programs. The next part of this review addresses the unique aspects of distance education environments, and especially online settings, that influence student learning experiences.

Distance Learning Environments

Teaching methods in traditional distance education courses have been used to recreate, to the greatest extent possible, the learning experiences of a face-to-face classroom. Peters (1998) defended this practice as necessary to maintaining the academic quality of distance education, and cautioned against a primary focus on technical processes and delivery modes. Research has found, however, that the majority of college and university courses are taught through the lecture method. Educational institutions are able to provide this content through distance

technologies, but Gardiner (1998) questioned the value of emphasizing lecture-based instruction. He maintained that this format is inadequate for developing the higher-level thinking skills that are the hallmark of higher education.

Cropley and Kahl (1983) described core dimensions of effective instruction, including organization of learning, motivation, learning processes, didactic activities, and evaluation and feedback. They maintained that distance education offers the opportunity to individualize many of these aspects, either through course design or the choices made by students as they participate in the learning experience. However, traditional distance-learning environments are bound by the limits of the medium (e.g., print, audiotapes and videos) and the geographical separation of instructors and students. Unless real time technologies are used, such as telephones and closed circuit television, the distance classroom is not immediately adjustable or responsive to learner needs (Chute, Sayers, & Gardner, 1997).

More recently, Knowlton (2000) identified the need for a new philosophy of instruction because of the growing popularity of online classrooms. Online education is developing within the context of a rapidly changing society that responds to the possibilities of the virtual classroom as well as impacts the nature of the course design and delivery of instruction. Consequently, web-based courses hold the promise of greater teacher-student interaction.

Online learning environments

Traditional distance education models often emphasize learner autonomy and separation of participants in time and place. Compared to traditional distance

education methods, computer-mediated formats can provide learning experiences that “are more integrated and interactive” (Cannone-Syrcos & Syrcos, 2000, p. 171).

Existing formats of distance instruction can be accommodated with greater efficiency or new methods may be created to increase interaction and minimize separation (Brace-Govan and Clulow, 2000). However, the amount and the structure of information available online implies that access rather than quality of experience is predominant.

Because information is available anywhere and at any time, as long as the user is connected to the Internet, online learning environments introduce a level of complexity that is not present in other types of educational systems. The backbone of web-based communication is hypertext, a nonlinear electronic language that links previously stored information through various protocols and graphical interfaces so that users can access information on almost any topic (McGreal, 1997; Lin & Davidson-Shivers, 1996). Although these interfaces provide visual and organizational cues, they do not always help users understand what is presented (Jonassen, Dyer, Peters, Robinson, Harvey, King & Loughner, 1997). Information is stored through a vast system of related links that lacks an apparent and consistent hierarchical structure (Cahoon, 1998) Interactions take place in virtual environments that allow multiple simultaneous inputs without the associative cues that accompany face-to-face communication (Gunawardena & Duphorne, 2000).

Another aspect of complexity relates to the various definitions and uses of web-based technology in delivering instruction. For example, an online classroom

can be a synchronous text-based virtual meeting room, an exchange of electronic mail via a secure distribution list; a web-based conferencing area where streaming audio and video files are presented and archived; a graphical interface that acts as a repository for instructional materials and asynchronous threaded discussions; or a virtual space where self-paced and self-managed learning occurs (Yu, 2000; Chute, Sayers & Gardner, 1997). Although each of these examples falls within the definition of web-based or online systems, the underlying instructional design may be quite different.

Weigel (2002) stated that the various forms of web-based instruction are particularly suited to promote the deep learning that is the intended outcome of higher education. He indicated that this type of learning is characterized by “conditionalized knowledge, metacognition, and communities of inquiry” (p.5). Because the Internet provides access to information from different sources and in various formats, individuals have to think critically about the truthfulness and value of what they are learning. They must contextualize the knowledge, identifying pertinent and non-associated concepts. Online learners also need to be able to analyze their thinking or “monitor and reflect on [their] level of understanding, to know when this understanding is not adequate, and to know how to remedy this inadequacy” (p.7). Additionally, web-based education allows people to make connections and exchange information with others in their field. As demonstrated in this review, the demands of the environment require appropriate responses from learners, yet Schellens and

Valcke (2000) posited that these demands may be inconsistent with the learner preferences and behaviors.

The variety and complexity of online learning environments were discussed in this section. Following is a review of predisposing characteristics that may impact student success in the online classroom.

Predisposing Characteristics

Successful adult learners are seen as being able to choose, analyze, revise and abandon intellectual tasks based on interactions between external factors and internal values (Jegede, Taplin, Fan, Chan & Yum, 1999). In other words, they approach learning in ways that engage cognitive and psychological functions within the context of the educational environment (Knowles, 1980). Merriam and Cafferella (1999) noted that adults are seen as being primarily responsible for identifying desired outcomes and achieving personal goals related to their own learning (Smith & Pourchot, 1998). Research suggests, though, that not all adults desire or know how to take control of their learning and the demonstration of independent behavior is not adequate to explain the successful adult learner in formal educational settings (Cafferella, 1993). To understand the interactions between the environment and individual determinants related to academic success, a deeper examination of learner characteristics is needed.

The literature on characteristics of successful online learners borrows from traditional distance education and adult learning research yet lacks solid empirical support. Brace-Govan & Clulow (2000) observed that most studies in the field

focused on teaching methods and strategies but largely ignored whether or not a student is suitable to the online learning environment. Because the computer-mediated classroom varies widely in structure, there is a need to know how students work in virtual environments and what abilities are needed to succeed. Mason (1998) stated that it is unlikely that all students would be able to learn equally well in face-to-face and distance courses and suggested that individuals in distance settings must take responsibility for their learning, possess high levels of motivation and practice good time management. Maushak, Chen, Martin, Shaw & Unfred (2001) stated that high achieving students possess a sophisticated repertoire of cognitive rules and understand associative relationships that link new information to existing knowledge, while Knowlton (2000) reported that individuals must be self-directed and assume an active role in the learning activities. Pachnowski & Jurczyk (2000) found an assortment of variables in the literature linked to successful online learning including: internal locus of control; field independence; preferences for reading over direct experience; self-direction; and reflection. The authors noted that most reports are anecdotal in nature because online learning is a recent phenomenon, yet it is noteworthy that cognitive and psychological traits dominate the list of variables. Pertinent aspects of studies that addressed these issues are presented in Table 2.3.

Table 2.3 Studies related to predisposing characteristics

Author	Topic Independent	Methodology	Population	Variables
Brace-Govan & Clulow (2000)	Behaviors & responses of students in online courses	Qualitative, exploratory study using reflective journaling methodologies	n=14	n/a
Bullan (1998)	Variables affecting the demonstration of critical thinking	Qualitative, using case study methodology	University-level course computer information systems	Course design, instructor interventions & student situational & dispositional characteristics
House (1999)	Effect of student entering characteristics & environmental factors on degree completion	Quantitative	n=594	High school GPA, self-ratings of academic ability, & expectations of graduating with honors
Leitsch & Van Hove	Psychological type & critical thinking	Quantitative, using MBTI & WGCTA	n=272	Psychological type
Pachnowski & Jurczyk (2000)	Self-directed behaviors & technical skills	Quantitative	n=31	Students' habits & attitudes; student success in online courses

Cahoon (1998) maintained that the ability to use the Internet for learning requires effective reasoning and problem-solving skills. Learning in a web-based environment is predicated on the student's ability to comprehend the meaning of what is located on the Internet and integrate the information with what is already known "into some kind of coherent, conceptual scheme" (Jonassen, Dyer, Peters, Robinson, Harvey, King & Loughner, 1997, p. 120). Because the online classroom lacks the traditional structures of simultaneous visual, verbal and nonverbal cues, students must be able to conceptualize the learning space. Hence, the notion that learning is a function of creating meaning from experience takes on more importance. Although online learners share experiences, the interpretation is negotiated within a greater variety of settings (e.g., location of student, type of equipment and limitations of access). Psychological traits, such as self-pacing and self-evaluation are of special importance in the online classroom. In face-to-face classrooms, the majority of conversations and interactions relate to the content and purpose of the learning activity. In online environments, flexibility of time and place introduces elements that compete for the learner's attention. As a result, students encounter a variety of stimuli that do not all pertain to the learning activity (Lin & Davidson-Shivers, 1996).

Although not directly addressing persistence, Olgren's (1998) work is pertinent because it describes the cognitive skills and learning behaviors that impact outcomes in distance education. These outcomes are dependent on the individual's ability to organize and integrate new information received during the educational experience. These traits are known also as self-regulatory processes (King, Harner &

Brown, 2000), which include metacognition, cognitive styles and affective dispositions toward the environment. These cognitive skills and learning behaviors are “associated with deep approaches to learning that emphasize...understanding and applying the material” (Olgren, p.85). Bullen (1998) suggested that learning style preference and personality may help to explain success in online education. In a small study examining participation in an online undergraduate course, students who did not complete the course cited their inability to adapt to the environment as a primary cause for dropping out.

Cognitive styles have been described as habitual or consistent predispositions of perceiving, remembering, thinking and making decisions. They are characterized by stability across tasks and over time, and are somewhat resistant to change (Liu & Ginther, 1999). Additionally, cognitive styles are independent of traditional measures of general ability and relate in some manner to characteristics of the instructional environment. Findings from both qualitative and quantitative research demonstrate that cognitive styles differ among students. Various concepts of cognitive styles have been advanced in the literature: field independence vs. field dependence; holist-analytic; sensory preferences; hemispheric preferences; Kolb’s Learning Style Model and the Myers-Briggs Type Indicator (MBTI). The authors stated that research literature uses cognitive styles and learning styles interchangeably; however, cognitive styles typically are considered in theoretical research while learning styles relate to practical applications.

Maushak, Chen, Martin, Shaw and Unfred (2001), in a review of distance education research, identified the affective dispositions that may impact student persistence. These include self-efficacy, anxiety about the learning experience and personal goals related to the course of study. Morgan and Tam (1999) listed self-confidence and motivation as dispositional variables, while Gibson and Graff (1992) cited energy, stress, ability to concentrate and organizational habits as factors that influence retention.

Clearly, there are a variety of factors purported to influence retention and success in online environments. Most of the literature is not supported fully by empirical data, yet higher level thinking skills and learner dispositions emerge as unifying concepts in recent studies. Cognitive abilities and psychological factors are closely aligned with research in critical thinking and psychological type theory. Those lines of inquiry may provide a better understanding of factors that contribute to learner success in higher education settings. The following sections discuss critical thinking and psychological type as guiding frameworks for understanding the predisposing variables that interact with the instructional environment to influence learner success.

Critical Thinking

Although no single definition of critical thinking is found in the literature (Adams, Stove & Whitlow, 1999; Pepa, Brown and Alverson, 1997; Pascarella, 1989), it is commonly understood as a cognitive activity that seeks to arrive at a conclusion integrating "all available information and that can therefore be

convincingly justified" (Kurfiss, 1988, p.2). Critical thinking is a rational inquiry process that includes the analysis of premises, arguments and evidence (Garrison, 1992; Brookfield, 1988) and is comprised of metacognitive components, performance components and cognitive learning strategies (Olgren, 1998; Sternberg, 1986).

Olgren (1998) posited that cognitive learning strategies affect learning outcomes and identified four levels at which a learner processes information. Selection strategies enable an individual to focus attention on relevant information and rehearsal strategies provide a means of recall through repetition. The first two strategies promote learning at a surface or verbatim level. The second two strategies of organization and elaboration allow learners to organize and elaborate upon new information creating deeper levels of understanding, integration and application. These more complex strategies reflect definitions of critical thinking that incorporate the ability to recognize problems and patterns and to apply knowledge about inferences, abstractions and generalizations (Loo & Thorpe, 1999).

Brookfield (1987) suggested that critical thinking abilities are not fixed at a certain age or experience level. These skills can be developed in adults and the process is greatly facilitated through interaction with others in environments that foster creative, divergent thinking. Participation in group-based activities that require cognitive reflection and analysis of the learning experience correlates positively with improvements in critical thinking skills. Additionally, there is some agreement that instruction in generalized "thinking skills" must be coupled with content-specific knowledge in order to promote critical thinking (Kurfiss, 1988).

The concept of critical thinking was widely discussed in the fields of education and psychology throughout that latter half of the twentieth century and has often been defined by the instrument used to measure the construct (Fulton, 1989). One of the most prominent tests of critical thinking is the Watson-Glaser Critical Thinking Appraisal (WGCTA) that assesses five pertinent areas: inference; recognition of assumptions; deduction; interpretation; and evaluation of arguments. Five subtests comprise the WGCTA and, although each section is scored individually, the composite results are necessary to yield a reliable measure of critical thinking (Loo and Thorpe, 1999). Woehlke (1985) stated that the WGCTA can be used to study the relationship of critical thinking to other mental abilities and it has been correlated with intelligence, academic ability and GPA in secondary and higher education settings. Several related studies are referenced in Table 2.4.

Researchers have used the WGCTA to explore the influence of critical thinking on various facets of medical training. Molitor, Elstain and King (1978) found that the WGCTA, in addition to other measures such as MCAT scores and GPA, predicted problem-solving skills in medical school applicants. Wilson and Wagner (1981) also attempted to predict academic performance for students enrolled in an accelerated medical school program. Composite GPAs from two courses were the criterion measures. If used alone, the SAT scores were found to be a more powerful predictor of achievement yet a moderate amount of unique variance was attributable to the WGCTA scores. Pepa, Brown and Alverson (1997) compared the scores of nursing students in traditional courses to those in accelerated courses at time

of entry into the programs. While there were significant differences between the two groups at the outset, their scores at the completion of the course sequence were not statistically different. Behrens (1996) addressed the relationship between WGCTA scores and academic performance in nursing studies. Pearson correlational analyses between critical thinking measures and fall semester GPAs for three freshman classes were significant at the .01 level, yet WGCTA scores did not improve as a function of continued enrollment in the program.

Table 2.4 Studies related to WGCTA

Author	Topic	Methodology	Population	Independent Variables
Behrens (1996)	Critical thinking & success in a diploma program	Quantitative, using WGCTA	n=172	Critical thinking skills as measured by WGCTA
Brabeck (1983)	Critical thinking & reflective judgment	Mixed, using WGCTA & Reflective Judgment Interview	n=119	Critical thinking skills as measured by WGCTA
Gadzella, Ginther, Bryant & Caldwell, (1996)	Critical thinking & academic performance	Quantitative, using WGCTA & course grades	n=98	Critical thinking skills as measured by WGCTA
Molidor, Elstain & King (1978)	Measures of creative thinking abilities & critical thinking skills	Quantitative	n=54	Reasoning, thinking skills related to problem solving abilities
Pepa, Brown & Alverson (1997)	Critical thinking & performance in a baccalaureate nursing program	Experimental, using WGCTA	n=88	Participation in an accelerated or traditional baccalaureate nursing program
Steward & Al-Abdulla, (1989)	Critical thinking & academic performance	Quantitative, using WGCTA	n=237	Critical thinking skills as measured by WGCTA
Wilson & Wagner (1981)	Critical thinking & academic performance	Quantitative, using WGCTA	n=55	Critical thinking skills as measured by WGCTA

Steward and Al-Abdulla (1989) examined critical thinking and academic performance in a more generalized population of 237 undergraduates. Scores on the subtests of inference, interpretation and evaluation of arguments, as well as the WGCTA composite score, correlated significantly ($p < .05$) with cumulative GPA. The relationship between critical thinking and achievement was significant ($p < .04$) on three subtests and the composite test scores for a sample of 98 college freshmen (Gadzella, Ginther, Bryant & Caldwell, 1996). Critical thinking skills have also been linked to the development of reflective judgment, which, at its highest level, is characterized by sophisticated reasoning about complex issues (Brabeck, 1983). In a study of women students in private religious secondary schools and colleges, Brabeck found that reflective judgment mean scores "were higher for high critical thinking subjects than for low critical thinking subjects at each educational level" (p.30) and suggested that critical thinking skills may be necessary, albeit not sufficient, for the mature development of reflective judgment.

This section examined critical thinking as one of the predisposing characteristics that influences academic success. An additional variable that is related to student achievement is psychological type. This concept will be discussed in the following section.

Psychological Type Theory

Contemporary concepts of psychological type are rooted in Carl Jung's theory that individuals are motivated through the activity of personality. Psychological type is a function of the manner in which a person perceives information and makes

decisions. Seemingly random variations in individuals' behaviors are consistent when viewed within the context of psychological type theory (Lynch, 1987).

Jungian mental functions are two dichotomous pairs that define either perceiving or judging behaviors. Sensing and Intuition describe opposite ways in which people perceive or prefer to gather information. Thinking and Feeling are identified as judging behaviors, or the opposite means by which people prefer to make decisions.

Psychological type theory also presumes that individuals prefer one of two opposite attitudes or orientations of energy. Extraverts direct attention toward people and events in the external environment while Introverts focus on internal experiences and thoughts. Jung theorized eight psychological types by pairing Extraversion or Introversion with one of the perceiving functions or one of the judging functions.

Isabel Myers and Katherine Briggs expanded on Jung's work by defining Judging and Perceiving, a fourth dichotomy that describes the orientation or manner in which people prefer to respond to the outer world. Sixteen distinct types emerge from combining this dichotomy with the other pairs identified in Jung's theory (Myers, McCaulley, Quenk & Hammer, 1998).

Psychological type is regarded as a somewhat fixed characteristic, yet the development of type and the demonstration of type-related behavior are influenced by context and culture. For this reason, psychological type is discussed in terms of preferences, or preferred ways of thinking and behaving given a situation in which a person feels most comfortable and confident.

Considering the foundations of psychological type theory, Deuschle (2001) stated that not all type categories are well understood. He maintained that a “vague characterization” (p. 18) of Introversion, Intuition and Feeling “causes failure to distinguish attitudes and functions clearly in the standard theory” (p. 19). Evidence for the sixteen distinct types has been questioned (Johnson, Mauzey, Johnson, Murphy and Zimmerman, 2001) and Pittenger (1993) stated that there is “a tradition of skepticism concerning the value of type theories of personality” (p. 469). However, these limitations have not dimmed the continuing interest in psychological type theory, demonstrated by the widespread use of the Myers-Briggs Type Inventory (MBTI) by researchers and practitioners (Johnson, et.al).

The Myers-Briggs Type Inventory

Based on their interpretation of Jung’s theory, Isabel Myers and Katherine Briggs developed the Myers-Briggs Type Inventory (MBTI). The purpose of the MBTI is to “sort people into groups to which, in theory, they already belong” (Myers, McCaulley, Quenk & Hammer, 1998, p.127). It was designed to promote greater self-understanding in nonclinical, normal populations (Johnson, Mauzey, Johnson, Murphy & Zimmerman, 2001) and is used widely in counseling, career planning, educational and organizational settings.

Pittenger (1993) took an in-depth look at the research conducted on the MBTI and concluded that the validity and utility of the instrument were not supported by available evidence. He questioned the existence of sixteen distinct types, suggesting instead that the MBTI “may be a special case of a more general framework for

understanding personality, and the research on the MBTI may be understood within this system” (p.475). Pittenger presents a static interpretation of type theory, however, seeming to ignore theoretical constructs of dynamism and type development discussed in Myers, McCaulley, Quenk & Hammer (1998).

The current standard version of MBTI is Form M, published in 1998. It consists of ninety-three items presented in forced-choice formats. Although Form M appears to be a stronger instrument than earlier versions, several weaknesses have been identified (Quenk, 2000). These include:

1. An adequate understanding of psychological type theory is needed to administer and interpret the instrument.
2. The simplicity of the questions suggests that type theory is simple and static rather than complex and dynamic.
3. The sixteen types are not measured directly and without knowledge of the theory, individuals may interpret results as four independent traits.

Quenk also stated that the modest correlation between items relating to Sensing and Judging, and Intuition and Perceiving appears to contradict the underlying concept of independent scales. However, she noted that Sensing/Intuition and Judging/Perceiving items loaded clearly on the appropriate scales. She concluded that the current version supports the theory and the distinctiveness of sixteen types.

Despite these criticisms, the MBTI has proved to be useful in various educational settings. It continues to be widely employed by practitioners who examine personality differences, learning preferences and motivations. MBTI

provides valuable information when used as to promote increased self-knowledge and greater appreciation for diverse perspectives.

Type tables

An initial understanding of the sixteen types can be daunting (Myers & Myers, 1995). Consequently, type tables have been created to display information about the sixteen types “in a logical relationship” (Myers, et.al, 1998, p.36). These tables provide a means by which one can see each type in relation to the others (Myers & Myers). They are used as a tool for understanding whole types and specific combinations of preferences.

Figure 2.1 presents the format of the type tables. Introverted types are listed on the first and second rows of the type table; extraverted types occupy the third and fourth rows. Sensing types are located on the first and second columns of the type table while Intuitive types are located on the third and fourth columns. Thinking types are listed on the first and fourth columns and Feeling types are located on the middle two columns. Judging types are found on the top and bottom rows and Perceiving types are located on the middle two rows.

The type tables allow practitioners to identify group types that share specific characteristics. For example, the columns in the table display types according to the four mental functions (ST, SF, NF and NT). These type relationships “have received a great deal of research attention over the years” (Myers, McCaulley, Quenk & Hammer, 1998, p. 40) and descriptions of common characteristics have been developed from this information. Often, these function pairings are linked to learning

preferences or cognitive styles. Table 2.5 summarizes the characteristics of the four mental functions.

Other ways to group the types is by examining the combination of attitudes (IJ, IP, EP and EJ) or the combination of judgment and one's orientation to the outer world (TJ, TP, FP, FJ). Of this latter group, Myers, McCaulley, Quenk & Hammer (1998) noted that the TJ combination has the greatest amount of research available and "may reflect the unique qualities that permit them to be described as 'executive' types, a status that is generally highly valued in our culture" (p.52). The characteristics of these type combinations are presented in Table 2.6 and Table 2.7.

Figure 2.1 MBTI type tables

ISTJ	ISFJ	INFJ	INTJ
ISTP	ISFP	INFP	INTP
ESTP	ESFP	ENFP	ENTP
ESTJ	ESFJ	ENFJ	ENTJ

Introversion
Extraversion

Sensing	Intuition
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Thinking	Feeling	Feeling	Thinking
----------	---------	---------	----------

Judging
Perceiving
Perceiving
Judging

Table 2.5 Characteristics of the four mental functions

Mental Function	Characteristics
Sensing Thinking (ST) "Practical and Matter-of-Fact Types"	Focus on facts; use objective analysis to make decisions; demonstrate interest in tasks involving nonpersonal analysis of concrete facts
Sensing Feeling (SF) "Sympathetic and Friendly Types"	Focus on facts; emphasize personal values when making decisions; attracted to situations where personal warmth and emotion can be coupled with concrete tasks
Intuitive Feeling (NF) "Enthusiastic and Insightful Types"	Focus on possibilities rather than facts, demonstrating an interest in underlying patterns, symbolic meaning and theoretical concepts; prefer to use these insights in human relationships
Intuitive Thinking (NT) "Logical and Ingenious Types"	Focus on possibilities rather than facts and use a nonpersonal, cause-and-effect approach to making decisions; tend to be logical and innovative

Note: Adapted from Myers, McCaulley, Quenk & Hammer (1998)

Table 2.6 Characteristics of type related to the four attitudes

Type	Characteristics
Introverted Judging (IJ) "Decisive Introverts"	Introspective, persevering, resistant to change unless given sufficient evidence; often state conclusions without providing adequate explanation for decision
Introverted Perceiving (IP) "Adaptable Introverts"	Introspective, appear to be adaptable and flexible in minor details; firm on important issues; new information must address logic or values to be regarded as valid or relevant
Extraverted Perceiving (EP) "Adaptable Extraverts"	Active, energetic and sociable; flexible and adaptable; seek new experiences; optimistic about opportunities and personal abilities to interact successfully with "outer world"
Extraverted Judging (EJ) "Decisive Introverts"	Active, decisive and appear confident to others; seen as natural leaders; resistant to change once decisions have been made unless negative consequences can be identified

Note: Adapted from Myers, McCaulley, Quenk & Hammer (1998)

Table 2.7 Characteristics of T-F and J-P types

Type	Characteristics
Thinking Judging (TJ) "Logical Decision Makers"	Seeks to bring order to external environment; expresses thought and judgments with directness and clarity. Focuses on critiquing systems, procedures and ideas
Thinking Perceiving (TP) "Adaptive Thinkers"	Seeks to order internal thoughts through logical systems of understanding. Focuses on reflective observation in critiquing reality; identifies inconsistencies often overlooked by others
Feeling Perceiving (FP) "Gentle Types"	Seeks a meaningful and complex inner life by maintaining consistency of personal values and actions; adaptable, affiliative, and concerned with human aspects of problems
Feeling Judging (FJ)	Seeks harmonious relationships; highly aware of people's needs and expectations. Observant about people; loyal and facilitates achievement of group goals

Note: Adapted from Myers, McCaulley, Quenk & Hammer (1998)

MBTI in education

The MBTI has been used to study a variety of issues in education (Macdaid, 1991) and is currently the area that has the greatest volume of research on psychological type. A common approach has been to address whether certain types are found more frequently in a given sample than would be expected in a base population. Comparative sample statistics are categorized according to descriptors such as class, field of study and academic background. Researchers have also examined how differences among types may influence levels of performance on specific tasks related to learning and success in academic settings. Although MBTI is intended to describe whole type as an interaction of the four dichotomies, most research in education has focused on the interactions between a single dichotomy and other variables (DiTiberio, 1998). These include learning styles (Schroeder, 1993; Jensen, 1991), participation in academic activities (Booth & Winzar, 1993), academic performance (Fox & Roberts, 1993; Hester, 1990), and persistence and attrition (Schurr, Ruble, Palomba, Pickerill, & Moore, 1997; Anchors, Robbins & Gershman, 1989). Selected studies are summarized in Table 2.8 and are discussed in the following section. Additionally, the MBTI Manual (Myers, McCaulley, Quenk & Hammer, 1998) included a review of ten years of research on Form G (the forerunner of Form M) and a synthesis of the educational-related findings categorized by single dichotomies, dominant functions and the sixteen types. Pertinent aspects of this information are provided in Tables 2.9, 2.10, and 2.11.

Table 2.8 Studies related to MBTI

Author	Topic	Methodology	Population	Independent Variables
Anchors, Robbins & Gershman (1989)	Psychological type & persistence to graduation	Quantitative, using MBTI	n=710	MBTI preference profiles
Brown & DeCoster, (1991)	Psychological type & conceptual thinking	Quantitative, using MBTI & the Paragraph Completion Test	n=221	MBTI preference profiles
Cahoon & Lundgren (2001)	Psychological type & counterfactual thinking	Mixed, using MBTI and a stimulus scenario to evaluate counterfactual thinking	n=106	S-N & T-F preferences on MBTI
Dewar & Whittington (2000)	Psychological type & student behaviors in online learning environments	Qualitative, exploratory	n=21	n/a
Hester (1989)	Psychological type, logical reasoning & academic achievement	Quantitative, using MBTI & two measures of logical reasoning	n=48	MBTI preference profiles & logical reasoning
Hester (1990)	Psychological type & performance on theoretically-salient learning tasks	Quantitative, using MBTI and seven performance measurements	n=166	MBTI preference profiles

Table 2.8, continued Studies related to MBTI

Author	Topic	Methodology	Population	Independent Variables
Kalsbeek (1987)	Psychological type, retention & academic integration	Quantitative, longitudinal study using MBTI, demographic data & a student survey	n=4000	MBTI preference profiles, SAT scores & related demographic data
Schurr, Ruble, Palomba, Pickerill & Moore (1997)	Psychological type & degree completion	Quantitative, longitudinal path analysis study using MBTI & demographic data	n=1,114	MBTI preference profiles, SAT scores, high school percentile rank & related data
Stewart (2000)	Psychological type & critical thinking related to doctoral program GPA	Quantitative, using MBTI & WGCTA	n=86	S-N preferences on MBTI; WGCTA score
Thomas, Benne, Marr, Thomas & Hume (2000)	Psychological type & performance in an engineering course	Quantitative, using MBTI and quantitative measures of academic achievement	n=195	MBTI preference profiles

Table 2.9 Summary of characteristics of learners by psychological type

Type	Characteristics
Extraverts	<p>Work best in action Prefer collaborative learning approaches Lean toward active experimentation and/or concrete experience Tend to demonstrate high academic self esteem & high goal orientation</p>
Introverts	<p>Prefer reflective observation and lecture formats Appear to do their best thinking when given time to process information Tend to demonstrate abstract sequential learning style</p>
Sensing	<p>Tend to demonstrate concrete experiential learning style Prefer sequential learning through fact retention & methodical study Adaptive approach to creativity</p>
Intuitive	<p>Described as holistic learners; innovative in creativity Tend to demonstrate abstract conceptual learning style Tend to demonstrate high academic self-esteem & high academic comfort</p>
Thinking	<p>Tend to demonstrate abstract conceptual learning styles Tend to prefer a fact orientation and methodical study Field independent learners Tend to be adaptively creative and participatory learners</p>
Feeling	<p>May demonstrate concrete experiential learning or abstract random learning style Tend toward holistic learning Field dependent learners and tend to be adaptively creative</p>
Judging	<p>May demonstrate abstract conceptual learning or concrete sequential learning style; prefer fact retention and methodological study Like structure & motivation in learning Tend to demonstrate high academic self-esteem & high academic comfort</p>
Perceiving	<p>May demonstrate concrete experiential, concrete random, abstract random or active experiential learning style Tend toward holistic learning, collaboration & dependent learning approaches</p>

Note: Adapted from Myers, McCaulley, Quenk & Hammer (1998)

Table 2.10 Characteristics of type by dominant function

Dominant Feeling Types (ESFJ, ENFJ, ISFP, INFP)

- Work at their best when they care personally about the activity
- Response to environmental factors can affect their persistence in college
- In learning situations, may need to feel welcomed and receive regular encouragement; may need challenges in areas of natural ability

Dominant Thinking Types (ESTJ, ENTJ, ISTP, INTP)

- Least likely to be influenced by aspects of environment
- Rely most on decisions made objectively
- Tend to take charge of their environment
- May minimize the importance of human expectations of instructors and peers
- In learning situations, may prefer challenges related to analysis and problem solving

Dominant Intuitive Types (ENTP, ENFP, INTJ, INFJ)

- May have the greatest advantage in education, especially higher education, over other types
- Attend to conceptual matters, theory and broad patterns
- Need for originality may lead to creative productivity in some school settings and to trouble-making in others

Dominant Sensing Types (ESTP, ESFP, ISTJ, ISFJ)

- Vary distinctly in their response to academic life
 - ISTJs and ISFJs prefer a careful orientation to environment; tend to remember facts of situations for future reference
 - ESTPs and ESFPs tend to experience tangible world more directly, freely and without structure; more affected by ability of instructors and peers to assist them in learning process
 - May do better in college when not distracted by competing priorities
-

Note: Adapted from Myers, McCaulley, Quenk & Hammer (1998)

Table 2.11 Summary of research findings on the 16 types in education

Type	Characteristics
ISTJ and ISFJ	Quietly gather facts & carefully store for later use Considered most reliable of all types Hard-working orientation
INFJ and INTJ	Seem to have a natural affinity for academic world Consistently appear near top in most investigations of academic achievement INFJ found among highest persisters in college
ESTP and ESNP	Least likely to be patient with demands of traditional academic life Prefer collaborative learning Dependent learners with minimal intellectual curiosity Responsive to environment
ENFP and ENTP	Most notably enthusiastic about new possibilities Challenge existing ideas with fresh and original options Don't like routine Among lowest group for retention in college
ISTP and INTP	Quiet analysis of situation without being distracted by others Able to work in isolation for long stretches; value independence Along with ENFP, types most likely to have trouble in school
ISFP and INFP	Quietly, deeply and personally involved in whatever they do Typically do not volunteer their reactions to situations Tend to be dependent on encouragement from world around them Tend to be less confident of their abilities compared to other types
ESTJ and ENTJ	Strong orientation for personal and environment control Forthright; tend to take command in social & leadership situations Among four types with highest overall undergraduate grades Among highest for retention in college
ESFJ and ENFJ	Most friendly and supportive of the types ENFJs least likely to have trouble in school Rely on encouragement and support to do well Mixed results in studies related to college persistence

Note: Adapted from Myers, McCaulley, Quenk & Hammer (1998)

MBTI and academic achievement

Jensen (1991) stated that the MBTI is a useful learning style instrument due to its research base and its complexity. This complexity accounts for most traits identified by other learning style inventories, such as cognitive styles and patterns of attitudes and interests that affect how students perceive and respond to learning environments. Learning styles in the context of psychological type can be identified as:

1. Cognitive styles or preferences related to habitual patterns of processing information and forming ideas and judgments.
2. Attitudes and interests that influence a person's attention and performance in learning situations.
3. Dispositions toward learning environments that are compatible with preferred cognitive styles.
4. Inclinations toward the use of certain learning tools and avoidance of others.

Since the inventory assesses personality type rather than behavior, it can help predict relationships between specific components of instructional settings and learning outcomes. However, the MBTI does not address individual preferences for visual, auditory or kinesthetic modes of perception and communication.

Studies have shown a significant relationship between personality preferences and academic success in degree programs. Hester (1989) studied the impact of psychological type on success in a beginning computer course, reporting significant

interactions between the Sensing-Intuition and the Judging-Perceiving (J or P) dichotomies with SPs “particularly vulnerable to poor performance” (p. 47). In later work, Hester (1990) examined the relationship between psychological type and learning outcomes in an attempt to describe specific behaviors associated with the different types. When controlling for academic aptitude, the author found “moderate support for the assumption that individual differences in MBTI type influence performance on various learning tasks” (p. 24).

Thomas, Benne, Marr, Thomas & Hume (2000) stated that the interactions among E-I, S-N, and T-F dimensions significantly predicted final exam grades. The J-P dichotomy was related to withdrawal from the program. Citing Tinto's model as a theoretical framework, Schurr, Ruble, Palomba, Pickerill and Moore (1997) examined the influence of psychological type on college attrition. The authors found that type preferences affected student integration into academic and social environments, which is a contributing factor to completing a degree program. Specifically, S-N and J-P preferences were found to be significant; S types were more prevalent among those who graduated and J types demonstrated a greater work ethic toward academic tasks.

In studies of undergraduate retention and academic integration, Kalsbeek (1987) noted that there is a “clear and valuable role for MBTI in retention efforts based on Tinto's model” (p. 34). He further stated that “the inability of students to perform academically is the single most important fact contributing to attrition” (p. 49) and if students experience academic difficulties early in their college careers they

may not persist to graduation. In a longitudinal study of entering undergraduate students at a large state university, preferences for I, N and J were significantly related to first-term GPA, yet differences based on type were not found after the beginning of the junior year through graduation. Schroeder (1993), in discussing the results of Kalsbeek's work, described the following MBTI learning styles relevant to the study: concrete active (ES); concrete reflective (IS); abstract active (EN); and abstract reflective (IN). Abstract reflective (IN) students made the highest grades while concrete active (ES) received the lowest grades during their first year in college.

Anchors', Robbins' and Gershman's (1989) research in retention found that Sensing and Thinking preferences were "represented among persisters" (p. 23). The E-I and J-P dimensions were "not related to the likelihood of persisting" (p. 24) but Introversion and Judging were linked to higher GPAs. Echoing Tinto's (1987) emphasis on situational variables, the authors cautioned that studies relating psychological type to academic persistence should be analyzed within the specific context of the learning environment.

Psychological type also has been associated with various cognitive processes often identified as central to the learning endeavor. In a study of undergraduate and graduate nursing students, the S-N dimension was found to have predictive value for scores on measures of conceptual thinking, and ten percent of the variance in conceptual level was attributed to S-N, T-F and E-I (Brown & DeCoster, 1991). Haygood and Iran-Nejad (1994) found psychological type to be related to specific

cognitive strategies. Preferences for INTJ-INTP were associated with learning approaches that emphasize contextual components and self-regulation, which were significant predictors of academic success. Cahoon and Lundgren (2001) found that those who prefer Thinking (T) to Feeling (F) earned a higher score on a measure of counterfactual thinking.

Ehrman (1990) referred to psychological type as "perhaps the most versatile of the cognitive and learning styles models" (p. 12) and suggested that the MBTI research related to learning styles "has similar utility for the domain of distance education" (p.14). Based on general learning preferences associated with type, Extraverts, Intuitives, Thinkers and Judgers are thought to have a "theoretical advantage...in self-directed distance study" (p. 14), yet Stewart (2000) found no significant differences between Sensing and Intuition and GPA for online learners. Dewar and Whittington (2000) conducted a qualitative study with twenty online learners who had taken the MBTI and received training on its interpretation and use in academic settings. Acknowledging the small sample, the researchers suggested that Introverts and Extraverts "participate somewhat equally in this medium, although they do experience it quite differently" (p. 399). They recommended that further research is needed to understand how preferences interact within particular types in the context of online learning.

Psychological type is relevant to learner performance in distance education yet the issue remains largely unexplored. This study examined the impact of psychological type on achievement and persistence in the context of online education

and analyzed the data based on research that identified the central role of S-N and T-F dichotomies in retention. These preferences represent the mental functions involved in perception and judgment and relate to cognitive activities such as “attention, memory, recall, and the processes of language and thought” (Newman, 1998, p. 63). Additionally, the MBTI learning styles of concrete active (ES), concrete reflective (IS), abstract active (EN) and abstract reflective (IN) as discussed by Schroeder (1993) were used to further investigate issues of persistence and achievement.

The Interaction of Critical Thinking and Psychological Type

Beyond a single focus on critical thinking or psychological type, some research has explored the interaction of these phenomena related to academic success. Leitsch and Van Hove (1999) examined the relationship between psychological type and critical thinking in a sample of 272 students enrolled in education and allied health programs. The correlation coefficients for the EI, SN and TF scales and the composite WGCTA score were significant at the .05 level with a tendency toward Introversion and Intuition. However, they reported, “the robustness associated with that correlation is very slight” (p.57).

Using some of the same data that were examined in this study, Stewart (2000) explored the effect of critical thinking and psychological type on academic achievement. She used a 2x2 factorial ANOVA to analyze separately the effect of the Sensing and Intuitive scales and scores on the WGCTA on GPA. She found no significant interaction between S-N preferences, critical thinking and GPA, or S-N

and GPA. However, she reported significant differences between below-average and above-average critical thinkers and GPA [$t(84) = -2.51, p = .01 < .05$].

Summary

The variety of research on academic success and retention provides a useful framework for exploring these issues in online environments. The relative newness of Internet-based learning has provoked research interest yet much is still unknown about the variables that influence student success. Individual characteristics, institutional traits and environmental components combine in a complex relationship that defies simple understandings. Echoing Powell, Conway and Ross (1990), this researcher contended that the phenomenon does not demand "the concurrent investigation of all three sets of factors" (p. 4), and indeed, would benefit from a more in-depth look at predisposing characteristics that are relevant to academic performance. For this reason, cognitive traits and psychological type were examined in relationship to pertinent benchmarks in doctoral student progress.

CHAPTER 3

Research Method

Introduction

To explore the relationship between critical thinking, psychological type and success in online programs, this study used standardized measures analyzed through quantitative methods. This chapter describes the participants, measures and methods of data collection and analysis for the research.

Participants

The population for this study was derived from a convenience sample of doctoral students who enrolled in a multi-disciplinary online program in organizational leadership at a private graduate university. The university was established twenty-five years ago and currently has two campuses that serve approximately 2800 residential and online students. Educational programs are offered at the masters and doctoral level and students may choose to take individual courses or entire programs through online distance education. All online doctoral programs require some type of on-campus residency experience. Students are selected for the program through a competitive process that mirrors requirements for traditional Ph.D. programs across higher education. Prospective students must submit an application, two recommendations and a sample of scholarly writing, and provide documentation of prior academic work, achievement tests and applicable credentials. The Ph.D. program is structured so that students progress through a pre-determined sequence of coursework and educational experiences as part of a cohort.

Students are admitted during the fall term only and must complete three on-campus residencies at specific times in the program. The first residency begins the program and the two succeeding residencies are held during the second and third years of the program. The initial residency provides administrative and technology orientations, as well as academic coursework and opportunities to socialize with other cohort members. Students are required to complete two years of core and content courses with an additional year of cognate courses in business, education, government or divinity studies. At the completion of the core and content requirements, students sit for comprehensive written exams.

During the first residency, various data are collected from the students. In addition to demographic information, students complete the Watson-Glaser Critical Thinking Appraisal (WGCTA) and the Myers-Briggs Type Inventory (MBTI). The instruments are self-scoring; participants report the results to program administrators after they have scored the inventories. These data are recorded in secure databases and are kept confidential in accordance with university policies.

Data for this study were collected from students who entered the program during the years 1997 – 1999. The subjects of this study are career professionals in business, education, military, non-profit and religious organizations and range in ages from the mid-twenties to late fifties. There are one hundred thirteen subjects in this study population; thirty-seven are female and seventy-six are male. Five separate ethnicity groups are represented in this sample. Scores on WGCTA for this group ranged from eighteen to forty. The distribution of MBTI scores is displayed on Table

3.1. Table 3.2 displays the distribution of pass rates on the comprehensive exam according to psychological type.

Table 3.1 MBTI distribution in study population

N = 113

ISTJ	ISFJ	INFJ	INTJ	E	n=59	(52%)
				I	n=54	(48%)
				S	n=50	(44%)
				N	n=63	(56%)
I				T	n=81	(72%)
ISTP	ISFP	INFP	INTP	F	n=32	(28%)
				J	n=83	(73%)
				P	n=30	(27%)
ESTP	ESFP	ENFP	ENTP			
ESTJ	ESFJ	ENFJ	ENTJ	IJ	n=41	(36%)
				IP	n=13	(12%)
				EP	n=17	(15%)
				EJ	n=42	(37%)
				ST	n=34	(30%)
				SF	n=16	(14%)
				NF	n=17	(15%)
				NT	n=46	(41%)
				SJ	n=43	(38%)
				SP	n=7	(7%)
				NP	n=23	(20%)
				NJ	n=40	(35%)
				TJ	n=62	(55%)
				TP	n=18	(16%)
				FP	n=12	(11%)
				FJ	n=21	(18%)
				IN	n=30	(27%)
				EN	n=33	(29%)
				IS	n=24	(21%)
				ES	n=26	(23%)

Table 3.2 Pass rate on comprehensive exams & psychological type

N=113

Pass=58

No Pass=55

ISTJ n=16 pass: 7 no pass: 9	ISFJ n=5 pass: 4 no pass: 1	INFJ n=3 pass: 2 no pass: 1	INTJ n=17 pass: 9 no pass: 8
ISTP n=2 pass: 1 no pass: 1	ISFP n=1 pass: 1 no pass: 0	INFP n=3 pass: 2 no pass: 1	INTP n=7 pass: 5 no pass: 2
ESTP n=2 pass: 1 no pass: 1	ESFP n=2 pass: 2 pass: 0	ENFP n=6 pass: 3 no pass: 3	ENTP n=7 pass: 5 no pass: 2
ESTJ n=14 pass: 6 no pass: 8	ESFJ n=8 pass: 3 no pass: 5	ENFJ n=5 pass: 0 no pass: 5	ENTJ n=15 pass: 7 no pass: 8

The Watson-Glaser Critical Thinking Appraisal

The Watson-Glaser Critical Thinking Appraisal (WGCTA) is designed to measure specific aspects of critical thinking based on theoretical concepts as well as practical applications (Watson & Glaser, 1994). Goodwin Watson and Edward Glaser did pioneering work on this instrument in the 1940s and 1950s. Their original test was expanded in 1964 to include forms YM and ZM and given its present name (Woehlke, 1985). In the 1980s, Forms A and B superceded earlier forms and were composed of eighty items presented in five different subtests. Critical thinking, as assessed by the WGCTA, is conceptualized as attitudes, knowledge and skills comprised of inference, recognition of assumptions, deduction, interpretation and evaluation of arguments. Form S, which is a shortened version of Forms A and B, offers forty items and may be completed in thirty minutes. This shortened version is more quickly administered yet does not change the essential components of what is being measured. Raw scores are the total number of correct responses; the maximum score is forty. Raw scores can be rank ordered for a specific population but are not meaningful apart from a comparison to defined normative groups (Watson & Glaser). No normative data are provided on graduate students but Table 3.2 provides several categories that are pertinent to this research sample.

Table 3.3 Normative data from WGCTA representative samples

Occupation	85 th to 90 th percentile & above	60 th percentile and above	35 th percentile and above
Upper-level management applicants	Scores 36 – 40	Scores 33 – 35	Scores 30 – 32
Mid-level management applicants	Scores 37 – 40	Scores 35 & 36	Scores 32 – 34
Ministry candidates	Scores 37 – 40	Scores 35 & 36	Scores 30 – 32
Clergy	Scores 37 – 40	Score of 36	Scores 33 – 35

Note: Adapted from the Watson-Glaser Critical Thinking Appraisal Manual, Form S (1994)

The WGCTA has been used to predict performance in a variety of educational settings and is appropriate for individuals who possess the equivalent of a ninth-grade education or above. WGCTA scores from college freshman, nursing students, pre-service educators and doctoral students correlate with measures of achievement, such as course grades, GPA and licensing exams (Watson & Glaser, 1994). Steward and Al-Abdulla (1989) and Gadzella, Ginther, Bryant and Caldwell (1996) found similar results in their studies of college students in academic settings.

Watson and Glaser (1994) provided reliability data on the WGCTA Form S through estimates of internal consistency and stability of test scores. Split-half reliability coefficients were calculated for a development sample of 1,608 subjects, which produced a coefficient of .81. Additionally, coefficients were calculated for separate groups that included subjects who were not a part of the development sample. These statistics ranged from .66 to .87. The authors also reported the results of a test-retest study with a small sample ($n = 42$) of employees from a publishing company. The mean score from the first test was 30.5 ($SD = 5.6$). Two weeks later the test was administered again, yielding a mean score of 31.4 ($SD = 5.9$) and a test-retest correlation of .81 ($p < .001$).

Modjeski and Michael (1983) reported on an evaluation of the WGCTA and the Cornell Critical Thinking Test conducted by a panel of psychologists. The WGCTA was rated highly based on the sample and standards used in conducting validity studies. It was judged more favorably than the Cornell test based on the description of procedures and sampling used to determine reliability coefficients and

the method by which the test creators report reliability data. Woehlke (1985) wrote that the evidence for construct validity was not supported in all aspects but found that the WGCTA was an "admirable attempt to assess a very complex attribute" (p. 685). Other researchers echoed these critiques, noting that face validity and adequate reliability measures make the WGCTA a useful test for the construct it purports to measure (Berger, 1985; Helmstadter, 1985).

The Myers-Briggs Type Indicator

The Myers-Briggs Type Indicator (MBTI) is based on the construct of personality type advanced by Carl Jung. Four dichotomous relationships define type and MBTI results are reported as a four-letter type. Forced-choice and phrase questions are used to determine basic preferences on each of the four dichotomies specified or implicit in Jung's theory (Myers, McCaulley, Quenk, & Hammer, 1998).

Isabel Myers and Katherine Briggs created the MBTI in the early 1940s. The purpose of the instrument is to sort people into groups "according to which, in theory, they already belong" (Myers, McCaulley, Quenk, & Hammer, 1998, p. 127). Development of the MBTI has continued since its inception; major revisions to the instrument were made in the 1950s, 1970s and 1990s. Form M emerged in 1998 and was constructed using item response theory (IRT) as a development tool.

Internal consistency was determined using a logical split-half procedure. All available statistics were employed to match items that were most alike. Additionally, a consecutive item procedure split the test items for comparison purposes. Reliability coefficients ranged from .48 to .91 at the .05 level (Leitsch & Van Hove, 1999) and

"regardless of the method, the Form M reliabilities in the national sample [were] quite high" (Myers, McCaulley, Quenk, & Hammer, 1998, p.160).

Thompson and Borrello (1986) noted that "a number of reliability and validity studies" (p.746) exist for MBTI. Their study of 359 university students used factor analysis to confirm construct validity, yielding correlations of greater than .30 in absolute value for items pertaining to each of the four dichotomous scales. Wiggins (1989) observed that there is a "considerable body of evidence regarding the validity of the MBTI that now exists" (p. 538) yet these results tend to be ignored by those who do not accept the tenets of the theory.

Psychological type theory presumes that basic preferences for Sensing or Intuition lead to different interests and that preferences for Thinking or Feeling influence the way individuals choose to act on those interests. If these preferences do exist and can be measured by the MBTI, they should be demonstrated in directions predicted by type theory. Confirmatory factor analyses provided evidence for the structure of the instrument, yet Wiggins (1989) acknowledged that the structural model of bimodal discontinuous types prevents greater acceptance by researchers. Bess and Harvey (2002) also questioned the empirical support for bimodal scores. They analyzed a large sample (n~12,000) using the BILOG IRT program and found that the scores for each dichotomous dimension were center-weighted with nonbimodal distributions when scores are computed using a large number of quadrature points (e.g., 50). However, the authors noted that using a smaller number of quadrature points indicated bimodality. They concluded that, "as a practical

matter, we are at a loss to envision a situation in which it would make much of a practical difference which method were (sic) used" (p. 186).

Data Analysis Method

This study explored the relationship of critical thinking skills, personality type and success in online educational programs. Due to the exploratory nature of the research, correlation and regression tests were used to analyze the data because the tests enable researchers to determine statistical relationships between variables and predict group membership from a set of independent variables. After determining that population cell sizes were adequate for the correlation or regression test, analysis proceeded.

Research data were stored as dichotomous variables or interval scores. This required parametric and nonparametric procedures, depending on the type of analysis being conducted. The dependent variable of success was represented as a dichotomy; subjects were categorized by whether or not they persisted to the point of passing the comprehensive exam at the appointed time in the program. Subjects who enrolled in courses but dropped out or stopped out of the program prior to sitting for their exams were included in the "no pass" category. Data for this variable were dummy-coded for the purposes of the statistical analysis. Individuals who passed the comprehensive exams were assigned a positive value; all other subjects were assigned the zero value code.

Independent variables were scores from the Watson-Glaser Critical Thinking Appraisal (WGCTA) and the Myers-Briggs Type Indicator (MBTI). Additionally,

GPA (measured at the end of the first and second years of the program) was entered in the correlation and regression equations.

Individual results on the WGCTA Form S are reported as a raw score of all correct responses out of a maximum total of forty. Although Watson and Glaser (1994) indicated that raw scores should be linked to some normative group for meaningful interpretation, this study was not concerned with establishing norms for the subject population. Consequently, WGCTA raw scores were used as variables in this analysis.

MBTI assesses the psychological dimension of personality along four dimensions, yielding a single four-letter descriptor from sixteen possible type categories. Using the complete MBTI profile to explore this study's questions was not feasible, due to the small sample available. However, based on the research presented in chapter two, this study employed two different approaches to examining the influence of psychological type on retention. S-N and T-F mental functions have been linked to academic success and persistence in undergraduate programs. This study analyzed the relationship between these preferences and measures of persistence in an attempt to gain greater understanding of these issues (Ehrman, 1990). Additionally, personality type and learner success are related to the concept of the MBTI as a measure of learning style. These preferences are seen as attitudes and interests that influence what is attended to in a learning situation (Cooper & Miller, 1991). To that end, the combination of the E-I and S-N dichotomies are described as abstract-reflective (IN), abstract-active (EN), concrete-reflective (IS), and concrete-

active (ES) learning styles. These MBTI learning style indicators were also analyzed in reference to the study questions.

For the purposes of this study, MBTI data were dummy-coded in accordance with theoretical concepts discussed in the literature review and the research questions. Individuals who indicated a preference for Introverted Intuitive (IN) [N=20, 27 percent of sample] and Intuitive Thinker (NT) [N=46, 41 percent of sample] were positively coded. All other scores were coded as zeroes.

Summary

This study sought to identify variables that influence student retention and success in online programs. Data collected from students in an online doctoral program were analyzed using correlation and regression procedures. Independent variables included scores on the Watson-Glaser Critical Thinking Appraisal and the Myers-Briggs Type Indicator. The dependent variable of success was identified as a 'pass' or 'no pass' designation relative to the comprehensive exam. Both WGCTA and MBTI have adequate validity and reliability to complete this analysis and the significance of the research questions is supported by the literature on retention and persistence in higher education.

CHAPTER 4

Results

Introduction

This study examined the influence of learner characteristics and personality preferences on success in an online doctoral program. Scores from the Watson-Glaser Critical Thinking Appraisal (WGCTA) and preference scores from the Myers-Briggs Type Indicator (MBTI) were analyzed in relation to a program-specific measure of student success. Grade point average (GPA), an accepted standard of academic achievement, was also used as a dependent variable in exploring the study questions. This chapter presents the results of the data analysis.

Study sample

Data for this study were collected from students who enrolled in an online doctoral program in organizational leadership from 1997 – 1999. There were one hundred thirteen subjects in the study population, thirty-seven females (33 percent) and seventy-six males (67 percent). Five ethnic groups were represented in the sample; eighty Whites (seventy-one percent); twenty-one Blacks (nineteen percent); seven Hispanics (six percent); three Asians (three percent) and two Native Americans (one percent).

The sample population was reduced during data analysis due to incomplete data sets. MBTI profiles were available for all subjects; however, WGCTA scores were available for one hundred ten students and the “pass/no pass” designation for comprehensive exams was available for one hundred six individuals. Fifty-eight

(fifty-five percent) students passed the comprehensive exams and forty-eight students (forty-five percent) did not pass the exams at the specified point in the doctoral program. GPAs at the end first and second years of the program (just prior to administration of comprehensive exams) were available for ninety subjects (eighty percent of total sample).

Data Analysis

Quantitative analyses for this study were conducted using SPSS 11.0. The following research questions were addressed:

1. Do critical thinking skills, as measured by WGCTA, influence student achievement as measured by successfully passing the comprehensive exams?
2. Do psychological type indicators, measured by a combination of the E-I and S-N components of MBTI, influence student achievement as measured by successfully passing the comprehensive exams?
3. Do psychological type indicators, as measured by a combination of the S-N and T-F components of MBTI, influence student achievement as measured by successfully passing the comprehensive exams?

Additional research issues were examined after the initial data analysis in an attempt to gain additional understanding about student characteristics and success. These included: (1) the relationship between GPA and pass rate; (2) the relationship between GPA and critical thinking; (3) the relationship between GPA and psychological type; and (4) the interaction between critical thinking and psychological type.

Scores for MBTI and pass/no pass designations are dichotomous variables. For this analysis, IN and NT scores were positively coded and all other variables (EN, ES, IS, ST, SF, IF) were assigned a zero value.

WGCTA and GPA data are continuous; therefore, mean, minimum and maximum values, and the standard deviation for WGCTA and GPA were calculated. These statistics are presented in Table 4.1.

Table 4.1 Mean, Minimum, Maximum and Standard Deviation of Sample

Variables

	N	Minimum	Maximum	Mean	Standard Deviation
WGCTA	110	18.0	40.0	31.6	5.5276
GPA	90	1.89	4.0	3.6332	.28760

To address each question, the data were analyzed using correlation tests and regressions. Nonparametric correlations were used to analyze dichotomous data and logistic regression was used in cases where the dependent variable was dichotomous.

Critical thinking, psychological type and pass rate

Correlation coefficients were computed between WGCTA scores and the pass/no pass variable using Spearman's rho. A p-value of less than .05 was required for significance. The correlation was not significant. In response to research question one, no statistically significant relationship was found between critical thinking and an individual's pass/no pass status. Table 4.2 displays the results of the analysis.

Table 4.2 WGCTA and pass/no pass

N=103	WGCTA
Pass Coefficient (Spearman's rho)	-.060
Sig.	.550
Pass=57	
No Pass=46	

Correlation coefficients were computed between the IN psychological type dimension and the pass/no pass variables using Spearman's rho. A p-value of less than .05 was required for significance. The correlation was not significant. In response to research question two, no statistically significant relationship was found between the IN dimension and an individual's pass/no pass status. Table 4.3 displays the results of the analysis.

Table 4.3 IN and pass/no pass

N=106	IN
Pass Coefficient (Spearman's rho)	-.115
Sig.	.240
Pass=58	
No Pass=48	

Correlation coefficients were computed between the NT psychological type dimension and the pass/no pass variables using Spearman's rho. A p-value of less than .05 was required for significance. The correlation was not significant. In response to research question three, no statistically significant relationship was found

between the IN dimension and an individual's pass/no pass status. Table 4.4 displays the results of the analysis.

Table 4.4 NT and pass/no pass

N=106	NT
Pass Coefficient (Spearman's rho)	-.112
Sig.	.251
Pass=58	
No Pass=48	

In summary, the research analyses show no predictive value of critical thinking or psychological type for student success as measured by the pass rate on comprehensive exams.

Additional research issues

GPA and pass rate

Although GPA was not used as the independent measure of success for this study, research has indicated that academic achievement does influence persistence at the undergraduate level (House, 2001; Nauta & Kahn, 2000). GPAs were available at the end of the first and second years in the program; these statistics were correlated with the pass rate on the comprehensive exams. No statistically significant relationship was found between GPA, at the first or second year in the program, and the pass rate. Tables 4.5 and 4.6 display the result of the data analysis.

Table 4.5 GPA (1st) and pass/no pass

N=101	GPA1
Pass Coefficient (Spearman's rho)	.116
Sig.	.249
Pass=56	
No Pass=45	

Table 4.6 GPA (2nd) and pass/no pass

N=84	GPA2
Pass Coefficient (Spearman's rho)	.194
Sig.	.077
Pass=44	
No Pass=40	

Critical thinking, psychological type and GPA

In an attempt to explore further the relationship between predisposing characteristics and learner success, additional statistical tests were performed on the data. GPA is a traditional measure of success in academic programs and may be influenced by critical thinking and psychological type. Using the available GPAs as the dependent variable, correlation and regression tests were used to examine these issues.

Correlation coefficients were computed between WGCTA scores and GPA first year data. A p-value of less than .05 was required for significance. Table 4.5 shows that a moderate but significant correlation exists between critical thinking and first year GPAs [$r(104) = .304, p < .01$]. Table 4.6 shows the results of a linear regression analysis confirming a coefficient of .304, $t(104) = 3.25, p < .01$. WGCTA

scores predict first year GPAs, with critical thinking accounting for approximately nine percent of the variance.

Table 4.7 WGCTA and GPA 1st year

N=106	WGCTA
GPA (1 st) Coefficient (Pearson)	.304**
Sig.	.002
*Correlation is significant at the 0.01 level	

Table 4.8 WGCTA and GPA 1st year (regression)

N=106	B (S.E)	Beta	t	Sig.
Independent variable WGCTA	1.509 (.005)	.304	3.250	.002
Dependent variable GPA (1 st)				
R square = .092				

Additionally, correlation coefficients were computed between WGCTA scores and second year GPAs. A p-value of less than .05 was required for significance. Table 4.7 shows that a significant slight to moderate correlation exists between critical thinking and second year GPAs [$r(85) = .249, p < .05$]. Table 4.8 shows the results of a linear regression analysis confirming a coefficient of .249, $t(85) = 2.371, p < .05$. WGCTA scores predict second year GPAs to a lesser degree than first year GPAs, with critical thinking accounting for approximately six percent of the variance.

Table 4.9 WGCTA and GPA 2nd year

N=87	WGCTA
GPA (2 nd) Coefficient (Pearson)	.249*
Sig.	.020
*Correlation is significant at the 0.05 level	

Table 4.10 WGCTA and GPA 2nd year (regression)

N=87	B (S.E.)	Beta	t	Sig.
Independent variable: WGCTA	1.305 (.006)	.249	2.371	.020
Dependent variable GPA (2 nd)				
R square = .062				

To examine the relationship between psychological type and GPA, separate correlation coefficients were computed between the IN psychological type dimension and first and second year GPAs using Spearman's rho. A p-value of less than .05 was required for significance. The correlation between IN and first year GPA was not significant. No correlation was found between IN and second year GPA. Tables 4.9 and 4.10 display the results of the analysis.

Table 4.11 IN and GPA 1st year

N=109	IN
GPA (1 st) Coefficient (Spearman's rho)	.152
Sig.	.114

Table 4.12 IN and GPA 2nd year

N=90	IN
GPA (2 nd) Coefficient (Spearman's rho)	.000
Sig.	.996

Correlation coefficients were computed between the NT psychological type dimension and first and second year GPAs using Spearman's rho. A p-value of less than .05 was required for significance. The correlations were not significant. Tables 4.11 and 4.12 display the results of the analysis.

Table 4.13 NT and GPA 1st year

N=109	NT
GPA (1 st) Coefficient (Spearman's rho)	.063
Sig.	.514

Table 4.14 NT and GPA 2nd year

N=90	NT
GPA (2 nd) Coefficient (Spearman's rho)	-.085
Sig.	.424

The results of these tests revealed a significant effect of critical thinking on GPAs, with a stronger correlation occurring between WGCTA scores and first year GPAs. No statistically significant relationships were found between psychological type dimensions of IN or NT and GPA at the end of the first or second year in the program.

Interaction of critical thinking and psychological type

Based on precedents in the literature investigating the interaction of critical thinking and type (Leitsch & Van Hove, 1999), correlation and regressions tests were run on WGCTA scores and psychological type variables. First, correlation coefficients were computed between WGCTA scores and the IN dimension of psychological type. A p-value of less than .05 was required for significance. Table 4.13 shows that a significant slight to moderate correlation exists between WGCTA and IN [$r(108) = .250, p < .01$]. Table 4.14 shows the results of a linear regression analysis of the same data with a coefficient of .267, $t(108) = 2.88, p < .01$. The IN dimension of psychological type accounts for approximately seven percent of the variance in critical thinking.

Table 4.15 WGCTA and IN

N=110	IN
WGCTA Coefficient (Spearman's rho)	.250**
Sig.	.008

**Correlation is significant at the .01 level

Table 4.16 WGCTA and IN (regression)

N=110	B (S.E.)	Beta	t	Sig.
Independent variables; IN	3.3 (1.146)	.267	2.88	.005
Dependent variable: WGCTA				
R square = .071				

Correlation coefficients also were computed between WGCTA scores and the NT dimension. A p-value of less than .05 was required for significance. Table 4.15

shows that a significant slight to moderate correlation exists between WGCTA and NT [$r(108) = .244, p < .05$]. Table 4.16 shows the results of a linear regression analysis of the same data with a coefficient of .262, $t(108) = 2.823, p < .05$. The NT dimension of psychological type accounts for approximately seven percent of the variance in critical thinking.

Table 4.17 WGCTA and NT

N=110	NT
WGCTA Coefficient (Spearman's rho)	.244*
Sig.	.010

*Correlation is significant at the .05 level

Table 4.18 WGCTA and NT (regression)

N=110	B (S.E.)	Beta	t	Sig.
Independent variables: NT	2.9 (1.039)	.262	2.823	.006
Dependent variable WGCTA				

R square = .069

These findings indicate that there is a statistically significant relationship between critical thinking and the IN component of the MBTI at the .01 level, with the combination of Introversion and Intuition accounting for approximately seven percent of the variance in critical thinking. Likewise, there is a significant relationship between critical thinking and NT at the .05 level, with the combination of Intuition and Thinking also accounting for approximately seven percent of the variance.

Summary of findings

The following statements summarize the findings of the data analyses.

1. **There is no statistically significant relationship between critical thinking and the pass rate on the comprehensive exams; neither is there a relationship between psychological type and the pass rate. Consequently, critical thinking and psychological type were not found to influence this measure of success in doctoral programs.**
2. **A statistically significant relationship was found between critical thinking and GPAs at the end of the first and second years in the program at the .01 and .05 levels respectively.**
3. **Psychological type did not influence GPAs from the first or second years in the program.**
4. **The psychological type combination of Introversion and Intuition is significantly related to critical thinking at the .01 level. The psychological type combination of Intuition and Thinking is significantly related to critical thinking at the .05 level.**

CHAPTER 5

Discussion and Recommendations

Introduction

Understanding factors that contribute to success and persistence in online programs can provide important information for administrators, program directors and faculty in higher education. This study sought to add to the research in this field by examining the influence of predisposing characteristics on success in an online doctoral program. Standardized measures of critical thinking and psychological type were independent variables, and the dependent measure of success used for data analysis was the pass rate for comprehensive exams. The following sections discuss the results of the data analysis and offer recommendations for future research.

Discussion of Results

The research questions addressed the impact of critical thinking and psychological type on success in an online doctoral program. Success is most notably marked by persistence until satisfactory completion of program requirements. Benchmark evaluations provide information relative to one's success, such as grade point average (GPA), comprehensive exams and dissertations. Comprehensive exams were chosen as the dependent measure of success in this study for several reasons: (1) this program is structured so that students progress as a cohort through predetermined course sequences; (2) students who are successful should complete the comprehensive exams at the end of their second year in the program; (3) the program has not existed long enough to collect sufficient data on completion rates; and (4)

doctoral-level GPAs rarely show enough variance to be used as definitive variables of success.

Despite the fact that comprehensive exams are viewed as a meaningful benchmark in doctoral programs, the statistical analyses conducted for this study showed no significant relationship between critical thinking, as measured by the Watson-Glaser Critical Thinking Appraisal (WGCTA), and the pass rate on comprehensive exams. Likewise, there was no significant relationship found between psychological type, as measured by the Myers-Briggs Type Indicator (MBTI), and passing comprehensive exams. As a result, this researcher concluded that the characteristics of critical thinking and psychological type do not significantly influence success in a graduate program, when success is defined as passing the comprehensive exams.

Research at the undergraduate level has shown a relationship between GPA and persistence. In light of this, additional data analyses were completed after the initial research questions were answered. Correlations computed between GPA and the pass rate on comprehensive exams found no statistically significant relationship.

Critical thinking, psychological type and GPA

Although critical thinking and psychological type did not influence the pass rate on comprehensive exams in the study population, these predisposing characteristics have been found to affect other measures of academic success. For this reason, statistical tests were conducted to determine the impact of critical thinking and psychological type on GPA.

The analysis indicated a statistically significant correlation between critical thinking and GPA measured at the end of the first and second years in the program. These results support Stewart's (2000) analysis of some of the same data used for this research. She conducted a 2 x 2 factorial ANOVA between critical thinking and GPA and found that the main effect of critical thinking on GPA was statistically significant at the .05 level [$F(1, 82) = 6.75, p = .01$]. The findings also agree with other research that showed a relationship between critical thinking and academic achievement at the undergraduate level (Behrens, 1996; Gadzella, Ginther, Bryant & Caldwell, 1996; Steward & Al-Abdulla, 1989; Wilson & Wagner, 1981). Additionally, the nonsignificant relationship between critical thinking and pass rate on the comprehensive exam reflects Behren's findings. In spite of the influence of critical thinking on GPA in his study population, WGCTA scores did not differ significantly between attrited and graduated students.

The relationship between critical thinking and GPA was found to be stronger on first year GPA (approximately nine percent variance) compared to second year GPA (approximately six percent variance). There may be several reasons for this difference. Critical thinking is related to measures of academic aptitude (Jenkins, 1998), which may have accounted, in part, for success in the initial stages of the program. Typically, individuals who are accepted into a doctoral program possess a higher level of academic ability than found in the general population. The variance in critical thinking skills may affect performance in first year courses and contribute to decisions related to continuing or dropping out of the program. If this is the case,

students who remain in the program after the first year would demonstrate more homogeneity in thinking skills; therefore, other variables would exert greater influence on academic achievement. At this writing, similar findings at the doctoral level have not been identified in the literature.

An analysis of psychological type related to first and second year GPAs yielded no significant results. Stewart (2000) examined a similar question, although she focused solely on the relationship between the S-N dimension of type and GPA. She found no effect for psychological type on GPA. These findings directly contrast with studies that demonstrate a significant relationship between type and exam grades (Thomas, Benne, Marr, Thomas & Hume, 2000) and GPA (Anchors, Robbins & Gershman, 1989; Hester, 1989; Kalsbeek, 1987); however, the studies examined traditional undergraduate populations. This research study may demonstrate that psychological type does not directly affect overall academic achievement at the graduate level. As individuals progress through educational programs, other variables may exert greater influence on success and persistence, such as life situations, past academic achievement and economic factors. It is also possible that successful students gain cognitive skills and coping strategies that help them succeed in spite of personal preferences. Kalsbeek's work seemed to support this assumption; he stated that the impact of psychological type in his study population was not significant after the beginning of the junior year.

Interaction of critical thinking and psychological type

The interaction of critical thinking and psychological type was a statistically significant finding of this research. Analysis of the sample data yielded a small, yet significant relationship between critical thinking and the E-I, S-N and T-F dimensions of the MBTI. Specifically, this analysis supported the concept that the abstract reflective (Introverted Intuitive) learning style and the mental functions of Intuition and Thinking influence cognitive processes (Myers, McCaulley, Quenk & Hammer, 1998; Newman, 1998; Schroeder, 1993). Descriptions of critical thinking that emphasize logical analysis (Garrison, 1992; Brookfield, 1988), cognitive learning strategies (Olgren, 1998; Sternberg, 1986) and the ability to apply knowledge about inferences, abstractions and generalizations (Loo & Thorpe, 1999) are reflected in psychological type theory. Individuals who prefer an Introverted Intuitive (IN) learning style demonstrate sequential thinking habits and possess greater tolerance for abstract concepts. Those who prefer Intuition and Thinking (NT) tend to focus on concepts, theories and patterns in learning situations. IN and NT types have been found to be among the highest achievers in studies relating to academic success (Myers, et.al.).

The significant relationship between critical thinking and psychological type in this study aligns with similar findings reported by Leitsch and Van Hove (1999). They identified a weak but significant correlation between critical thinking and preferences for Introversion, Intuition and Thinking. In another study, S-N was found to be the best predictor of conceptual levels in undergraduate and graduate

populations, and the combination of E-I, S-N and T-F explained ten percent of the variance (Brown and DeCoster, 1991). This result adds to the literature on critical thinking at the doctoral level since the relationship was not analyzed in Stewart's (2000) research.

Summary and Recommendations

This study examined predisposing characteristics of students that may influence success in online programs. The research partially supports work that has been done in predominantly undergraduate settings. Almost no research exists in the area of doctoral programs, and for this reason, the study has merit.

In some respects the data from this sample could prove useful in future studies. No substantive research that addresses success in online programs currently exists in the literature. Many studies have reviewed single courses or done course-by-course comparisons, yet almost nothing has been conducted at the programmatic level. Longitudinal studies on this population could provide greater insight into student behaviors at the doctoral level and within an online program. Following models of retention presented in the literature (Braxton, Milem & Sullivan, 2000; House, 1999; Tinto, 1975), program administrators could implement research procedures that would help advance knowledge in an area that is largely unexplored (Brace-Govan & Clulow, 2000; Porrás-Hernández, 2000; Hara & Kling, 1999; Martínez, Bunderson, Nelson and Ruttan, 1999; Merisotis. & Phipps, 1999).

Additionally, the results have emphasized the relationship between critical thinking and GPA. Since GPA is widely used and understood as a measure of

academic success, administrators and faculty in higher education should consider ways in which critical thinking skills can be strengthened in program curricula. The influence of psychological type on critical thinking is another area that bears further inquiry. Although psychological type did not directly impact GPA in the study population, Introversion, Intuition and Thinking do seem to be expressed partly through the demonstration of critical thinking. Future research should investigate these relationships for the purpose of devising strategies to support students who do not possess adequate critical thinking skills. Understanding psychological type and developing one's non-preferred dimensions may help promote an increased ability to think critically, which contributes to academic success.

The value of the findings in promoting a deep understanding of doctoral student persistence must be questioned, however. Students in Ph.D. programs exhibit characteristics that may not be found in undergraduate and masters populations. These include personal habits and intentions that have contributed to success in academic endeavors and enabled them to pursue advanced study. Since this was an ex post facto study, these factors were not examined nor were data available relative to this type of inquiry. Those characteristics, as identified by the success and retention literature (House, 2001; Braxton, Milem & Sullivan, 2000; Nauta & Kahn, 2000; Tinto, 1987) influence educational experiences and decisions related to persistence.

Additionally, the online environment provided the context for the study, but it was not researched as a variable. Although the study results partially reinforced what

is known about students in higher education, no aspects unique to online learning were incorporated into the analysis. Consequently, an analysis of student responses mitigated by the characteristics of online programs cannot be described in this research.

Characteristics of the study sample also restrict the general usefulness of the study. As mentioned previously, doctoral students comprise a relatively small percentage of individuals in higher education. Students in the study population are a small subset of all doctoral students, in that they were enrolled in a multi-disciplinary leadership program conducted at a private religious university. Even though religious affiliation is not a prerequisite for enrollment, students self-select on the basis of program characteristics. It is assumed that individuals in the sample may differ considerably from their counterparts in other programs.

For most situations, this study failed to target the variables that influence academic success in a meaningful way. The information gained from this research seemed to indicate that persistence and success are multifaceted and complex. Factors that affect goal achievement at graduate levels may have less to do with cognitive abilities and personality tendencies than with life circumstances, professional roles and personal commitments. While collecting data on critical thinking and psychological type may be useful in identifying learning preferences, the effort does not shed much light on the issue of persistence.

In conclusion, studying success and persistence in non-traditional programs remains a compelling need. Rovai (2002) called for a greater understanding of this

issue due to an increasing number of non-traditional students seeking higher education; a proliferation of distance and online programs created to serve these individuals; and a greater emphasis by the U.S. government on student retention. He suggested that success and persistence in online programs are influenced by cognitive and affective variables identified by Tinto (1975) and other researchers (Braxton, Milem & Sullivan, 2000; House, 1999), as well as skills in such areas as computer literacy, information literacy, time management and computer-based interaction. Additionally, instructional design and teaching strategies affect student perceptions in ways that may be overlooked in face-to-face settings. These considerations extend previous models of retention that examine the simultaneous interaction of variables.

Research can help to clarify success and persistence in online programs by assessing student skills upon enrollment; defining the characteristics of the instructional medium and designing learning activities appropriate for the medium. However, graduate students may be able to overcome programmatic deficiencies in these areas if other facets of the educational experience accommodate their individual circumstances. Future studies should explore the patterns of roles and responsibilities in students' lives that motivate or impede successful participation in graduate education. While this is an inherently complex endeavor, information gleaned through that inquiry promises a more direct path to describing the behaviors of persistence and success.

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