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Using Academic and Demographic Variables to Predict Success in the General Education Curriculum.

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Louisiana State University and Agricultural & Mechanical College

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USING ACADEMIC AND DEMOGRAPHIC VARIABLES TO PREDICT SUCCESS IN THE GENERAL EDUCATION CURRICULUM

A Dissertation
Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy in
The School of Vocational Education

by
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May 1998
DEDICATION

This dissertation is dedicated to my wife, Emilyn, who stood by me through all of my academic endeavors knowing that the light would eventually be at the end of the tunnel; my children, Madeline Elizabeth and Mary Katherine, who lost so many hours with their father; my father, Allen, whose own academic accomplishments gave me the inspiration to see mine through; and my mother- and father-in-law, Madeline and Harold Matthews, for their endless encouragement and hours of babysitting my wife and my children.

This manuscript is also dedicated to the memory of my mother, Betty Millsapugh Horton, a 30-year educator whose inner strength gave me the determination to complete this era of my education.
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ABSTRACT

Student success and attrition in all levels of education is becoming a more important issue in an age where education dollars are diminishing while various schools of higher learning are increasing. As a result, schools are reevaluating their current programs of study in an attempt to determine if both students and universities are fulfilling their respective goals. This process of reevaluation has several fundamental considerations, one of these which is addressed in this study--the effectiveness of prerequisite requirements and other demographic variables on predicting the success of students in courses in the general education curriculum.

The purpose of this study, therefore, was to determine if a specific set of factors can be used to predict whether a student will successfully complete various courses in the general education curriculum. Four first-year courses in a small rural university were studied: College Algebra, Basic Composition and Rhetoric, Basic Physical Science and Basic Biological Science. Variables studied included prerequisite requirements for the courses, student age and enrollment status at the time the courses were taken, ACT subscores and composite scores, type of high school diploma, type of high school attended and gender. Approximately 1,737 students were analyzed as part of the study.

Discriminant analysis found that the model significantly identified the variables gender, type of high
school attended, ACT subscores, ACT composite scores and specific prerequisites as predictors of success/failure.
Ideas and suggestions were given for more research directions and for evaluators of general education programs.
CHAPTER I
INTRODUCTION

Rationale of the Study

No more important issue faces advocates of the general education curriculum than that of defining the concept of general education. According to Arnold & Civian (1997), general education is a perennial topic, which has spurred countless debates inside and outside the academy (p. 19), mainly because of the lack of an overall purpose for general education. Why does it exist? Within what parameters was it originally developed? How do those parameters affect today’s needs? Do those courses meet the current goals of universities? Why are so many students not successful in them? Could success in these courses affect retention rates at colleges and universities unnecessarily?

General education reformation is becoming more and more common across the country, and in light of the recent mandates for assessment of institutional effectiveness from a number of accrediting organizations, there is a growing concern to explore whether or not their programs are still effective in their purposes. As part of this investigation, universities are taking the following three issues and others into account as part of their goal to determine if their general education curriculums are currently in line with their mission.

Student demographics/needs are changing. As a faculty member and student advisor at Northwestern State University,
the researcher has noticed a drastic change in the characteristics of the student population, such as age, socioeconomic status, standardized test scores, and overall grade point average. These changes presented a challenge to most general education teachers who were accustomed to having only 18- or 19-year-old-students in their classes. In some instances, if the classroom demographics were different, such as the classes having older, more experienced students, teachers were able to cover much more than the syllabus required; however, some were not. In the researcher's situation, the difference in what was accomplished came from the fact that the class was more experienced in life's experiences. However, because of the rigid requirements in the general education program that required teachers to cover only a certain amount of material and to use departmentalized tests, those students desiring more were not challenged. Even though their grades were good, they felt they did not get a valuable experience. Is that fair to the students? Is the curriculum currently in place meeting the needs of this changing population? Will students leave because of these requirements, ultimately affecting retention at the university?

University goals and objectives are changing. Most universities consider their general education curricula "programs of general studies" (Sudermann, 1992; Wee, 1981), adding that such programs should be congruent with the goals and objectives of the particular institution. This
individualized approach has caused a resurgence of debate concerning the validity of the concept covering a unified curriculum. Since many universities have seen vast changes in their particular goals and objectives over the last decade, many are making sometimes sudden changes to existing programs to meet these needs (Rudolph, 1977). Thus universities are losing the "snug fit" that their goals and objectives once had within a standardized "program of general study." Many goals and objectives are changing mainly because of the recent assessment mandates imposed by accrediting councils such as SACS and journalism/mass communication, across the country (Southern Association of Colleges and Schools, 1995).

A major change in the university setting is the formal definition of its population. The term "adult learner" is a new buzz word in higher education, mainly because the population of higher education is being affected by adult learners (Green, 1987). Since the adult learner is difficult to categorize, the word is used interchangeably as "learner" or "non-traditional student." Thus, in the field of higher education, all learners should be considered and treated as adult learners, but sometimes they are not. According to Peter Ewell, senior consultant for the National Center for Higher Education Management Systems, the true definition of an adult learner is constantly changing and is applied differently in various settings (personal communication, April 6, 1997). For example, the U. S. Department of
Education considers a “non-traditional” student one who is 25 years of age or older and is entering college for the first time (Dr. Dan Carr, personal communication, Sept. 23, 1997). According to Yvonne Alost, coordinator of credit programs for Northwestern State University’s Department of Continuing Education, Northwestern identifies its “non-traditional” student by the same guidelines, adding that Northwestern’s non-traditional student population is at a record 30% (personal communication, Sept. 23, 1997). Instead of trying to operationalize the term, Cranton (1988), believed that it is easier to describe what differentiates adult learners from what is considered the traditional student. Just knowing that information makes it easier to provide for instruction in a manner that will meet their needs and goals.

Since the non-traditional learner population is increasing annually, institutions are, therefore, considering reevaluating curricular designs to accommodate the needs of this population. According to Ewell (personal communication, April 6, 1997), that concern has spawned two points for consideration. First, as part of this redefinition, some necessary changes have been made to existing degree program requirements but without considering the relationship of the overall goal of the general education curriculum to the changes in the major area. One of the most common claims of adult learners questioned by educators is that they have “life experiences” which may
exempt them from taking certain courses. This assumption of “prior knowledge” is constantly under attack by educators because some say it holds no credibility (Smith, 1981). Others say, however, that learning by experience holds the same credibility as any other type of “learning,” and will accept this as an equivalent to traditional classroom instruction (Smith, 1981).

Ewell’s second concern was that many changes made in the general education curricula nationwide were simply “patches” implemented over the years rather than cohesive plans which examined the whole issue and the relationship of these changes to content material (personal communication, September 23, 1997). For example, if a change is made in a math component of the general education curriculum based on analyses of the mathematical skills required in general, how do those changes affect science, reasoning, reading, or other goals of the general education curriculum? In other words, can a change be made in one component of the core without affecting the whole?

Need to reevaluate course requirements and prerequisites. One especially important component is the validity of course requirements imposed upon students as well as the prerequisites they require. Initially, prerequisites were instituted so that students undertook a planned sequence of events that led to a predetermined performance (Scheamberg, 1979). Prerequisites provided some type of control of enrollment numbers and student quality as
to who could or could not enroll in specific courses based on set criteria (Bowen, 1980). According to Bowen, prior knowledge/competencies better enabled students to be successful in more advanced courses.

At Northwestern State University, some students and faculty are disappointed with the limitations of the curriculum in terms of course selections and content and began to question them. One major argument among faculty advisors and students was the requirement of prerequisites in the program. Currently, several of Northwestern’s general education courses require prerequisite coursework. Students have become irritated with the imposition for four reasons:

1. In some situations students could not schedule the prerequisite requirements because of outside responsibilities, such as work, or the fact that the sections of the courses were closed.

2. Students complained of having to schedule and pay for prerequisite courses they did not feel they needed, such as a chemistry/physics prerequisite for a biological science class. They questioned the validity of such prerequisites because one was not related to another. Even though they admitted both may be necessary for a "core" experience, they questioned the order in which they were required because it put a strain on scheduling.

3. Students have complained constantly about prerequisite requirements being imposed based on minimum
standardized test scores, such as the American College Test. They argued that test scores were not the only predictor of their success in a course. Traditional students say that their high school ranking and grade point average should be used as a consideration, and non-traditional students believe that their age and background experiences should be considered. Based on an analysis of standardized test scores, class ranking, incoming grade point averages and final grades in certain general education courses that this researcher taught over the past five years, they were right in many cases, even though the literature supports the use of test scores for placement and sequencing purposes (Keeley, Hurst & House, 1994).

4. Some students felt that their prior educational and life experiences (i.e., high school education or 20 years of work experience) gave them the proper preparation to enter certain courses without the required prerequisites. They saw those prerequisite courses as a waste of time and money.

Faculty at Northwestern as well as other universities tended to disagree with the above student opinions. Christine Neuner, an adjunct English professor at the University of Southwestern Louisiana (personal communication, December 18, 1997), believed that the imposition of prerequisite requirements such as minimum ACT scores only strengthened the classes she taught. She admitted that life's experiences do play an important role; however, sometimes those experiences did not always
guarantee success when it came to assessing quality of compositions. Dr. Linda Roach, a physical science professor at Northwestern, agreed with Neuner, but added that her classes benefit from those same “life experiences.” She added that having a strong mathematical background produced higher grades on tests and assignments (personal communication, March 5, 1998).

These reasons have supported the researcher’s belief that an overall evaluation of course requirements in the general education curriculum is a good idea. Based on the summary research in Chapter II of this dissertation that overwhelmingly supports the contention that the higher education student population is changing for various reasons, it is necessary to evaluate how the university’s existing curriculum is meeting the needs of today’s student.

In light of the fact that universities are again evaluating their general education curricula, this study addresses the importance of reevaluation as an attempt to see that both students and universities are fulfilling their respective goals to provide students with a quality academic experience. This process of reevaluation has several fundamental considerations, one of which is addressed in this study—the effectiveness of various academic and demographic variables on predicting the success of students in courses in the general education curriculum.

Prediction of success is not a new topic in higher education. Scores on nationally standardized exams such as
the American College Testing program (ACT), Scholastic Achievement Test (SAT), and Collegiate Assessment of Academic Proficiency (CAAP) have been used as criteria for student admission, both to an institution and to a specific academic program. Recognizing that test scores do not always provide adequate information, researchers continue to conduct studies in an attempt to identify additional variables influencing success in various degree programs. Findings from these studies continue to suggest that grade point average, standardized test scores, leadership potential, and class standing were components that predict performance. Other studies have focused on analyzing variables affecting achievement in various courses in an academic specialization.

Currently, Northwestern State University is beginning a state mandated review of its general education curriculum. The revision became necessary for several reasons. First, the general education curriculum has not been evaluated as a whole since it was established in 1980-1981 and implemented in the summer session of 1981. Second, the evaluation was considered important because the Southern Association of Colleges and Schools mandates assessment plans as part of its institutional effectiveness component of its assessment process.

One aspect for the review will be to determine whether the current curriculum “fits” with the current university mission and goals. According to Dr. Merritt Moseley, who
serves as director of the Asheville Institute on General Education, assessment of general education is a constant for most universities currently in the process of general education revision (personal communication, March 12, 1998). Another aspect will involve evaluating why student success rates in the general education curriculum are so low, which, according to Moseley, is now becoming a concern to many in an age where student dollars control what a university can and cannot do.

Understanding Northwestern’s core curriculum. NSU has a broadly based general education curriculum that meets the university’s mission and fulfills the requirements of the Louisiana Board of Regents’ requirements for general education in a college degree program. The university’s curriculum “encompasses the knowledge and abilities that Northwestern believes are essential to college graduates” (Northwestern State University General Catalog 1996-1997, p. 21). The university’s core requirements are designed to improve students’ writing and speaking, familiarize them with computer usage, give them an appreciation and knowledge of the arts and humanities, provide them with ample mathematics skills, broaden their understanding of the biological and physical sciences, and develop their knowledge of health and nutrition. “In addition, these requirements enhance students’ problem-solving acumen, critical thinking abilities, and qualitative skills” (Northwestern State University General Catalog 1996-1997, p. 10).
21). They also are intended to stimulate independent learning and to enable graduates to be competent and contributing members of society.

Today students are required to take 44 hours of coursework in the areas of communication, mathematics, physical and natural sciences, fine arts, social sciences, health and personal fitness, university orientation, and computer literacy—all of these are state requirements. Courses in communication, mathematics, and physical and natural sciences are sequenced so that students must complete certain courses before pursuing others. For example, students must complete English 1010 before enrolling in English 1020. Several courses have similar sequencing requirements as prerequisites, such as Mathematics 1020 and Science 1020. Other courses have no prerequisites, such as History 1010 (World History I), 1020 (World History II), 2010 (United States History I), and 2020 (United States History II). Definitions for “success” differ for these courses by major or college. For example, education majors must make a minimum grade of “C” on all core classes, while business majors need to make only a cumulative “C” average on all core courses taken.

Northwestern also offers a comprehensive developmental education program that offers college preparation courses in reading, English, mathematics and study skills. “Since many students reach college without adequate academic preparation, developmental education can play an important
part in the achievement of a degree of the satisfaction of these students' postsecondary education aspirations" (Northwestern State University General Catalog 1996-1997, p. 26). Students are placed in developmental classes on the basis of their American College Test scores or optional departmental placement tests scores. Developmental education students must enroll in and complete any developmental course requirements during the first three semesters of enrollment at Northwestern. Achievement of a letter grade of "C" or better is required to exit a developmental education course or to progress to a higher level of that subject area. If after three semesters a student has not completed all developmental requirements, the student will not be eligible to continue at Northwestern. Developmental education courses do not fulfill any degree requirements at Northwestern; however, they constitute extra hours added to the students' transcript that are used in the computation of a student's grade point average. These courses are also used as prerequisites to freshman-level courses in English, mathematics, physical and biological science.

Statement of the Problem

Change in general education affects organizational structure, and the consequences for faculty and students can be significant. To start, several philosophical and political implications of what is or what is not included in a general education program or in specific classes tend to
control what is actually done with such a program. For instance, changes in general education curricular requirements can lead to shifts in the distribution of students among departments offering general education courses, which affects the student credit hours that departments may own (Whitehead, personal communication, September 23, 1997). This deleting or adding a given requirement or instituting prerequisite requirements on courses could have severe consequences for an institution.

These concerns make the overall goal of the general education curriculum hard to understand because of the many implications of its existence. Although universities attempt to define clearly and fully their goals and expected learning outcomes, most will admit that this is a difficult task, and many will admit that they do not really know the overall purpose of their general education program. Defining what a student should know remains as elusive as ever. Until universities implement outcome assessment plans in their overall activities, they will never be able to determine if their goals and objectives are being met.

Predicting student success is also an important concept, but it is also a vague one, and that poses a problem. Are students adequately prepared for their programs of study? Does a prerequisite requirement ensure this preparation? Few faculty would argue that students who passed their course should not be prepared for subsequent courses which require the completed course as a prerequisite. The implied
contract creates an obligation. If the teacher says a student is ready for advanced study, the teacher needs to stand behind that assertion. He or she should want to know if the student does not succeed and why. Knowing ahead of time if a student is a possible risk for failure can give the teacher a head start on working with that student toward success in the course. Several demographic and academic factors could play an important part in this prediction.

The purpose of this study, therefore, was to determine if a specific set of factors can be used to predict whether a student will successfully complete various courses in the general education curriculum. Information gained from this study could be utilized by faculty and advisors to increase student potential for success in courses in the general education curriculum as well as address the high non-success rate in these courses which ultimately leads to a retention problem. Specifically, discriminant analysis will be used to test the null hypotheses of the following four objectives:

Objective 1. To determine if a model exists that increases the researcher’s ability to accurately classify subjects on the variable of whether or not they were successful in Mathematics 1020, as determined as a final grade of “C” or better, from the following measures.

a. Whether or not the student completed the prerequisite requirement (minimum score of 19 on the Math ACT or grade of “C” or better in Math 0920;
b. Age of student at the time the course was pursued;
c. ACT composite score;
d. Part-time or full-time status at time course was taken;
e. Type of high school diploma (traditional or GED);
f. If a traditional graduate of an in-state school, was it public or non-public?
g. Gender.

Objective 2. To determine if a model exists that increases the researcher’s ability to accurately classify subjects on the variable whether or not they were successful in English 1010, as determined by a final grade of "C" or better, from the following measures.

a. Whether or not the student completed the prerequisite requirement (minimum score of 18 on the English ACT or grade of "C" or better in English 0920);
b. Age of student at time course was taken;
c. ACT composite score;
d. ACT reading score;
e. Part-time or full-time status at time course was taken;
f. If a traditional graduate of an in-state school, was it public or non-public?
g. Gender;
h. Type of high school diploma (traditional or GED);

**Objective 3.** To determine if a model exists that increases the researcher’s ability to accurately classify subjects on the variable of whether or not they were successful in Science 1020, as determined by a final grade of “C” or better, from the following measures.

a. Whether or not the student completed the prerequisite (Science 1010 with a grade of “C” or higher);

b. Age of student;

c. ACT composite score;

d. ACT science score;

e. ACT reading score;

f. ACT math score;

g. Part-time or full-time status at time course was taken;

h. Type of high school diploma (traditional or GED);

i. If a traditional graduate of an in-state school, was it public or non-public?

j. Gender.

**Objective 4.** To determine if a model exists that increases the researcher’s ability to accurately classify subjects on the variable of whether or not they were successful in Science 1010, as determined by a final grade of “C” or better, from the following measures.
a. Whether or not the student completed Mathematics 1020 with a grade of "C" or higher;

b. Age of student;

c. ACT composite score;

d. ACT science score;

e. ACT reading score;

f. ACT math score;

g. Part-time or full-time status at time course was taken;

h. Type of high school diploma (traditional or GED);

i. If a traditional graduate of an in-state school, was it public or non-public?

j. Gender.

Significance of the Problem

The initial rationale behind the implementation of prerequisites is that students need to adhere to a certain sequence of coursework in order to reap maximum benefits from the courses, mainly a passing grade (Darkenwald, 1982). Does that reason support the overall goals and objectives of a general education program? Does the implementation of prerequisites guarantee success in future courses? Could other demographic variables give advisors and instructors a better indication of student success?

This study provides data to support a more individualized program of study for the student in terms of predicting success in courses in the general education
curriculum. This approach would allow for the identification of specific factors that can be used to predict outcomes, and it would assist university faculty and administrators in developing appropriate curricula, determining prerequisite requirements for courses, designing instruction, advising and counseling students so that the needs of the student and university are met, which ultimately could strengthen student performance and retention figures for the university. Even though this study was completed using undergraduate students from Northwestern State University, its findings can be generalized to all universities that are concerned with student success as well as retention.

**Definition of Terms**

In order for the reader to have a basic understanding of this dissertation, the following terms are defined:

**ACT**—Known as the American College Test, it consists of five subtests in reading comprehension, mathematics, English, science reasoning and social science reasoning. Northwestern State University uses ACT subtest and composite courses for student placement in the general education curriculum. Students may also submit scores from the Scholastic Aptitude Test for placement purposes; however, they are converted to ACT-equivalent scores.

**Baccalaureate degree**—Also referred to as an undergraduate degree, it is a certification of coursework completed within the scope of a college or university.
Departmental placement tests--At Northwestern State University, students may schedule examinations in English and mathematics in lieu of submitting ACT/ACT-equivalent scores. These scores are used for placement in English and mathematics classes. For students having both ACT/ACT-equivalent scores and placement test scores, the higher of the two scores is used for placement. These tests are strictly optional; if students are not satisfied with their ACT score placement, they may take the departmental placement test with the hope of meeting the minimum score requirement (75% for each test) for a higher course placement. These tests have been offered to students since the fall semester of 1995.

Prerequisite--A prerequisite is a course prescribed by an academic discipline to proceed another course. Sometimes prerequisites may include minimum test scores or other competencies.

Sequential progression--Sequential progression requires completion of coursework in a prescribed manner. For example, at Northwestern State University, Mathematics 1020 must be completed before taking Mathematics 1060 or Mathematics 2010.

Success--For the purpose of this study, success is defined as completion of an academic course with the grade of "C" or better.
CHAPTER II
REVIEW OF RELATED LITERATURE

The purpose of this review of related literature is to explore the rationale for the incorporation of a general education (core) curriculum in higher education, including its history, characteristics, and strengths and weaknesses. The review addresses the issue of sequencing of courses in the general education curriculum, how various established prerequisites may or may not be predictors of student success, and how other demographic and academic factors may play an important role in this prediction. In order to describe completely the importance of proper usage of the term "general education curriculum," the concept of the "adult learner," its emergence in higher education and its impact on curriculum planning and sequencing, is first delineated.

Adult Learners in the Higher Education Setting

The manner in which the adult learner has been described in the literature is sometimes incompatible with programs typical to institutions of higher education. For example, little consideration is given to the changes that occur in the adult population due to multiple roles, changing roles, and the real world of the adult learner. Because of individual, personal, educational and professional histories, adult learners continually present a unique challenge to educators (Green, 1987), and since the adult learner population is increasing by leaps and bounds...
annually, institutions of higher learning have reevaluated curricular designs to accommodate their needs. However, much curricular planning and implementation has been wasted because of a lack of knowledge about and understanding of the adult learner and what is wanted and needed from his or her educational endeavors (Green, 1987).

Defining the adult learner. Since there is no single definition of what the “adult learner” is, no universal statements about what characterizes all adult learners can be made. In fact, a number of questions about what characterizes the adult learner may be asked. Is the adult learner someone who is eligible to vote? A 25-year-old graduate student who still lives with his/her parents? A full-time worker? Someone who has been away from a formal learning environment for more than two years? Someone who is entering college for the first time? Since the adult learner is difficult to categorize, the term is used interchangeably as “learner.” Thus, in the field of higher education, all learners should be considered and treated as adult learners, but sometimes they are not. According to Peter Ewell (personal communication, April 6, 1997), the term was first used for those adults who were returning to an educational setting to pursue a GED, i.e., high school education. After that, continuing education departments developed at colleges to offer courses needed by adults who were not necessarily college graduates but who did have a GED or high school diploma. Then continuing education
increased activities to provide for college graduates who needed additional training or skills in order for universities to compete with industry's and private enterprise's educational activities. Also, another impact on the definition of adult learner in higher education was the changing of the age of majority from 21 to 18.

Even though demographic research supports the fact that there is an increase in "true" adult learners in higher education, arguments are made frequently that a majority of college students enter immediately after earning a high school diploma without any intent to "compete with industry," therefore they do not fit the definition of adult learner. However, according to Harrington (1977), they do and should be considered. In his study that addressed the future of adult learning, he observed, "...what was once a slogan of 'lifelong learning' is now becoming a reality and is bringing many new people into higher education all of their lives'" (p. 28).

Based on the changes in higher education, this realignment of the concept of "adult learner" is becoming a highly attractive option to be considered since the number of traditional-age students based on the "old" definition is slowly declining, and it is forcing universities to reconsider their goals and objectives when it comes to curriculum design (Bridgeman & Lewis, 1996; Harrington, 1977). While one should not discount the importance of other possible options open to institutions, such as increasing
the quality of their offerings; expanding research and public service activities; or even large scale retrenchment, the important message is that bringing what was once considered “nontraditional study” into the mainstream is the most desirable and significant option that is available to higher education institutions in terms of economic gain, cultural advancement and most importantly, institutional survival.

Assumptions about adult learning. The above information suggests that adult learners are now being considered a part of the age group of 18 years and older. This information presents a process through which the individuals are viewed as capable of transforming knowledge and skills through experience. This is in contrast to child learning, i.e. preschool through 12th grade, which forms knowledge and skills from the classroom experience (Clark & Starr, 1986; Knowles, 1984; Peters & Jarvis, 1991).

Similarly, learning techniques as defined by Merriam and Caffarella (1991) identify andragogy as the art and science of helping adults learn, and defines pedagogy as the art and science of helping children learn. Agogos is the root, which means “to lead”.

Based on his andragogical theory, Knowles (1980) identified four assumptions that have a direct impact on the way adults learn: self concept, life experience, readiness to learn, and orientation to learning. These concepts highlight many of the key characteristics of adulthood and
have a major impact on the success and failure of those pursuing higher learning, and they should be considered when planning curricula and instruction as well as assessing these curricula as successes or failures (Knowles, 1980).

**Self concept**

When planning for the adult learner, one should consider the individual’s “self concept,” which is the cognitive element that supports the individual’s notions, beliefs, convictions and knowledge of self. During maturation, the learner moves from a dependent being to a self-directed one. This change in character, according to Darkenwald and Merriam (1982), constitutes a better indicator of self-concept than the chronological approach, which supports the idea that one develops emotionally over time. Today there are too many individuals who are chronologically defined as “adults” who do not possess the drive or self-esteem that the typical adult should. The emotional element of self concept, which is termed “self esteem,” is the individual’s element of self worth. This is seen when one analyzes one’s own behavior and how it conforms to the self ideal (Brundage & Mackeracher, 1980). These components of self concept form the differences between individuals and, according to Andrews, Houston and Bryant (1981), are responsible for the differences in learners: these differences account for some individuals who require structure and for others who prefer the freedom to
be self-directed in learning. These differences can also play important roles in a learner's success or failure.

This self concept begins to develop at birth, but its effects are truly evident when the individual begins to manage his own affairs. Usually a lack of self concept stems from an unsuccessful attempt at achieving a desired goal. For some, this failure occurs as late as young adulthood because they are never given the opportunity to establish and achieve goals as children and adolescents (Loudon & Bitta, 1988). This may account for high dropout rates in both high school and college, according to Andrews, Houston and Bryant (1981). They believe that one should take one's self concept into consideration when planning for his academic future.

Life experience

The second assumption of adult learning is that adults have lived longer, and they usually bring more life experiences to the classroom. Frequently, these experiences provide a great resource for learning and a foundation upon which to build new knowledge. Experiences also contribute to one's self-identity. However, in other instances, these experiences can create barriers to learning, since adults' attitudes, values and beliefs are established as a result of their experiences. This is often the case when it comes to taking certain courses such as algebra or literature. According to Bridgeman and Lewis (1996), in their work with gender differences in college mathematics grades, men had
substantially higher average scores than did women. Their research did not identify the reason for the differences in gender, but their research did indicate that this difference may be so prevalent because of the learner's negative or positive attitude toward the subject, which could affect their outcome in certain courses. Their findings were supported by Thorndike (1992), who found that success in the math/science areas was related to attitude more than genetics. Her study found that females' lack of confidence in their abilities to learn mathematics contributed to their higher levels of mathematics anxiety, coupled with a lack of interest in mathematically-related careers. Her research suggested the same when it came to males and their success in the liberal arts courses such as music appreciation. Lee and Burkam (1996) believed that the solution to bad attitudes toward both math/science and the liberal arts is to introduce the areas through laboratory/lifetime experiences such as plays and experiments.

Learning for adults frequently involves "a process of reaffirming, reorganizing and reintegrating one's previous experiences" (Smith, 1981, p. 136). This second assumption recognizes that the knowledge acquired through life experience is largely non-academic; thus for some, it holds no credibility, and for others, learning by experience can be easily quantified; however, more and more universities recognize it as a valuable tool for building programs of study. For example, at Northwestern State University, all
students are required to schedule a college algebra course before they take the finite mathematics course as part of their “general education” curriculum (Northwestern State University General Catalog 1996-1997). In Finite Math, students are introduced to such concepts as calculating annuities, balancing checkbooks and performing various statistical computations useful throughout life. Many students come to this course with prior knowledge and use it to complete various daily tasks in their lives. According to Dr. Leigh Ann Myers, a finite math teacher at Northwestern State University, the purpose of the prerequisite course is not clear to her since these students are prepared to complete the tasks in finite mathematics from their life experiences, such as balancing a checkbook, but some lack the mathematical skills to perform the computations, such as adding and subtracting (personal communication, June 16, 1997).

Readiness to learn

In an attempt to summarize how development and adult learning are related, Merriam and Caffarella (1991) explored three developmental theories. The first was largely based on age-related issues. The physical, psychological and sociological changes that occur over a lifetime are integrated by the learner and have a direct impact on the individual’s response to various situations (pp. 6-15). Typically, adults between 18 and 25 are pursuing credentials or starting careers. Those age 26-45 are concentrating on
occupations and career advancement, while those 50 and above are beginning to prepare for retirement. The third theory deals with learning styles. One’s learning style is individualized; each person explores meanings and values as they relate to reality. According to Merriam and Caffarella (1991), the commonality in these theories lies in the individual’s readiness to move from a stable state to a changing state and again to a stable state after learning takes place.

Orientation to learning

As individuals mature, knowledge is expected to have immediate application rather than future application. In very few instances do people strive for knowledge with no immediate reason. Hence, knowledge is problem-centered rather than subject-centered. Because of this, adults will admit that they return to the educational setting seeking relevant job-related educational experience (Merriam & Caffarella, 1991), and those entering the higher education arena immediately following a high school education are searching for that same knowledge that will make their transition to the working world much easier. According to Dr. Geraldine Holmes, an adult education professor at Louisiana State University, because of their highly developed cognitive skill, those adults returning to the classroom often tend to question course requirements and their relevance to the working environment. Also, in
reference to time, adults thrive on structure and tend to want a set program of study that will see them to the completion of a task without any deviations that will waste time (personal communication, February 12, 1996).

These assumptions demonstrate to the educator that a complex interrelationship exists between learning and adulthood. As the education system approaches the 21st century, more of an emphasis is being placed on curricula that take these assumptions and apply them so that students gain the most out of their experience (Bowen, 1980). But how do educators determine if students are getting the best? And also, how do educators know if what they are providing these students is what they really need to enter society?

**Defining the General Education Curriculum**

No more important issue faces advocates of the general education curriculum than that of defining the concept. Over the past 10 years universities faced the realization that the overall purpose of the general education or “core” curriculum is difficult to define; thus it has not been taken as seriously as warranted by its importance by those in higher education (Sudermann, 1992). This past vagueness of the purpose of the core has caused university administrators now to reevaluate the necessity of the core, mainly because there is little literature available that addresses a strong definition of core, much less its necessity or purpose (Sudermann, 1992). However, Sudermann
believed that trying to corral a definition of general education could ultimately damage the purpose of it (p. 11).

Ideally, the central purpose of general or core education is to enable men and women to live quality lives and to undertake the broad responsibilities of citizenship in a free society (Cheney, 1989). Although general education seeks to discover and nurture individual talents, its primary emphasis is preparation for roles that individuals share in common as human beings and as members of family and community groups.

Most universities call their general education curriculum a "program of general studies" (Wee, 1981). A "program" suggests concern for direction, organization, spirit, appropriate instruction and evaluation. According to Wee, the direction of such a program should be clear from its goals and the objectives of component courses. Wee added that organization of these programs should assure that general education is continuous, sequential, cumulative and integrative (p. 8); evaluation provides integrity by assuring that assessment focuses on achieving desirable competencies related to the curriculum's goals.

According to Beverly Pitts (personal communication, July 29, 1997), in a presentation at the American Association of Higher Education Conference on Assessment and Quality, a program of general studies should strive to develop the following competencies:
a. An ability to engage in lifelong education by learning to acquire knowledge and to utilize it toward intelligent ends, (b) an ability to communicate at a level conducive to the minds of college graduates, (c) an ability to clarify one's personal values and be sensitive to those held by others, (d) an ability to recognize and seek solutions for the common problems of living by drawing on a knowledge of historical and contemporary events and those aspects of the cultural heritage related to those events, (e) an ability to work in concert with others in solving the common problems of living, and (f) an ability to assess one's unique interests, talents and goals and to choose those specialized learning experiences which will foster their fulfillment.

History of the general education curriculum. The general education curriculum movement in higher education began during the mid 1700's in the private universities in England such as Oxford and Cambridge as an attempt to provide a strong liberal arts education to its students. According to Pitts (personal communication, July 29, 1997), traditionally, the liberal arts were eight in number: grammar, rhetoric, catechism, logic--the arts of language; and arithmetic, geometry, music and astronomy--the arts of mathematics. In more contemporary terms, the liberal arts brought to light what is involved in the use of words and numbers in all kinds of thought--in analyzing, speaking and
in writing; and also in measuring, deducing and demonstrating.

Universities in Germany also supported a strong general education curriculum, but they had a different interpretation of its purpose, which was entirely research-oriented. Their curriculum emphasized discussion, translation, writing, experimentation, mathematical demonstration and analysis.

Harvard University was the first university to emphasize a general education curriculum in its programs. According to Pitts (personal communication, July 29, 1997), Harvard initially replicated the British curriculum, believing that the ideal function of the liberal arts was "to bring about an awareness of the forms that are embodied in combinations of words and in numbers so that they became means of understanding." Eventually the concept of a "core curriculum" in the land grant universities became commonplace but these schools preferred a hybrid of both the British and German viewpoints, which would provide a broad liberal arts education (British philosophy) with a mixture of research activities (German philosophy). Bossing (1949) said that the American core curriculum was originally thought to include "those types of experiences necessary for all learners in order to develop certain behavior competencies considered essential for effective living in our democratic society" (p. 394). According to Bossing, the core should place emphasis on life experiences, problem
solving and skills. Based on the above premise, Bossing believed that core curricula are constructed based on five principles (p. 395):

1. Learning experience and process form the backbone of core, not mastery of knowledge; subject matter serves as a means or tool for engaging common social and personal needs, not as an end in itself;

2. Core emphasizes problem solving by the group across fields and disciplines; textbooks and teachers do not control the agenda;

3. More time is to be allotted to core classes than the standard 45 to 60 minutes;

4. Teachers are to guide students inside and outside the classroom, often working with the same pupils for two or three years;

5. Core becomes the organizing scheme for the entire school experience; non-core activities supplement core.

Hutchins (1952), and Dewey (1960) disagreed with Bossing’s platform and believed that the purpose of a core curriculum was more to “stress a common cultural heritage and to pose enduring questions about life and nature—a more traditionalist philosophy” (Levine, 1978, p. 8). Over the past 30 years vacillation between the two beliefs occurred; however, more and more institutions of secondary and higher learning agree that the core curriculum is more of a union of the two philosophies. According to Sudermann (1992), in his synthesis of the two platforms: (a) both viewpoints
stress learning experience and process over subject matter, (b) both see learning as an ongoing modification of behavior, (c) both reject the compartmentalization of knowledge, (d) both favor collaborative problem-solving through dialogue, (e) both give priority to skills and habits that will permit further growth; (f) Both believe that relevant problems and controversies will grip students; and (g) both believe in education for moral purposes and civility (p. 8).

Commonalities of core curricula. Based on the summation of arguments of Bossing (1949), Hutchins (1952) and Dewey (1960), Sudermann (1992) created his own definition of the core curriculum, noting that the core curriculum is definitely a spin-off of the term “general education” (p. 9). His definition had eight components:

1. Student needs and learning experience take precedence over subject matter. What must college students learn to survive intellectually, spiritually, physically and to contribute socially?

2. Courses in a core curriculum form a coherent whole, integrated either through disciplines, themes, content, skills, ways of knowing, modes of teaching and learning, or a combination of these.

3. Core courses emphasize discussion and group problem-solving.
4. Learning is not restricted to the classroom. Most core programs also provide for informal activities outside of class--common meals, lectures, films and field trips.

5. Study of original materials, whether print, film, art, music, dance, drama or other original sources, typifies core.

6. More important than subject matter, however, is the study and practice of the disciplinary arts as they are applied to original sources. History, philosophy, ethics and language form the overarching disciplinary arts. Core curricula preserve and reinterpret the tradition of the liberal arts.

7. Core curriculum is based on the notion of commonality. Students live in the same world, participate in a common group of activities, and they deal with the same questions of existence, share culture as a heritage, must learn moral judgment, and must accept common responsibility for building the community. A core program weaves these elements together for common reflection and discussion.

8. Almost without exception, the core curriculum involves a special program of faculty development.

More so, according to Sudermann (1992), when synthesizing the above components, the compelling concept is that the core curriculum provides the seeds of intellectual training, cultural literacy, aesthetic sensibility and moral temperament that later will bear fruit in the professions and in private life (p. 9). However, Sudermann believed
that everyone will tend to see each of these components differently, based on one's individual situation. Hence, trying to determine one definition for all is impossible (Sudermann, 1992).

The problem of definition. "Literature on general education seems to avoid defining core" (Sudermann, 1992, p. 3). Rather, the literature tends to summarize important qualities and circumstances that make up such a program of study. According to Wee (1981), key elements and purposes will all be present in some degree, most of the time, including "common student experience," "basic skills," "interdisciplinary learning," "integration of knowledge," "non-American culture," "value-laden issues and skills to handle them," "training in the skills of good citizenship," and "great books" (pp. 12-13). According to Sudermann (1992), all of the above terms can be conceived as either too general, too loose or too restrictive, adding that they set parameters to developing such a curriculum or generating discussion in the area. The best definition of a "core curriculum" rests with the individual institution developing such a curriculum for the purposes that the university sets. How each institution deals with implementing a core or general education curriculum is what determines its effectiveness at that University (Sudermann, 1992).

Planning and sequencing the curriculum. The terms "sequencing" and "prerequisite" as topic areas in curriculum design began to appear in the literature in the late 1950's.
The terms were both described as a succession of planned instructional events that lead to learning a predetermined performance. The literature generally reflected studies done with children, such as Piaget's (Scheamberg, 1979). Piaget's studies were supported by varied learning theories, such as the behaviorist, neo-behaviorist and cognitivist. A logical case for sequencing could be made given the developmental theories along with teaching/learning theories (Darkenwald, 1982). In the case of the adult learner in higher education, the argument for sequencing courses and curricula are not clearly identified since the term "adult learner" and higher education are just becoming used in the same contexts (Bowen, 1980). However, several universities are implementing prerequisites to courses that would give some control as to who can or cannot enroll in specific courses based on set criteria; some of these criteria are valid, and some may not be valid. Others implement prerequisites to provide the student the best opportunity for success in the course (Bowen, 1980).

**Sequencing principles**

Posner (1973, 1974) developed a categorization scheme for sequencing content. Posner's intent was to provide a framework or a common set of concepts for thinking about sequencing content. Posner presented an overview of sequencing principles and subsets of each principle to organize a range of phenomena in a useful way.
Posner’s (1973, 1974) first principle deals with the ways content can be sequenced so that it is world-related. The subsets of this relationship involve space, time and physical attributes. This principle calls for content to be delivered chronologically, spatially and physically.

The second principle suggests that the content be logically consistent in organization with the concept to be taught. The four subsets of this principle include class relations, which involves the grouping of things or events which have common properties; propositional relations, which focus on the relationship between propositions instead of what the proposition itself reflects; and sophistication, which is a broad concept that reflects differences in levels of precision. Bruner (1966) demonstrated the relevance of this third subset and suggested that there is an order for presenting material with the implementation leading the learner to focus and refocus on fundamentals through what is described as a spiral curriculum. This idea is premised by a sequence in which the learner thoroughly understands fundamentals so that material can be meaningfully related. This process allows the learner to reinforce current knowledge and expand the knowledge each time the topic is introduced. Bruner’s theory allows sequencing to have more flexibility by adding more specific information each time the topic is introduced.

The logical prerequisite is the last subset of the second principle of sequencing. This subset focuses on the
need to understand an initial concept in order to understand the second concept. This also depends on the commonality rather than the differences in the concept to be taught.

The third principle of sequencing of content seeks consistency with the process of inquiry in relation to concepts. This sequence should reflect the nature of logic, methodology or thought. The only subset is logic of inquiry, which is defined as a valid argument.

The fourth principle asks that curriculum be structured to be consistent with the learning process based on empirical prerequisites, difficulty, familiarity, interest development and internalization.

Instructional models developed in the 1960s support this concept of sequencing. Gagne's work (1965, 1970, 1977) was instrumental in defining the hierarchical sequence. By considering the task to be learned and listing all the skills needed to learn the task, the hierarchy is identified. He contended that the skills mastered at the base of the hierarchy are subordinate to learning skills of a higher order. For Gagne, it is the hierarchy that controls the order; thus the presentation of information is usually from simple to complex, which supports his argument that “a learner must know/be able to do in order to...” (Gagne, 1962, p. 71). Given a desired competency, a task analysis may be employed to develop prerequisites. The prerequisites are established on the content to be learned exclusive of learner characteristics.
While the hierarchy controls the sequence, Gagne (1965, 1970, 1977) describes internal and external conditions which must be met to ensure learning. Internal conditions are defined within the learner, and include prerequisite skills and the capability of being able to discriminate different dimensions of stimuli. The external conditions of learning come from outside the learner function to stimulate and support the learning process. Such conditions of learning are internal/external to the learner (Gagne, 1970).

The fifth principle of sequencing centers on the utilization process. The focus of this sequencing order is within a social, personal or career context. The two subsets to this question would be procedure and frequency of use. This principle can best be applied to the proponents of a core curriculum concept.

The contention of Posner's principles of sequencing still remains that the use of these models will sequence the content in a particular way, not because of the model but because the developer may not have thought of alternative approaches. In some cases, according to Ewell, universities may impose prerequisite requirements not knowing whether they are effective or not; he added that other factors, or a combination of these factors, may be better predictors, such as age, gender, and prior educational background (personal communication, April 6, 1997).
Concerns about core reevaluation. According to Dr. Thomas Burns, chair of Louisiana’s general education committee, universities across the nation are looking closely at their general education curricula to determine their effectiveness in several areas (personal communication, March 13, 1998). How each university carries out this evaluation is determined by the individual situation at that university; some states have their own mandates for assessment and revision, and others follow mandates imposed by various accrediting agencies. Several universities across the country and in Louisiana, including public and private two- and four-year degree awarding institutions, were questioned about their concerns in general education revision and how they were dealing with these issues.

Concerns for general education across the country

Reform is a buzz word at Longwood College in Farmville, Va., according to Dr. Edward Smith, Director of Assessment (personal communication, March 13, 1998). His university has been begun a reevaluation of its core curriculum as a result of a statewide and national assessment mandate in 1997. Since the small, rural public college’s general education program was instituted in 1986, no plan for assessment was formed because of the nature of the curriculum. As part of the assessment process the school’s committee is looking closely at the curriculum as to its correct focus in relationship to the university’s mission, since all students
there follow a similar program of study. Since the mandate, the university has implemented its assessment program in stages. This year, departments were required to use common syllabi and departmental exams for each course, and all students taking general education courses were required to complete in-course surveys that assessed several competencies identified in their university mission such as writing, computer literacy and critical thinking. University officials there are concerned that their students are all getting a consistent education that conforms to the mission and goals of the university.

No form of evaluation of the general education curriculum is being done at the University of North Carolina at Asheville. According to Dr. Merritt Moseley (personal communication, March 12, 1998), no formal evaluation of the university’s program is being conducted because it has an assessment program already in place. He did say that the development of the university’s assessment program came from an earlier accreditation mandate that suggested that general education curricula in general were not accomplishing anything if an assessment plan was not in place, adding that it would be impossible to determine if a program had lost its focus unless an assessment plan was implemented. He said that the university’s assessments consist of departmental final exams, consistent course syllabi and surveys conducted throughout the students’ academic career.
Southwest Texas State University is in the middle of a major reevaluation of its general education curriculum, according to Dr. David Nelson, Assistant Dean for General Studies (personal communication, March 12, 1998). He said the mandate for reevaluation was made because the addition of a doctoral degree at the university changed its status and its regional accreditation requirements. Reevaluation also was mandated because of a movement in Texas that would create one core curriculum for all schools, which would aid in students' matriculation from one school to another. Southwest Texas' curriculum is based on "perspectives," which are also considered "concentrations" that students must select courses from to complete their 42-hour university core requirement. According to Nelson, the administration is concerned that Southwest Texas State students are mastering a particular body of knowledge that will enable them to function in an everyday life—not so that they can master a particular curriculum of study. Since the idea of a statewide core curriculum is being mandated, they are also concerned about student retention and matriculation—if and why their students are leaving, and will they leave if such a curriculum is implemented. At this time the committee is standardizing its curriculum by rewriting course descriptions, syllabi and sequencing to correlate with the university’s mission. Even though retention is a concern, the committee has not reached the
point where that question can be answered through an assessment plan.

Concerns for general education in Louisiana

Louisiana universities as a whole are reviewing their general education for two reasons. First, recent SACS legislation now requires universities falling under its jurisdiction to assess their programs of study to determine if the program is doing what it says its doing. Second, state officials are now requiring universities to evaluate their general education programs to determine if they are in focus with the goals and missions of their respective university. Public and private in-state schools view this challenge differently, as do the community colleges now operating in the state.

Southeastern Louisiana University shares the same concerns as Northwestern State University when it comes to general education reform. According to Dr. Randy Moffitt, Vice President of Academic Affairs and Provost, Southeastern’s general education committee is concerned that the university has the appropriate general education sequence (personal communication, March 13, 1998). The university is looking at current course requirements as they pertain to state and SACS requirements, prerequisite requirements and measurability of the courses’ effectiveness in terms of preparation for future major-related courses. Southeastern also is concerned with how its core curriculum affects retention of students during their academic career,
since there is a push in the state for lowering the number of required hours in a degree program to approximately 120 hours. Moffitt said that this is one of the biggest challenges of the committee since this reduction will probably cost the general education program now in use there to cut course requirements.

Currently, the university has no method of assessment. Recently, the committee disbanded Southeastern’s current Academic Profile assessment, a standardized assessment that was to measure what students learned after earning between 80 and 99 semester hours. According to Dr. Beatrice Baldwin, Director of Institutional Research at Southeastern (personal communication, March 13, 1998), Southeastern administrators felt that the test provided no information to support whether the general education program was effective or not. At this point, she said the university is looking for another instrument that will provide more valuable information in that area. Southeastern is also waiting on the performance funding initiatives being discussed in the legislature as well as the requirements for the use of those funds for assessment.

Louisiana State University in Baton Rouge is one of the only schools in Louisiana to have a complete assessment plan currently in use that evaluates student learning outcomes as well as course content in the general education program. Dr. Bobby Matthews, Director of the Measurement and Evaluation Center at LSU, said that the university has not
gone through a major general education revision since the early 1990's when the assessment plan in use today was piloted (personal communication, March 13, 1998). Currently the university is piloting various assessment methodologies that are measuring student learning outcomes in general education courses. He added that the committee reviewing the pilot programs is presently pleased with its outcome, and the committee will continue to discuss various ways to improve on the methodology currently in place.

In Louisiana, the community colleges concept is becoming a reality, as Governor Mike Foster plans to ask the legislature in 1998 to create a system of technical and community two-year colleges in the University of Louisiana system with the 42 trade schools under the Board of Elementary and Secondary Education ("Foster Lists His Ideas," 1998). According to Dr. Barbara Jones, chair of Bossier Parish Community College's Division of Allied Health and chair of the SACS reaffirmation team, BPCC feels that it is ready to work with Governor Foster's plan for the merger. According to Jones, BPCC's general education program of study has been in place since 1983 and was created based on SACS and state guidelines implemented in the 1980's (personal communication, March 13, 1998). The only change BPCC had to make when it joined the state system was altering its mathematics requirements to include college algebra. BPCC's program's major focus, however, is remediation. The school has in place a remediation program
that serves approximately 50% of its student body in the areas of reading, math, and English. Students in the program are provided tutors, college success guidance and a great amount of one-on-one instruction. Their major concern is that students in the developmental program are successful; not only do they learn something from the remedial courses, but they can build their confidence and self-esteem in those areas. Jones said that this self-confidence should give them a better chance for success in future courses. Over the past two years, students at BPCC were tracked once they left the remedial program to determine if they actually were successful in later courses. Even though BPCC has no plans for a general education revision in the next year, their future goal is to track these students once they leave the community college to determine if their developmental program had any effect on their success in the four-year institutions.

Private schools are also affected by the reevaluation movement. According to Nelson (personal communication, March 12, 1998), even though private schools are not held accountable by state mandates for curriculum development, they are held accountable through national and regional accrediting bodies, such as SACS. He said that St. Mary's University, which is located in San Antonio, requires completion of a core curriculum by its students, but these classes are determined by the specific mission of the university. Since the school has Catholic foundings, its
curriculum requires a catechism component, and several of its courses impose similar Catholic philosophies, such as its history classes. Until recently, universities of its status, according to Nelson, did not adhere to recommendations and requirements of state schools; however, Nelson said that if they are going to compete with a statewide core curriculum they may need to evaluate their curriculum in terms of its mission as it relates to the state’s.

On the other hand, Tulane University, a private institution in New Orleans, takes a different approach to general education than does St. Mary’s, according to Mary Frances Gleason, coordinator of the curriculum committee for Newcomb College and Tulane College (personal communication, March 13, 1998). The university’s general education curriculum follows the SACS mandates for general education imposed on other public and private four-year institutions; however, Tulane has built its two-year program on breadth, which is part of the university’s mission—to expose its students to diversity, community, and service. Based on this mission, Gleason said that students at Tulane are exposed to a large variety of interdisciplinary courses, such as western civilization, as well as proficiency courses in English and math. According to Gleason, students get the depth in the junior and senior years as part of their major requirements, but no assessment plan is currently in place that assesses whether this goal of breadth is being met. No
plan for reform is in place at Tulane; according to Gleason, Tulane practices the "Band-Aid effect," whereby changes to the curriculum are considered when they are needed—or when the mission of the university is altered. She said that major changes to the program are rare, adding that reform may be in the future if the newly elected president of Tulane mandates it.

Assessment of Learning: Identifying and Meeting Needs and Expectations of Students

Do students enter college (or graduate school, calculus, upper-division courses) with skills required for success? Do grades in prior courses accurately reflect their capabilities? Do standardized test scores accurately predict or measure one’s potential for success? Does one’s age, gender, or race have an effect on one’s potential for success? Educators have beliefs about these and similar questions; and assessment is a tool that can ensure that such beliefs are supported by more than intuition or theory.

Assessment has historically been an important part of higher education. New directions in assessment refer both to a change of methodologies used in the classroom and an awareness that assessment is important at other levels beyond individual courses. With several notable exceptions such as college entrance examinations, statewide examinations such as the Louisiana Educational Assessment Program--LEAP, college entrance examinations such as the ACT and graduate qualifying examinations, much less attention
has been given to assessment of the impact of programs and sequences of courses. American educational traditions—most notably, the tradition of local control of education—may account for the lack of assessment at this level. In contrast, assessment at a program or institutional level is an important feature in many other nations (P. Ewell, personal communication, April 6, 1997). These examinations have significant consequences for students, faculty and institutions.

Based on the fact that adult students do bring more life experiences to the classroom than the younger student, it would seem that their background would provide a rich resource for learning and a foundation upon which to build new knowledge (Polson, 1993, p. 2). As stated earlier, however, very few studies validate this belief (Smith, 1981). Cattell (1963), however, in his theory of fluid and crystallized intelligence, supported the enriched life of the adult learner and those experiences that may provide a base for new learning. According to Cattel, fluid intelligence is required for the adaptation to new situations. It is considered to be biologically determined. This type of intelligence reaches an early maximum at 14-15 years or can continue as late as age 28 depending on the culture and subcultures involved. Fluid intelligence, however, declines with age and continues to decline through the aging process. His finding supports the idea that as
adults get older they have difficulty adapting to new situations (Polson, 1993).

In contrast, crystallized intelligence is cognitive (Cattell, 1963). Cattell believed that skills and knowledge are applied as a result of earlier learning. Crystallized intelligence is heavily influenced by general knowledge and experience and has no age limitations. His research contended that both types of intelligence show different patterns in aging, but are compatible in terms of adaptation.

In the absence of external assessments, the search for ways to monitor the impact of programs and institutions has turned both outward to commercial testing services (Banta, 1993, p. 39), and inward to the institution itself. At Northwestern, several subsets of the ACT/CAAP (ACT’s College Academic Assessment Program) examination. These include the areas of mathematics, reading, science reasoning and writing. Also, students majoring in Education take the Communication Skills and General Knowledge subtests of the National Teachers Examination (NTE), and students in Nursing and Radiological Technology take the National League of Nursing pre-clinical examination. Other methods used to determine effectiveness of the general education curricula include departmental examinations for certain courses and self-reported information derived from survey instruments.

Significant findings on success indicators. Several studies have indirectly investigated success predictors in
general education programs. Michael (1983) found that standardized test scores such as the ACT, SAT, and Miller's Analogy Test were valid predictors of success in college curricula overall.

Other studies have examined the relationship between admissions test scores, such as the ACT, and academic success of a student in a college-level course. Kohler (1973) found that students' ACT-Math scores were significant predictors of their grades in college algebra. Similarly, Gussett (1974) found a significant relationship between students' SAT-Math scores and their subsequent grades in college freshman mathematics. When college calculus grades were used as a criterion measure, Edge and Friedberg (1984) found that ACT-Math scores were significantly correlated with grades earned, and one's age did play a role in the score they received. Haywood's (1976) earlier research also supported this philosophy and found that ACT test scores were significantly higher in the younger groups than in the older groups. Her research concluded that once these older students make progress in the area of test-taking after "getting back into training," their performance on the test as well as all tests would increase.

House (1993) found a significant correlation between ACT-Composite scores and grades earned in college finite mathematics. Additionally, several studies to date have identified the predictive validity of ACT for English or science outcomes (Keeley, et al., 1994).
In another study, Coyner (1993) investigated which set of teacher education program admissions criteria best predicted achievement by examining the relationship between outcomes in the teacher education program and test scores and other indicators of academic achievement. The six predictor variables selected included incoming cumulative GPA, the ACT English score, grades in two education course prerequisites and whether the ACT had been taken. Data analysis indicated that the best indicator of future performance was past performance, and standardized tests were preferable to course grades due to outside factors (e.g., grade inflation). However, performance in the two specific education courses did seem to be predictive of academic achievement.

Keeley, et al. (1994) expanded upon the above findings by looking at the effects of demographic variables such as gender, ethnicity, and student classification on college mathematics outcomes. They also looked at the completion of prerequisites as predictors of success in mathematics programs through regression analysis. They found that women earned higher grades in mathematics courses than did men but had lower ACT test scores than did men. They also found that minority students entered with lower test scores than did non-minority students and also earned lower grades in mathematics courses, and those entering as freshmen and sophomores earned higher mathematics grades and entered with higher test scores than did upperclassmen. Keeley, et al.‘s
(1994) study also found that course grades in mathematics classes increased as grades in the course’s prerequisites increased.

In a related study, Harrison (1990) questioned the relationships between grades in the components of a freshman music theory class and selected background variables, identifying as predictors of success certain instrument studies and SAT mathematics scores. She found that SAT scores were the best indicator of grades in written work and ear training, while music experience and aptitude forecast sight singing and harmonics performance.

Several studies address predictor variables in graduate education. Chartrand (1992) found that Medical College Admissions Test (MCAT) scores, undergraduate science grades, and the academic caliber of an undergraduate degree program as indicators of academic performance/success in the first year of medical school. Others have used MCAT scores, undergraduate science grades and academic caliber of an undergraduate degree program to predict academic performance/success in the first year of medical school (Chartrand, 1992).

Malaney (1987) in a paper to the Association for the Study of Higher Education, provided a comprehensive review of the research focused on achievement in undergraduate programs as a predictor of success in graduate education. He found that the most popular topic of research was in the area of matriculation, including components of recruitment,
admission, and student characteristics; and the second area dealt with prediction of student performance. His summary indicated that standardized test scores, such as the GRE, have a positive correlation with success in various types of doctoral programs.

Findings also show a significant relationship between various non-academic attributes and academic success. A study by Larose and Roy (1991) provided data that personal characteristics such as fearing failure, associating success with facility, and experiencing anxiety were better predictors of success in a college career than was high school academic performance. Young and Barrett (1992) found that the academic vigor of a high school program was effective in predicting college grade point average. Also researchers have suggested that contributing factors to one's success in a college program can also include student life, family support and one's own self image (Andrews, Houston & Bryant, 1981). Malaney (1987) found that prediction and retention factors were described as sometimes related to non-academic issues, such as finances, poor working relationships with major professors, or a lack of time to complete required research.

A significant study related to predicting success in terms of prerequisite course requirements was conducted by Pieronek (1991). Pieronek's study examined the relationship between successful completion of pathophysiology, a required liberal arts course, with several science prerequisites and
the experienced registered nurses’ outcome in these classes as measured by final grades and the length of time since they had taken them. A t-test indicated no significance in the grade in the course between subjects who had completed the prerequisite science course and those who had not. Her study also found no significant relationship between the grade and the students’ age, number of dependent children, marital status, admitting grade point average, current grade point average and nursing specialty. However, in her study she did find a significant relationship between the grade in pathophysiology and the years since other science required prerequisites were met. Her results indicated that the prerequisites for the pathophysiology course could be waived, which supported her hypothesis that the experienced registered nurse could make the judgment for adhering to the prescribed sequence.

Summary

This review of literature was designed to explore the rationale for the incorporation of a general education (core) curriculum in higher education, including its history, characteristics, and strengths and weaknesses. In order to describe completely the importance of proper usage of the term general education curriculum, the concept of the “adult learner” and general education’s emergence in the higher education arena and its impact on curriculum planning and sequencing were delineated.
An overview of adult education through a historical perspective demonstrates the integration of these learners into higher education. The systems used to integrate these learners is sometimes counterproductive to mobility and not designed to build on life experiences.

Because of this rapid influx of students and other reasons identified in this review, universities across the country are now reevaluating their general education curricula to determine their effectiveness in meeting the needs of their population. This evaluation is not only a requirement in some cases, but it is also an attempt to assure the university and its student population that the course requirements are meeting the mission of the university and the needs of the students enrolled.
CHAPTER III
METHODS AND PROCEDURES

Introduction

Discriminant analysis was used to determine if a specific set of factors could be used to predict whether a student will successfully complete four courses in the general education curriculum at Northwestern State University. In this chapter, the following issues related to the study will be addressed: population and sample, research design, instrumentation, procedures and data analysis.

Discriminant analysis is defined in Ary, Jacobs and Razavieh (1996) as a statistical procedure "related to regression analysis in that it uses predictor variables to classify subjects into two or more groups, such as dropouts versus persistors, successful versus unsuccessful students, delinquents versus nondelinquents, and so on" (p. 410). The procedure results in an equation, or discriminant function, which can be used to assign individuals to groups on the basis of their scores on two or more measures. It is useful in a variety of studies, including prediction, assessing consistency and describing relationships (Kerlinger, 1963, p. 650). It can also be used to study the relationships among variables in different populations or samples.

According to Kachigan (1991), certain assumptions must be taken into consideration when using discriminant analysis:
1. Predictor variables are presumed to be the same in the populations from which the groups are drawn.

2. The correlation between any two of the predictor variables must be the same within their respective criterion groups.

3. Unequal sample size will not present any problems; however, the sample size of the smallest group should exceed the number of predictor variables (Tabachnick & Fidell, 1996). As differences in sample sizes among groups occur, overall larger sample sizes are required to assure robustness with regard to the assumption of multivariate normality. Robustness may be expected with at least 20 cases in the smallest group if only five or less predictors exist (Tabachnick & Fidell, 1996).

Population and Sample

When designing this study, the researcher defined the target population as all first-time freshmen (those having earned no college hours prior to entering college). The accessible population for this study was defined as those students who were first-time freshmen at Northwestern State University in the fall semester of 1995.

The sample (census) for the study included those first-time freshmen from the accessible population who were enrolled in Mathematics 1020, English 1010, Science 1020 and Science 1010 in the Fall 1995, Spring 1996, Summer 1996, Fall 1996, Spring 1997, Summer 1997 and Fall 1997 semesters. The university’s student information system had available
all academic information and demographic information for
students included in the sample.

Research Design

The research design is termed exploratory. The
researcher used discriminant analysis determined if a
specific set of factors can be used to predict whether a
student will successfully complete Mathematics 1020, English
1010, Science 1020, and Science 1010. The selected general
education courses and their catalog descriptions include:

a. Mathematics 1020--College Algebra--3 credit hours. A graphing treatment of the topics considered essential for a college algebra course with emphasis on functions, graphs and application. A graphing calculator will be required in the course. Placement in course dependent on ACT score or placement test score.

b. English 1010--Composition and Rhetoric I--3 credit hours. The short paper; rhetoric, with emphasis on writing. Placement in course dependent on ACT score or placement test score.

c. Science 1010--Basic Concepts of Physical Science I--3 credit hours. Basic concepts of physics and chemistry.

d. Science 1020--Basic Concepts of Biological Science I--3 credit hours. Basic biological principles with human perspective. Prerequisite: Science 1010.

It must be noted that the four courses selected for this study are departmentalized on the Northwestern State University campus; that is, all teachers are required to use
the same syllabus, are required to cover the same material, and all students are tested with the same final examination for each course. The grading scale is also the same for each course.

This study was designed as an exploratory study that included various demographic and achievement variables as the predictor variables, which differed for each objective. Student outcome was the criterion variable, which included two levels on each objective: success in the course, as determined by the grade of "C" or higher; and non-success in the course, as defined by the grades "D," "F," or "W".

By determining the discriminant functions that differentiate the groups, the researcher was able to determine which students would succeed in four general education courses. The information gained from this model is vital to instructors and advisors in planning for instruction for their students as well as to determine if the present method of imposing prerequisite requirements is the best method of guaranteeing success in future courses. If this information is used early in the student's academic career it may make a monumental difference in the student's potential to succeed (Frerichs & Eldersveld, 1981). Moreso, such a study allows for the use of a mathematical equation that can be used to predict such outcomes (Klecka, 1980; Tabachnick & Fidell, 1996). These variables were used to address the following four objectives:
Objective 1. To determine if a model exists that increases the researcher's ability to accurately classify subjects on the variable of whether or not they were successful in Mathematics 1020, as defined by a final grade of "C" or better, from the following measures.

a. Whether or not the student completed the prerequisite requirement (minimum score of 19 on the Math ACT or grade of "C" or better in Math 0920);

b. Age of student at the time the course was pursued;

c. ACT composite score;

d. Part-time or full-time status at time course was taken;

e. Type of high school diploma (traditional or GED);

f. If a traditional graduate of an in-state school, was it public or non-public?

g. Gender.

Objective 2. To determine if a model exists that increases the researcher's ability to accurately classify subjects on the variable of whether or not they were successful in English 1010, as determined by a final grade of "C" or better, from the following measures.

a. Whether or not the student completed the prerequisite requirement (minimum score of 18 on the English ACT or grade of "C" or better in English 0920);
b. Age of student at time course was taken;
c. ACT composite score;
d. ACT reading score;
e. Part-time or full-time status at time course was taken;
f. If a traditional graduate of an in-state school, was it public or non-public?
g. Gender;
h. Type of high school diploma (traditional or GED).

Objective 3. To determine if a model exists that increases the researcher's ability to accurately classify subjects on the variable of whether or not they were successful in Science 1020, as determined by a final grade of "C" or better, from the following measures.

a. Whether or not the student completed the prerequisite (Science 1010 with a grade of "C" or higher);
b. Age of student;
c. ACT composite score;
d. ACT science score;
e. ACT reading score;
f. ACT math score;
g. Part-time or full-time status at time course was taken;
h. Type of high school diploma (traditional or GED);
i. If a traditional graduate of an in-state school, was it public or non-public?

j. Gender.

Objective 4. To determine if a model exists that increases the researcher’s ability to accurately classify subjects on the variable whether or not they were successful in Science 1010, as determined by a final grade of “C” or better, from the following measures.

a. Whether or not the student completed Mathematics 1020 with a grade of “C” or higher;

b. Age of student;

c. ACT composite score;

d. ACT science score;

e. ACT reading score;

f. ACT math score;

gh. Part-time or full-time status at time course was taken;

h. Type of high school diploma (traditional or GED);

i. If a traditional graduate of an in-state school, was it public or non-public?

j. Gender.

Data Analysis

All data for the study were collected from the Student Information System (SIS) at Northwestern State University. Course grades for all students completing the four identified courses were obtained from the SIS; course grades
of "A," "B," "C," "D," "F," and "S" were used to classify students as successful (those with a grade of "A," "B," "C," "S") and unsuccessful (those with a grade of "D," "F," or "W"). Other demographic and achievement data such as test scores were also obtained from first-time freshman students in the fall semester of 1995. The three-year time period should have given those students in the sample ample time to complete the four courses identified in the research design.

Data were analyzed for descriptive statistics appropriate for describing the subjects with regard to the predictor variables defined in the objectives. They also were analyzed for the development of predictor equations for student outcomes in four general education courses at Northwestern State University.
CHAPTER IV

FINDINGS

The purpose of this chapter is to present the data and explain the findings which are organized according to the four objectives of this study.

This study was designed as an exploratory study that included various demographic and achievement variables as the predictor variables, which differed for each objective. The sample for the study was first-time freshmen at Northwestern State University in the Fall 1995 semester who were enrolled in Mathematics 1020, English 1010, Science 1020 and Science 1010 at any time during the Fall 1995, Spring 1996, Summer 1996, Fall 1996, Spring 1997, Summer 1997, and Fall 1997 semesters. The university’s student information system had available all academic information and demographic information for the students included in the sample of first-time freshmen enrolled in the four courses during the identified time period. The sample size for each course differed, as the census consisted of only those students who were enrolled in the course past the 14-day enrollment count at Northwestern (Brenda Dailey, personal communication, March 13, 1998).

The basic assumptions of discriminant analysis include the assumption of multivariate normality and equal covariance. However, in this study, the variables age and ACT scores exhibited deviations from normality across the groups for all four objectives.
According to Klecka (1980), violations of normality are sometimes common; rarely do all variables used in a specific analysis meet all assumptions of normality. If a model is highly significant in terms of explanations of differences between groups, then these violations are probably not so detrimental to the accuracy and efficiency of the model itself. However, if the model is moderate to weak in significance, no interpretation can be made.

Objective 1

The purpose of Objective 1 was to determine if a model exists that would allow the classification of subjects in terms of their success in Mathematics 1020 on the following variables:

a. Whether or not the student completed the prerequisite requirement (minimum score of 19 on the Math ACT or grade of "C" or better in Math 0920);

b. Age of student at the time the course was pursued;

c. ACT composite score;

d. Part-time or full-time status at time course was taken;

e. Type of high school diploma (traditional or GED);

f. If a traditional graduate of an in-state school, was it public or non-public?

g. Gender.
Exactly 960 students were included in the census of those who took Math 1020. Approximately 64.6% of these students were female and 35.4% were male. The ages of the students ranged from 17 to 44, with a mean age of 19.87 years and standard deviation of 3.54 years. Approximately 91% of the students fell in the 17-21 range. Of the students enrolled, approximately 92% were enrolled full-time, while 8% were part-time. About 89% of the students had a public school education, and 11% had private school education. Ninety-four percent of the students enrolled had met the prerequisite of a minimum score of 19 on the Math ACT or a grade of "C" or better in Math 0920.

Of the 960 students who took Math 1020, 106 were excluded from the census because they were missing at least one discriminating variable. Only 854 students were included in the census of those who took Math 1020. Of this number, 565 (66%) were successful in the course (they received grades "A," "B," "C," or "S"), and 289 (34%) were unsuccessful (they received grades "D," "F" or "W"). Descriptive statistics are provided in Table 1 for the discriminating variables used in the analysis of the two groups (success and no success). According to the data, significant differences were found among the means for both groups on all variables except school type and whether the prerequisite for the course was met. Also, there were no GED students enrolled in this course, as indicated by the
constant factor for this variable. An a priori level of significance of .05 was used in determining the results.

Based upon the results of the Box M (9.91, p < .02), the assumption of equal covariance was violated, which may lead to a distortion in canonical discriminant function and the classification equation. Box M is sensitive to mild departures from multivariate normality as well as normal sample sizes. For this reason, the results in this study would be affected due to violations of multivariate normality (SPSS, 1997). To more accurately interpret the significance of the model, an interpretation of the canonical coefficients and Eigenvalues must be considered to explain the amount of group variation. An a priori level of significance of .05 was used in determining the results as listed in Table 1.

Table 1
Means, Standard Deviations, and F-ratios Between Groups for Discriminating Variables for Math 1020

<table>
<thead>
<tr>
<th>Discriminating Variable</th>
<th>Group</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Success (n=565)</td>
<td>Non-Success (n=289)</td>
<td>ratio</td>
</tr>
<tr>
<td></td>
<td>m/sd</td>
<td>m/sd</td>
<td></td>
</tr>
<tr>
<td>ACT Composite</td>
<td>20.47</td>
<td>17.85</td>
<td>107.34</td>
</tr>
<tr>
<td></td>
<td>3.66</td>
<td>3.14</td>
<td></td>
</tr>
</tbody>
</table>

(table con’d.)
### Table 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation 1</th>
<th>Correlation 2</th>
<th>Correlation 3</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of student</td>
<td>19.28</td>
<td>19.79</td>
<td>8.35</td>
<td>&lt; .01</td>
</tr>
<tr>
<td></td>
<td>2.71</td>
<td>1.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full- or part-time</td>
<td>0.95</td>
<td>0.91</td>
<td>5.01</td>
<td>.03</td>
</tr>
<tr>
<td></td>
<td>0.22</td>
<td>0.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prerequisite met</td>
<td>0.01</td>
<td>0.01</td>
<td>0.46</td>
<td>.50</td>
</tr>
<tr>
<td></td>
<td>0.09</td>
<td>0.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public/Private</td>
<td>0.89</td>
<td>0.88</td>
<td>0.25</td>
<td>.62</td>
</tr>
<tr>
<td>high school</td>
<td>0.31</td>
<td>0.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of HS diploma</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.32</td>
<td>0.57</td>
<td>7.01</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>0.50</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 = Full-time, 0 = Part-time  
1 = Met, 0 = Not met  
1 = Public, 0 = Private  
1 = Traditional, 0 = GED  
Constant  
1 = Male, 0 = Female

Table 2 illustrates the correlations between the discriminating variables used in the study. The strength of the correlations was interpreted using Hinkle, Wiersma and Jurs' scale (1988, p. 118). The correlations and their interpretation include:

**Correlation** | **Interpretation**
--- | ---
± 0.90 to ± 1.00 | Very high positive (negative) correlation
\[ \pm 0.70 \text{ to } \pm 0.90 \] High positive (negative) correlation
\[ \pm 0.50 \text{ to } \pm 0.70 \] Moderate positive (negative) correlation
\[ \pm 0.30 \text{ to } \pm 0.50 \] Low positive (negative) correlation
\[ \pm 0.00 \text{ to } \pm 0.30 \] Little if any correlation

All of the variables showed little or no correlation either in the positive or negative direction except ACT Composite scores and age, which showed a low negative correlation coefficient \((r = -0.31)\). According to the literature, this is an understandable relationship since ACT Composite scores sometime decrease as one’s age increases (Edge & Friedberg, 1984; Haywood, 1976). None of the correlations found in Table 2 were high enough to indicate colinearity among the variables.

Table 2

**Pooled Within-Groups Correlation Matrix for Math 1020: Discriminating Variables (N = 854)**

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>ACTC</th>
<th>Gender</th>
<th>Status</th>
<th>Prereq</th>
<th>HS met</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTC</td>
<td>-0.31</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-0.05</td>
<td>-0.02</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>-0.22</td>
<td>0.14</td>
<td>0.06</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prereq</td>
<td>0.01</td>
<td>0.02</td>
<td>0.02</td>
<td>-0.02</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>met</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(table con’d.)
The stepwise method of discriminant analysis was used for all four objectives because of the study's design, which was exploratory in nature, since the literature did not provide any insights as to whether a particular predictor variable would automatically be included in the model. Table 3 indicates that ACT Composite score and gender had high correlations with the discriminant function. Group means were different based on the lambda shown in Table 3. "A Wilks lambda of 1 occurs when all observed group means are equal" (Norusis, 1988, p. 79). Based on these findings at the .05 significance level, the researcher would reject the null hypothesis that the predictor variables ACT Composite score and gender would not discriminate between student success in Mathematics 1020, as defined as a final grade of "C" or better, and no success (.882, p<.05.) However, the researcher would fail to reject the null hypothesis based on the remaining predictor variables tested.

The Eigenvalue is the amount of variance that has been accounted for by the discriminant function (SPSS, 1997; Hair, Anderson & Tatham, 1987). It is comparable to r in regression analysis. The canonical correlation is the measurement of the association between the discriminant scores and groups. Although the Wilks lambda indicates that the function is statistically significant in its ability to
predict, the actual association between the scores and
groups is a low positive correlation ($R_\pi = .342$).
Furthermore, the Eigenvalue indicates that only 13.3% of the
total variation between the groups can be explained by the
canonical variables.

Table 3

Summary Data for Stepwise Discriminant Analysis (Math 1020)
(N = 854)

<table>
<thead>
<tr>
<th>Discriminant Function 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
</tr>
<tr>
<td>ACTC</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>$B_0$ (constant)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>$R_\pi$</th>
<th>Wilks lambda</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>.133</td>
<td>.342</td>
<td>.882</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

$b$ = standardized discriminant function coefficient
$s$ = within-groups structure coefficient
$B_\pi$ = unstandardized discriminant function coefficient
$R_\pi$ = canonical correlation coefficient

Table 4 shows the numbers of correct and incorrect
classifications of the categories for Math 1020. Only the
cases with complete information for all predictor variables
were included in the classification results table.
Approximately 64% of the cases analyzed were classified
correctly, which represents a 27.38% improvement over chance alone; the substantive significance of percentage of cases classified correctly was determined using the Tau statistic. (Barrick & Warmbrod, 1988). According to Norusis, "A discriminant function with an observed misclassification rate of 50% is performing no better than chance" (1988, p. 88).

Table 4

**Classification of Cases for Math 1020**

<table>
<thead>
<tr>
<th>Actual Group</th>
<th>No. of Cases</th>
<th>Predicted Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Success</td>
<td>290</td>
<td>195 95</td>
</tr>
<tr>
<td></td>
<td></td>
<td>67.2% 32.8%</td>
</tr>
<tr>
<td>Success</td>
<td>565</td>
<td>213 347</td>
</tr>
<tr>
<td></td>
<td></td>
<td>38.6% 61.4%</td>
</tr>
</tbody>
</table>

Percent of cases correctly classified: 63.69%

**Objective 2**

The purpose of Objective 2 was to determine if a model exists that would allow the classification of subjects in terms of their success in English 1010 on the following variables:
a. Whether or not the student completed the prerequisite requirement (minimum score of 18 on the English ACT or grade of "C" or better in English 0920;
b. Age of student at time course was taken;
c. ACT composite score;
d. ACT reading score;
e. Part-time or full-time status at time course was taken;
f. If a traditional graduate of an in-state school, was it public or non-public?
g. Gender;
h. Type of high school diploma (traditional or GED).

Exactly 1,062 students were included in the census of those who took English 1010. Approximately 60.4% of these students were female and 39.6% were male. The ages of the students ranged from 16 to 47, with a mean age of 20.21 years and standard deviation of 4.56 years. Approximately 87% of the students fell in the 16-21 range. Of the students enrolled, approximately 92% were enrolled full-time, while 8% were part-time. About 83% of the students had a public school education, and 95% of the students enrolled had met the prerequisite of a minimum score of 18 on the English ACT or a grade of "C" or better in English 0920.

Of the 1,062 students included in the census, 942 students were included in the analysis; 120 were excluded because they were missing at least one discriminating
factor. Of this number, 751 (80%) were successful in the course (they received grades "A," "B," "C," or "S"), and 191 (20%) were unsuccessful (they received grades "D," "F" or "W"). Descriptive statistics are provided in Table 5 for the discriminating variables used in the analysis of the two groups (success and no success).

According to the data, significant differences were found among the means for both groups on all variables tested except enrollment status and whether the prerequisite requirement had been met, which indicated that the groups were equal. An a priori level of significance of .05 was used in determining the results. To determine whether the covariance matrices were equal, Box's M was used. Based upon these results M (1.62, p.66), the assumption of equal covariance was not violated.

Table 5

Means, Standard Deviations, and F-ratios Between Groups for Discriminating Variables for English 1010

<table>
<thead>
<tr>
<th>Discriminating Variable</th>
<th>Group</th>
<th></th>
<th>F</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Success (n=751)</td>
<td>Non-Success (n=191)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>m/sd</td>
<td>m/sd</td>
<td>ratio</td>
<td></td>
</tr>
<tr>
<td>ACT Composite</td>
<td>20.05</td>
<td>13.23</td>
<td>37.64</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>3.70</td>
<td>3.57</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(table con'd.)
Table 6 illustrates the correlations between the discriminating variables used in the study. The strength of the correlations was interpreted using Hinkle, Wiersma and Jurs' scale (1988, p. 118). All of the variables showed little or no correlation either in the positive or negative
direction except ACT Composite scores and ACT Reading scores, which showed a high positive correlation coefficient (r = .89). Again, this is a understandable relationship since ACT Composite scores are computed using a combination of ACT subtest scores, which include ACT Reading.

Table 6

| Pooled Within-Groups Correlation Matrix for English 1010: Discriminating Variables (N = 942) |
|-----------------------------------|-----------------|----------------|----------------|----------------|----------------|
| Age                               | Gender          | ACTC           | ACTR           | Status          | Prereq          |
| Age                               | 1.00            |                |                |                |                |
| Gender                            | -.02            | 1.00           |                |                |                |
| ACTC                              | -.26            | .02            | 1.00           |                |                |
| ACTR                              | -.24            | -.01           | .89            | 1.00           |                |
| Status                            | -.06            | .02            | .10            | .07            | 1.00           |
| Prereq                            | .25             | .02            | .01            | .01            | .02            |
| met                               | .06             | -.02           | -.07           | -.07           | -.02           |
| Type                              | .02             | 1.00           |                |                |                |

Table 7 indicates that gender and ACT Composite scores had high correlations with the discriminant function. Group means were different based on the lambda shown in Table 7. Based on these findings at the .05 significance level, the researcher would reject the null hypothesis that the predictor variables ACT Composite score and gender would not discriminate between student success in English 1010, as defined as a final grade of "C" or better, and no success.
(.939, p<.05). However, the researcher would fail to reject the null hypothesis based on the remaining predictor variables tested.

Although the Wilks lambda indicates that the function is statistically significant in its ability to predict, the actual association between the scores and groups has little if any positive correlation (R_ = .245). Furthermore, the Eigenvalue indicates that only 6.4% of the total variation between the groups can be explained by the canonical variables.

Table 7

**Summary Data for Stepwise Discriminant Analysis (English 1010) (N = 942)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>b</th>
<th>s</th>
<th>P</th>
<th>Group</th>
<th>Centroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTC</td>
<td>.30</td>
<td>.79</td>
<td>.21</td>
<td>Success</td>
<td>.13</td>
</tr>
<tr>
<td>Gender</td>
<td>-.61</td>
<td>-.59</td>
<td>-1.23</td>
<td>Non-success</td>
<td>.50</td>
</tr>
<tr>
<td>B_c (constant)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.34</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>R_</th>
<th>Wilks lambda</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>.064</td>
<td>.245</td>
<td>.939</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

b  = standardized discriminant function coefficient

s  = within-groups structure coefficient

B_c = unstandardized discriminant function coefficient

R_ = canonical correlation coefficient
Table 8 shows the numbers of correct and incorrect classifications. Only the cases with complete information for all predictor variables were included in the classification results table. The substantive significance of percentage of cases classified correctly was determined using the Tau statistic, which represents a 30.44% improvement over chance alone, making the Tau statistic significant (Barrick & Warmbrod, 1988). Approximately 65% of the cases were classified correctly.

Table 8

<table>
<thead>
<tr>
<th>Actual Group</th>
<th>No. of Cases</th>
<th>Predicted Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Non-Success</td>
</tr>
<tr>
<td>Non-Success</td>
<td>192</td>
<td>119</td>
</tr>
<tr>
<td></td>
<td></td>
<td>62.0%</td>
</tr>
<tr>
<td>Success</td>
<td>751</td>
<td>255</td>
</tr>
<tr>
<td></td>
<td></td>
<td>34.0%</td>
</tr>
</tbody>
</table>

Percent of cases correctly classified: 65.22%

Objective 3

The purpose of Objective 3 was to determine if a model exists that will allow the classification of subjects in
terms of their success in Science 1020 on the following variables:

a. Whether or not the student completed the prerequisite (Science 1010 with a grade of "C" or higher);
b. Age of student;
c. ACT composite score;
d. ACT science score;
e. ACT reading score;
f. ACT math score;
g. Part-time or full-time status at time course was taken;
h. Type of high school diploma (traditional or GED);
i. If a traditional graduate of an in-state school, was it public or non-public?
j. Gender.

Exactly 402 students were included in the census of those who took Science 1020. Approximately 62% of these students were female and 38% were male. The ages of the students ranged from 18 to 42 years, with a mean age of 20.47 years and standard deviation of 3.14 years. Approximately 91% of the students fell in the 18-21 range. Of the students enrolled, 94% were enrolled full-time, while 6% were part-time. About 90% of the students had a public school education, and 80% of the students enrolled had met the prerequisite requirement of Science 1010.
Of the 402 students included in the census, 359 students were included in the analysis; 43 were excluded because they were missing at least one discriminating factor. Of these 359 students, 246 (69%) were successful in the course (they received grades “A,” “B,” “C,” or “S”), and 113 (31%) were unsuccessful (they received grades “D,” “F” or “W”). Descriptive statistics are provided in Table 9 in regard to each of the groups (success and no success) and predictor variables tested in the discriminant model. According to the data, significant differences were found among the means for both groups on all predictor variables except enrollment status and the age of the student at the time the course was taken, which indicated that the groups were equal. Also, there were no GED students enrolled in this course, as indicated by the constant factor for this variable. An a priori level of significance of .05 was used in determining the results.

To determine whether the covariance matrices were equal, Box’s M was used. Based upon the results of the Box M (50.29, p .00), the null hypothesis of equal covariance matrices could not be rejected. The assumption of equal covariance was violated, which may lead to a distortion in canonical discriminant function and the classification equation. Thus, it may not provide maximum separation between the groups. Box M is sensitive to mild departures from multivariate normality as well as normal sample sizes. For this reason, the results in this study would be affected
due to these violations of multivariate normality (SPSS, 1997).

To more accurately interpret the significance of the model, an interpretation of the canonical coefficients and Eigenvalues must be considered to explain the amount of group variation. An a priori level of significance of .05 was used in determining the results.

Table 9

Means, Standard Deviations, and F-ratios Between Groups for Discriminating Variables for Science 1020

<table>
<thead>
<tr>
<th>Discriminating Variable</th>
<th>Group</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Success (n=246)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-Success (n=113)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>m/ sd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT Composite</td>
<td>20.52</td>
<td>18.95</td>
<td>13.80</td>
</tr>
<tr>
<td></td>
<td>1.88</td>
<td>3.32</td>
<td></td>
</tr>
<tr>
<td>ACT Science</td>
<td>20.51</td>
<td>19.42</td>
<td>7.58</td>
</tr>
<tr>
<td></td>
<td>3.68</td>
<td>2.92</td>
<td></td>
</tr>
<tr>
<td>ACT Reading</td>
<td>21.36</td>
<td>19.87</td>
<td>5.90</td>
</tr>
<tr>
<td></td>
<td>5.66</td>
<td>4.82</td>
<td></td>
</tr>
<tr>
<td>ACT Math</td>
<td>19.33</td>
<td>17.69</td>
<td>16.78</td>
</tr>
<tr>
<td></td>
<td>3.87</td>
<td>3.05</td>
<td></td>
</tr>
<tr>
<td>Grade in SCI 1010</td>
<td>0.74</td>
<td>0.51</td>
<td>18.77</td>
</tr>
<tr>
<td></td>
<td>0.44</td>
<td>0.50</td>
<td></td>
</tr>
</tbody>
</table>

(table con’d.)
<table>
<thead>
<tr>
<th>Variable</th>
<th>19.98</th>
<th>20.32</th>
<th>2.14</th>
<th>.14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of student</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full- or part-time</td>
<td>0.95</td>
<td>0.95</td>
<td>0.03</td>
<td>.86</td>
</tr>
<tr>
<td>Public/Private</td>
<td>0.87</td>
<td>0.95</td>
<td>4.89</td>
<td>.03</td>
</tr>
<tr>
<td>High school</td>
<td>0.34</td>
<td>0.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of HS diploma</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.33</td>
<td>0.48</td>
<td>7.40</td>
<td>.01</td>
</tr>
</tbody>
</table>

*1=Pass, 0=Fail

*1=Full-time, 0=Part-time

*1=Public, 0/Private

*1=Traditional, 0=GED

*Constant

*1=Male, 0=Female

Table 10 illustrates the correlations between the discriminating variables used in the study. The strength of the correlations was interpreted using Hinkle, Wiersma and Jurs' scale (1988, p. 118). All of the variables showed little or no correlation either in the positive or negative direction except ACT composite scores and ACT subtest scores. Moderate positive correlations existed between the variables ACT Reading and ACT Math ($r = .56$), and ACT Science and ACT Math ($r = .62$). High positive correlations existed between ACT Science and ACT Composite ($r = .86$), and ACT
Reading and ACT Composite ($r = .90$). As in Objective 2, this is a understandable relationship since ACT Composite scores are computed using a combination of ACT subtest scores.

Table 10

**Pooled Within-Groups Correlation Matrix for Science 1020: Discriminating Variables (N = 359)**

<table>
<thead>
<tr>
<th></th>
<th>SCI</th>
<th>Gen</th>
<th>Age</th>
<th>ACTC</th>
<th>ACTS</th>
<th>ACTR</th>
<th>ACTM</th>
<th>Status</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1010</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>-0.17</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.09</td>
<td>0.01</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTC</td>
<td>0.22</td>
<td>0.09</td>
<td>0.23</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTS</td>
<td>0.18</td>
<td>0.00</td>
<td>-0.15</td>
<td>0.86</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTR</td>
<td>0.19</td>
<td>0.09</td>
<td>-0.19</td>
<td>0.90</td>
<td>0.74</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTM</td>
<td>0.22</td>
<td>0.05</td>
<td>-0.32</td>
<td>0.77</td>
<td>0.62</td>
<td>0.56</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>0.08</td>
<td>0.10</td>
<td>-0.06</td>
<td>0.11</td>
<td>0.11</td>
<td>0.09</td>
<td>0.14</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Sch.</td>
<td>0.03</td>
<td>-0.05</td>
<td>0.08</td>
<td>0.01</td>
<td>0.01</td>
<td>0.05</td>
<td>0.10</td>
<td>-0.04</td>
<td>1.00</td>
</tr>
<tr>
<td>Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 11 indicates that the grade in Science 1010, gender, ACT Math score and school type (public/private) had high correlations with the discriminant function. Group means were different based on the lambda shown in Table 11. Based on these findings at the .05 significance level, the researcher would reject the null hypothesis that the
predictor variables grade in Science 1010, gender, ACT Math score and school type would not discriminate between student success in Science 1020, as defined as a final grade of "C" or better, and no success (.901, p<.05). However, the researcher would fail to reject the null hypothesis based on the other predictor variables tested.

Although the Wilks lambda indicated that the function is statistically significant in its ability to predict, the actual association between the scores and groups is a low positive correlation (R = .313). Furthermore, the Eigenvalue indicates that only 10.9% of the total variation between the groups can be explained by the canonical variables.

Table 11
Summary Data for Stepwise Discriminant Analysis (Science 1020) (N = 359)

<table>
<thead>
<tr>
<th>Variables</th>
<th>b</th>
<th>s</th>
<th>R</th>
<th>Group</th>
<th>Centroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade in SCI 1010</td>
<td>.52</td>
<td>.69</td>
<td>1.14</td>
<td>Success</td>
<td>.22</td>
</tr>
<tr>
<td>ACT Math</td>
<td>.53</td>
<td>.66</td>
<td>.15</td>
<td>Non-success</td>
<td>-.49</td>
</tr>
<tr>
<td>Gender</td>
<td>-.39</td>
<td>-.44</td>
<td>-.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School Type</td>
<td>.34</td>
<td>.35</td>
<td>-1.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B₀ (constant)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.22</td>
</tr>
</tbody>
</table>

(table con’d.)

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Table 12 shows the numbers of correct and incorrect classifications. Only the cases with complete information for all predictor variables were included in the classification results table. Approximately 68% of the cases were classified correctly. The substantive significance of percentage of cases classified correctly was determined using the Tau statistic, which represents a 35% improvement over chance alone, making the Tau statistic significant (Barrick & Warmbrod, 1988). The findings were an improvement over chance or randomness that could be obtained on these findings using the predictive formula.

Table 12

Classification of Cases for Science 1020

<table>
<thead>
<tr>
<th>Actual Group</th>
<th>No. of Cases</th>
<th>Predicted Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Non-Success</td>
</tr>
<tr>
<td>Non-Success</td>
<td>114</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td></td>
<td>64.9%</td>
</tr>
</tbody>
</table>

(table con’d.)
Objective 4

The purpose of Objective 4 was to determine if a model exists that will allow the classification of subjects in terms of their success in Science 1010 on the following variables:

a. Whether or not the student completed Mathematics 1020 with a grade of "C" or higher;

b. Age of student;

c. ACT composite score;

d. ACT science score;

e. ACT reading score;

f. ACT math score;

g. Part-time or full-time status at time course was taken;

h. Type of high school diploma (traditional or GED);

i. If a traditional graduate of an in-state school, was it public or non-public?

j. Gender.

Exactly 547 students were included in the census of those who took Science 1010. Approximately 60% of these
students were female and 40% were male. The ages of the students ranged from 18 to 41, with a mean age of 19.58 years and standard deviation of 2.34 years. Approximately 95% of the students fell in the 18-21 range. Of the students enrolled, approximately 97% were enrolled full-time, while 3% were part-time. About 89% of the students had a public school education, and 89% of the students enrolled had completed Math 1020 prior to scheduling this course.

Of the 547 students included in the census, 496 students were included in the analysis; 51 were excluded because they were missing at least one discriminating factor. Of this number, 330 (67%) were successful in the course (they received grades “A,” “B,” “C,” or “S”), and 166 (33%) were unsuccessful (they received grades “D,” “F” or “W”). Descriptive statistics are provided in Table 13 in regard to each of the groups (success and no success). According to the data, significant differences were found among the means for both groups on all variables except enrollment status and school type. Also, there were no GED students enrolled in this course, as indicated by the constant factor for this variable.

Based upon the results of the Box M (23.95, p.00), the assumption of equal covariance was violated, which may lead to a distortion in canonical discriminant function and the classification equation. Thus, it may not provide maximum separation between the groups. Thus, it may not provide maximum separation between the groups. To more accurately
interpret the significance of the model, an interpretation of the canonical coefficients and Eigenvalues must be considered to explain the amount of group variation. An a priori level of significance of .05 was used in determining the results.

Table 13

Means, Standard Deviations, and F-ratios Between Groups for Discriminating Variables for Science 1010

<table>
<thead>
<tr>
<th>Discriminating Variable</th>
<th>Group</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Success (n=330)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-Success (n=166)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>m/sd</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m/sd</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT Composite</td>
<td>20.55</td>
<td>17.68</td>
<td>74.49</td>
</tr>
<tr>
<td></td>
<td>3.58</td>
<td>3.32</td>
<td></td>
</tr>
<tr>
<td>ACT Science</td>
<td>26.61</td>
<td>18.27</td>
<td>53.03</td>
</tr>
<tr>
<td></td>
<td>3.53</td>
<td>23.06</td>
<td></td>
</tr>
<tr>
<td>ACT Reading</td>
<td>21.64</td>
<td>13.33</td>
<td>44.67</td>
</tr>
<tr>
<td></td>
<td>5.12</td>
<td>5.13</td>
<td></td>
</tr>
<tr>
<td>ACT Math</td>
<td>19.35</td>
<td>16.51</td>
<td>84.99</td>
</tr>
<tr>
<td></td>
<td>3.47</td>
<td>2.72</td>
<td></td>
</tr>
<tr>
<td>Grade in MATH 1020‡</td>
<td>0.78</td>
<td>0.26</td>
<td>163.19</td>
</tr>
<tr>
<td></td>
<td>0.42</td>
<td>0.44</td>
<td></td>
</tr>
<tr>
<td>Age of student</td>
<td>19.21</td>
<td>19.75</td>
<td>12.42</td>
</tr>
<tr>
<td></td>
<td>1.55</td>
<td>1.74</td>
<td></td>
</tr>
</tbody>
</table>

(table con'd.)
Table 14 illustrates the correlations between the discriminating variables used in the study. The strength of the correlations was interpreted using Hinkle, Wiersma and Jurs' scale (1988, p. 118). All of the variables showed little or no correlation in either the positive or negative direction except ACT subtest scores and ACT Composite scores. Moderate positive correlations existed between the variables ACT Math and ACT Science \((r = .61)\), and ACT Math and ACT Reading \((r = .51)\). High positive correlations existed between ACT Math and ACT Composite \((r = .74)\), ACT Science and ACT Composite \((r = .86)\), and ACT Reading and ACT Composite \((r = .90)\). As in Objective 2 and 3, this is a understandable
relationship since ACT Composite scores are computed using a combination of ACT subtest scores.

Table 14

**Pooled Within-Groups Correlation Matrix for Science 1010: Discriminating Variables (N = 496)**

<table>
<thead>
<tr>
<th></th>
<th>Math</th>
<th>Age</th>
<th>Gender</th>
<th>ACTC</th>
<th>ACTS</th>
<th>ACTR</th>
<th>ACTM</th>
<th>Status</th>
<th>Sch.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1020</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>.03</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-.06</td>
<td>.07</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTC</td>
<td>.17</td>
<td>-.22</td>
<td>-.09</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTS</td>
<td>-.16</td>
<td>-.15</td>
<td>.03</td>
<td>.86</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTR</td>
<td>.10</td>
<td>-.16</td>
<td>-.10</td>
<td>.89</td>
<td>.72</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTM</td>
<td>.19</td>
<td>-.27</td>
<td>.06</td>
<td>.74</td>
<td>.61</td>
<td>.51</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>.02</td>
<td>.19</td>
<td>.01</td>
<td>.03</td>
<td>.07</td>
<td>-.03</td>
<td>.08</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sch.</td>
<td>.00</td>
<td>.05</td>
<td>-.02</td>
<td>-.05</td>
<td>-.04</td>
<td>-.04</td>
<td>-.07</td>
<td>.01</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 15 indicates that Math 1020 grade, ACT Math score and gender had high correlations with the discriminant function. Group means were different based on the lambda shown in Table 15. Based on these findings the researcher would reject the null hypothesis that the variables Math 1020 grade, gender and ACT Math score would not discriminate between student success in Mathematics 1020, as defined as a
final grade of "C" or better, and no success (.688, p<.05). However, the researcher would fail to reject the null hypothesis based on the other predictor variables tested.

Although the Wilks lambda indicates that the function is statistically significant in its ability to predict, the actual association between the scores and groups is a moderate positive correlation (R = .559). Furthermore, the Eigenvalue indicates that only 45.4% of the total variation between the groups can be explained.

Table 15

Summary Data for Stepwise Discriminant Analysis (Science 1010) (N = 496)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Discriminant Function 1</th>
<th>Group</th>
<th>Centroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade in Math 1020</td>
<td>.74 .05 1.75</td>
<td>Success</td>
<td>.48</td>
</tr>
<tr>
<td>ACT Math</td>
<td>.49 .62 .15</td>
<td>Non-success</td>
<td>-.95</td>
</tr>
<tr>
<td>Gender</td>
<td>-.25 -.26 -.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B0 (constant)</td>
<td>-3 .62</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>R</th>
<th>Wilks lambda</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>.454</td>
<td>.559</td>
<td>.688</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

b = standardized discriminant function coefficient
s = within-groups structure coefficient
B0 = unstandardized discriminant function coefficient
Rc = canonical correlation coefficient
Table 16 shows the numbers of correct and incorrect classifications of the groups "success" and "non success". Only the cases with complete information for all predictor variables were included in the classification results table. Approximately 78% of the cases were classified correctly. The substantive significance of percentage of cases classified correctly was determined using the Tau statistic. This procedure determines the proportion of cases correctly classified more than would have been expected by chance. The findings were an improvement over chance or randomness that could be obtained on these groups using the predictive formula (Barrick & Warmbrod, 1988).

Table 16

<table>
<thead>
<tr>
<th>Actual Group</th>
<th>No. of Cases</th>
<th>Predicted Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Non-Success</td>
</tr>
<tr>
<td>Non-Success</td>
<td>167</td>
<td>127</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>76.0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24.0%</td>
</tr>
<tr>
<td>Success</td>
<td>330</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td></td>
<td>260</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21.2%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>78.8%</td>
</tr>
</tbody>
</table>

Percent of cases correctly classified: 77.87%
CHAPTER V
SUMMARY, RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to determine if a specific set of factors could be used to predict whether a student would successfully complete various courses in the general education curriculum. Information gained from this study could be utilized by faculty and advisors to increase student potential for success in courses in the general education curriculum. Specifically, discriminant analysis was used to answer questions based on the following four objectives:

Objective 1. To determine if a model exists that would increase the researcher's ability to accurately classify subjects on the variable of whether or not they were successful in Mathematics 1020, as defined as a final grade of "C" or better, from the following measures.

a. Whether or not the student completed the prerequisite requirement (minimum score of 19 on the Math ACT or grade of "C" or better in Math 0920);

b. Age of student at the time the course was pursued;

c. ACT composite score;

d. Part-time or full-time status at time course was taken;

e. Type of high school diploma (traditional or GED);
f. If a traditional graduate of an in-state school, was it public or non-public?

g. Gender.

Objective 2. To determine if a model exists that would increase the researcher's ability to accurately classify subjects on the variable of whether or not they were successful in English 1010, as determined by a final grade of "C" or better, from the following measures.

a. Whether or not the student completed the prerequisite requirement (minimum score of 18 on the English ACT or grade of "C" or better in English 0920);

b. Age of student at time course was taken;

c. ACT composite score;

d. ACT reading score;

e. Part-time or full-time status at time course was taken;

f. If a traditional graduate of an in-state school, was it public or non-public?

g. Gender;

h. Type of high school diploma (traditional or GED).

Objective 3. To determine if a model exists that would increase the researcher's ability to accurately classify subjects on the variable of whether or not they were successful in Science 1020, as determined by a final grade of "C" or better, from the following measures.
a. Whether or not the student completed the prerequisite (Science 1010 with a grade of "C" or higher);
b. Age of student;
c. ACT composite score;
d. ACT science score;
e. ACT reading score;
f. ACT math score;
g. Part-time or full-time status at time course was taken;
h. Type of high school diploma (traditional or GED);
i. If a traditional graduate of an in-state school, was it public or non-public?
j. Gender.

Objective 4. To determine if a model exists that would increase the researcher's ability to accurately classify subjects on the variable of whether or not they were successful in Science 1010, as determined by a final grade of "C" or better, from the following measures.

a. Whether or not the student completed Mathematics 1020 with a grade of "C" or higher;
b. Age of student;
c. ACT composite score;
d. ACT science score;
e. ACT reading score;
f. ACT math score;
g. Part-time or full-time status at time course was taken;

h. Type of high school diploma (traditional or GED);

i. If a traditional graduate of an in-state school, was it public or non-public?

j. Gender.

Population and sample. The researcher defined the target population as all first-time freshmen (those having earned no college hours prior to entering college). The accessible population for this study was defined as those students who were first-time freshmen at Northwestern State University in the fall semester of 1995. The sample for the study was first-time freshmen who were enrolled in Mathematics 1020, English 1010, Science 1020 and Science 1010 in the Fall 1995, Spring 1996, Summer 1996, Fall 1996, Spring 1997, Summer 1997 and Fall 1997 semesters.

Data collection and analysis. All data for the study were collected from the Student Information System (SIS) at Northwestern State University. Course grades for all students completing the four identified courses were obtained from the SIS; course grades of “A,” “B,” “C,” “D,” “F,” “S” or W were used to classify students as successful (those with a grade of “C” or better), and unsuccessful (those with a grade of “D,” “F,” or “W”). Other demographic and achievement data such as test scores were also obtained
from first-time freshman students in the fall semester of 1995.

Data were analyzed for descriptive statistics appropriate for describing the subjects with regard to the predictor variables defined in the objectives. They also were analyzed for the development of predictor equations for student outcomes in four general education courses at Northwestern State University.

Results

The purpose of this study was to determine if a model exists that would allow the classification of subjects in terms of their success in four general education courses: Mathematics 1020, English 1010, Science 1020 and Science 1010 based on several variables. Overall, very few significant predictor variables were found. Results of these analyses are broken down by objective.

Objective 1. Discriminant analysis found that ACT Composite scores and gender were the only significant predictors of success in Mathematics 1020 based on the seven variables tested at the .05 significance level. The results did support, however, that success in mathematics and science courses, as well as liberal arts courses is sometimes gender-related (Bridgeman & Lewis, 1996; Lee & Burkam, 1997; Thorndike, 1992). Results of this study supported the literature that males tend to perform better in mathematics-related courses than females. Overall, the model classified approximately 64% of the 854 students
taking Mathematics 1020 correctly, which indicates that the model was a weak predictor for success or non-success. It did, however, reinforce prior findings that ACT scores are an accurate placement indicator.

**Objective 2.** Discriminant analysis found that gender and ACT composite scores were the only significant predictors of success in English 1010 based on the eight variables tested. There was no statistical evidence, however, showing whether completion of the currently required prerequisite for English 1010 had any effect on success in English 1010. As in Objective 1, the results did support that success in liberal arts courses is sometimes gender-related (Bridgeman & Lewis, 1996; Lee & Burkam, 1997; Thorndike, 1992), and results of this study found that females were more successful in English 1010 than males. The model classified approximately 65% of the 943 students correctly, indicating that the model was a weak predictor.

**Objective 3.** Discriminant analysis found that the grade earned in Science 1010, gender, ACT Math scores and school type (public or private) were the only significant predictors of success in Science 1020 based on the nine variables tested. These results did, however, support the need for the Science 1010 prerequisite currently required for admission into Science 1020. As in objectives 1 and 2, the results did support that success in math/science courses is sometimes gender-related. However, contradictory to the literature, results of this analysis found that females were
more successful in Science 1020 than were males. The model classified approximately 68% of the 360 students correctly, indicating that the model was a weak predictor, as in the first two objectives. However, it suggested that one’s high school education may play an important role in success in the course.

**Objective 4.** Discriminant analysis found that the grade earned in Math 1020, gender and ACT Math scores were the only significant predictors of success in Science 1010 based on the nine variables tested. Of the four courses tested using this discriminant model, this course was the only one where success in another course played any predictor role in the course used as part of the analysis. This finding supports the current feeling among Northwestern science faculty that students should have successfully completed Math 1020 before taking Science 1010. As in the above objectives, the results did support that success in math/science courses is sometimes gender-related. However, contradictory to the literature, results of this analysis found that females were more successful in the course than were males. The model classified approximately 77% of the 497 students correctly, indicating that the model was an adequate predictor of success.

**Conclusions**

The purpose of this study was to determine if a model existed that would allow the classification of subjects in terms of their success in four courses in the general
education curriculum at Northwestern State University. Very few statistically significant relationships were found between various predictor variables and student success/failure. The study, however, did not validate the need for current prerequisites for the first college English and math courses; it did validate a current prerequisite for an introductory biology course and the belief that a prerequisite should be imposed on a basic physical science course.

Results of the study suggested that the current developmental education may not be providing the necessary preparation needed for successful completion of the beginning English and math courses, as evidenced by its lack of predictive ability found by the discriminant model used. The findings also indicated that school type (public or private) had a significant effect on student success in the science area.

Student gender was also found to have a significant effect on student success, particularly in the math and science areas. The study's findings contradicted prior findings that suggested that males were more successful in the math/science areas, and females were more successful in the liberal arts area. (Bridgeman & Lewis, 1996; Lee & Burkam, 1996; Thorndike 1992). This finding may exist because of the alternative teaching methods used in these courses that tend to alleviate anxiety toward the subject matter (Lee & Burkam, 1996).
The models confirmed prior findings that ACT subscores were a valid predictor of success (Keeley, et al., 1994); also, the findings suggest that ACT composite scores are strong predictors of success as well.

**Recommendations**

Five recommendations were made based on the results, conclusions, ideas and suggestions arising out of this study.

**Recommendation 1: Math 1020 and English 1010.** Based on the findings of the models that indicated that only ACT Composite scores and gender were significant predictors of success in the first math and English courses, university officials should investigate the validity of using the developmental education program and/or ACT minimum scores as prerequisites in both areas as to their validity in preparing students for entry into the traditional college mathematics and English curricula.

As a part of this investigation, the administration should not only look at the content of the curriculum but also at the methodology used in teaching the material. According to Lee & Burkam (1996) and Thorndike (1992), gender anxiety toward mathematics achievement comes mainly from a fear of the unknown. These researchers support a more “hands-on” approach to the teaching of math and English, including laboratory assignments, computer instruction, and problem-solving based on life’s experience. Interestingly, teachers in the math and English courses
studied do incorporate alternative methods of instruction into their classes; students are taught writing by computer in English, and math teachers use graphing calculators to relay concepts. These alternative methods may account for the success rates for females in English. With further exploration, the same may eventually hold true for math.

Another area for evaluation as to its validity as a predictor is the minimum ACT scores incorporated as prerequisites for the math and English course. Based upon the results of this study, the cutoff scores may need to be reevaluated to include a weighted ACT Composite score and an ACT math score rather than relying on the subscale alone. For instance, a student may score moderately low in math but very high on the other subtests, which gives him or her a lower Composite score. The math score alone may place the student in developmental math; however, the student may possess the ability to succeed even though the math score does not indicate such. Providing a weighted scale would take into account this instance and maybe provide the benefit of the doubt. Based on the findings of the model, such may be the case.

Instructors in these areas should continue to take a more in-depth look at their rosters at the beginning of each semester, not only at ACT scores of the students, but at their gender. These two variables may give them insight as to how to prepare for the upcoming course. Interestingly, this finding supports one of the main foundations of adult
education: to take students from THEIR starting point and work forward.

**Recommendation 2: Science 1020.** The discriminant model supported the prerequisite for a "C" or better in Science 1010 before enrolling in Science 1020. Also, as stated in Recommendation One, student gender should be taken into consideration when planning lessons/methodology. Student success may continue to increase if a different approach to teaching continues to be incorporated in the curriculum. Even though students complain that one class is not related to another, there must be a commonality in the two courses; for example, a student probably needs a firm understanding of molecular development that he or she learned in Science 1010 for a complete understanding of cells that is covered in Science 1020.

The model used for Science 1020 also presented another significant predictor of success: school type. If one's high school education, whether public or private, plays an important role in student success in this college course, instructors may want to explore exactly what these students were taught prior to enrolling in the course. Even though the State Department of Education mandates minimum standards in its core curriculum, which includes physical science and biology, there may be differences in the specific courses in the public/private schools. This may come from money allocated to the different programs, the types of teachers, the number of students actually in the classes, and the

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variety of courses taught in those areas. For example, a small public school in rural St. Mary Parish may only offer the mandated science courses with minimum financial support for outside experiences. A larger, private school, such as Loyola College Preparatory Academy in Shreveport, may offer those minimum courses, but add others such as Chemistry II or Human Anatomy, both taught by adjunct college faculty who bring with them a vast amount of experiences. Students from these two school settings come to the college classroom with vast, very different experiences, which may help or hurt them in the long run. Even though this predictor variable was found significant only in Science 1020, further investigation in other courses such as English 1010 and Math 1020 may indicate the same deficiency/strength in their student population.

Recommendation 3: Science 1010. The discriminant model used for Science 1010 again found that ACT Math and gender were predictors of success in the tested course. However, the model also found that success in Mathematics 1020 was a predictor of success/failure in Science 1010, which is a philosophy of the physical science faculty at Northwestern. As a matter of fact, even though it is not currently a prerequisite, Science 1010 teachers will force students to drop the class if they have not completed Mathematics 1020.

Also of interest is the fact that gender was a significant factor in the prediction of student success.
Ironically, in Mathematics 1020, the gender "male" was most closely correlated to success, while in Science 1010, which includes a math component, the gender "female" was more closely correlated with success. Based on the research of Lee & Burkam (1996) and Thorndike (1992), could this difference be a question of perception of mathematical concepts as they are presented in Science 1010 as opposed to Mathematics 1020?

Even though Science 1010 is a physical science and Science 1020 is a biological science, mastery of basic physical science and mathematics skills must be an important component for students to be successful.

Based on this finding, university officials should evaluate the course content of each class and determine what common ground these courses have. For example, students calculating velocity in Science 1010 may need basic mathematics concepts mastered in Mathematics 1020, such as the graphical, numerical and analytical representations of these problems.

**Recommendation 4: Further research on predictors.** Even though the discriminant model was only a moderate predictor of success in certain courses in the general education curriculum at Northwestern, it was able to eliminate several variables as predictors of success. However, since the models were only about 60-75% accurate in determining those predictors that could affect a student’s success in college, there must be other variables that could affect success and
ultimately increase the accuracy of this model. For example, one's high school grade point average or type of high school curriculum may be an indicator.

There is another arena of variables that may play an important role in predicting success, including extracurricular involvement, amount of financial aid received, educational background of parents, family support, whether students are working while attending college, and their family responsibilities while attending college. Even though these are only a few of the several variables that have not been tested, they may give advisors and instructors better insight to attributes that students bring with them to the classroom. This could ultimately increase the success rate in these and other courses as well as the already declining enrollments in Louisiana universities.

Recommendation 5: Further research on models. Even though this study suggested that the model was only a moderately accurate predictor of success in four general education courses, it did give insight into variables that may affect student success/failure in his or her first year of college. There is no reason that this model could not be used for predicting success in other types of classes including major-related courses in all majors. University advisors in majors with low attrition rates may use this or a revised version of the discriminant model to identify potential students needing special attention prior to not succeeding in the major course or any other course.
Too many schools are using assessment instruments that prove nothing for the school. Northwestern and Southeastern Louisiana University are two schools that admitted that their instruments were not providing them with any usable information and have therefore abandoned them. An interesting finding was that even though SACS requires its accredited institutions to have an assessment plan in place, only one school interviewed as part of this study had one--Southwest Texas State University. How are these schools sure that their programs of study are actually meeting their goals and expectations?

Recommendation 6: Further research on retention. Even though this study did not validate success in developmental education programs as a predictor of success in mathematics or English, further research in the area of retention could give more insight into why the success rate in these courses is low. Southeastern Louisiana University spends a great deal of its time tracking students who have successfully completed their developmental education sequence to determine if this success continues throughout their students' college career. The main goal of Southeastern's developmental programs is to boost students' confidence and self esteem in specific subject areas; the university feels this confidence will enable students to be successful in future courses. This concept is supported in the literature (Edge & Friedberg, 1984; Haywood, 1976); however, very few
schools interviewed as part of this study admitted to this type of assessment.

Summary

This study determined that a model could be developed that would provide a moderately accurate classification of students in terms of their success in four general education classes at Northwestern State University. Even though it found very few significant predictor variables, it did add to the existing body of knowledge in the area of student attrition, and it provided enough comprehensive data to show what various types of universities are doing as part of their assessment mandates. It is hoped that continuous research in this area will add to those already significant predictors and eventually provide an empirical evaluation of a student’s potential for success in all areas of education.
REFERENCES


Barrick, R., & Warmbrod, J. R. (1988, December). Discriminant analysis. AYA Presession. Department of Agriculture, Ohio State University, Columbus, Ohio.


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APPENDIX A

BOARD OF REGENTS GENERAL EDUCATION REQUIREMENTS
IN ASSOCIATE AND BACCALAUREATE PROGRAMS

<table>
<thead>
<tr>
<th>Subject</th>
<th>Required*</th>
<th>Suggested*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGLISH</td>
<td>6 hours (composition)</td>
<td>6 hours (composition)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 hours (literature)</td>
</tr>
<tr>
<td>MATHEMATICS</td>
<td>6 hours</td>
<td>6 hours</td>
</tr>
<tr>
<td>COMPUTER LITERACY</td>
<td>(requirements to be determined by each campus)</td>
<td></td>
</tr>
<tr>
<td>NATURAL SCIENCES</td>
<td>9 hours</td>
<td>11 hours (to be met by taking courses for majors; to include laboratory courses)</td>
</tr>
<tr>
<td>ARTS</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>HUMANITIES**</td>
<td>9 hours (to include at least 3 hours at sophomore level or above)</td>
<td>15 hours (to include at least 3 hours at sophomore level or above; at least 6 hours of a foreign language above the introductory level)***</td>
</tr>
<tr>
<td>SOCIAL STUDIES</td>
<td>6 hours</td>
<td>6 hours</td>
</tr>
<tr>
<td>TOTAL HOURS</td>
<td>39 hours</td>
<td>50 hours</td>
</tr>
</tbody>
</table>

*Students may obtain equivalent credit for required or suggested coursework in accordance with policies and procedures of the college or university, e.g., for advanced placement tests of the College-Level Examination Program (CLEP).

**The Board recommends (but does not require) that each student take a course in philosophy/ethics to help clarify his/her moral values and choices.

***No credit hours earned in introductory foreign language coursework can be used to fulfill requirements for the Regents' Certificate of Excellence. Introductory coursework (or its equivalent) and advanced coursework must be in the same foreign language.
APPENDIX B

HISTORY OF CHANGES IN CORE AT NORTHWESTERN
1985-PRESENT

**Fall 1985**
Deleted Dance/PE activity courses; deleted ENGL 2030, 2040

**1987**
Deleted behavioral science component
PSYC 1010 moved to social science component
Core reduced from 47 hours to 44 hours
Deleted Math 1150, 1160

**Fall 1989**
Deleted SST 1510
Changed HED 1130 to 1110; 2020 to 1090

**Fall 1991**
Deleted CHEM 1031, 1041, 1071; added CHEM 1051, 1091
Added MATH 1110; added sequence of MATH 1100/2010; 1100/2100

**Fall 1992**
Added "Or one of the following in Health and Personal Fitness; only one HEC course can be used to satisfy core requirements"

**Fall 1993**
Changed MATH 1100 (5-6 hours)
Added MATH 1210 (6 hours)
Deleted MATH 1140
Deleted sequence MATH 1100/2010; 1100/2100
Deleted ECON 1500
Changed ECON 2020 to 2000

**Fall 1995**
Deleted MATH 1030; 1050
Deleted sequence MATH 1030/1060; 1030/1090; 1030/2010; 1050/1060
Added MATH 1020
Added sequence MATH 1020/1060; 1020/1090; 1020/2010
Changed HEC to FACS 1020, 1030, 1050
VITA

Steven Giles Horton was born on May 21, 1966, in New Iberia, Louisiana. He is the son of Allen and the late Betty Millspaugh Horton, who are retired teachers/administrators in the Louisiana school system. He graduated from New Iberia Senior High School in 1984, received bachelor’s degrees in journalism and secondary teaching from Northwestern State University in 1988, and the master’s degree in journalism from Louisiana State University in 1990.

His first teaching assignment was in Shreveport, Louisiana, as a computer literacy/English/journalism teacher at an urban high school. In 1989 he joined the faculty at Northwestern State University as a marketing teacher, and the next year began teaching journalism and also advised the student newspaper and yearbook. Since that time he has been promoted to assistant professor, has been named director of Alumni Affairs for the university, and has become active in many professional and civic organizations.

He is married to the former Emily Jo Matthews, a special education preschool teacher in the Natchitoches Parish school system. He is the father of two daughters, Madeline Elizabeth, age 3, and Mary Katherine, who turned age 1 the week this dissertation was completed.
DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Steven Giles Horton
Major Field: Vocational Education
Title of Dissertation: Using Academic and Demographic Variables to Predict Success in the General Education Curriculum

Approved:

\[\text{Signature}\]
Major Professor and Chairman

\[\text{Signature}\]
Dean of the Graduate School

EXAMINING COMMITTEE:

\[\text{Signature}\]

\[\text{Signature}\]

\[\text{Signature}\]

\[\text{Signature}\]

Date of Examination:

March 18, 1998

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